

ABSTRACTS

Mendoza, Argentina, 9 - 14 August 2009

IMC 10 10th International Mammalogical Congress



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Sunday, August 9th

The IFM Opening Conference

MY LIFE: ORIGIN AND EVOLUTION

Eviatar Nevo, Institute of Evolution, University of Haifa, Israel, nevo@research.haifa.ac.il

In this overview Nevo, 2009) I describe my interdisciplinary meandering in the science of evolutionary biology focusing on subterranean mole rats, *Spalax*, and on «Evolution Canyon». Born a naturalist, I enjoyed, loved, admired, and studied nature from childhood. Biology and geology, combined by necessity and chance, sculpted my first steps in scientific activity. My first encounter with blind subterranean mole rats occurred in 1948 when working in the vegetable garden of my kibbutz. I could hardly imagine then that they would become my major evolutionary model of adaptation and speciation throughout my life (Nevo, 1991, 1999; Nevo et al., 2001). Fascinated by geology, I joined the scientific army in geology in 1949, participating in mapping the Negev Desert, finding by chance the biggest world collection of Lower Cretaceous fossil frogs, which I chose as my PhD thesis (Nevo, 1968). In my first postdoc at the University of Texas (with Frank Blair), and afterwards at Harvard (with Ernst Mayr), I studied speciation and adaptation of the cricket frog genus *Acris* (Nevo, 1973a,b; Nevo and Capranica, 1985). In my second postdoc in the University of Chicago (with Richard Lewontin) and at the University of California at Berkeley, I studied speciation and adaptation of *Thomomys talpoides*, pocket gophers in the Rocky Mountains (Nevo et al., 1974). Returning to Israel in 1973, I continued my studies of genetic variation in natural populations (Nevo, 1978, 1988, 1998) and embarked upon pollution and genetic evolution of marine organisms (Nevo, 1986), and the origin and evolution of wild cereals (Nevo et al., 2002). A major exciting discovery was the occurrence of filamentous fungi in the Dead Sea, a potential genetic resource for revolutionizing saline agriculture (Nevo et al., 2003). My short-term work in Amazonia with Bill Hamilton (Nevo, 1993) was followed by the mutation study on Chernobyl human liquidators (Weinberg et al., 2001). My work climaxed in the research program of «Evolution Canyon» (EC), a microcosm of life's evolution (Nevo, 1995, 1997, 2001, 2006). My main life's creation is the Institute of Evolution I founded in 1973, which I directed till 2008, followed by the International Graduate Center of Evolution. What next? I feel that I am just starting now to confront the real challenge of my academic life: highlighting stress and evolution by translating environmental stress into genotypic and phenotypic realities of genomes, proteomes, metabolomes and phenomes in model organisms old and new from EC. These represent the most fascinating perspectives of nature, the origin and evolution of species from bacteria to humans and their extraordinary adaptations to the ever-changing stressful world.

REFERENCES

All cited references appear in Nevo full and subdivided lists of publications (subterranean mammals, wild cereals, pollution biology, and «Evolution Canyon» at <http://evolution.haifa.ac.il>, and in the book honoring my 80th birthday,

The Evolution of Eibi Nevo 2009 (Edited by Professors Abraham Korol and Solomon Wasser, ISBN 978-965-555-401-4)



Monday, August 10th

DISCOVERING THE MAMMALS OF ARGENTINA: BIODIVERSITY DATA ACROSS TIME AND SPACE

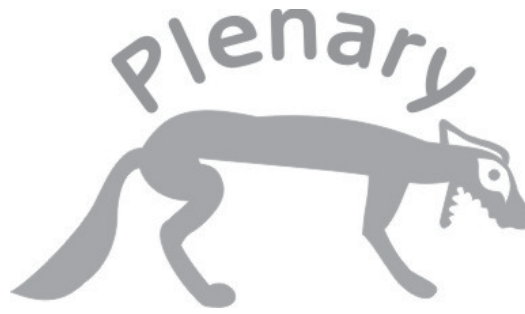
Michael A. Mares, Sam Noble Oklahoma Museum of Natural History University of Oklahoma, USA.

Argentina has been visited by mammalogists and collectors for centuries. As a result, mammal specimens from Argentina in museums are distributed worldwide. This makes specimen examination a daunting task. Specialists have not verified most specimens collected in Argentina. Most have not had their taxonomic status upgraded to meet the modern understanding of systematics. This means that there are many errors in mammal identifications in museum collections. This also means that the distribution of a particular species if data of unverified specimens are utilized may in fact be a confusing mix of localities for several similar (and sometimes not so similar) species. As part of a work in progress on the Mammals of Argentina, specimens from most of the world's collections have been examined (and all will eventually be examined). The pattern in which mammals were collected is interesting and far from random. Early collections were often based on personalities, personal situations, or happenstance. Perhaps 50,000 mammals from Argentina are in museums, and the great majority of specimens are in museums in Argentina. Most of the type specimens are in the Natural History Museum in London (as is true for most of the world's mammals) or are in several other museums that are among the oldest and largest in the world. In recent years there has been a change in the pattern of mammal collecting, with most being done by Argentine scientists. When all museum specimens are considered, far too few mammals have been collected in Argentina to provide a solid database on mammals and current collecting levels are neither extensive nor adequate to resolve this problem. This level of understanding of the fauna can only be obtained by a national survey of Argentina's mammals conducted by as many mammalogists as possible. Given the rate of habitat destruction within Argentina, the need to clarify the distribution and identity of the mammals of Argentina is urgent. More mammalogists need to spend significantly more time in the field collecting specimens and studying taxonomy, systematics, distribution, habitat selection, and other topics related to specimen acquisition. Without such foundational data on the mammals of Argentina, future research in ecology, behavior, physiology, and other disciplines will be greatly compromised.

AUSTRALIAN MAMMALS: LESSONS FROM A LONG HISTORY OF EXTINCTION

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Australia has a rich and unique mammal fauna, now sadly depleted. The decline of Australia's mammals took place in three waves: the extinction of Pleistocene megafauna soon after human arrival; the Holocene loss of the remaining large marsupial predators of mainland Australia; and the decline of medium-sized mammals since colonisation by Europeans. The causes of each of these extinctions has been controversial. I argue that they are historically connected, and that each was due to changes in predator-prey and predator-predator interactions. The impact of the first Aboriginal people was overwhelmingly that of a new predator, whose effect was to remove all mammals (large or small, but mostly large) that were ecologically and demographically susceptible to overharvest. This process was essentially identical to that which removed Pleistocene megafauna elsewhere on the globe. The Holocene loss of marsupial predators was primarily due to competition and direct predation by people. The recent losses of medium-sized mammals were caused by the exceptional impact of exotic mesopredators in a continent lacking large mammalian top predators. This history lesson tells us that constructive management of predation is crucial to effective conservation of mammalian biodiversity. In Australia we have the opportunity to use the dingo, along with habitat management designed to limit exposure of small mammals to mesopredators, to restore some mammal communities and prevent further losses.



Tuesday, August 11th

THE EVOLUTION OF MODULARITY IN THE MAMMALIAN SKULL: A TALE OF PATTERN STASIS AND MAGNITUDE CHANGE

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Morphological integration refers to the modular structuring of inter-trait relationships in an organism, which could bias the direction and rate of morphological change, either constraining or facilitating evolution along certain dimensions of the morphospace. Morphological integration in the skull of several mammalian orders was compared and the following questions addressed: Are there common patterns of inter-trait relationships? Are these patterns compatible with hypotheses based on shared development and function? Do morphological integration patterns and magnitudes vary in the same way across groups? Mammalian groups differ on how those patterns and magnitudes of integration constraint or facilitate evolutionary change? We digitized more than 3,500 specimens spanning 15 mammalian orders, estimated the correspondent pooled within-group correlation and variance/covariance matrices for 35 skull traits and compared those matrices among the orders. We also compared observed patterns of integration to theoretical expectations based on common development and function. Finally we use a simulation approach based on random selection vectors to study the evolutionary consequences of modularity. Our results point to a largely shared pattern of inter-trait correlations, implying that the mammalian skull diversity has been produced based on a common covariance structure. Yet, magnitudes varied markedly across groups. We found that larger magnitudes of integration were associated with a blur of the modules in the skull and to larger portions of the total variation explained by size, which in turn can exert a strong evolutionary constraint and less evolutionary flexibility. Conversely, lower overall magnitudes of integration were associated with clearer modules in the skull, to a smaller fraction of the total variation associated with size and, consequently, to weaker constraints and more evolutionary flexibility. Flexibility and constraints are, therefore, two sides of the same coin and we found them to be quite variable among mammals. Our data provide evidence that mammalian skull evolution can be viewed as marked by plastic changes in the magnitude of integration, with the modules themselves being more clearly marked in those lineages with lower overall magnitude of integration.

WITHER MACROECOLOGY?

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Macroecology has emerged as an important research program in ecology driven by the increasing recognition of the importance of a) regional factors in affecting local dynamics, b) availability of data at local regional and global scales, and c) the limitation of reductionist approaches. After its original definition, the term macroecology has taken different meanings. The two most commonly in use are (1) macroecology as the study of biodiversity patterns and processes at large spatial and long temporal scales, a sort of large-scale community ecology, and (2) macroecology as a sort of statistical mechanics, where the emphasis is on the statistical regularities that emerge from the study of ensembles or large collections of species, about which it tries to make the fewest possible assumptions, the same as with particles in statistical mechanics. The first definition I would argue, is more of the same old pattern driven ecology whose end result would be a massive collection of facts with empirical generalizations at its best, but without solid foundations in theory and first principles explanations. Macroecology under the second definition, however, is essentially interdisciplinary, focused on the identification of efficient and quantitative theories and able to explain as well as predict patterns in ecology and other systems. This second generation macroecology, will flourish and likely transform ecology, and the mammals practicing it.



Thursday, August 13th

EMERGING THREATS TO TROPICAL MAMMALS

William F. Laurance (Smithsonian Tropical Research Institute, Balboa, Panama; and James Cook University, Cairns, Australia)

I will highlight several new or growing threats to tropical mammals and their forest ecosystems. The drivers of tropical deforestation and key perils to biodiversity have changed in recent years. Industrial drivers of forest conversion—such as logging, large-scale soy and cattle farming, oil-palm plantations, and oil and gas development—have escalated in importance in recent decades, buoyed by increasing globalization, economic growth and rising standards of living in developing nations. Hunting is a growing threat because core areas of unhunted forest are shrinking, particularly as a result of industrial logging and expansion of transportation infrastructure. Climate change has emerged as a potentially serious threat for tropical mammals, especially for cool-adapted endemic species at higher elevations.

In general, old-growth forests are vanishing rapidly and being replaced by fragmented, secondary, and logged forests. We still know far too little about how such habitats will sustain tropical mammals and biodiversity. Much is also unknown about how climate change will affect tropical biota, or how this will interact with ongoing land-use change. Further, we have only the most rudimentary idea of how climate change will affect tropical precipitation—a crucial deficit given the acute sensitivity of tropical forests to drought and fire. Information on environmental synergisms is meager at best. I will highlight these and other issues on the horizon of conservation science, with a focus on their implications for tropical mammals.

AREOGRAPHY: GOSSIP ON THE PREHISTORY OF MACROECOLOGY

Eduardo H. Rapoport, Universidad Nacional del Comahue, rapoporteduardo@speedy.com.ar

Areography (do not confuse with aerography) is a term coined by Cain (1944) to name the study of geographic ranges or species' areas. Based on Hall and Kelson's (1959) range maps of 697 species of Central and North American mammals I measured the total area of each species and subspecies and began to understand the 'game' or 'strategy' of nature at large continental scale. The first results were presented at a meeting of the Asociación Venezolana para el Progreso de las Ciencias (ASOVAC – 1970).

The story, however, began a few years earlier when I bought the impressive work «Panbiogeography» by León Croizat, the Italian biogeographer. In the present article, I reveal some details about our discussions on biogeography, Croizat's opinions on authors from Darwin to contemporary American colleagues, and the use of statistics and mathematics in geographical ecology.



Friday, August 14th

NEW NEEDS FOR NATURE IN THE AGE OF GLOBAL WARMING

Anthony D. Barnosky, Department of Integrative Biology, University of California, Berkeley, CA 94720.

Even the best-case scenarios for global warming indicate that by the 2050s Earth will be hotter than it has been since humans evolved. Therefore within just a few decades climatic parameters will inevitably change within the boundaries of many existing natural areas that now support endangered mammal species, such that the reserves will no longer be climatically suitable to sustain the species and ecosystems they were set aside to protect. In the face of that reality, it is necessary to approach conservation biology in a new way, following a strategy I summarize as Keep, Connect, and Create. «Keep» refers to ensuring that the 12% of Earth's lands already protected as nature reserves are retained, and keeping on with successful strategies already underway, like «win-win ecology» and trading in ecosystem services. «Connect» requires acceleration of ongoing efforts to connect natural areas with habitat corridors, with the new twist that the corridor strategies now must take into account climatic zones that are likely to shift over decadal to century scales. «Create» is the critical new component, for it requires abandoning the «one-stop-shopping» conservation strategy of setting aside a big enough piece of land and assuming that tract will protect all three faces of nature: ecosystem services, biodiversity, and feelings of wilderness. In the age of global warming, we need to create a new concept of nature conservation that recognizes two kinds of separate-but-equal nature reserves. One class of reserves will have the explicit goal of saving species, and will consider such tools as assisted migration as part of the conservation arsenal. The other kind of reserve will have the explicit goal of preserving ecological interactions that proceed with minimal human manipulation, even though we lose some species within them.

HOW THE LEOPARD GOT HIS SPOTS: THE EVOLUTION OF COLOR AND COLOR PATTERN IN MAMMALS

Hopi E. Hoekstra, Department of Organismic and Evolutionary Biology and The Museum of Comparative Zoology, Harvard University

One of the most diverse traits among mammals is color pattern – from the stripes of zebra to the spots of leopards. However, most mammals use color to conceal themselves from either their prey or more often their predators. Such is the case for oldfield mice (*Peromyscus polionotus*), which show extreme color variation throughout their range in the southwestern U.S. While mice in the mainland have typical dark brown coats, mice that have recently colonized Florida's coastal dunes and barrier islands have evolved light color and a unique color pattern to blend into the brilliant white beaches. In this talk, I will present data — from both the lab and the field – in which we (1) experimentally demonstrate that coloration matters for survival in the wild and (2) identify the genes and developmental process responsible for color variation in these mice. Together, these results allow us to retrace the evolutionary path of color pattern change in the wild, teaching us new lessons about the evolution of diversity along the way.



Monday, August 10th

MAMMALIAN PHYLOGEOGRAPHY

CONVENER: **Jeremy Searle** (York: jbs3@york.ac.uk)

AN OVERVIEW OF MAMMALIAN PHYLOGEOGRAPHY IN NORTH AMERICA

Joseph A. Cook, Jason Malaney, Andrew Hope, Yadeeh Escobedo, Natalie Dawson, Stephen O. MacDonald
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87108

The structure of mammalian biomes in North America was heavily influenced by Quaternary glaciations and the evolutionary consequences of Pleistocene climatic changes are now being uncovered. Paleoeological and molecular findings in the field of phylogeography suggest a series of southern, northern and coastal refuges hosted temperate and arctic species during the last glacial maximum. We broadly summarize the current state of terrestrial mammalian phylogeography in North America and then focus on a series of boreal mammals that persisted in hypothesized glacial refugia. These refugia, characterized by heterogeneous landscapes, were key to generating intraspecific variation in a number of taxa. Expansion from distinct refugia into deglaciated regions led to the formation of hybrid, or in some cases, suture zones. We demonstrate the use of ecological niche modeling to produce a priori testable hypotheses related to the biogeographic history of boreal mammals. We then begin to use a variety of analytical approaches now available for phylogeographic analysis to better integrate coalescent theory and environmental variables. Finally we discuss future conservation considerations for boreal mammals in light of environmental alterations, impending climate change and habitat destruction.

PHYLOGEOGRAPHY AND SYSTEMATICS OF SELECTED SOUTH AMERICAN SIGMODONTINE RODENT SPECIES

Eduardo Palma and Enrique Rodriguez-Serrano

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We evaluated the phylogeographic and systematic relationships in three of the most common Chilean rodent species of the genus *Abrothrix* and *Oligoryzomys*, members of the Abrothrichini and Oryzomyine tribes, respectively. In addition, we included the second species of *Oligoryzomys* inhabiting Chile, *O. magellanicus*. *A. olivaceus*, *A. longipilis* and *O. longicaudatus* characterize for having a wide range of distribution in Chile. The latter two taxa range from the south of the Atacama Desert, southward to the Patagonia of Chile (and adjacent Argentina), whereas *A. olivaceus*, in addition to the former distributional range, extends from northernmost Chile in the Parinacota region. *O. magellanicus* is restricted to a couple of islands in the Strait of Magellan. When analyzing the phylogeography and systematic relationships of these taxa by using different molecular markers (e.g., *dloop*, cytochrome b) we found different evolutionary patterns along their distributional range. *O. longicaudatus*, characterize for showing a homogeneous pattern of genetic variation along its range, whereas the reverse is true for *A. olivaceus* and *A. longipilis*. In the intraspecific phylogeny for each of the latter two species we recovered several of the subspecies recognized for these taxa. *O. longicaudatus* constitutes a unique taxon between Atacama and Magallanes with the exception of some southern islands where *O. magellanicus* is found. Pleistocene biogeography suggests the occurrence of refuge areas in southern Chile where populations of *O. longicaudatus* remained, with further dispersal to both the Mediterranean and Patagonian ecoregions in Chile during

postglacial times. For *A. olivaceus* we detected a significant influence of paleoclimatic events particularly in southcentral Chile, whereas *A. longipilis* seems to demonstrate a more ancient history of differentiation. Finally, *O. magellanicus* constitutes a good species whose differentiation is a result of the insularity of the Patagonia triggered by Pleistocene events.

PLEISTOCENE SAVANNAH REFUGIA IN SOUTHERN AND EAST AFRICA: INSIGHTS FROM POPULATION GENETICS OF AFRICAN UNGULATES

Eline Lorenzen, and Peter Arctander

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Studying the genetics of natural populations across a landscape can yield important insights into the evolutionary forces that have shaped the patterns that we see today. Genetic data can be used to infer population phenomena such as demographic change, migration, hybridization, and speciation, enabling us to uncover the roles of geographical history and ecology in generating species diversity.

Data from multiple species with varying life histories are required to gain thorough insight into the historical biogeography of a region. The African savannah biome south of the Sahara harbours the greatest diversity of ungulates (hoofed mammals) on earth, and of the estimated 46 ungulate taxa, phylogeographic studies have been published on almost 20 species.

We present some of these studies—including data from zebra, buffalo, waterbuck, grant's gazelles, and kob antelope, and discuss their use in the inference of population demographic parameters. We focus on data from southern and East Africa, where most species show concordant patterns of genetic structuring between the two regions. Although the degree of structuring differs among taxa, these regional patterns of differentiation reflect the survival of populations in savannah refugia during the Pleistocene. In a comparative framework, the data indicate a long-standing savannah refuge in southern Africa, and a mosaic of refugia in East Africa, suggesting different climatic and evolutionary trajectories in the two regions.

THE INFLUENCE OF CLIMATIC OSCILLATIONS ON THE GENETIC STRUCTURE OF ASIAN BLACK BEARS IN JAPAN

Naoki Ohnishi, Reina Uno, Yasuyuki Ishibashi, Hidetoshi B. Tamate, and Toru Oi

Tohoku Research Center, Forestry and Forest Products Research Institute, Japan

The Asian black bear (*Ursus thibetanus*) inhabits two of main islands, Honshu and Shikoku, in Japan. To determine how climatic oscillations during the Quaternary Era affected the genetic structure of the black bear populations in Japan, we examined their phylogeographic relationships and compared their genetic structures. We analysed a ca. 700-bp sequence in the D-loop region of mitochondrial DNA collected from 589 bears in the present study and 108 bears in a previous study. We observed a total of 57 haplotypes and categorised them into three clusters (Eastern, Western, and Southern) based on the spatial distribution of the haplotypes. All but 2 of the 41 haplotypes in the Eastern cluster were distributed locally. Genetic diversity was generally low in northern Japan and high in central Japan. Demographic tests rejected the expansion model in northern populations. Haplotypes of the Western and Southern clusters were unique to local populations. We conclude that the extant genetic structure of the Asian black bear populations arose as follows: First, populations became small and genetic drift decreased genetic diversity in the northern area during the last glacial period, whereas large continuous populations existed in the southern part of central Japan. These patterns were essentially maintained until the present. In western and southern Japan, the effects of climatic oscillations were smaller, and thus, local structures were maintained.

‘LOCAL PHYLOGEOGRAPHY’: COLONISATION OF THE BRITISH ISLES BY SMALL MAMMALS

Jeremy Searle, Ross Barnett, Keith M. Dobney, Jeremy S. Herman, A. Rus Hoelzel, Eleanor P. Jones, Petr Kotlík, Allan D. McDevitt, Natália Martínková and R. Victor Rambau

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The colonisation history of the British Isles is a fascinating microcosm of continent-wide processes that makes an interesting target for phylogeographic analysis. The islands were mostly covered by ice at the Last Glacial Maximum, and there was a land connection with mainland Europe then. Some cold-hardy species were present in the unglaciated areas of ‘Britain’ and ‘Ireland’ at that time, and our phylogeographic studies suggest that at least one of them (the stoat, *Mustela erminea*) persisted from then

until now. Other species colonised once the ice disappeared, but by that stage there was only a land connection to Britain. Once again, the phylogeographic analysis of current British populations has allowed us to investigate the nature of those colonisation events which show surprising complexities. There was a final phase of colonisation involving humans. They introduced mammals throughout the British Isles, at different times. Our phylogeographic analyses help establish the source areas of those colonisations and the degree to which there were movements within the British Isles. In one case, the neolithic introduction of the common vole (*Microtus arvalis*) onto Orkney, we have used ancient DNA techniques to elucidate the colonisation process.

GLOBAL PHYLOGEOGRAPHY OF THE WESTERN HOUSE MOUSE, *MUS MUSCULUS DOMESTICUS*

Sofía Gabriel, Maria da Luz Mathias, Jeremy Byron Searle

University of York, Department of Biology and University of Lisbon, Department of Animal Biology

Due to its behavioural plasticity and incredible adaptability to different habitats, including most importantly its commensalism with humans, the house mouse (*Mus musculus*) colonised the world, becoming one of the most widespread and successful mammals living on earth today. The Western European subspecies, *M. m. domesticus*, is the most widespread, currently occupying Western Europe, Africa, Australasia and the Americas. Their commensal relationship with humans extends back 10,000 years and started in the Fertile Crescent, Middle East, when mice started to exploit the earliest human settlements and food stores. Later on, about 3000 years ago, the mice began to expand their geographical range, spreading opportunistically with Iron Age people through Western Europe and North Africa. The global colonization of commensal mice only started during the early days of ocean-going navigation, with mice being transported well beyond their native range as stowaways on ships. Here we show that the movements of *M. m. domesticus* around the world can be traced using genetic markers. These allow the source areas of colonisations to be identified and compared with the expectations on the basis of human movements and colonisation history. Our study builds on an excellent dataset for mitochondrial D-loop sequences from Western Europe. With the help of many collaborators around the world, we have been able to add data on more than 500 new individuals and generate the first global phylogeography of the western house mouse.

MAMMAL-PARASITE BIODIVERSITY IN CENTRAL ASIA

CONVENERS: Luis Ruedas, David Tinnin & Mitsuhiro Asakawa

INTRODUCTION TO THE SYMPOSIUM ON MAMMAL-PARASITE BIODIVERSITY IN CENTRAL ASIA

S. L. Gardner¹, L. A. Ruedas²

¹ Harold W. Manter Laboratory of Parasitology, University of Nebraska - Lincoln, Nebraska, USA. ² Museum of Vertebrate Biology, Portland State University, Portland, Oregon, USA.

This talk will introduce the symposium and provide a brief overview of the problems and challenges of doing simultaneous work on mammals and their micro- and macro-parasites focusing on problems from field collection to analysis of data.

ZOOGEOGRAPHICAL OVERVIEW OF HOST-PARASITE RELATIONSHIPS BETWEEN FREE-RANGING/CAPTIVE MURID AND HELIGMOSOMID NEMATODES

M. Asakawa

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The gastro-intestinal nematode family Heligmosomidae, especially *Heligmosomoides* and *Heligmosomum*, is not only an interesting zoogeographical/co-evolutionary biomarker of the host-parasite relationships between rodents including the families Sciuridae, Cricetidae, Muridae, Arvicolidae etc. and the nematode group, but also an experimental model in captive condition. Hence, the nematode group is a well-studied parasite of the host group in both wild and laboratory. Among the nematode

species, *Heligmosomoides polygyrus* shifted from *Mus musculus* is regarded as a highly pathogen in captive endangered rodent species. First of all, this presentation will give an overview of the zoogeographical host-parasite relationships in Europe, Asia, Far Eastern Russia, Japan, Taiwan, North America and North Africa, mainly with data derived from recent our survey performed in Central Asia including Siberia, Xing-Jiang, Nepal, Tibet and Inner Mongolia. Principally, the relationships have evolved as a result of adaptive radiation or co-speciation between the native rodents and parasitic nematodes, but secondary phenomena including host-shifts and extinction. Now, aberrant host-parasite relationships due to the presence of alien (exotic) rodent hosts and/or nematodes (e.g. *H. polygyrus*) have been found in free-ranging and captive condition. These relationships should be discriminated from the native relationships, and be regarded as risk factor for natural ecosystem. Some potential strategies including monitoring with consideration of the nematodes' life cycle will be presented briefly. The present survey was supported in part by a Grant-in-Aid (No. 18510205) of the Ministry of the Education, Science and Culture, Japan.

BIODIVERSITY OF HELMINTHS IN WILD MAMMALS OF MONGOLIA

S. Ganzorig¹, N. Batsaikhan², R. Samiya², Y. Oku¹, M. Kamiya³, and S. L. Gardner⁴

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Mongolia, a large landlocked country in Central Asia, occupies the transition zone where four ecosystems meet: taiga forest, steppes, mountains, and Gobi desert. These different ecosystems support a wide variety of plant and animal species, including 68 species of fish, 8 species of amphibians, 20 species of reptiles, 410 species of birds, and 134 species of mammals; many of these taxa are globally or regionally endangered. The biodiversity of helminthes in Mongolia should theoretically follow that of the hosts in that the evolutionary history of the parasites is linked to that of the host species. However, the biodiversity of the helminth parasites in Mongolia is relatively poorly known. Very few reports published on the parasitic helminths of wildlife and humans in Mongolia. At present, about 600 species of helminths have been recorded from Mongolia; of these, 272 species are known from wild and domestic mammals. Most of the results have been obtained during 1960-80's, but the volume of research in the field has sharply declined. It is speculated that the helminth fauna of the Mongolia is heterogeneous and ancient. The parasitological situation in wildlife and livestock in Mongolia has drastically changed after the country abandoned socialism and shifted to the free market system. Some of these changes include: lack of funds, insufficient numbers of parasitologists, outdated facilities at medical and veterinary institutions, high growth of the privatized livestock and inadequate veterinary service. In addition to these human infrastructural issues, natural factors as such global climate change have coupled with infrastructural changes to result in added problems, such as increases in emerging and re-emerging diseases.

MONGOLIAN VERTEBRATE PARASITE PROJECT: BACKGROUND AND PRELIMINARY RESULTS

D. Tinnin and S. L. Gardner.

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PARAPHYLETIC HANTAVIRUS LINEAGES IN SHREWS AND MOLE

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Hantaviruses belong to the Bunyaviridae family. While usually hosted by wild mammals, they are potentially pathogenic for humans, and several serologically distinct groups associated with different syndromes have been identified. Yet, investigations have mostly been conducted where human infections by hantaviruses constitute a real and well-identified public health problem, i.e., the holarctic and neotropical areas. However, some hantaviruses also have been described from: a shrew, *Suncus murinus*, in India, «Thottapalayam» virus (TPMV); Africa, in a shrew *Crocidura theresae*, Tanganya (TGNV); Vietnam where «Cao Bang» virus (CBNV) has been identified from the Chinese mole shrew, *Anourosorex squamipes*; The Eurasian common shrew, *Sorex araneus*, in Switzerland, «Seewis» virus (SWSV); The northern short-tailed shrew, *Blarina brevicauda*, «Camp Ripley» virus (RPLV), from the United States; Later two new hantaviruses: «Ash River» virus (ARRV) in *Sorex cinereus* and «Jemez Spring» virus (JMSV) in *Sorex monticolus*, also were discovered in the United States; Finally, «Imjin» virus (IMJV) was found in the Ussuri shrew *Crocidura lasiura*, in South Korea and «Asama» virus (ASAV), from the Japanese shrew mole *Urotrichus talpoides*. A Bayesian analysis was performed using a data set including 173 Hantavirus S sequences from rodents and insectivores. In the resulting tree, five main clades are distinguished: Insectivore 1 and 2, or Rodent 1, 2, and 3. This result is used to discuss and try to understand the common history between the Hantaviruses and their hosts.

SUMMARY OF THE SYMPOSIUM ON MAMMAL-PARASITE BIODIVERSITY IN CENTRAL ASIA

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This talk will provide an instant summary of the symposium and will outline areas of needed focus and highlight areas of strength that are indicated and shown by the symposium attendees. Insight into the future will be provided by the speaker.

ECOLOGICAL NICHE MODELING IN ANALYSIS GEOGRAPHIC DISTRIBUTION OF MAMMALIAN SPECIES: APPROACHES, PERSPECTIVES AND APPLICATIONS

CONVENERS: **Georgy Shenbrot & Víctor Sánchez-Cordero**

ADRENOCORTICAL FUNCTION AS INDICATOR OF POPULATION HEALTH AND ITS POSSIBLE IMPACT ON SPECIES DISTRIBUTION

Eugeniy Novikov

Institute of Animal Systematics and Ecology, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia

LIFE IS UNCERTAIN: THE WRONG PLACE AT THE WRONG TIME

John Wieczorek

University of California- Berkeley, USA

ECOLOGICAL NICHE MODELING, CLIMATE CHANGE AND EMERGING DISEASES

Sahotra Sarkar

University of Texas-Austin, USA

APPLICATION OF ECOLOGICAL NICHE MODELS IN CONSERVATION AND SPECIES INTRODUCTION IN SOUTHERN SOUTH AMERICA

Marcelo Tognelli, Merino, Marian, L. Abba, Agustín M., Bender, J. Benjamín

National Research Council of Argentina (CONICET)

When confronted with limited data, ecological niche models (ENMs) have proven to be very useful tools for estimating the potential distribution of species, particularly in poorly-studied regions such as South America. Here, we present three case studies in which we apply ENMs in conservation and species introduction in southern South America. In all cases, we used Maxent to model species potential distributions. In the first example, we combined ENM and reserve selection algorithms to assess conservation priorities of all the species of armadillos and anteaters of Argentina. Our objectives were to assess the performance of the current protected area system at representing the target species, and to identify potential conservation areas to expand the existing network. We found that several species were underrepresented within protected areas. We provide a map to illustrate where the areas of highest conservation concern are. In the second example, we modeled the distribution of the pudu, a small deer endemic to the Temperate Rainforests of Chile and Argentina. To account for changes in land cover we

used historic (ca. 1550) and recent (2000) vegetation maps to restrict the potential distribution of the species. Thus, areas that have been transformed or degraded were excluded from the potential distribution. We found that approximately 50% of what could have been suitable habitat for the deer is now converted or degraded. Finally, in another study we modeled the distribution of the wild boar to assess its potential invasiveness in southern South America. In this study, we used data from the native and introduced range to generate the models. We found that the Atlantic coast of Argentina, Uruguay and Brazil, the central region and the southern forests of Argentina and Chile are areas of high vulnerability to wild boar invasion.

PUSHING THE (CLIMATIC) ENVELOPE: USING ECOLOGICAL NICHE MODELING FOR PREDICTING THE DISTRIBUTION OF SPECIES' ABUNDANCES

Enrique Martínez-Meyer

Ecological niche models make possible hypotheses regarding potential distributions of species and have proved useful for addressing a variety of questions in conservation, evolutionary biology, invasive species, and climate change, among others. However, niche-based distributional maps provide no biologically meaningful information regarding the internal structure of distributional areas. Herein, I propose a conceptual and methodological approach based on analysis of the internal structure of ecological niches of individual species that makes possible production of spatially-explicit predictions of abundance of species. This approach represents a qualitative improvement in ecological niche modeling and enhances its applicability for both here-and-now studies, as well as for analyses implying model transferability in space and time.

MODELING THE ECOLOGICAL NICHE OF THE RARE AND SPECIALIZED ANDEAN CAT: IMPLICATIONS FOR HIGH ANDES CONSERVATION

Jorgelina Marino, Bennett, Magdalena Villalba, Lilian Lucherini, Mauro Iriarte, Agustín Sillero-Zubiri, Claudio Wildlife Conservation Research Unit, University of Oxford, Tubney house, Tubney OX13 5QL, United Kingdom

Aspects of the spatial ecology of specialized organisms can inform conservation actions when their elusive nature precludes deeper understanding of their behaviour and population biology. We applied ecological niche modeling to study the rare and endangered andean cat (*Oreailurus jacobita*). Restricted largely to the High Andes, this is the more specialized of a guild of carnivores feeding on a narrow range of high-altitude prey species. Potential habitat for the cat and its main prey (the southern mountain vizcacha *Lagidium viscacia*) exists in protected areas that tessellate across international borders around the triple frontier between Argentina, Bolivia and Chile. From coordinated international research we explored ecological limitations to the species distribution from key environmental variables at local level (using presence/absence data on prey and carnivores and Resource Selection Functions) and landscape level (using presence-only data and Maximum Entropy Models -MAXENT). Our results contribute to generate ecological adaptation hypotheses and to identify key areas for the long-term protection of High Andean vertebrates across international borders.

WHAT CAN WE LEARN ABOUT ECOLOGICAL NICHE FROM THE SPECIES DISTRIBUTIONAL DATA?

Georgy Shenbrot

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The usual question in ecological niche based species distribution modeling is «What niche theory can tell us for distribution modeling?» However, ecological niche concept is far from being well-developed body of ecological theory, especially concerning application of the concept to different spatial and temporal scales and the problem of niche evolution. It seems essential to ask how we can use species distributional data to improve our understanding of ecological niche. Comparison of values of environmental variables in points of occurrence with that of in random points across geographic range of a species allows analyzing geographic variation in main niche parameters, position and breadth. The application of this approach is illustrated with examples of niche geographic variation in several species of rodents. It is demonstrated that habitat niche breadth increase from the center of geographic range to the areas around the center and than decrease to periphery of geographic range. Comparison of rates of spatial change of habitats selected by a species with that of environment demonstrated three types of species' niche reaction to environmental change: (1) opportunistic (selected habitats change with similar rate as environment), (2) stabilization (selected habitats change significantly slower than environment) and (3) niche fast change (selected habitats change significantly faster than environment). The areas of niche stabilization usually situated near species' distributional limits, whereas the areas of niche fast change coincide with areas of phylogenetic breaks and borders between subspecies. Surprisingly, presence of competitors does not have significant effect

on species' niche parameters at geographic scale. These findings challenge modification of species distribution modeling techniques and question standard interpretation of modeling results in terms of fundamental and realized niche.

APPLICATIONS OF ECOLOGICAL NICHE MODELING TO PROBLEMS OF CONSERVATION, PUBLIC HEALTH AND CROP PESTS

Víctor Sánchez-Cordero

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Ecological niche modeling (ENM) projected as species' potential distributions have become increasingly popular last years due to easily available appropriate software, distributional and environmental data. I provide applications of ENM to problems of conservation, public health and crop pests using this theoretical framework. Modeled species distributions included as biodiversity surrogates can be used to identify priority areas for conservation and build models of conservation areas networks. ENM of reservoirs and vectors of zoonotic diseases can serve to delineate the geography of a disease of public health importance, such as Chagas disease and Leishmaniasis. Finally, ENM can be used to produce agricultural risk maps of main crop pests. I provide examples of ENM applications to these problems.

DISTRIBUTION AND CONSERVATION STATUS OF *LONTRA FELINA* (MOLINA, 1782) ALONG OF CHILOENSE MARINE ECOREGION, CHILE

Ricardo Alvarez, Claudio Delgado & Jorge Ruíz

ONG Conservación Marina, Centro Ballena Azul - Instituto de Ecología y Evolución, Universidad Austral de Chile. ralvarez@cmarina.org

Lontra felina is an endangered mustelid that lives along the exposed rocky shores of Peru, Chile and Argentina. Habitat destruction and illegal hunting pose the main threats to this species. The information available is not sufficient to enable the necessary activities for marine otter conservation. This research, which involves an innovative, effective and methodical study, contributes to the current knowledge of marine otters by analysing their population density and distribution in unexplored areas of southern Chile. The area was divided into 32 grids measuring 20x20 km. Two transects 10 km apart were established in each quadrant. The variables evaluated during the study included population density and habitat characteristics. These variables were analysed using satellite imagery, GIS tools and appropriate statistical analyses. Research was conducted between 2006-09 and preliminary results show that 53% of quadrants was evaluated positively, indicating otter presence. Otter density in the study area as a whole was 0,86 ind/km (SD: $\pm 0,98$), with 1,4 individuals/km (SD: $\pm 1,13$) on Chiloé Island; 0,46 individuals/km (SD: $\pm 0,69$) in the Palena area and 0,72 individuals/km (SD: $\pm 0,82$) in the Guaitecas Archipelago. This information establishes southern Chiloé Island as a key zone for otter protection. Moreover, habitat type results show that otter presence correlates with rock size. Areas exposed to the seashore with large rocks are likely to be inhabited by marine otters while areas lacking these characteristics are less likely to be inhabited by otters, explaining the absence or low otter densities in Palena. On the other hand, in the Guaitecas Archipelago the effect of illegal hunting in latest recent decades has maintained low species density. These results are important since otters have been used as environmental indicators of critical areas in marine conservation planning.

INTRA-GUILD COMPETITION IN SMALL CARNIVORES

CONVENERS: **Mauro Lucherini** and **Claudio Sillero-Zubiri**

TROPHIC ECOLOGY, INTERFERENCE COMPETITION, AND THE DYNAMICS OF THE SMALL-FELID GUILD OF TROPICAL AMERICA

Tadeu Gomes de Oliveira, Marcos Adriano Tortato, Rosane Vera Marques, Fábio Dias Mazim, Carlos Benhur Kasper and José Bonifácio Garcia Soares
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Throughout most of their range ocelots (*Leopardus pardalis*), jaguarundis (*Puma yagouaroundi*), margays (*Leopardus wiedii*) and little spotted cats (*Leopardus tigrinus*) live in sympatry. There is considerable overlap among these sympatric species not only in geographic range but also in habitat use, feeding habits, activity patterns and body size, suggesting the potential for interspecific competition. An assessment of their trophic ecology and abundance was made with a view to revealing their ecological differences and potential for interspecific competition and how this might be affecting the dynamics of the small-felid guild. For this we compared their diet, morphological traits and abundance. Diets based on scat analysis were compared using mean mammalian prey mass (MWMP) and niche overlap. Body size proportions and canine diameter were assessed as morphological traits related to intra-guild predation and competition. To evaluate the possible population effect of one species on another, correlation analyses were performed based on species abundance ratios or density estimates. The diets of these felids suggest competitive pressure from the larger ocelots upon the smaller jaguarundis, margays, and little spotted cats. Canine diameter differed significantly between them, excepting margays and jaguarundis, and ocelot's body size was 2.2–4.6 times that of the smaller cats. Food niche overlap values were high, given their differences in body size and canine dimensions, and MWMP differed significantly. The obvious potential for competition amongst these felids may be offset by the considerable difference in MWMP between ocelots and the smaller species. The latter showed lower than expected population densities, suggesting that they may deviate from predicted values due to the effect of the larger ocelots. We speculate that intra-guild predation by ocelots, or its potential, might be the mechanism by which ocelots affect small cat dynamics in the Neotropics, the «ocelot effect».

LOWLAND AND UPLAND CARNIVORES FROM THE SOUTHERN CONE OF SOUTH AMERICA

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Two contrasting hypotheses have been proposed about the competitive ability of widespread vs. geographically restricted species. One maintains that widespread species have become widespread because they are competitively dominant over related, geographically restricted species. The alternative hypothesis is that narrow-ranging species are ecological specialists that competitively dominate specific habitats/resources.

Through radiotracking, live and camera trapping we compared intraguild niche overlaps and population abundances of medium-sized carnivores in three areas, one located in the High Andes deserts and composed by the culpeo fox (*Lycalopex culpaeus*), Andean cat (*Leopardus jacobita*) and Pampas cats (*L. colocolo*) and two in central Argentina, in the Pampas grassland and Monte ecoregion, and comprising the Pampas fox (*L. gymnocercus*), Geoffroy's cat (*L. geoffroyi*) and Pampas cat. In both guilds, the puma was the only large carnivore.

Several lines of evidence suggest that in the Pampas guild composition was altered by human disturbance, which affected primarily the puma and, possibly, the felid/canid abundance ratio, favoring the more adaptable foxes. As expected, in both guilds niche overlap was the largest between the most similar species (i.e. small cats), but we found evidences of trophic, spatial and temporal segregations, which probably facilitate species coexistence. Although specialized, restricted species could be more efficient resource exploiters and still have smaller populations because they use rarer resources, the lower abundance of Andean cats, a trophic specialist, than the more widespread Pampas cats in areas where the main prey of Andean cats is abundant suggests that Pampas cats were competitively dominant. Interestingly, while the Pampas cat was the most abundant felid in the High Andes, it was less common than the Geoffroy's cat in the Pampas. While we cannot exclude that Geoffroy's cats are more efficient competitors, we suggest that species-specific habitat association may affect the competitive ability of carnivores.

TEMPORAL AND SPATIAL SEGREGATION OF ACTIVITY FAVOURS THE COEXISTENCE OF MORPHOLOGICALLY SIMILAR SPECIES IN NEOTROPICAL CARNIVORE ASSEMBLAGES

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Carnivores have been used as models to understand the effects of competition in community structure. Community-wide character displacement has been described in carnivore assemblages and interpreted in the light of the competitive exclusion principle. However, some sympatric Neotropical cats and foxes are morphologically similar and share similar diets (e.g., jaguarundi-margay-*oncilla*, pampas fox and crab-eating fox). Behavioral mechanisms that facilitate species coexistence are still poorly explored and may explain these supposed exceptions to the competitive exclusion principle. Using the results of camera-trap surveys conducted in the Atlantic Forest (AF) and the Iberá Reserve (IR) of NE Argentina between 2003 and 2009 we describe the spatial and temporal patterns of records of syntopic cat and fox species to elucidate behavioral differences that may facilitate species coexistence. In the AF, the morphologically more similar cat species had the most contrasting spatial and temporal patterns of records: the margay was exclusively nocturnal and the jaguarundi diurnal and they showed a negative spatial association. Felid species alternate their peaks of activity in an orderly pattern in relation to their body weights. At IR, the crab-eating fox was more frequently recorded in forest habitats than the pampas fox, which preferred the grasslands, but their recording rates were not negatively correlated. The pampas fox showed mostly diurnal activity in areas where the nocturnal crab-eating fox was more abundant. The contrasting temporal patterns observed between the morphologically more similar pairs of species and the ability of some species to adjust their activity patterns to local conditions may facilitate the coexistence of these carnivore species. This may also explain the lack of a community-wide character displacement in the Neotropical felid assemblage. Time partitioning is an important mechanism that allows the coexistence of carnivore species.

LANDSCAPE MODELS FOR CARNIVORES: INTEGRATING HABITAT ASSOCIATIONS AND INTRAGUILD COMPETITION

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Carnivore communities are structured by two fundamental processes: habitat associations and competitive dynamics among guild members. Habitat ecology forms the basis for most models of carnivore landscape ecology, but interspecific competition has yet to be fully incorporated into efforts to devise predictive landscape models. To address these themes in concert, we created predictive landscape models for a community of seven putatively competing mesocarnivores (coyote, bobcat, gray fox, striped skunk, eastern spotted skunk, raccoon) and one mid-sized marsupial (opossum) inhabiting the >63,000 km² forested Ozark region of Missouri, USA. We combined noninvasively derived survey data with multi-scale habitat and environmental variables to model the habitat associations of each species as well as to assess the effects on models of predicted occupancy by including the presence data for the other guild member during the model building process. For each examined scenario (coyote – bobcat, coyote – gray fox, bobcat – gray fox, raccoon – opossum, striped skunk – spotted skunk) where we hypothesized a priori that intraguild competition may be an important driver of the probability of landscape occupancy, this prediction was upheld, as including information on the distribution of potential competitors improved the fit of the models over alternative models that were based solely on habitat associations. Most intriguing were the results for the coyote-bobcat-gray fox triumvirate, which suggest that coyotes produce a strong regional structuring dynamic on these other two forest carnivores. Overall, these results indicate that when modeling the landscape ecology of a carnivore, incorporating the predictions of intraguild competition alongside the more traditionally used habitat data strengthens the models and thereby provides a more ecologically holistic understanding of the distribution of species.

FOOD WEB INTERACTIONS AND INTRAGUILD PREDATION: INFLUENCE OF LANDSCAPE, PREDATORS, AND PREY ON A NATIVE MESOCARNIVORE

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Trophic level interactions between predators create complex relationships such as intraguild predation. Theoretical research has predicted two possible paths to stability in intraguild systems: intermediate predators either out-compete higher order predators for shared resources or select habitat based on security. The effects of intraguild predation on intermediate mammalian predators such as swift foxes (*Vulpes velox*) are not well understood. We examined the relationships between swift foxes and both their predators and prey, as well the effect of vegetation structure on swift fox - coyote (*Canis latrans*) interactions. In a natural experiment, we documented swift fox survival and density in a variety of landscapes and compared these parameters in relation to prey availability, higher order predator abundance, and vegetation structure. Swift fox density varied significantly between study sites, while survival did not. Coyote abundance was positively related to the basal prey species and vegetation structure, while swift fox density was negatively related to coyote abundance, basal prey species, and vegetation structure. Our results support the prediction that under intraguild predation in terrestrial systems, top predator distribution matches resource availability (resource-match), while intermediate predator distribution inversely matches predation risk (safety match). While predation by coyotes may be the proximate cause of swift fox mortality, the ultimate mechanism appears to be exposure to predation moderated by shrub density.

FROM FACILITATION TO HOSTILITY: INTERACTIONS BETWEEN BADGERS AND INVASIVE RACCOON DOGS IN THE BIALOWIEZA PRIMEVAL FOREST, POLAND

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Białowieża Primeval Forest is inhabited by rich community of carnivores numbering 12 species. One of the them is an invasive raccoon dog *Nyctereutes procyonoides*, potential competitor to the native red foxes *Vulpes vulpes* and badgers *Meles meles*. Based on radio-tracking and observations at burrows we studied interactions between of badgers and raccoon dogs in Białowieża Primeval Forest (Poland). We addressed the hypothesis that facilitative interactions between a native (badger) and an alien (raccoon dog) species contributed to the invasion success of the latter. In winter, 88% of badger setts were occupied by both badgers and raccoon dogs. Duration of occupation of badger setts by raccoon dogs averaged 117 days. In summer, only 10% of badger setts were cohabited by raccoon dogs, mainly for reproduction. Seasonal variation in raccoon dog use of badgers setts was explained by changes in ambient temperature: the lower was the temperature, the higher the rate of sett occupation by raccoon dogs. When wintering in the same sett, badgers and raccoon dogs used different parts of it. Direct observations of interactions between badgers and raccoon dogs at badger setts showed that aggression of hosts (badgers) towards another species did occur (killing of pups). We found very high mortality of raccoon dog pups was (61%) during the first 3 months following parturition. Shared use of sett may also lead to disease and parasite transmission, as utilization of the same sett chamber by both species was recorded, and rabid raccoon dogs were found at badger setts. We conclude that facilitation by badgers (through habitat amelioration and refuge from cold and predation) makes the realized niche of raccoon dogs larger than predicted from their fundamental niche. The facilitating role of badger is stronger in winter, which is a critical period for raccoon dog survival in the temperate and boreal zone.

COMPETITION AND NICHE SEPARATION BETWEEN CORSAC AND RED FOXES IN MONGOLIA

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Competition has the potential to profoundly affect behavior and community ecology. Among canids, competition often occurs and may be reduced by partitioning use of food, time, and habitat resources. However, competition studies have focused mainly on larger species in North America, Sub-Saharan Africa, and South America and details of the competitive relationships between many of the smaller foxes remain few. We examined competition between the corsac fox (*Vulpes corsac*) and red fox (*V. vulpes*) that live sympatrically across northern and central Asia. We documented survival and mortality and compared food, activity, and habitat selection among radio-marked foxes ($n = 18$ corsacs; $n = 17$ red foxes) in Ikh Nart Nature Reserve, Mongolia from September 2004 to September 2007. Survival probability was 0.34 for corsacs and 0.46 for red foxes, and mortality of both species resulted mostly from hunting, but also predation by larger canids and unknown causes. Corsac and red foxes exhibited similar diets that consisted mainly of insects and small mammals, but also reptiles, birds, carrion, plant material, and garbage. We detected differences in diet during most of the year with the exception of winter when food resources were scarce. Corsac and red foxes also exhibited similar activity patterns as both species were active mainly at night, but fine-scale differences in nocturnal movements were evident. Both species occurred in all major habitats, but we detected differences in habitat selection

at multiple spatial scales. Corsacs selected mainly 'steppe' habitats, whereas red foxes selected mainly 'semi-desert' habitats. Our results suggest that interference competition occurs between species and that competition is reduced through niche separation.

MANAGEMENT AND CONSERVATION STRATEGIES FOR THE NEOTROPICAL DEER

CONVENER: **Dr. Susana González**

ADVANCES IN THE STUDY OF ARGENTINE DEER DURING THE LAST DECADE AND IMPACT ON THEIR CONSERVATION

Mariano L. Merino
CICPBA, Museo de La Plata.

At present, fifty-one species of deer are recognized worldwide, 16 of which correspond to Neotropical species; in Argentina, deer are currently represented by eight species in the genera *Mazama* (3 spp.), *Hippocamelus* (2 spp.), *Blastocerus*, *Ozotoceros* and *Pudu*. These species inhabit a wide variety of environments, and some of their populations face serious survival problems. All of the Argentine species are categorized in red lists with some degree of threat, both at national and international level. This has prompted intense conservation efforts during the last 20 years, allowing new approaches to diverse aspects of knowledge of these species and generating information that may be used through adaptive management as feedback and reliable support for effective conservation tasks. This work presents an updated account of the population status of Argentine deer. The relationships between the generation of information on diverse aspects of deer biology by the scientific community, the conservation measures and their implementation, are analyzed. The advances made at different levels in both research and conservation measures are discussed with respect to the national conservation plans and the action plan elaborated by the IUCN Specialist Group. On the basis of the latter analysis, information voids that should be the focus of future research are detected.

MAZAMA TEMAMA STATUS AND DISTRIBUTION

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Brocket deer *Mazama temama* is a least known deer in the neotropic. Our objective was to analyze the current information to determine their status and distribution in México and Central America. *M. t. cerasina* occurs in north and central Belize, Guatemala, El Salvador, Costa Rica, Nicaragua and Honduras. *M. t. reperticia* in Panama, and northern Colombia, but this one needed to be confirmed. In México there are records along the states of the Gulf of Mexico and the Pacific Ocean: Tamaulipas, San Luis Potosí, Veracruz, Oaxaca, Chiapas, Tabasco, Campeche and Quintana Roo, also it is found in Queretaro. Total population size is unknown. The density found in few localities in Mexico, in the tropical forests was 0.09 deer/km² and 0.25 deer/km², in a protected area of Q. Roo was 1.7 deer/km²; and in a cloud forest 0.32 deer/ km². There are no reliable estimates for Central American countries and Colombia. Abundance indexes have been estimated from track counts (0.1 to 0.6), in areas where the species is the only *Mazama*, but where it is sympatric with *M. pandora* the index for both species was > 1.8 track/km. Brocket deer is considered representative of well-preserved tropical forest sites, but it can be found in transformed sites such as secondary forests and croplands. Habitat fragmentation by human activities and natural disasters, such as wildfires and hurricanes could be factors that influence their distribution. Hunting for cultural activities and food affect their population levels, behavior and habitat use. Other threats include tourism, and pest control in bean crops. It is necessary to get more information on their habitat status, distribution and abundance and the importance for local communities in terms of use, harvest pressure and crop pest control to know the real status because it may be in danger in some localities.

IS *MAZAMA AMERICANA* A SUPER SPECIES?

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How many deer species do we have in South America? It is not an easy question to solve with the actual knowledge, especially due to the complex taxonomy of the genus *Mazama*. However, the red brocket (*Mazama americana*) constitutes the most amazing case of a cryptic species system of the Cervidae. There is a great chromosome and molecular variation between animals from different regions of South America. The goal of the project is to analyze the complex taxonomy of the red brocket group by examining some karyotype variants (cytotypes) to determine phylogeographical patterns and the speciation processes involved. The research is being carried out in the field and in the captive breeding facilities of UNESP. In the field we are surveying two populations in Brazil using radio telemetry and camera traps, with the aim to describe if there are ecological differences between them. In captivity we are crossing some of these cytotypic variants to evaluate the fertility status of the hybrids and to discover if there is post zygotic reproductive isolation between them. Up to now we successfully produced seventeen F1 animals (hybrids and pure). The preliminary results showed differences between pure and hybrid animals in terms of fertility and functionality of the ovary and testis. The synaptonemal complex of the spermatocytes showed anomalous chromosome pairing in the hybrids. The ovaries of the hybrids showed malfunction with anomalous corpus luteum and unviable oocytes during in vitro fertilization. Meanwhile, there are no significant differences in the activity patterns between the two surveyed field populations of the species. These preliminary results support that chromosome differences between populations can generate post reproductive isolation explaining the existence of cryptic species, justifying to consider the status of the red brockets *Mazama americana* in the superspecies concept.

CAN ENVIRONMENTAL CHANGES AFFECT NEOTROPICAL DEER HEALTH?

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In nature, pathogens of wildlife assist in the regulation of host populations, serving an essential function. However, escalating anthropogenic influences such as habitat destruction, pollution, resource depletion, and other state, apply stress to and upset ecosystem balances, leading to increased susceptibility of wildlife hosts to pathogens. Diseases may affect the survival and reproduction of individuals, population size and gene flow, species composition (dominant and abundant species), and consequently disturb ecosystem structure, function and resilience. Conservation of most deer species in the neotropics is threatened by a variety of factors (mostly human related), including those derived from increased contact with livestock. However, disease exposure information for neotropical deer is extremely scarce, reflecting how little we know about these species and how scant published reports of health/disease studies are in our region. Seventy seven percent of pathogens found in livestock are shared with other host species. For example, bovine tuberculosis infections have been reported in buffalo and lion in Kruger NP in South Africa; brucellosis is compromising the recovery of bison in North America; foot and mouth disease outbreaks have affected livestock and wildlife in southern Africa and Mongolia; and chronic wasting disease has led to massive cullings of white-tailed deer (*Odocoileus virginianus*) in North America. Oftentimes, the presence of disease in wildlife threatens conservation goals either through misguided management actions to control the disease, or by preventing land-use choices that are compatible with wildlife. Understanding the ecology of these diseases must therefore be used to facilitate conservation oriented management actions, and to use health as a tool for policy change and increased public support. It is likely that our lack of knowledge about the possible impacts of disease and interactions with domestic animals are currently hindering our efforts to protect neotropical deer dwindling populations, particularly more so for highly endangered species.

NEOTROPICAL DEER: CURRENT SITUATION AND IUCN RED LIST CONSERVATION RECOMMENDATION

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The Global Mammal Assessment (GMA) completed in 2008 updated the information available and conservation recommendations on the now recognized 18 species of Neotropical deer. This represents an increase of 4 species, all in the genus *Mazama*. A

great deal of new information has been provided although much is still lacking; 4 species were removed from the category Data Deficient and reclassified, although 3 still remain. Red List recommendations changed for 6 species and stayed the same for 8. The new Red List categories show the following situations for the species: Endangered: 1; Vulnerable: 8; Near Threatened: 1; Least Concern: 5; Data Deficient: 3. These statistics reveal the dangerous situation of over half of Neotropical deer species; the principal threat is habitat loss, cited for 17 species, followed by over-hunting and poaching in 12 cases. Further important threats are predation by domestic and feral dogs (8 cases) and fragmentation of populations as a result of habitat loss. In general, the most threatened deer are the largest (4 species), with the exception of the North American species of *Odocoileus*, and the smallest (6 species). The most threatened species is the huemul (*Hippocamelus bisulcus*), which is in a very dangerous situation with only 1000-1500 individuals remaining; the vulnerable species include swamp deer (*Blastocerus dichotomus*), taruca (*H. antisensis*), 4 small species of brocket deer (*Mazama* sp.) and the 2 species of pudu (*Pudu* sp.), while the pampas deer (*Ozotocerus bezoarticus*) is near threatened. The principal recommendations cited for the conservation of these species are development of management plans for the respective species and further research to define better distribution, abundance and population status. Other recommendations include conservation education of local populations, strengthening of controls over protected areas and captive breeding for the most endangered.

CONCLUSIONS AND MANAGEMENT RECOMMENDATIONS AND CONSERVATION STRATEGIES FOR THE NEOTROPICAL DEER

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CELEBRATING THE BEAGLE AND THE ORIGIN: ECOLOGICAL AND EVOLUTIONARY DYNAMICS IN THE STRUGGLE FOR EXISTENCE

CONVENERS: **Joel S. Brown; Burt P. Kotler; Douglas W. Morris**

THE DENSITY OF MAN AND HABITAT SELECTION IN RELATION TO SEX

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Although sexes must cooperate for reproduction, their best strategies for reproduction and survival frequently conflict with one another. Direct conflict, where benefits to one sex are achieved at expense to the other, are well documented in numerous taxa. No-one has yet evaluated whether similar conflict can occur over habitat selection. It is essential that we do so because rapid habitat change through human activity is altering habitat choice for much of the world's biodiversity. We develop the underlying theory to demonstrate that sexual conflict over habitat may be widespread and that the sexes will frequently differ in the optimal distribution of individuals between habitats. We test the theory by manipulating habitat quality in a captive population of individually marked meadow voles. We use remote censusing technologies to infer the distribution of males and females among habitats. The data illustrate that meadow voles are density-dependent habitat selectors, and that males and females are conflicted in their preferred distribution of individuals between habitats. Males are more abundant than females at low density. Females are more abundant than males at high density. This conflict appears to be resolved by sexual differences in home-range size. Although male home ranges are larger than those of females, the difference is less at high density than it is at low density.

PALEOECOLOGY AND EVOLUTION OF RODENT COMMUNITIES

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THE ECOLOGY AND EVOLUTION OF GEOGRAPHICAL RANGE LIMITS: FROM DARWIN'S DAY TO OUR OWN

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DENSITY AND FREQUENCY DEPENDENT EVOLUTIONARY GAMES OF HABITAT SELECTION AND FEAR

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Darwin never had a course in game theory, yet his writings show that he understood how an adaptation may depend upon the traits of others (e.g. sexual selection). Habitat selection provides an example where the choices of others influence habitat quality. Another example occurs when clever prey attempt to avoid clever predators. Here, we combine these two games by letting prey choose their habitats based on resources and predation risk. Furthermore, the populations' experience of habitats may influence the evolution of morphological traits associated with resource exploitation and predation. This coadaptation between habitat selection, fear responses and morphology can drive diversification and species coexistence. We use two examples to illustrate these feedbacks. It seems that habitat heterogeneity and predation risk both drove and maintain the coexistence of fox squirrels (*Sciurus niger*) and grey squirrels (*S. carolinensis*) in the Eastern United States, even though other prey species such as voles (*Microtus* sp.), chipmunks (*Tamias striatus*) and mice (*Peromyscus* sp.) likely support the predators that drove the diversification. Two gerbil species (*Gerbillus pyramidum* and *G. andersoni allenbyi*) inhabiting sand dune habitats of the Negev desert, Israel tell a curiously similar story. They too play a predator-prey foraging game with owls, foxes and snakes. And, predation risk and habitat heterogeneity likely drove their evolution and promote their coexistence. Theirs, however, is a game that can be played temporally over the course of a night as well as spatially across sand dunes that vary subtly in the degree of sand stabilization. Even with 175 years since the Beagle, we suspect that Darwin would see, understand and be pleased with these games within the context of his theory of evolution by natural selection.

MICROEVOLUTIONARY DYNAMICS: GEOGRAPHIC VARIATION OF BEHAVIOR IN CONTRASTING ENVIRONMENTS

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AN ECOLOGIST'S TELESCOPE: ENVISIONING THE FUTURE OF VERTEBRATE SPECIES DIVERSITY AT THE GLOBAL SCALE

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MARSUPIAL DEVELOPMENT AND REPRODUCTION

CONVENER: Lynne Selwood

MARSUPIAL-SPECIFIC DEVELOPMENTAL PROTEINS REDUCE FERTILITY IN BRUSHTAIL POSSUMS AND REVEAL NOVEL MAMMALIAN CONTRACEPTIVE APPROACHES

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New Zealand has no native marsupials, but the introduced brushtail possum has become an ecological and agricultural pest. Proteins essential for normal embryonic development, the vesicle associated proteins (VAPs) of the oocyte and the shell coat proteins (CPs) that enclose the conceptus for most of development, have been developed as contraceptive vaccines. The proteins were identified by PAGE and amino acid sequencing, the genes were cloned and the proteins produced using a bacterial vector. Using the proteins and their antibodies, in vitro assays were used to establish that the proteins were essential for normal embryonic development. Three CPs and VAP1 were marsupial-specific. Shell coat protein 4, (CP4) and VAP1 were tested as vaccines in immune trials and significantly reduced fertility by 49-52% for between 9 and 36 months. The maximum period of reduced fertility was not determined, as animals were killed during pregnancy to determine the effect of the vaccine on pregnancy. ELISA titres were high for CP4 and VAP1, varying between 1:1,600 to 1:128,000. Immune responses were cell mediated following CP4 vaccination and resulted in destruction of uterine glandular tissue, the shell coat and the zygote to cleavage stages. VAP1 immunization resulted in an antibody mediated response that degraded the oocytes in the ovary. The presence of clumps of macrophages suggested that when oocytes were ovulated and fragmented in the oviduct or uterus, a cell mediated response may have occurred. We conclude that CP4 and VAP1 should be used for further analysis of the vaccine and delivery systems.

USE OF CONTRACEPTIVE DESLORELIN IMPLANTS TO MANAGE REPRODUCTION IN BLACK-FLANKED ROCK WALLABIES (*PETROGALE LATERALIS LATERALIS*) IN WESTERN AUSTRALIA

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In a fragmented landscape, isolated populations of black-flanked rock wallabies can increase to the point where they cause problems including crop damage and overgrazing of native vegetation in the reserves where they occur, with obvious risks for population persistence. Fertility control using hormone implants has potential for managing population size in these situations. We tested whether deslorelin, a superagonist of gonadotropin-releasing hormone (GnRH), suppresses reproduction in female black-flanked rock wallabies. We synchronised the reproduction of free-living adult female rock wallabies by removing pouch young (RPY) at Mt Caroline Nature Reserve in autumn 2007. Females were treated with either 4.7 (n=19) or 9.4 mg (n=20) implants of deslorelin, or a placebo (n = 20). All females were then monitored for 24 months for the presence of new pouch young. Following RPY, diapaused blastocysts reactivated in 5/15 recaptured females treated with 9.4 mg implants and carried through to weaning. Subsequently, none of these 5, or any of the 40 other recaptured wallabies treated with deslorelin, at either dose, conceived. As a second measure of suppression of reproduction we challenged females with GnRH (2.5 µg/kg im) on 6 occasions over the 24 months. Deslorelin suppresses pituitary function and we expected that suppressed females would show no hormonal response but placebo females would show a rise in Luteinising Hormone (LH). Placebo animals did show significant increases in serum LH concentration at all times after the GnRH challenge (p<0.05) and maintained an average reproductive rate of over 90% during the study. This was in contrast to those animals on either dose of deslorelin who neither reproduced nor responded to the GnRH challenges. In conclusion, deslorelin blocks the hypothalamic-pituitary-gonadal axis and inhibits reproduction for at least 24 months in female black-flanked rock wallabies. It is a valuable tool for managing instances of overabundance in this species.

ENVIRONMENTAL CONTROL OF REPRODUCTION IN MARSUPIALS

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Mammals use environmental cues to select for the best time of year for reproduction. Photoperiod or daylight, and especially daylength, is a cue believed to be used to time reproduction, but good data are scant for most mammals. Proximate cues that regulate reproduction and daily activity patterns are well described for «placental» mammals, but for surprisingly few species, with experimental data available for <1% of the >4,000 «placental» mammalian species. Data for marsupials are restricted to only a few species, although this still represents 3 % of extant marsupials. Components of the photoperiodic signal have been demonstrated to be a proximate cue for reproduction in *Antechinus* spp., the dunnarts (*Sminthopsis* spp.) and the brush-tailed possum (*Trichosurus vulpecula*). Changing photoperiod rather than absolute daylength is an important Zeitgeber for reproduction in marsupials. Pineal gland involvement (which transduces the photoperiodic signal into a hormonal signal) in reproductive timing has been unequivocally demonstrated for the kangaroos, Bennett's Wallaby (*Macropus rufogriseus*) and the Tammar Wallaby (*Macropus eugenii*). Actions of the pineal hormone melatonin are known to be involved in reproductive timing and activity patterns in the northern brown bandicoot (*Isodon macrourus*), and the marsupial shrew (*Antechinus stuartii*). Melatonin administration disrupts both reproductive synchrony and daily activity cycles in the marsupial shrew. Marsupials, similar to other mammals, use aspects of the yearly cycle of the photoperiod, but appear to use changing photoperiod rather than absolute photoperiodic length, as has been seen in many «placental» mammals, to determine optimum reproductive timing. Whether this difference is phylogenetic rather than geographically (latitudinally) driven is yet to be determined.

MATE CHOICE INCREASES BREEDING SUCCESS IN CAPTIVE MARSUPIALS

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Devising new non-invasive techniques to maintain natural behaviours, assist management and increase breeding success of captive populations is becoming a significant priority in the conservation of endangered species world-wide. However, this has rarely been examined in, or applied to, endangered marsupials. Research into wild and captive agile antechinus (*Antechinus agilis*) showed that females chose males based on olfactory cues and genetic dissimilarity. We followed this research by investigating the use of female mate choice and male scent storage to increase the breeding success of a long term colony of a small dasyurid, the stripe-faced dunnart (*Sminthopsis macroura*) and examined the application of mate choice techniques in a range of other related marsupials. Experiments were conducted in captivity using olfactory cues from males to determine the mate preference of females. In each 10 minute trial, females were simultaneously offered used bedding or scent-marked objects from multiple males in their familiar enclosure and their behaviours and movements were recorded and timed. Female dunnarts paired with males chosen during scent trials had significantly more observed matings and sperm detected in their urine per oestrous cycle than females paired based on genetic pedigree in 2007, 2006 and 2005. Pairings following mate choice resulted in more than twice the number of pregnancies than pairs assigned using pedigrees. Prior familiarity between mates did not affect female preferences, but significantly decreased the levels of aggression and minor injuries between mates. Storing a male's scent at -20°C for up to 40 days did not affect female mate choice and may be a powerful tool for enabling mate preference between captive breeding institutes. The results show that female mate choice can significantly increase breeding success in captive marsupial breeding colonies.

OVARIAN FOLLICULAR GROWTH IN THE BRUSHTAIL POSSUM (*TRICHOSURUS VULPECULA*)

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The brushtail possum (*Trichosurus vulpecula*) is a nocturnal, arboreal marsupial. In New Zealand, this introduced species has become a pest of significant ecological and economic importance. To help manage the possum population, methods of fertility control are being investigated. This requires a greater understanding of their reproductive biology. The mechanisms controlling ovarian follicular growth involve a complex exchange of systemic signals between various organs and the ovary and a localised exchange of molecules within the ovary. The possum is monovular, meaning that during each reproductive cycle a single follicle is recruited for ovulation. One aim of our research is to characterise follicular growth and specifically, the factors that affect granulosa cell function. A key finding from our research has been that the luteinising hormone (LH) receptor is expressed in granulosa cells at a much earlier stage of follicular development than in eutherian mammals, suggesting a different regulatory mechanism and role for LH. At a later stage when a follicle is recruited for ovulation, the granulosa cells produce increasing

amounts of steroids affecting both the pituitary gland and the reproductive tract. From gene expression and cell culture studies, a number of growth factors together with pituitary hormones have been shown to regulate steroid production in granulosa cells. Although the precise role is yet to be elucidated, it appears that prolactin also plays an important role in follicular growth. An area of increasing interest in our lab is determining the mechanisms involved in the interactions between the oocyte and surrounding cumulus cells, which has a unique phenotype in possums. Whilst many characteristics of follicular growth are similar in the possum to other mammals, there are key differences. In this respect, the possum represents one of a limited number of monovular animal models that can be used to study ovarian function.

SPERM-EGG INTERACTIONS IN AUSTRALIAN AND AMERICAN MARSUPIALS— WHAT CAN WE LEARN FROM MORPHOLOGY?

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Fertilisation occurs when a spermatozoon and egg unite to form a new individual. For this, the sperm has to first penetrate the zona pellucida; it then fuses with the oolemma and, after incorporation, egg activation results. Morphological observations have suggested that eutherian mammals exhibit a highly derived sequence of events which may be due to the thick zona pellucida (Bedford, 2004, Biol. Rev. 79:429-460). How does fertilisation occur in marsupials? Early studies using *Didelphis virginiana* suggested an ancestral condition similar to that of nonmammalian vertebrates (Rodger & Bedford, 1982, JRF 64: 171-179), whereas subsequent investigations with *Monodelphis domestica* indicated similarity to eutherians (Taggart et al., 1993, Anat. Rec. 237:97-110). Here we summarise our observations on in vivo fertilisation in an Australian insectivorous marsupial, *Sminthopsis crassicaudata*, in an attempt to resolve this controversy. Our results show that shortly after mating sperm reside within oviductal crypts from where a few migrate to the ampulla. Sperm-zona binding then takes place and exocytosis of some, but not all, the acrosomal contents occurs. Sperm penetrating the zona pellucida exert compression on the surrounding zona matrix, whereas a spermatozoon partly within the perivitelline space suggested that its head lay parallel to the oolemma prior to entry into the ooplasm. Recently incorporated sperm heads retained a membrane, presumably inner acrosomal membrane, over part of the condensed sperm chromatin, and the sperm head travels some considerable distance within the ooplasm prior to chromatin swelling and decondensation. These results in general support the conclusion that marsupial sperm-egg interactions are similar to those of eutherians. They suggest that the divergent processes of sperm-egg interactions observed in eutherians probably evolved in a marsupial-eutherian common ancestor prior to divergence into these two major extant mammalian lineages.

DEVELOPMENTAL GENE EXPRESSION IN *MONODELPHIS DOMESTICA* EMBRYOS

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Early embryos of eutherian and metatherian mammals differ considerably in how they undergo cleavage divisions and form blastocysts. In eutherian embryos, cleavage-stage cells adhere to each other and do not require the zona pellucida for blastocyst formation. Metatherian embryos, by contrast, produce initially non-adherent cleavage-stage blastomeres which attach individually to the zona pellucida before establishing cell-cell junctions. The resulting blastocyst which forms does not surround an inner cell mass which in eutherian mammals represents the pluripotent cells from which the embryo proper eventually develops. In metatherians, the blastocyst forms as a unilaminar cell sheet closely adherent to the interior aspect of the zona pellucida. This sheet contains the cells of both the pluriblast and the trophoblast. The transcription factors encoded by *tead4*, *oct4*, *cdx2*, *sox2*, and *nanog* are instrumental in differentiating the trophoblast from the inner cell mass in the eutherian (mouse) embryo. Using immunocytochemistry, we investigated the expression pattern of these proteins in embryos of the laboratory opossum *Monodelphis domestica*, to determine whether they have similar roles in lineage differentiation in metatherian embryos. Our results suggest that some, but not all, differences in cleavage pattern and blastocyst formation are reflected by the expression pattern of these developmentally important genes.

MECHANISMS OF PLURIPOTENCY IN MARSUPIALS

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Transcription factors controlling specification of the earliest cell lineages have been well characterised in the mouse. However, early embryogenesis in marsupials shows marked morphological differences to that of eutherians, especially with respect to blastocyst formation and early lineage allocation. We are interested in characterising genes encoding early lineage-specific

transcription factors in the tammar to use as markers of pluripotent cell populations and early differentiation events. Central amongst these is Pou5f1 (Oct3/4), which encodes a master regulator of pluripotency in the mouse. We have cloned and characterised a tammar orthologue of POU5F1 and a related gene, POU2, which is absent in eutherian genomes but orthologous to zebrafish pou2. Expression patterns of POU5F1 and POU2 suggest that these genes have at least partly divergent functions while, for unknown reasons, the role of POU2 became redundant in an ancestor of eutherians.

MOLECULAR CONTROL OF THE DIAPAUSING MARSUPIAL EMBRYO

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Embryonic diapause is widespread amongst mammals. The tammar wallaby is a seasonal breeder that has a lengthy diapause of 11 months. In tammars, the early blastocyst is formed by day 5-6 post partum (pp). By day 7pp the blastocyst enters diapause if there is a young suckling in the pouch. If not, it continues its development to full term 26.5 days later uninterrupted. The ~80 cell blastocyst remains in diapause with no cell division and no measurable cell metabolism. My laboratory has been studying the signals that put the blastocyst to sleep, and those that wake it up at reactivation. We have characterised the morphological changes in the early embryo and uterine endometrium and the expression of important growth factors, IGF2 and LIF, as well as factors like PAF-R during entry into and exit from diapause. PAFR is present throughout all stages in the glandular epithelium of the endometrium. Quantitative PCR shows both LIF and IGF2 in the uterine endometrium remain low throughout the period of diapause, rising again after reactivation, suggesting that it is their withdrawal from endometrial secretions that forces the blastocyst into diapause. Thus, the diminishing availability of these growth factors is consistent with a role in the control of embryonic diapause, perhaps controlled by the rapid decline in oestrogen after ovulation. The question of totipotency of the unilaminar layer of cells of the diapausing blastocyst is as yet unanswered. Since there is no inner cell mass, which cells form the placenta and which form the embryo is not yet clear, but blastocyst cells of the tammar express CDX2. OCT4 and NANOG are also important markers that are currently under investigation. The results of our ongoing study will have important implications for understanding marsupial stem cells.

ADVANCES IN MAMMALIAN CYTOSYSTEMATICS: INSIGHTS FROM NEW MOLECULAR TECHNIQUES AND FROM NEW FIELD EXPLORATIONS

CONVENERS: **Peter Taylor** and **Milton Gallardo**

HOMOPLASY, HEMIPLASY, AND ANCESTRAL STATES: PHYLOGENETIC RECONSTRUCTIONS OF MAMMALIAN KARYOTYPES BASED ON CHROMOSOME PAINTING AND GENOME SEQUENCE ASSEMBLIES

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The need to distinguish between chromosomal characters that are symplesiomorphic and those that define monophyletic groups has placed significant constraints on defining the eutherian ancestral karyotype. A cladistic analysis of genome assemblies (syntenic associations) for eutherian mammals against two distant outgroup species—opossum and chicken—permitted a refinement of the 46-chromosome karyotype. We show that two intact chromosome pairs and three conserved chromosome segments are probably symplesiomorphic for Eutheria because they are also present as unaltered orthologs in one or both outgroups. Seven additional syntenies, each involving human chromosomal segments that in various combinations correspond to complete chromosomes in the ancestral eutherian karyotype, are also present in one or both outgroup taxa and thus are probable symplesiomorphies for Eutheria. However, eight intact chromosome pairs and three chromosome segments are derived characters potentially consistent with eutherian monophyly. Our analyses clarify the distinction between shared-ancestral and shared-derived homology in the eutherian ancestral karyotype. They also indicate how hemiplasy (idiosyncratic lineage sorting producing homoplasy-like consequences for character states that are genuinely homologous) can offer a plausible explanation for apparent cases of gene-tree/species-tree discordance in cytogenetic datasets.

ALLOTETRAPLOIDY AND RETICULATE EVOLUTION IN SOUTH AMERICAN OCTODONTID

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Whole genome duplications are irrelevant to mammalian evolution and speciation due to the developmental impairment that affect polyploid humans and mice. This notion was overturned by the discovery of tetraploidy in *T. barrerae* ($2n = 102$). Phylogenetic relationships and meiotic pairing suggest this species resulted from hybridization between the tetraploid golden vizcacha rat, *Pipanacoctomys aureus* ($2n = 92$) and diploid *Octomys mimax* ($2n = 56$), provided that non-reduced gametes were produced in the latter species. Genome in situ hybridization (GISH) allowed the discrimination of 31 chromosomes derived from *O. mimax* since they exhibit entirely bright green hybridization signals. Twenty nine intact DAPI-counterstained chromosomes are derived from *P. aureus*. Intergenomic translocations are reflected in 42 chromosomes having fluorescent and non-fluorescent segments of varying length. GISH on mitotic plates of *P. aureus* allowed the discrimination of 20 chromosomes derived from *O. mimax* and fourteen chromosomes from the other, unknown putative progenitor. Moreover, 58 chromosomes label green and blue, indicating intergenomic exchanges. The large-scale intergenomic translocations detected refute the hypothesis of genome conservation in mammals as opposed to that of polyploid flowering plants. The network analysis of mitochondrial data supports interspecific hybridization for *T. barrerae* since it shares haplotypes with *O. mimax* and *P. aureus*. The recurrent formation of the red vizcacha rat is supported by the reciprocal maternal contribution detected by sequencing data. Our results emphasize the importance of past geomorphological events in the reticulate evolution of this species. Funded by FNC 1070217

PHYLOGEOGRAPHY OF THE SOUTHERN AFRICAN VLEI RAT, *OTOMYS IRRORATUS*, INFERRED FROM CHROMOSOMAL AND DNA SEQUENCE DATA

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The southern African vlei rat, *Otomys irroratus* is characterized by phenotypic conservatism across its distribution yet shows great chromosomal variation ranging from $2n = 23 - 32$. Three cytotypes are recognized within the species and these comprise the A cytotype characterized by an acrocentric karyotype, the B cytotype containing eight pairs of autosomes possessing short heterochromatic arms, and the C cytotype distinguished from the B cytotype by having four pairs of autosomes containing heterochromatic short arms. This study examines the phylogeography of the species by analyzing $N=100$ specimens collected throughout the range of the species in South Africa using the mitochondrial cytochrome b gene (950bp) and FISH (Fluorescence in situ hybridization). Phylogenetic analysis of the sequence data retrieved two main clades. The south and eastern clade (SE) encompassing the Western and Eastern provinces of South Africa comprising specimens containing the B and C cytotype. The second clade (Eastern Clade, EC) includes specimens from Free State and KwaZulu-Natal Provinces in the central and eastern part of South Africa. The EC clade is composed of specimens with both acrocentric karyotype (A cytotype) and the biarmed karyotype (C-cytotype). The mean sequence divergence between the main clades (SE and EC) is 7.0% and between subclades comprising EC is 4.8%. The SE clade is further distinguished from the EC by the presence of inversions/centromeric shifts involving autosomes 1, 4, 6, and 10. The distribution of the two main clades closely mirrors the contraction and expansion of forests and grasslands suggesting that cladogenesis in this species complex was largely influenced by habitat preference. The new data support a taxonomic revision suggested by Taylor et al. 2009 which proposes that the EC clade should be a recognized species called *O. auratus*.

COMPARATIVE CYTOGENETICS OF SOUTHERN AFRICAN ROCK MICE, *AETHOMYS* (RODENTIA: MURIDAE)

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Chromosomal rearrangements and syntenic regions provide an independent suite of nuclear markers that can be used in a phylogenetic context. However, it is critical to establish primary homology using sensitive molecular cytogenetic protocols such as fluorescence in situ hybridization (FISH) and to score these characters (chromosomal changes) using appropriate outgroups. In this study, we compare the karyotypes of southern African rock mice, *Aethomys namaquensis* ($2n=24$), *A. granti* ($2n=32$), *A. ineptus* ($2n=44$) and *A. chrysophilus* ($2n=50$) using a combination of classical banding (C- and G-banding) and FISH (employing the 21 *Mus musculus* whole chromosomes as probes). Eight chromosomes or chromosome arms are shared (conserved) between *A. namaquensis* and *A. granti*, and fifteen homologies are shared between entire chromosomes of *A. ineptus* ($2n = 44$)

and *A. chrysophilus* ($2n = 50$). *Aethomys namaquensis* and *A. chrysophilus* share four chromosomes or parts of chromosome and one fusion between the chromosomes 1 and 3 of *A. chrysophilus* formed the chromosome 2 of *M. namaquensis*. These regions of homeology are supported by the FISH results. Further, data obtained from syntenic associations (contiguous chromosome segments) identified by the mouse whole chromosome paints clearly show that genome organization of rock mice is highly conserved relative to the proposed ancestral murid karyotype. In conclusion, our comparative analysis indicates that chromosome variation ($2n=24-50$) within this group is partly driven by fusion/fission events, and other chromosome rearrangements (tandem fusions and inversions) that can only be identified using fluorescence in situ hybridization.

ROBERTSONIAN FAN OF *ELLOBIUS TANCREI*: TEMPORAL AND SPATIAL ANALYSIS

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Robertsonian fan of *Ellobius tancrei* ($2n=32-54$) was discovered in Pamiro-Alai 35 years ago (Lyapunova, 1974). During next ten years this area was studied carefully in numerous field researches. We mapped the distribution of chromosomal forms, studied zones of hybridization and found nonhomologous fusions inside and outside Rb-zone. Later, because of perestroika, we had no possibility to continue field research in Tajikistan and worked with cytogenetic collection and experimental model of Rb fan. Results of long-term hybridization of chromosomal forms revealed meiotic disturbances in hybrid spermatogenesis and nonrandom segregation of Rb translocations. In 2008 we carried through new expedition to Pamiro-Alai together with the Institute of Zoology and Parasitology, Tajik Academy of Sciences. We checked the borders of Rb fan and the central part. The northern region is still inhabiting by low-chromosomal forms $2n=32-34$. The eastern border showed the same state at the same place, but at the western border we revealed pure low-chromosomal form $2n=32$ instead of mix of $2n=32-35$. At the central part we found an extremely high level of hybrids with lower chromosome numbers comparing 25-years-old samples. This region is known by high seismic activity and landscape changes due to mudflow. We have a failure to find animals with specific fusion since the population vanished because of extremely powerful mudflow and human impact. Amazing results were exposed by comparative chromosome painting. For animals with similar chromosome numbers (48-50) we revealed different Rb translocations which were not able to distinguish by G-banding. It explains large decreasing of hybrid fertility which we showed earlier and means that low-chromosomal forms from opposite banks of the Surkhob River should carry different sets of translocations. New investigations are supposed to confirm this assumption. The study was funded in part by the Russian Foundation for Basic Research.

INTEGRATING KARYOTYPES, MORPHOLOGY AND MOLECULAR APPROACHES TO IDENTIFY CRYPTIC SPECIES OF AGRICULTURAL PEST RODENTS IN AFRICA: THE ECORAT PROJECT

Taylor, P.¹, J., Mulungu, L.², Massawe, A.², Mahlaba, T.³, Dlamini, M.³ Eiseb, S.⁴ Nair, D., Downs, S.⁵, Lamb. J.⁵ Bastos, A.⁶ & Belmain, S.⁷

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FUTURE RESEARCH DIRECTIONS IN POPULATION DYNAMICS OF LARGE HERBIVORES

CONVENERS: **Marco Festa-Bianchet** and **Graeme Coulson**

DYNAMICS OF LARGE HERBIVORES IN NON-NATIVE RANGES

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The faunas of Australia and New Zealand now contain many populations of non-native large mammalian herbivores and some of these populations are managed as pests. The factors determining the establishment of non-native large mammalian herbivores in Australasia will be described and it will be argued that their subsequent dynamics are usually 'irruptive' (a dynamic that seems common for introduced populations elsewhere). The irruptive dynamic appears to be determined by changes in per capita food availability, but no studies have attempted to estimate how the quantity and quality of food affects the vital rates that drive population dynamics. Because herbivores can cause undesirable changes in their food supply (e.g. changes in the abundance of species), understanding the interactions between the herbivore and the plant communities that they interact with is critical for management of 'pest' populations. Two Australasian examples will be used to highlight this point. The first example will be changes in thinking about the reversibility of the impacts of deer control in New Zealand forests. The second example will be an attempt to estimate the number of female koalas that need to be sterilised to avoid a mass die-off event in a south-eastern Australian forest. Directions for further research will be highlighted.

FEEDBACK EFFECTS OF OVERABUNDANT CERVID POPULATIONS ON LIFE-HISTORY STRATEGIES

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Increasing cervid populations are negatively affecting their habitat in many areas worldwide, but few studies have assessed the long-term effects of overabundant populations on individual life-history traits. Using two long-term studies of cervids in Quebec, Canada, we investigated potential feedbacks of long-term and heavy browsing on life-history traits. We studied a population of overabundant white-tailed deer (*Odocoileus virginianus*) introduced on Anticosti Island and two large populations of migratory caribou (*Rangifer tarandus*) in the Quebec-Labrador peninsula. We assessed whether chronic browsing contributed to a decline of the quality of deer diet, and evaluated the impacts of reduced diet quality on body condition and reproduction. In addition, because body size is generally density-dependent, we related body measurements of caribou to population size and annual range. In deer, rumen nitrogen content declined 22% through time, indicating a reduction in diet quality. After accounting for the effects of year, age and date of harvest, peak body mass declined 12% and 6% for males and females, respectively. Caribou from both migratory herds showed significant declines in mandible length at high population density, associated with increasing annual range, while mandible length increased at low density indicating large plasticity in body size. In deer, the probability of conception increased through time, but litter size at ovulation declined, resulting in a similar total number of ovulations. We hypothesize that the density-dependent effects observed on body size and mass might have been exerted through habitat degradation. Our results suggest that following a decline in habitat quality, females in deer modified their life-history strategies to maintain reproduction at the expense of growth. Such modifications may contribute to maintain high population density of large herbivores despite negative effects on habitat.

INTERSPECIFIC AND GEOGRAPHIC VARIATION IN THE DYNAMICS OF HARVESTED KANGAROO POPULATIONS

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The dynamics of kangaroo populations have been well described in arid environments, but are poorly described elsewhere across their broad range. This deficiency can be addressed by developing numerical response models from regular density estimates. These have been derived from aerial surveys that have been used for over 25 years to set annual harvest quotas for

four species throughout eastern Australia. Outside the sheep rangelands, kangaroo populations can be regulated by dingo predation. Within the sheep rangelands, dingo numbers are kept low, and kangaroo populations are limited primarily by food supply and to some extent by commercial harvesting. Numerical response models should ideally be based directly on food supply, but this is rarely available, so rainfall has been used as a surrogate. A combination of recent (drought mortality) and lagged rainfall (recruitment) proved a useful predictor of rate of increase, but this was only in some areas for some species. Relationships were poor in northern Australia and for species at low density. Strong correlations found in earlier studies used data that were dominated by drought-induced adult mortality. Over a longer time frame, it is juvenile survival that has the strongest influence on kangaroo population dynamics and so correlations are weaker. As predicted by population models, there tended to be a stronger correlation between rate of increase and rainfall in more arid areas. Importantly, models also indicate that as uncertainty in density estimates increases, the correlation with rainfall declines and the initially weak correlation between rate of increase and density increases, spuriously indicating strong density dependence. Nevertheless, density dependence tended to be stronger in more mesic areas as expected. Where kangaroo rate of increase can be predicted with reasonable success, the frequency and intensity of expensive aerial surveys can be reduced.

THE IMPACTS OF JAW DISEASE ON THE POPULATION DYNAMICS OF A LARGE HERBIVOROUS MARSUPIAL

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The role of infectious disease as a factor regulating population dynamics is often poorly understood. We report on the impacts of jaw disease in a population of eastern grey kangaroos (*Macropus giganteus*) in Victoria, Australia. Lumpy jaw is a progressive bacterial infection (*Fusobacterium necrophorum*) in kangaroos and wallabies which is characterised by lesions in the maxilla and mandible. It is common in captive colonies, but there have been few reports in free-ranging populations. Our study population reached an extremely high density of kangaroos (4.6/ha) in 2006, coinciding with a period of very low rainfall and pasture biomass. The mortality rate increased to 33% over one year. We collected skulls from most kangaroos that died within the park and from a sample of surviving kangaroos shot during a cull. A high proportion of kangaroos were affected by lumpy jaw: 53% of the skulls collected within the park had severe lumpy jaw with lesions of osteolysis and osteoproliferation. Severe lumpy jaw was less prevalent in the sample culled (33%) but the prevalence was still much higher than in other nearby free-ranging populations. Both sexes were affected equally. Older kangaroos had more severe lesions, suggesting the disease is progressive; the majority of the surviving kangaroos were less than six years old. Body condition of the culled sample, as indicated by kidney fat index, was the lowest recorded for this species regardless of disease state. Fecundity was also much lower (typically 80-90%): only 23% of adult females were suckling a pouch young. Disease thus played an important role in population regulation through reduced survival, but impacts on growth and reproduction were likely overridden by the poor condition of the population overall.

PUMA PREDATION ON SHEEP IN THE TORRES DEL PAINE REGION OF MAGALLANES, CHILE: CONSERVING TOP PREDATORS AND LOCAL LIVELIHOODS

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There has been conflict between ranchers and the Patagonia Puma in the Magallanes region of Chile for nearly 150 years. Within the region, however, this conflict has reached its apex in the ranches surrounding Torres del Paine National Park (TdP). During this century various ranches have abandoned the sheep industry for cattle ranching and/or tourism. Even on ranches that are still involved with sheep, there is mounting concern about the number of sheep lost to pumas each year (up to 36% of sheep/ranch). Rancher's demand that pumas be hunted legally, yet the Chilean Agriculture and Livestock Service (SAG) refuses to allow pumas to be hunted legally, except in special situations. At the present time the ranches surrounding TdP report a total loss of nearly US\$2.8 million/year, which is attributed primarily to puma predation. Ranchers believe that their livelihood is under assault, yet they have no legal means of protecting themselves. At the same time, pumas are likely persecuted unjustly in many situations due to their history of sheep predation. One of the unique biological characteristics of this situation is the extremely high density of pumas - 3 to 4 times higher than in other areas of the world. This high density may, in part, be attributed to the tens of thousands of sheep in the immediate area, but no one knows. Our objective is to promote sustainable ranching activities, while at the same time conserving the Patagonia Puma.

HERBIVORE POPULATION DYNAMICS: WHAT'S NEXT?

Marco Festa-Bianchet

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Research on large herbivores over the past few decades has provided substantial contributions to our understanding of vertebrate population dynamics. Much of that progress has been based on long-term monitoring of survival and reproductive success of marked individuals. Those high-quality long-term data underline the important roles of density-dependence, weather, disease and predation. Recent research has revealed the importance of temporal changes in sex-age structure and quantified the relative importance of different vital rates in affecting population growth. Although changes in adult female survival inevitably have dramatic impacts on population growth, many studies found that adult female survival varies little over time, so that changes in population growth rate are driven by changes in juvenile survival and to lesser extent in the age of primiparity. I will identify some emerging questions in population biology of large herbivores, particularly the roles of changes in predation and human harvests in a context of global change. I will examine the potential impacts of natural and artificial selection on population growth, and contrast the qualitative and quantitative differences in mortality imposed by natural selection and by harvest, particularly sport hunting. Changes in the probability of survival according to sex, age and phenotype can affect both the population dynamics and the evolution of life-histories in large mammals, providing a potentially important feedback loop between evolution and population ecology. Detailed studies of population dynamics of harvested populations of large herbivores are urgently needed, because their dynamics may be fundamentally different from those of the largely unharvested populations that have been the subject of most long-term studies.

MAMMALOGY IN LATIN AMERICA: PAST, PRESENT AND FUTURE PERSPECTIVES

CONVENERS: **C. Miguel Pinto** and **Jorge Salazar-Bravo**

INTRODUCTION TO THE SYMPOSIUM 'LATIN AMERICAN MAMMALOGY: PAST, PRESENT AND FUTURE PERSPECTIVES'

Jorge Salazar-Bravo

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The diversity of mammals in the Neotropics is legendary, as the region includes more families of mammals than any other faunal region of the world. Moreover, the region ranks first among all continental landmasses in the number of newly discovered species between 1992 and 2005. In addition, the face of mammalogy in Latin America is changing at an accelerated pace, as many more Latin American scientists are actively participating on mammalogical research than in any time in the past; many at their home countries and institutions. However, the development of research programs across the region is punctuated by national and regional differences that are not well understood.

Therefore, the specific aims for this symposium are:

- 1) To identify regional patterns and trends in terms of the development of mammalogy as a science,
- 2) To identify the more pressing problems associated with growing programs in the region,
- 3) To highlight common goals and potential lines of collaboration that may strengthen developing programs in Latin America.

SOME DEVELOPMENTS IN LATIN AMERICAN MAMMALOGY, 1492-1900

Keir B. Sterling

International Federation of Mammalogists, USA

From the 1490s, Spanish and Portuguese observers in Latin America chronicled its human and natural history. Early accounts included both first and second hand accounts of mammals. Some early authors viewed indigenous species in the context of

classical taxonomic constructs; others saw them in utilitarian terms. Spanish scientists valued empirical colonial data. As investigators focused upon personal observations of Latin American mammalian morphology, new species descriptions were published in Europe. Philip II of Spain (reigned 1556-1598), encouraged scientific inquiry, and sent the first official scientific expedition to Mexico in 1570. He sought specific information, biological and otherwise, from all expeditions for state purposes. Most results were considered state secrets, although some information was published elsewhere. But Philip's many other civil and military initiatives bankrupted the Spanish treasury. Continuing fiscal constraints often prevented realization of his scientific objectives, and those of his successors. For reasons of state—with few exceptions—scientific exploration in Latin America by investigators from other European nations was prohibited by Spanish and Portuguese authorities. Scientific reports from Dutch Brazil (1624-1654), on the other hand, were widely circulated in Europe. The volume of zoological input from South America was impressive, but only one quarter of the continent had been scientifically surveyed as late as 1940. The world's first complete vertebrate fossil, a *Megatherium*, uncovered in Argentina in 1787, exemplifies Latin-American leadership in paleomammalogy. Sent to Madrid, mounted, and described by Cuvier, it is still on exhibition there. Nineteenth Century Latin American field work was mainly accomplished by British, French, and German naturalists. Research done at that time helped shape conclusions regarding evolutionary theory and the geographic distribution of mammals. North American mammalogists were increasingly active in Latin America after the 1850s. The last state-sponsored Spanish scientific expedition to the Americas occurred between 1862 and 1866.

MAMMALOGY IN ARGENTINA: HISTORY, DEVELOPMENT AND PROGRESS

M. Mónica Díaz

Universidad Nacional de Tucumán, Argentina

Mammalogy in Argentina was originated in researches conducted by foreign naturalists of the 19th century, as were Bonpland, von Humboldt, or de Azara; they were the main source of inspiration for many young scientists arrived later to South America, with the purpose to explore its great diversity. In the 20th century Angel Cabrera established the basis for the study of mammals in the country, and together with José Yepes published «Mamíferos Sudamericanos». Other researchers, who contributed to develop Mammalogy in Argentina, were Claes Olrog, Oliver Pearson, and Michael Mares, with projects supported initially by their countries. About the middle of the 20th century began the training of local mammalogists, directed and stimulated by Osvaldo Reig, who promoted in the 1980s the formation of a group of research in evolutionary Biology and the creation of SAREM together with a group of prominent mammalogists, some of which are still supporting the life of the society; Elio Massoia, who deserve to be mentioned, dedicated for four decades to the study of mammals in Argentina. There are currently many research groups throughout the country, studying different aspects of mammals: Systematic, Taxonomy, Genetics, Paleontology, and Ecology. Unfortunately, the majority of the universities do not dictate a specific subject in Mammalogy, so the students must reach their specialties under the support of constituted research groups; this restricts the natural expansion of the interest for the study of mammals. It is important to mention the role of the mammal's collections in the country; they have grown in concordance with the increases of the number of mammalogists. During many years the collected specimens and many holotypes were deposited outside Argentina. The last years there have been changes, and the foreign projects have the obligation to deposit the holotypes, plus additional specimens, in an Argentine collection.

BOLIVIAN MAMMALOGY: CURRENT SITUATION AND LESSONS LEARNED

Luis F. Aguirre, Teresa Tarifa & Humberto Gómez

Here we present an update of the most relevant activities conducted in research, conservation and education related to Bolivian mammals and organized by several institution from the country and elsewhere. Mammalogy started with the pioneering work of Sydney Anderson back in 1973, and to date more than 200 publications have been produced by several institutions. Most of the information (596 published papers up to 2007) is related to distribution and ecology (ca 50%), whereas only a small portion of it correspond to systematic and taxonomy (13%). In order to promote mammalogy in Bolivia we need to take in consideration three important aspects, but not limited to them: 1) There is a need to promote proper curatorial work with well-trained technicians and researchers; related to this, very few Bolivian mammalogists are actually working on systematics and taxonomy and most of them in conservation and ecology; 2) capacity building at all levels should be encouraged; courses on mammalogy need to be prepared on a regular basis, however, only very few Universities offer such a class in their study programs; 3) data stored in local collections should be more easily available to researchers.

UNDERSTANDING THE LEGACY TO PLANNING THE FUTURE OF COLOMBIAN MAMMALOGY

Hugo Mantilla-Meluk

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Four major periods characterized the development of mammalogy in Colombia: *Beginnings*: in the first half of the 1900's defined by surveys conducted by collectors of international institutions, first check-list of Colombian mammals (Allen 1916), and creation of the first collections. This first period is closed by the decade of field work conducted by Hershkovitz during the 1940's. *Establishment*: In the decade of the 1950's, is defined by the foundation of the Instituto de Ciencias Naturales led by Hernández-Camacho. Merit special recognition the contribution on zoonotic studies of Makenzie, Marinkelle, Tamsitt and Valdivieso who contributed to the development of the collections of the Universidad del Valle (UV) and Universidad de los Andes in the 1960's. *Consolidation*: Was possible with the schools directed by Cadena and Alberico who joined ICN and UV respectively in the decade of the 1970's, as well as posterior academic contributions of Muñoz (Universidad de Antioquia), and the museological work of Gómez-Laverde, Muñoz-Saba, Montenegro, Rivas-Pava. Of remarkable constancy is the primatological research of Defler, Izawa, Palacios, Rodríguez, and Stevenson as well as the research on aquatic mammals conducted by Trujillo at the Fundación Omacha starting in the 1980's. *Modern mammalogy*: Marked by the creation of the Instituto von Humboldt (IAvH) in 1993 is characterized by the first autochthonous checklists of mammals and documentation of the Colombian mammalian fauna by the IAvH and Conservation International through Rodríguez-Maecha; is of special interest the check-list of mammals of Alberico et al. published in 2000. Colombian mammalogy is a growing field with a promising generation of students receiving training in a number of institutions across the country. The responsibility of the new Colombian mammalogists is to bridge the internal and external political boundaries, and make sure that Colombian mammalogy will be validated by the international scientific community through publications.

CURRENT IMPROVEMENTS AND CONSTRAINTS TO THE FULL DEVELOPMENT OF MAMMALOGY IN BRAZIL

João Alves de Oliveira

Universidade Federal do Rio de Janeiro, Brazil

Brazilian Mammalogy has experienced a notable expansion in recent decades. This has been partially due to investment in sending students to recognized foreign graduate programs, but also to the enhancement and multiplication of national graduate courses in Zoology. Numerous mammal researchers have been hired in universities and research institutions throughout the country in recent years, and this initiative has contributed significantly to the growing number of students taking up Mammalogy as a career and in the number of publications in the field by Brazilian researchers. Paradoxically, however, several factors increasingly constrain the generation of sound mammalian taxonomic research in Brazil. They include: 1) a progressive departure from the specimen-based approach to biodiversity and taxonomic studies, resulting from an overvaluation of the molecular paradigm and the criminalization of collecting activities; 2) the absence of a tradition for the preparation and maintenance of research collections nationwide, and the consequent lack of quality standards for curatorial procedures; 3) the rapid pace of local extinctions of habitat types and their mammals even before they have been adequately surveyed and documented, as a result of agro-industrial and other large-scale development projects, so that wildlife and wildlife studies are being progressively confined to biological reserves and national parks; 4) the highly deficient representation of overall mammalian diversity in Brazilian collections, even at a South American scale, which frequently constrains the scope of comparative studies to certain endemic taxonomic groups; and 5) the relative decrease in the number of scientific journals devoted to morphological studies, a problem that has been particularly aggravated by the low grading of national (mostly institution-based) periodicals by government funding agencies. Since taxonomy informs many other areas of science and policy making, the adverse effects of all these constraints are not confined to Mammalogy.

HISTORY AND CURRENT STATUS OF THE ECUADORIAN MAMMALOGY

Diego Tirira

Ediciones Murciélagos Blanco, Ecuador

This paper presents an analysis of 15 years of data collection regarding the mammals of Ecuador. Historically scientific study of Ecuadorian mastofauna was based on (1) arrival of the Malaspina expedition from Spain in 1790 in Guayaquil and the collection and description of a number of specimens, and (2) in 1802 the German scientist Alexander von Humboldt visited Quito resulting in the publication of the first description of the mammals of Ecuador. Throughout the nineteenth century the country received visits from a number of expeditions and European naturalists (including Charles Darwin, Caetano Osculati and Marcos Jiménez

de la Espada) who carried out collections and published information about our mastofauna. But it is not until the end of the nineteenth century and the beginning of the twentieth that we see an increase in the number of publications, the majority based on descriptions of new species and their distributions, with M. O. Thomas, J. A. Allen and H. E. Anthony the principal proponents during this time. In the twentieth century new scientists appeared, contributing valuable studies not only in Ecuador but also for the whole neotropical region, they included A. Cabrera, G. H. Tate, P. Hershkovitz, R. Hoffstetter, among others. It is however clear that the majority of publications (over 85%) regarding Ecuadorian mastofauna appeared in the last 40 years, until the 1960's the number of studies were relatively scarce. We also found that the majority of scientific studies were carried out by foreign scientists and results published overseas. It is only in the last two decades that Ecuadorian scientists have for the first time published more material regarding the mastofauna of Ecuador than overseas researchers. In spite of this, even for the best known Ecuadorian mammals made up of some tens of species, the majority have only short summaries regarding their distributional status and information regarding the ecology, biology and behaviour of the majority of species are based on indirect and poorly substantiated inferences.

ORIGIN, DEVELOPMENT, AND PERSPECTIVES OF THE STUDY OF MEXICAN MAMMALS

Rodrigo A. Medellín, Joaquin Arroyo, Jorge Ortega, and Gerardo Ceballos

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The mammals of Mexico represent a complex array of Neotropical, Nearctic, and endemic species. Given the geographic location of the country, and its intricate topography, Mexico is in the top three countries in the world with its 524 species. Formal, scientific knowledge about this extremely diverse mammal fauna begun soon after the New World conquest by the Spanish conquistadors. The religious missionaries, primarily Jesuit and Franciscan, became assiduous collectors and observers of nature during the first stage of Mexican mammalogy. Then a new age began in the 1830s when explorers from the United States had the opportunity to survey northern Mexico and later on additional regions of the country. This was a significant advance that resulted in the description of well over 100 taxa (species and subspecies). A third period began in 1884 with the kindling of the interest of U.S. museums and the growth of the museum collections. This was a period of strong collecting activities that ended in 1919. Over 600 taxa were described, although at the end of that period, and due to the Mexican revolution and World War I, exploration and surveys all but came to a halt. The first taxon described by a Mexican is from this period, the Volcano rabbit. In 1922, the fourth period of Mexican mammalogy began, and here mammalogical activities conducted by Mexicans started taking off. Pioneers such as Bernardo Villa are notable in this period, because the first groups of mammalogists and the first museum mammal collections began shaping up. Over 200 taxa were described. The most recent period of Mexican mammalogy started in 1943 and is characterized by a flourishing of studies conducting conceptual synthesis assessments of Mexican mammalogy, from biogeography to ecology to evolution. Despite the still developing taxonomy, this branch of Mexican mammalogy has taken a rear seat in this science, while ecology and evolution are rapidly advancing. Disproportionally few established mammalogists in a megadiverse country such as Mexico, make the study of mammals a fundamental branch of biology. Many more Mexicans are needed to catch up and have an adequate knowledge of this group.

CONCLUSIONS OF THE SYMPOSIUM 'LATIN AMERICAN MAMMALOLOGY: PAST, PRESENT AND FUTURE PERSPECTIVES'

C. Miguel Pinto

Texas Tech University, USA

Despite clear differences in the mammalogical advances among the Latin American countries, it is evident that the region in general is experiencing a burst of local research in the diverse aspects of mammalogy. However, some major widespread problems need to be tackled to ensure continuity and improvement of these research efforts. These major problems are the lack of defined academic programs with emphasis in mammalogy, government policies that slow or prevent research initiatives (e.g., strong bureaucratic obstacles to obtain collecting, exporting, and research permits), and inadequate financial support for research. These three problems are interrelated and are administrative in essence. These problems also reflect the lack of involvement of biologists in general and by mammalogists in particular at the policy making level ranging from their own campuses to their respective governments. At the strict academic level, we should focus on what kind of research we are doing and if this research will continue to be recognized as scientifically competitive. Are we trying to (1) answer novel and attractive questions, (2) making unbiased and relevant descriptions of the natural world and (3) communicating effectively the research results to our peers and general public? These points seem more important today, where the lack of resources limit long term field research and the use of expensive technologies result in an under appreciation of the research that can be conducted. The quality of our objectives and practices must prevail, rather than application of costly methodologies. Among the great advantages that Latin American mammalogy possesses are vast gaps in the knowledge of our mammalian fauna that promote endless opportunities for research, ready access to field sites, and the early immersion of motivated people in our field. This is an interesting time for our field, with new challenges, opportunities and responsibilities.



Tuesday, August 11th

MAMMALIAN LIFE HISTORIES: THE CONTRIBUTION OF SEX-SPECIFIC PERSPECTIVES.

CONVENERS: **Hannu Ylönen** and **John S. Millar**

DO FEMALE SMALL MAMMALS WORK HARDER THAN MALES?

John S. Millar

University of Western Ontario, CAN

Do female small mammals work harder than males? John S. Millar, University of Western Ontario, Canada Female small mammals are income breeders and typically double or triple their daily food intake during lactation. This difference in energy requirements between breeding females and males/non-breeding females leads to the conclusion that breeding females work harder than males. However, field metabolic rates for 4 species of *Peromyscus* show no differences in metabolic rates between males and females. Variation in metabolism is explained by body size and ambient temperature, and no significant variation in metabolism is explained by sex, age, or reproductive status. Therefore, females may not work harder than males. The similarity in metabolism between males and females can be explained by compensatory mechanisms in females. These may include home range sizes and levels of activity, but the largest compensation likely arises from the fact that increased food intake by lactating females is converted into milk and metabolized by the young. The dam does not metabolize the increased food intake but gains compensatory heat production from the Specific Dynamic Action (heat of digestion). Finally, metabolism in small mammals is predominantly used for thermoregulation and a relatively small proportion of the overall energy budget is used for reproduction. Variation in daily metabolism related to thermoregulation may preclude the detection of any variation attributable to reproductive status in small endotherms. Field metabolic rates are useful in the study of interspecific but not intraspecific variation in life history parameters.

CLIMATE DETERMINANTS OF SEXUAL SIZE DIMORPHISM IN THE CHIPMUNKS (*TAMIAS* SPP)

Albrecht I. Schulte-Hostedde

Laurentian University, CAN

The evolution and maintenance of sexual size dimorphism is the result of independent, sex-specific selection acting on body size that leads to different optima for males and females. Although sexual selection has been offered as the major explanation for the predominant pattern of male-biased sexual size dimorphism among mammals, females are larger than males in many mammalian species, suggesting that sexual selection cannot be the sole explanation for the evolution of sex differences in body size. Climate has been shown to affect the evolution of body size and in mammals, and may be an important determinant of geographic patterns of sexual size dimorphism. Here I examine climate data and geographic variation in male and female body size from 40 populations of chipmunks (*Tamias* spp), to determine how climate affects variation in sexual size dimorphism. Chipmunks are small ground squirrels that exhibit a consistent degree of female-biased sexual size dimorphism. Multiple regression analysis revealed that (1) female-biased sexual size dimorphism was most pronounced in southern populations and in populations that experienced cool and dry climates, and (2) variation in sexual size dimorphism was most influenced by variation in male size, rather than female size as has been previously hypothesized. Geographic variation in male size relative to climate may be the result of sex differences in habitat use with respect to hibernation sites, or geographic variation in the strength of sexual selection on male size. A review of published studies indicates the general trend that male size increases

relative to females in warm, wet climates. Males may be emancipated from the costs of large size in benign climates, and thus climate does not constrain the evolution of male size via sexual selection.

LIFE HISTORY, SUPERFETATION, AND SEX ALLOCATION IN EUROPEAN HARES: AN EXPERIMENTAL APPROACH

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Superfetation is the conception of an already pregnant female. Since Aristotle this phenomenon was supposed to be part of the reproductive biology of the European brown hare (EBH; *Lepus europaeus*). Nevertheless, until recent evidence was scarce and functional mechanisms were still unclear. We therefore conducted a long-term study in a captive population of EBH at our field research station. Frequent ultrasound examinations on 159 pregnancies and the development of successful application of artificial insemination combined with structured breeding management lead to a new experimental perspective on superfetation in EBH. Females were mated up to four days before parturition. At the time of birth a new set of embryos was already developing in the oviduct and was therefore not affected by the event of birth. Paternity tests revealed that the semen must have passed the late-pregnant uterus to fertilize the ova. Until recently, superfetation in EBH was considered highly controversial. Our results confirm that superfetation exists and strongly suggest that it is an evolutionary adaptation that enhances female fitness. Superfetation does not only provide an accumulating time benefit during the breeding season. Litter sizes were also significantly higher in pregnancies conceived with superfetation. As a result, a female can potentially deliver up to one third more offspring per breeding season. There was also a strong indication that the sex of the offspring in litters conceived with superfetation was shifted in favour of males. These results were confirmed in both pregnancies induced by natural breeding and with artificial insemination. Which mechanisms might be responsible for these effects and what the functional significance of such a shift in sex allocation might be is presently unclear. Our results demonstrate the value of an experimental approach to life history studies and confirm that superfetation could have a major impact on life-histories of female EBH.

THE SMELL OF SEX: DOES SEX BIAS THE PREDATION RISKS OF OLFACTORY COMMUNICATION?

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In addition to the intended receiver, conspicuous signals are likely to also attract non-intended receivers such as predators, and the benefits of communication must therefore be weighed against the potential costs. These costs of signal conspicuousness have typically been assigned to signalling individuals and, because of their often greater investment in signalling, thereby to dominant males. But in the olfactory signalling systems favoured by territorial mammals, these costs may be borne equally or to a greater extent by receivers. This arises because of the unique spatial and temporal properties of olfactory signals, which enable signallers to deposit their signal (scent mark) then leave, thus having little temporal association with their signal. In contrast, individuals must make contact with a scent mark to receive the signal it contains, placing themselves at an increased risk of predation from coincidentally attracted predators. This suggests that individuals that are highly motivated to visit scent marks (receive) will be those most vulnerable to eavesdropping predators, irrespective of their subsequent signalling behaviour. This has significant implications for sex-specific differences in predation risk, as individuals of different sex and status differ in their investment of time and energy in scent marking and receiving. Importantly, while dominant males are typically categorised as «signalling» individuals, «receivers» can be male or female, dominant or subordinate. Using rodents as a model, this talk will explore the evidence that individuals are at an increased risk of predation when receiving, and the implications of sex-specific differences in scents and behavioural responses to scents on an individual's susceptibility to predation.

«USELESS» MALES AND FEMALE STRATEGIES: INFANTICIDE AND POLYANDRY IN SMALL MAMMALS

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Females and males often exhibit different and even antagonistic life history strategies. In breeding populations operational sex ratio of males is skewed, over winter males survive worse. In both seasons there seems to be an excess of males, competing for resources in winter, and for mates in summer. Breeding females have developed counter-strategies to surplus males, posing a threat for offspring in form of infanticide. For example, it has been hypothesized that polyandry evolved as female counterstrategy

to offspring loss: by mating with multiple males, females may cloak paternity and so prevent males from killing potential young. This presentation reviews our knowledge on the occurrence and expression of infanticide, male turnover, and female polyandry in the bank vole, *Myodes glareolus*, basing on numerous laboratory and field experiments. We show that multiple mating reduces the risk of infanticide and enhances offspring survival in the bank vole. Further, we discuss sex differences in seasonal life history strategies of the bank vole.

FEMALE FITNESS IN RELATION TO SEXUALLY SELECTED INFANTICIDE IN A HUNTED POPULATION OF BROWN BEARS

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Life history theory attempts to explain the broad features of a life cycle from birth and growth until maturity, reproduction and the number of offspring until death. To study the evolutionary aspects of life history strategies and lifetime reproductive success requires long-term studies of unhunted populations. However, most populations of large mammals are hunted. Hunting might affect female fitness in brown bears (*Ursus arctos*) directly, by killing them, or indirectly, by killing adult males, which may lead to sexually selected infanticide (SSI) caused by newly arriving males. We have conducted long-term individual-based research on two hunted populations of brown bears in Scandinavia. The number of yearlings weaned increased with female longevity, tended to be higher in the south, and tended to increase with female body size, but the importance of female body size decreased with increasing age. We also analyzed the factors influencing survival of cubs in 174 litters. Litter size was not associated with litter survival, but factors that were highly significantly associated with it were male turnover (a proxy for SSI, negative), female body size (positive), population density (negative), study area, and the interactions of food conditions the previous year : area, spring litter size : population density (with the negative effect of litter size increasing with increasing density), and body size : area. The factors food conditions the previous year (positive) and the interaction male turnover : population density (the negative effect of male turnover increased with increasing density) were also significant. Thus, female fitness was influenced directly by hunting, by reducing longevity, and indirectly, by reducing litter survival due to SSI.

SEX AND DEATH IN DASYURID MARSUPIALS

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The marsupial family Dasyuridae is the largest in the Australia-New Guinea region (69 species), and also extraordinarily diverse in the range of life histories that it encompasses. In general, many tropical dasyurids breed year round, while temperate and arid species are usually seasonal breeders. However, all members of the genera *Antechinus*, *Dasykaluta*, *Phascogale* and some populations of species within *Dasyurus* and *Parantechinus* show the phenomenon of male semelparity, perhaps the most divergent sex-specific strategy known among mammals. In this presentation I review the different life history patterns within Dasyuridae, and then evaluate hypotheses that have been advanced to account for post-mating male death in antechinuses and their relatives. Two explanations appear to be best supported. The first is based on evidence that females store sperm from multiple males during the two-week annual rut, and thus establish conditions for intense sperm competition. Males can maximize their chances of paternity by inseminating many females, but trade longevity to do so. The second hypothesis is based on observations that female survival is often low between birth and the weaning of young. Here, males can potentially achieve higher paternity success by inseminating many females and thus hedging their bets about which will survive, again trading longevity to do this. Males very occasionally survive the mating period, and do so either in low density (<1/ha) or in very high density (>50/ha) populations. These situations may allow males to reduce reproductive effort because sperm competition is less intense (at low density) or reflect greater per capita access to food resources (at high density). The incomplete or 'facultative' die-off seen in some *Dasyurus* and *Parantechinus* populations should allow future resolution of these possibilities.

ENVIRONMENTAL CHANGE AND SMALL RODENT ECOLOGY

CONVENERS: **Otso Huitu, Mauricio Lima, Janne Sundell**

LAND-USE CHANGE: EFFECTS OF SCALE ON OCCUPANCY PATTERNS OF SMALL MAMMALS

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Agriculture has transformed native ecosystems worldwide and is arguably the greatest anthropogenic disturbance influencing animal communities. Short-term behavioral and life history responses to disturbance interact with features at local, landscape, and regional scales to influence demography and occupancy patterns of small mammals. I summarize nearly 2 decades of research conducted on behavioral, population, and community responses of small mammals to agriculturally induced habitat change in Indiana, USA. Species of tree squirrels (*Sciurus* and *Tamiasciurus*) vary dramatically in their willingness and ability to move through farmland, often with pronounced effects on local occurrence and regional representation. For flying squirrels (*Glaucomys volans*), occupancy patterns appear related to interactions of movement with social constraints imposed by energetic demands. In some species (e.g., *Zapus hudsonius*), dramatic reductions in habitat quality and quantity lead to unexpected changes in local distribution and the potential for critical thresholds to viability. In species such as white-footed mice (*Peromyscus leucopus*) and eastern chipmunks (*Tamias striatus*), local demographic effects of habitat fragmentation exist, and genetic signatures imply reduced connectivity despite nearly ubiquitous current distributions. Disequilibrium and faunal relaxation are evident more than 150 years after the agricultural transformation began, suggesting further changes in local and even regional community composition unless action is taken to restore habitat quality and connectivity.

SMALL RODENT FLUCTUATIONS AND CLIMATE CHANGE: NATURAL LABORATORIES FOR TESTING POPULATION DYNAMICS THEORY.

Mauricio Lima

Pontificia Universidad Catolica de Chile, Chile

The dramatic responses of food resources to climate variability in different ecosystems represent a unique opportunity for testing basic principles of population dynamic theory. In particular, small rodent fluctuations are natural laboratories for studying the relative importance of the feedback structure (intrinsic processes) and exogenous (climatic or environmental) factors in determining population dynamics. In this presentation, I review the findings from different ecosystems about the role of climate in determining population dynamics of small rodents. Previous studies using long-term data from small rodent monitoring in North and South America have applied simple theoretically based population dynamics models for understanding small rodent fluctuations. The findings show that simple models can be useful in explaining and predicting the dynamics of natural populations, particularly when they are based on a sound theoretical framework. In particular, Royama's classification of exogenous perturbation effects has been extremely useful in population modeling. Using these models together with Royama's paradigm for classifying exogenous (climate) perturbations, it is possible to distinguish how climate influences the limiting factors (food) in small rodent populations. The remarkable simplicity and generality of the models used appear to be very successful in explaining rodent fluctuations at different ecosystems in North America and South America.

THE LEMMING CYCLE GONE WITH CLIMATE CHANGE

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The population cycles of rodents at northern latitudes have puzzled people for centuries, and their impact is manifest throughout the alpine ecosystem. As summary of past work – and speculations – are provided by way of introduction. The main focus of the talk will be on lemmings/voles and climate. Climate change is known to be able to drive animal population dynamics between stable and cyclic phases, and has been suggested to cause the recent changes in cyclic dynamics of rodents and their predators. But although predator–rodent interactions are commonly argued to be the cause of the Fennoscandian rodent cycles, the role of the environment in the modulation of such dynamics is often poorly understood in natural systems. Hence, quantitative links between climate-driven processes and rodent dynamics have so far been lacking. Here we show that winter weather and snow

conditions, together with density dependence in the net population growth rate, account for the observed population dynamics of the rodent community dominated by lemmings (*Lemmus lemmus*) in an alpine Norwegian core habitat between 1970 and 1997, and predict the observed absence of rodent peak years after 1994. These local rodent dynamics are coherent with alpine bird dynamics both locally and over all of southern Norway, consistent with the influence of large-scale fluctuations in winter conditions. The relationship between commonly available meteorological data and snow conditions indicates that changes in temperature and humidity, and thus conditions in the subnivean space, seem to markedly affect the dynamics of alpine rodents and their linked groups.

CLIMATE CHANGE AND CONSUMER-RESOURCE DYNAMICS: LONG-TERM INSIGHTS FROM A DESERT RODENT COMMUNITY

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Anticipating the response of ecosystems to environmental change is a pressing ecological issue, a challenge further complicated by the diversity of predicted changes operating across spatial and temporal scales. Using 30 years of data from the Portal LTREB, an arid system in the southwestern United States, we examine the long- and short-term relationships among climate, primary productivity, and the dominant consumers in this system, desert rodents. Although arid systems are often perceived as relatively simple and driven predominantly by water, we show that consumer-resource dynamics are surprisingly complex and variable through time at this site. Long-term climatic changes have led to dramatic increases in shrub densities, precipitating significant changes in the composition and structure of both the annual plant and rodent communities. Both communities have experienced the impacts of invasion, with the plants increasingly dominated by the exotic *Erodium cicutarium* and the rodent community impacted by a rapid increase of a recent colonist from the regional pool, *Chaetodipus baileyi*. These long-term changes have interacted with short-term dynamics, namely extreme precipitation events, to further alter composition and whole system responses to climate dynamics in unexpected ways. Specifically, we found that extreme events differentially impacted rodent species, altering competitive interactions and consequently community structure. Concomitant with compositional changes, the rodent community has exhibited stronger responses to variability in precipitation and primary productivity. Finally, new analyses using wavelet transforms have revealed additional details about how rodent response to climate dynamics varies across temporal scales. In summary, results from Portal have shown that the global phenomena of changing precipitation regimes, increasing frequency of extreme climatic events, and shrub encroachment can interact to reorganize communities and consequently ecosystem dynamics. Further exploration of the mechanisms underlying such reorganization is critical to understanding the long-term consequences of global climate change in ecological systems.

RODENT COMMUNITIES AND ENVIRONMENTAL CHANGE IN AGRO-ECOSYSTEMS IN SOUTHEAST ASIA

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Rodents are major pests in agricultural production. In Asia, rodents cause annual pre-harvest losses of 5–10% in rice crops. A loss of 6% is enough rice to feed 225 million people for one year. Currently there are eight major rodent pest species in Southeast Asia. Over the last decade there has been good progress in strengthening our knowledge of the ecology of many of these pest species, Field evidence is building that populations of rodent pests respond to increases in food supply in the wet/dry tropics, with the main drivers being changes in intensity of cropping, unusual rainfall events, and a late or staggered start to the tropical monsoons. The global food crisis in 2008 has placed increased pressure on the agricultural lands, particularly the favorable, lowland environments. We predict that both climate change, particularly through an increased frequency in unusual rainfall events, and increased human demand for food, will lead to changes in environmental use of rodents – both pest and non pest species. We will report on how two major pest species, *Rattus argentiventer* and *R. tanezumi*, respond to changes in environment use in Southeast Asia, and then build some scenarios for the future. We also report on the often neglected native species, which in the Philippines thrive in botanically diverse agro-ecosystems, but are likely to face significant range contraction if there are increases in intensity of agricultural production. We will present some limited evidence that native rodent species play an important ecosystem service at a landscape level in diverse agricultural habitats in the Philippines. Too little research has been conducted on these rodent communities. More research effort is needed urgently before land use decisions are made in a vacuum of information on the importance of conserving rodent communities in agro-ecosystems.

RESOURCE PULSES DRIVE RAPID EVOLUTION AND POPULATION DYNAMICS IN A SEED PREDATOR

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For some perennial plant species the periodic production of large numbers of seeds represents a reproductive strategy designed to satiate seed predators, but these resource pulses might also act as an agent of selection on the life histories of seed predators. Models of r- and K-selection predict that life histories associated with rapid and prolific reproduction will be favoured when resources are abundant, whereas more frugal life histories and the production of fewer, but more competitive offspring will be favoured when resources are scarce. As a result, ecological satiation of seed predators during mast events might be compounded by natural selection for more frugal life histories during intervening years of low seed production. Here we measure natural selection on the life histories of female North American red squirrels (*Tamiasciurus hudsonicus*) across 19 years and three white spruce (*Picea glauca*) mast cycles and use a replicated large-scale manipulation of food resources to experimentally identify food abundance as an agent of selection. Females producing many offspring had higher reproductive success, but also incurred an overall survival cost. This cost of reproduction, however, was mitigated in mast years and in experimentally supplemented populations. In contrast, natural selection on offspring quality was density-dependent. Higher spring densities, which followed abundant fall cone crops, favoured the production of faster growing offspring that were born earlier in the season. Experimental supplementation of food resources increased population densities and increased the strength of directional selection on offspring growth rates. These results provide observational and experimental evidence that the influence of pulsed resources on consumers extends beyond previously documented functional and numerical responses, to encompass natural selection on life history resulting from resource booms and busts.

***CTENOMYS*: NEW RESEARCH PERSPECTIVES FROM SOUTH AMERICAN SOIL**

Conveners: Ana Paula Cutrera, Daniel Antenucci and Eileen Lacey

EVOLUTION, PHYLOGEOGRAPHY AND POPULATION GENETICS IN FOUR SPECIES OF *CTENOMYS* IN THE SOUTH OF BRAZIL

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Three different aspects are addressed: geometric morphometrics, phylogeography and coat-color variation. The geometric morphometrics in *Ctenomys lami* were examined the shape variation in the skull to comparing males and females, different population blocks, diploid numbers, karyotypes and chromosomal pairs 1 and 2. We studied 90 skulls in all geographic distribution. The morphometry variation was studied in the dorsal, ventral and lateral views. The results confirm the initial hypothesis and suggest the existence of association between chromosome and morphological variation. Phylogeography patterns was obtained with mtDNA. *Ctenomys torquatus* with $2n=40$ to 46 were studied about chromosome, morphometry, morphology, phylogeny, biogeography and geographic distribution. Results show low haplotypic divergence, with a more frequent haplotype occurring throughout the species distribution. *Ctenomys minutus* occurs in a narrow line of the South Brazil, showing eleven different karyotypes from $2n = 42$ to 50, with two karyotype systems (a and b). The geographic genetic structure of *C. minutus* show 34 haplotypes. Results indicate that most of the populations are strongly structured. *Ctenomys flamarioni*, lives in South Brazil, show a genetic structure revealed strong differentiation among populations. *Ctenomys* species have a high diversity of coat colors as typical *agouti*, dark brown and paler coloration. We explore the relationship between coat-color polymorphism of MC1R in twelve tuco-tuco species coming from different phylogenetic lineages. Basically there are two groups of species, the mendocinus group and the others species. Individuals with discrete coloration also showed amino-acid patterns identical to *agouti* as species from the 'mendocinus' group, which include paler coloration, *agouti* and melanic, had different MC1R sequences. Thus, contrarily our results suggest that coding variation at is not only in MC1R.

EVOLUTIONARY MORPHOLOGY OF THE GENUS *CTENOMYS*: REVIEW AND PROSPECT

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The study of digging adaptations in the subterranean rodent *Ctenomys* is straightforward because there is well preserved fossil record of Ctenomyidae, which allowed the characterization of early stages of adaptation. Further, species belonging to the sister family Octodontidae encompass a broad array of behavioural/structural adaptations, from surface dwelling to subterranean forms, which provides a useful comparative framework. Fossorial habits independently evolved in many mammalian lineages in association with the emergence of open environments during the Cenozoic. This is an explanation mostly based on external factors, i.e. environmental conditions. We may also ask: what internal/organism factors have triggered the emergence of this novel niche? The functional analysis of *Ctenomys* and its living and extinct relatives yields a remarkable result: some species within Octodontidae are capable of digging complex burrows even in the virtual absence of morphological adaptations. This notion is consistent with early ideas by Ernst Mayr, who had claimed that the shifts into novel niches are almost without exception initiated by a change in behaviour that preceded and canalised subsequent structural change. The status of some characters differing in *Ctenomys* species of contrasting size, such as the width of the mandible across the angle, and incisor cross-section, are the outcome of the extension of the ontogenetic trajectory, which do not differ in either slope (allometric coefficient) or intercept. This fact indicates an evolutionary ontogenetic scaling associated with skull shape variation within the limits of a genus. New data coming from in vivo estimation of biting forces might be useful to characterise more deeply one striking feature of the dual masticatory-excavatory apparatus of *Ctenomys*: the hypertrophy of the masseteric musculature and jaw. This information, in conjunction with previous osteological and myological analysis concerning lever arms relationships of the skull will help to understand the performance of dentoexcavation in different soil conditions.

SPECIES AND POPULATION BOUNDARIES IN A CHANGING ENVIRONMENT IN THE SOUTH AMERICAN SUBTERRANEAN RODENT *CTENOMYS*

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Species of subterranean rodents of the genus *Ctenomys* (tuco-tucos) constitute an interesting model to assess the effects of habitat fragmentation at the interface between population genetics, ecology, historical biogeography and species boundaries. The «perrensi» group is a complex of three species (*C. roigi*, *C. perrensi* and *C. dorbignyi*), and several forms (*C. sp*) whose taxonomic status has not yet been determined. The three named species have diploid numbers of $2n=48$, 50 and 70, respectively, while *C. sp* exhibits $2n$ ranging from 40 to 65. The high karyotypic variability of the «perrensi» complex, together with the distribution of their populations in isolated demes, suggests that chromosomal evolution is an ongoing active and recurrent process in these genomes. Boundaries of the distribution areas of named species seem to be well established, but populations of the «perrensi» complex are patchily distributed in dry areas around the Esteros. The Esteros is a wetland that covers more than 12,000 km² consisting of a vast mosaic of marshes, swamps and lagoons, of which nearly 60% are permanently inundated. Because of the soil requirements for their fossorial life, tuco-tucos can only form patchy populations where the habitat is favorable in the wetland. Fluctuations in the area of the lagoons that form the esteros produce changes in the suitability of habitat for the rodents. Populations can become connected or isolated depending on the precipitation regime and other climatic alterations of the environment. We have been investigating the species and populations of the «perrensi» complex during the last 10 years, through chromosomal, mitochondrial and microsatellite analysis. Although results obtained with mitochondrial DNA, karyotypes and microsatellites are sometimes in conflict, they depict a complex and dynamic scenario involving genic and chromosomal divergence in allopatry and intermittent hybridization events.

SPECIES GROUPS AND THE EVOLUTIONARY DIVERSIFICATION OF TUCO-TUCOS, GENUS *CTENOMYS* (RODENTIA, CTENOMYIDAE)

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The phylogenetic identity, contents and relationships of species groups in *Ctenomys* have been tested to a limited extent. We have further evaluated some of these issues using complete DNA sequences of the mitochondrial cytochrome b gene, including 99 representatives of 39 species. Maximum Parsimony, Maximum Likelihood and Bayesian inference support the following

general hypotheses: 1) *Ctenomys sociabilis* is sister to the remaining tuco-tucos included in this study. 2) Eight major additional species groups are identified: Boliviano-Matogrossense (*C. boliviensis*, *C. goodfellowi*, *C. nattereri* & *C. steinbachi*) allied to three *C. sp.*, Boliviano-Paraguay (*C. conoveri*, *C. frater*, *C. lewisi* & *C. sp. Llathu*), Chaco (*C. argentinus*, *C. latro*, *C. oculatus* & *C. tucumanus*), *opimus-fulvus*, *mendocinus* (*C. azarae*, *C. australis*, *C. mendocinus*, *C. porteousi* and several *C. sp.*) allied to the complex *pundti-talarum*, and the novel groups Patagonian (*C. coyhaiquensis*, *C. fodax*, *C. haigi*, *C. sericeus* & *C. magellanicus* along undetermined forms) and *torquatus* (*C. pearsoni*, *C. perrensi*, *C. lami*, *C. minutus*, *C. roigi* & *C. torquatus*). 3) Other species remain either outside the species groups and lack clear phylogenetic relationships (*C. leucodon* & *C. maulinus*). The first six of these groups were already proposed in the literature and are corroborated here, with some variants. Relationships among these groups remain difficult to determine, which is consistent with a scenario of rapid diversification, as proposed earlier. The pattern of diversification of *Ctenomys* is more complex than the one envisioned previously and it is not assimilated in current classification.

IMMUNE VARIABILITY IN TUCO-TUCOS: GENETIC INFLUENCE, FITNESS BENEFITS AND ENERGETIC COSTS

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Parasites and pathogens are expected to exert strong selection pressures on their hosts by affecting variables intimately linked to host fitness. Because hosts exhibiting less efficient defenses should be selected against, it is intriguing that hosts vary so markedly in the strength and efficiency of their antiparasite strategies. Two main explanations have been proposed to account for this variation. First, parasite resistance is under genetic control, with negative frequency-dependent parasite-mediated selection on Major Histocompatibility Complex (MHC) genes acting to maintain variability in immune response. However, few studies that have demonstrated diversifying selection on MHC genes in free-living mammals have also explored the functional consequences of such variation. Interpopulation comparisons of levels of MHC variability in *Ctenomys talarum* revealed that heterozygosity and diversifying selection at MHC genes were consistently greater for the more pathogen-challenged population. To assess the functional consequences of this difference in polymorphism, we examined whether MHC variability is associated with levels of parasite resistance in this species. Second, because the immune response may entail substantial costs, variability in this response can arise from differential allocation of resources to immunity vs. other costly physiological processes. Among mammals, studies of immune response costs have focused on surface-dwelling rodents with often contradictory results. Studies on tucos – with lower mass-specific metabolic rates and a slower «pace of life» than surface rodents – will give insights into the factors that influence investment on immunity. Our studies of *C. talarum* indicated that mounting an immune response was associated with a significant increase in energy expenditure, suggesting that pathogens can impact the energy budget of tucos, creating the opportunity for trade-offs. Together, these lines of research involving *Ctenomys* are contributing to understanding the bases for variation in immune defense in natural populations of mammals.

CTENOMYS MENDOCINUS, A KEYSTONE SPECIES AND AN ECOSYSTEM ENGINEER AT THE SOUTH OF THE PUNA

Carlos Borghi, Natalia Borrueal, Natalia Andino, Gabriela Canovas, A. Rodríguez Navas, Graciela Agüero, Ana Srur, Carolina Rivero y Graciela Díaz
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Keystone species are those species whose impact on its community or ecosystem in a manner disproportionately large in relation to its abundance. Ecosystem engineer species are those who modulate directly or indirectly the availability of resources to other species, by causing physical state changes in biotic or abiotic materials. Many studies have suggested that others subterranean rodents could be considered as ecosystem engineers. Within this framework, we studied the role of *Ctenomys* in the functioning of the Puna ecosystem, at the Reserva Don Carmelo, San Juan, Argentina at 3150 m asl. We found that *Ctenomys* activities modified soil, vegetation structure, plant survival, floration, fructification, seed production and seedling emergence. It also indirectly modified the thermal landscape by its effect on the substrate and plant cover. As a combination of their effect as keystone species and an ecosystem engineer, their indirect effects modify plant composition, plant cover, and the distribution and abundance of animal species. For example, increasing relative abundances of lizard (e.g. *Liolaemus ruibali*), modified habitat use of big mammals like guanacos (*Lama guanicoe*), or birds as *Oreopholus ruficollis*, *Muscisaxicola alpina* and *Geositta cunicularia*. The activity of *Ctenomys* switches from a community structured by bottom up process (growth limiting resources like water and temperature) toward a community structured by top down process (by herbivory of *Ctenomys* population). Then, Puna populations can be under a dual control by resources and subterranean herbivores in a cycle of approximately 5 years long.

STUDYING STRESS AND HOMEOSTASIS IN TUCO-TUCOS: UNUSUAL PHYSIOLOGICAL TRAITS REVEALED WHEN LABORATORY AND FIELD STUDIES WORK TOGETHER

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The talk will describe our recent findings about the physiology of the stress axis and regulation of blood glucose in *Ctenomys talarum* (tuco-tucos). The species exhibits various peculiarities with plasma levels of glucocorticoids (GCs, cortisol and corticosterone) that fall at the lower extreme of the mammalian range and contrast with extremely-high testosterone concentrations. Noteworthy, cortisol and corticosterone were found in similar amounts in the field, which contrasts with previous studies in other rodents showing marked differences in the concentrations of both GCs. Furthermore, cortisol and corticosterone showed different patterns of variation in free-living animals throughout the breeding cycle and were differently affected by captivity. Also, experiments in the field and laboratory revealed that only cortisol is responsive to acute stress in the species. All these evidence suggest differentiated physiological roles for cortisol and corticosterone in tuco-tucos. When we were evaluating the possibility of using blood glucose as a stress indicator in the species, we registered a decreased capacity of regulating glycemia in glucose tolerance tests (GTT) in comparison to mammalian standards. Though hystricomorph rodents are known to have an insulin molecule with a decreased biological activity, only one species –the naked mole rat– has previously shown an impaired response in a GTT. All other species of caviomorphs rodents (South American hystricomorphs) assayed to date were able to regulate blood glucose in GTTs like non-hystricomorph mammals suggesting the existence of compensatory physiological traits. Importantly, blood glucose levels in field tuco-tucos were within the normal mammalian range which demonstrates that a larger capacity of regulating blood glucose is not actually required to achieve optimal concentrations. Our results indicate that species within the genus *Ctenomys* are very interesting models to explore the ecophysiology of the stress axis and blood glucose homeostasis in mammals.

SOCIAL SYSTEMS OF CTENOMYIDS: NEW DEVELOPMENTS AND NEW DISCOVERIES

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Studies of ctenomyids are generating important new insights into the evolution of mammalian social behavior. Three areas of investigation in which ctenomyids are playing a fundamental role are the ecology, physiology, and neuroanatomy of sociality. With regard to ecology, long-term field studies of the colonial tuco-tuco (*C. sociabilis*) have revealed that hypotheses developed to explain sociality among African mole-rats (Bathyergidae) are not comprehensive. Instead, there appear to be at least two distinct pathways to sociality among subterranean rodents, with the nature of the food resources consumed (subterranean versus aerial plant parts) being a potentially important mediator of the ecology of social structure in these animals. With regard to physiology, comparative studies of lone versus group-living female colonial tuco-tucos indicate that the social environment has a significant impact on baseline levels of corticosterone, a glucocorticoid hormone that contributes to multiple aspects of allostasis. In this species, lone and group-living females differ significantly in patterns of annual direct fitness and survival, providing an important opportunity to link socially-mediated differences in glucocorticoids to the adaptive consequences of sociality in a free-living mammal. With regard to neuroanatomy, comparative studies of *C. sociabilis* and the syntopic but solitary Patagonian tuco-tuco (*C. haigi*) have revealed significant differences in neuropeptide receptor distributions that may reflect the distinct social structures of these species. While previous studies of the neurobiology of sociality have emphasized male-female social bonds, the female kin groups found in *C. sociabilis* are more typical of mammals and hence studies of this species are providing novel information regarding the neuroanatomical bases for non-sexual social relationships. Despite these advances, the social systems of most ctenomyids remain unknown. As the number of ctenomyid species for which data on social organization are available grows, these animals should become increasingly important as subjects for comparative studies of mammalian behavioral biology.

DNA BARCODING IN MAMMALS: PRESENT STATUS, METHODS AND APPLICATIONS.

CONVENERS: **Judith Eger**, and **Eduardo Eizirik**

MAMMALIAN DNA BARCODING: TAXONOMIC AND GEOGRAPHIC OVERVIEW

Alex Borisenko

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The mammalian DNA barcoding campaign is assembling a reference library based on a standardized 650 base pair fragment of the cytochrome oxidase subunit I (COI) gene. This information is associated with taxonomically identified museum voucher specimens and being hosted on the Barcode of Life Data Systems (BOLD) at www.boldsystems.org. Currently the database comprises nearly 35,000 specimen records with COI sequences organized into 130 virtual projects. The taxonomic diversity represents all currently recognized orders of mammals, 82% of the families, 43% of the genera, and 22% of the species. Geographic coverage spans approximately 3,500 unique localities from 84 countries. Nearly 4/5 of these records were generated as a result of a dedicated barcoding effort within the past four years, which was made possible through contributions from almost 100 research institutions. Despite the initial success, considerable taxonomic and geographic biases remain in the data that reflect the areas of research focus of the principal contributors. Attaining a more comprehensive taxonomic coverage and geographic representation will require a well-coordinated approach and can only be achieved by a broad international research alliance. The implementation of standardized protocols for specimen and data aggregation, and the adoption of a uniform taxonomic framework will facilitate efficient barcode accumulation and stimulate systematic research.

EXPRESS DNA BARCODING AND TISSUE ARCHIVAL METHODS FOR MAMMALIAN FIELD SURVEYS

Natalia Ivanova

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The utility of DNA barcodes in confirming taxonomic field identifications of mammals has been demonstrated, but their broader application requires simple and time-efficient analytical techniques. Commonly used methods of tissue collection in the field include fixation in ethanol, salt-detergent buffers, dimethyl sulfoxide (DMSO) solution, and cryopreservation in liquid nitrogen. This study describes recently developed express protocols that enable rapid recovery of DNA barcodes from blood and tissue samples preserved on FTA Elute® cards (Whatman). After a single wash, DNA is eluted in water without using additional reagents. Contaminants such as hemoglobin bind to the card matrix and DNA is easily released into solution during incubation at 95°C. After this simple procedure, the DNA aliquot is amplified with a fast-cycling PCR enzyme to generate a DNA barcode in less than two hours. FTA Elute® cards are compact, convenient to handle, and easy to ship. The proposed protocol will enable researchers to confirm field identifications in real time and provide a robust backup option to traditional methods of tissue preservation.

PROSPECTUS FOR A GLOBAL RODENT BARCODE INITIATIVE (GRBI)

Kristofer Helgen and David Schindel

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Rodents are the most diverse group of mammals, encompassing more than 2,500 species (about 40% of global mammal diversity), including a large number of taxonomic complexes in which closely related species are difficult to identify. Rapid identification of rodents to the species level is important to many in the global community, but is currently an enormous challenge. In addition to being fundamental to the understanding of biodiversity and ecosystem function, rodents are of interest to many as agricultural pests, invasive species, and vectors of important diseases; they are prevalent on the watch-lists of public health and food safety officials, border inspectors, environmental protection agencies, and agricultural services. Many rodent species have close relatives that are hard to distinguish, even by experts, and in many contexts relevant to public health and safety, rodents often leave only bits of fur and feces behind, making it impossible to identify them reliably using traditional methods. As global trade and travel continue to increase, regulatory agencies need better, faster, and cheaper ways to identify rodent species without relying on access to taxonomic experts in each individual case. Here we discuss the need and prospects for a Global Rodent Barcode Initiative (GRBI), in which we hope many mammalogists will participate.

DNA BARCODING OF PALEARCTIC RODENTS REVEAL NEW RECORDS OF SPECIES AND NUMEROUS MISIDENTIFICATIONS

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Due to the wide scaled phylogeographic studies carried out on a number of most widely distributed but still insufficiently studied species of the subfamily Arvicolidae a quite representative database of mitochondrial (both COI and cyt b) and some nuclear sequences related to the voucher specimens stored at the main zoological collections in Russia (Zoological institute of RAS and Zoological museum of MSU) has been gathered. This allowed us to use this database as a reference one in exploring biodiversity of rodents in poorly studied areas and in identification of species very similar morphologically and hardly distinguishable otherwise. In result the *Myodes rex*, the Hokkaido red backed vole was for the first time found at the Sakhalin island. This species was never recorded before in the fauna of Russia despite numerous surveys. The identification made on the base of nucleotide sequence was reliably confirmed by the examination of molar pattern. Among the gray voles (g. *Microtus*), trapped in the south-western Yakutia (58° 14'N, 119° 30'E) on the base of analysis of DNA barcode (COI), cyt b and nuclear gene GHR the Middendorff's vole (*M.middendorffi*) has been discovered. This identification was also confirmed by morphological analysis. This record is thousands km to the south and west from the nearest known records of this species - 71° 45'N 124° E and 59° 24' N 154° 47'E. (Shenbrot, Krasnov, 2005). Above this due to the barcoding many field misidentifications were discovered. Among them most often are pairs of species *M. rutilus*- *M.rufocanus* and *M.glareolus* – *M.rutilus*. In the last case due to the known introgression in order of reliable DNA barcoding procedure the nuclear genes and microsatellite locus's were involved. The study was financially supported by Program of Presidium RAS «Biodiversity and dynamics of gene pools» and «Biosphere origin and Evolution» and grant RFBR 09-04—01330

THE ROLE OF GENETIC BARCODING IN DISCERNING SPECIES DIVERSITY IN RHINOLOPHID AND HIPPOSIDERID BATS

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Bats in the speciose Palaetropical families Hipposideridae and Rhinolophidae contribute significantly to the diversity of the bat fauna of the forests of the Old Tropics. These bats have had a difficult and tortuous taxonomic history, mostly due to the morphological similarity of many of its members. A clarification of the taxonomic and evolutionary diversity of these bats would help to set up priorities for their conservation and to understand their evolutionary diversification. Mitochondrial DNA sequence data have revealed some apparently clear new cryptic species within the genera *Hipposideros* and *Rhinolophus*, and multiple lineages within named taxa in the case of *Aselliscus*, *Hipposideros* and *Rhinolophus*. In some cases (i.e. distantly paraphyletic lineages) morphologically cryptic lineages can be immediately recognized as new cryptic species. However, the taxonomic status of deeply differentiated lineages within recognized taxa may not be so clear. Social structure clearly influences the genetic structure of populations: species living in scattered small social groups use to show little geographical differentiation in lineages, while species living in large colonies tend to show strong genetic differentiation across geography. We have identified a case of apparent horizontal transfer of the mitochondrial genome between nuclear gene lineages, which makes paraphyly an insufficient criterion for identification of cryptic diversity in these bats. In spite of these problems, genetic barcoding represents a fundamental exploratory tool to discern diversity in the rhinolophid and hipposiderid bats. It allows the identification of the systematic neighborhood of new samples, it allows matching specimens located in distant collections, and it points out to the convenience of other data (morphological, echolocation, nuclear DNA sequences) for resolving the systematics of the identified mitochondrial lineages.

PRELIMINARY ASSESSMENT OF NEOTROPICAL MAMMAL BARCODES

Burton Lim

Royal Ontario Museum, Toronto, CA

There are 1,657 species of mammals currently recognized in the Neotropical region broadly defined as including Mexico, Central America, the Caribbean Islands, and South America. This represents almost one-third of the total worldwide mammalian biodiversity. The Barcode of Life Data (BOLD) Systems established an institutional collaboration with the Royal Ontario Museum (ROM) beginning in 2005 to DNA barcode our tissue collections for the cytochrome oxidase I (COI) gene region. To date, over 13,500 specimens have been sequenced representing approximately 20% (> 340 species) of the known mammalian diversity in the Neotropics. This includes 11 of the 15 mammalian orders found in the Neotropics with the 4 missing orders representing less than 20 species. More than half of the bat species (172 of 323) have been barcoded but only 3% (4 of 128) of the primate

species have been done. Rodents are the most diverse order in the Neotropics, of which 13% of the species have been barcoded (119 of 882). In terms of geographic coverage, Middle America is the most comprehensively represented with only one country missing (Honduras), but half of the countries are not represented from South America and we have no samples from the Caribbean. There is also a sampling bias with approximately half of our specimens from Guyana. Although we have established an initial DNA barcode reference database for Neotropical mammals, there are obvious taxonomic and geographic areas that need to be filled to make it broadly applicable to general species identification in this region of high biodiversity.

BARCODING MEXICAN MAMMALS, THE MEXBOL PROJECT

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The MEXBOL project was born as an initiative of many researchers that believe that Mexico needs to join the international initiative of Barcoding. The Mexican project is sui generis because it has three main nodes in three geographical areas, south, central and north. Each one of the nodes is associated to a different research institution and has the goal to support only another institution in its geographical area. The project has been founded by the Mexican Council for Science and Technology (CONACYT). CONACYT gave a five year grant, of these, the first three years are guaranteed. Approximately the grant per year is of ~1 million US dollars. The money of the grant will be used for additional equipment, material and supplies for the laboratories. The professional fees for academic personnel and technicians associated to each of the nodes are covered by the institutions that hosts and offers the facilities. On the other hand, the steering committee of the MEXBOL project gives the bases to the National Commission for Use and Knowledge of Biodiversity (CONABIO) to open a grant to any university and research center for Barcoding collections of specimens. At the beginning of 2009 the three laboratories of the node began to operate. Now with much support from Guelph University in Canada, but at the end of the year the labs will be completely equipped.

BARCODING BRAZILIAN ATLANTIC FOREST MAMMALS

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We provide a status report on the Barcoding Atlantic Forest Mammals initiative. The Atlantic Forest of eastern South America is one of the top biodiversity hotspots, harboring about 260 mammal species, 70 of them endemic and 20 threatened with extinction. Our main goal is to generate barcodes for at least 50% of these species, focusing on the endemics. So far we have sequenced 211 specimens belonging to 61 species, 51 genera, 13 families, and 6 orders, with emphasis on small mammals (marsupials, rodents, and bats). Our samples come mainly from southeastern Brazil, but extend to the northern, southern, and western limits of this biome. All specimens have corresponding museum vouchers; most of them are stored in three Brazilian collections and have been identified by taxonomic experts. Sequence divergences average 0.6% within species, 11% within genus, 18% within family and 24% within order. Using the barcode library, we were able to: 1) provide putative identifications to several unidentified museum specimens, especially of small rodents, 2) detect misidentified specimens, calling for a re-examination of museum vouchers, 3) identify highly divergent, and potentially new species. Funding: Fundação de Apoio à Ciência e Tecnologia do Espírito Santo (FAPES), Critical Ecosystem Partnership Fund (CEPF).

LARGE-SCALE DNA BARCODING OF NEOTROPICAL MAMMALS: CHALLENGES AND PROSPECTS

Eduardo Eizirik

Centro de Biologia Genômica e Molecular, Pontifícia Universidade do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil

This talk will review the ongoing effort to generate DNA barcodes for all extant species of Neotropical mammals. This initiative is listed by CBOL as a regionally endorsed project in South America, and has already gathered a group of interested parties comprising over 20 research institutions in six countries. The talk will describe the status of this multi-centric project, the prospects for accomplishing its proposed goals, and the main challenges that still need to be overcome. I will also discuss the relevance and likely applications of DNA barcoding for Neotropical mammals, and review ongoing work incorporating this molecular approach into ecological studies targeting South American species.

THE GLOBAL MAMMAL BARCODING CAMPAIGN – THE WAY FORWARD

Judith Eger

Royal Ontario Museum, Toronto, CA

To date less than 1/4 of recognized mammal species have been barcoded; however, the observed diversity of the barcode region in the cytochrome c oxidase I (COI) gene suggests the existence of many more species potentially new to science. Furthermore, taxonomic and geographic coverage is uneven and has been dependent primarily on circumstantial collecting rather than on a concentrated, methodical approach. With more than 35,000 specimens barcoded, it is necessary to assess what has been done and how to go forward by formally organizing a global mammal barcoding campaign. It is proposed to coordinate efforts by using a Web portal to maintain a centralized real-time synopsis of barcoded taxa and by making available pre-publication summary statistics. This functionality is available in the newly established Mammalia Barcode of Life website (<http://mammaliabol.org>) which will incorporate a direct feed from the Barcode of Life Data Systems (BOLD) online repository. Using this portal will allow present and future contributors a means of knowing where to concentrate their research efforts in a more coordinated manner. By providing barcodes associated with museum specimens, the Mammalia Barcode of Life will support a standardized mammalian nomenclature and enable the research community to use DNA barcodes to test species identifications prior to their deposition in genetic sequence databases such as GenBank. Involvement of many researchers in museums, universities, zoos and wildlife agencies throughout the world will be needed in this effort to assemble the DNA Barcode reference library, which will be an important tool aiding in the identification, discovery, and documentation of mammalian biodiversity.

MESOPREDATOR RELEASE: ECOLOGICAL EFFECTS OF INTERACTIONS AMONG MAMMAL PREDATORS, AND THEIR IMPORTANCE TO BIODIVERSITY CONSERVATION

CONVENERS: **Chris Johnson & Euan Ritchie**

MESOPREDATOR RELEASE AND BIODIVERSITY CONSERVATION, AN OVERVIEW

Euan Ritchie & Chris Johnson

James Cook University Australia

There is growing recognition of the important roles played by mammalian predators in regulating ecosystems and sustaining biodiversity. Much attention has focused on the consequences of predator-regulation of herbivore populations, and associated trophic cascades. However apex predators may also exert control over smaller 'mesopredators' through intraguild interactions. Removal of apex predators can therefore result in changes to intraguild interactions and outbreaks of mesopredators ('mesopredator release'), and may lead to increased predation on smaller prey. Here we provide a review and synthesis of studies of predator interactions, mesopredator release and their impacts on biodiversity. Mesopredator suppression by apex predators is widespread geographically and taxonomically. Apex predators suppress mesopredators both by killing them, or instilling fear, which motivates changes in behaviour and habitat use of mesopredators that limit their distribution and abundance. Changes in the abundance of apex predators may have disproportionate (up to four-fold) effects on mesopredator abundance. Outcomes of interactions between predators may however vary with resource availability, habitat complexity and the complexity of predator communities. There is potential for the restoration of apex predators to have benefits for biodiversity conservation through moderation of the impacts of mesopredators on their prey, but this requires a whole-ecosystem view to avoid unforeseen negative effects.

AN ALIEN TOP-PREDATOR STEMS MAMMAL EXTINCTIONS

Mike Letnic

University of Sydney Australia

Alien predators can have catastrophic effects on ecosystems and are thought to be much more harmful to biodiversity than their native counterparts. However, trophic cascade theory and the mesopredator release hypothesis predict that the removal of top predators will result in the reorganization of trophic webs and loss of biodiversity. Using field data collected throughout arid Australia, I provide evidence that removal of an alien top-predator, the dingo, has cascading effects through lower trophic levels. Dingo removal was linked to increased activity of herbivores and an invasive mesopredator, the red fox (*Vulpes vulpes*), and to the loss of grass cover and native species of smallmammals. Using species distribution data I predict that reintroducing or maintaining dingo populations would produce a net benefit for the conservation of threatened native mammals across > 2.4 x 106 km² of Australia. This study provides evidence that an alien top-predator can assume a keystone role and be beneficial for biodiversity conservation, and also that mammalian carnivores more generally can generate strong trophic cascades in terrestrial ecosystems

LARGE CARNIVORE COMEBACK RESHAPES THE BOREAL FOREST COMMUNITY

Gilbert Ludwig

University of Jyväskylä, Finland

The loss of large mammalian carnivores has had far reaching effects on vertebrate communities of boreal forests. Recent recoveries of large carnivores throughout Fennoscandia may reverse the processes that have been elicited by their loss. In Finland, policies of large carnivore management were implemented according to the European Union habitat directive in the 90'ies. Ever since, large carnivores, especially the Eurasian lynx, have made a dramatic comeback. Using nationwide monitoring data, we show that this trend is increasingly affecting community structure by reversing mesopredator release. Mesopredators like foxes have decreased in numbers after the return of the lynx, which in turn facilitates the recovery of declining forest grouse populations.

TOP PREDATORS, MESOPREDATORS AND THEIR PREY: TOP-DOWN OR BOTTOM-UP?

Bodil Elmhagen

Stockholm University, Sweden

The red fox (*Vulpes vulpes*) is the dominating predator in present-day Fennoscandia, where it suppresses several prey species. It has been hypothesised that the red fox has risen to its dominant position due to mesopredator release, since top predators (wolf *Canis lupus* and Eurasian lynx *Lynx lynx*) were almost extirpated in the 19th century. In contrast however, community ecology theory predicts that the top-down impact of top predators depends on ecosystem productivity and there is a strong productivity gradient within Fennoscandia. We use historic and recent data from Sweden and Finland to explore the relationship between top predators, red foxes and prey in relation to bioclimatic productivity gradients. Statistical modelling of 19th century hunting bags indicate that declining top predator abundances triggered a mesopredator release in productive southern Sweden, but the impact weakened at lower productivities and was negligible in north boreal forests and alpine tundra. Statistical modelling of winter track data from the Finnish Wildlife Triangle Scheme shows that the re-establishment of lynx in the late 20th century has reversed some effects of mesopredator release. Community structures differ between regions where lynx has regained control of the red fox population and regions where red foxes still function as top predators. In both cases, the top-down impacts depend on productivity. Our findings indicate that mesopredator release has a strong impact on community structures in southern Fennoscandia. In the less productive north however, the expansion of red foxes appears related to increasing ecosystem productivity following climate change. Nevertheless, this expansion is changing northern community structures as well as biodiversity patterns.

INTRODUCED PREDATOR CONTROL AND THE RESPONSE OF NATIVE MARSUPIAL CARNIVORES IN SOUTH-WESTERN AUSTRALIA

Al Glen

Western Australian Dept Environment & Conservation

The western quoll, or chuditch (*Dasyurus geoffroii*), is a medium-sized marsupial carnivore (body mass up to 2 kg) that suffered catastrophic declines following European settlement in Australia. Control of introduced red foxes (*Vulpes vulpes*) has contributed to a recovery in parts of south-western Australia. However, recent concern has arisen that fox control may have led to mesopredator release of feral cats (*Felis catus*), with potentially deleterious effects on native fauna. If feral cats have been released from competition, what effects might this have on the threatened chuditch? Taking advantage of a large-scale predator removal experiment, my research aims to examine the responses of chuditch to fox control, and to examine evidence for impacts of feral cats on chuditch. At a broad geographic scale, chuditch are more abundant and have higher survival rates in the fox removal area. However, spatial variation in chuditch abundance within treatments indicates that factors other than fox control are also important. The diet of chuditch in the study area is similar to previously described diets of foxes and cats in Australia, suggesting the possibility of competition between all three species for prey. Interference competition may also be important. Introduced predators can be a major source of mortality for chuditch, and foxes have been considered the most likely aggressors. However, I have recorded the first confirmed killing of a chuditch by a feral cat, indicating that this predator may also be a threat to individual chuditch. The effects of cats on chuditch at the population level remain unknown. Depending on the level of threat posed by cats, predator control operations may have to shift to a multi-species approach in which foxes and cats are controlled simultaneously.

EXPERIMENTAL EVIDENCE OF INTERACTIONS AMONG SYMPATRIC CARNIVORES

Robbie McDonald, Gavin Wilson and Iain Trewby

The Food and Environment Research Agency, U.K

Management actions that result in changes in the relative abundance of sympatric carnivores can have far-reaching ecological consequences. There are now numerous observations of trophic cascades and species declines apparently arising from well-intentioned interventions. While such observations are compelling, experimental evaluations of the impacts of carnivore management are few and far between because of their logistical and ethical challenges. In this talk, we provide evidence from a replicated and controlled experiment involving the culling of Eurasian badgers *Meles meles* for disease control. We identify intraguild impacts on prey (hedgehogs *Erinaceus europaeus*) and competitors (red foxes *Vulpes vulpes*) for badgers. This unique experiment demonstrates the importance of intraguild relations in determining species abundance and of assessing the wider consequences of intervention in predator populations.

MESOPREDATOR RELEASE IN TASMANIAN: WHAT'S AT RISK IN THE ISLAND ARK?

Dean Heinze

Tasmanian Department of Primary Industries and Water

Since European occupation the Australian continent has experienced the highest rate of mammal extinction in the world primarily due to land use changes and introduced mammal predators, such as the European Red Fox *Vulpes vulpes*. Until recently the island state of Tasmania remained Fox-free and maintained a suite of animals that have become extinct, are close to extinction or have suffered large range contractions on the Australian mainland due to Foxes. The largest extant marsupial carnivore, the Tasmanian Devil *Sarcophilus harrisii*, was recently listed as endangered due to population declines by up to 80% associated with the Devil Facial Tumour Disease (DFTD). The decline of this species has left an abundance of food in the landscape, revealing a niche for introduced mammal predators. Feral Cat *Felis catus* numbers have increased, but of more concern is the incursion and possible establishment of the Fox in Tasmania. This paper discusses the implications of 'mesopredator release' and the incursion of the Red Fox in Tasmania, including the consequences that it may have for native wildlife. In the worst case scenario of eradication failure and full Fox establishment in Tasmania, resource limitations will necessitate prioritising of management actions that focus on species and regions where impact is likely to be greatest. In view of this, a risk assessment was carried out that ranked 'at-risk' wildlife species from high to low likelihood of population decline should foxes establish. Fauna that exhibit traits leaving them highly vulnerable to fox predation and/or competition have been highlighted as high at-risk species. The level and spatial distribution of genetic diversity, dispersal and gene flow among populations of at-risk species will

be determined using molecular techniques, and management units identified for population monitoring. Results will be used to highlight conservation priorities by defining vulnerable local populations that may require extensive management. Protecting the ecological function and genetic diversity and managing the risk to Tasmania's unique wildlife species is critical, should foxes establish. The research activities described here will allow us to assess, monitor and mitigate that risk.

DEVELOPING AN INTEGRATIVE CONSERVATION STRATEGY FOR XENARTHRA: ADVANCES IN RESEARCH

CONVENERS: **Mariella Superina** and **Flávia Miranda**

THE ROLE OF MOLECULAR DATA IN XENARTHROAN CONSERVATION

Frederic Delsuc

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In the last decade, xenarthroan biology has been revolutionized by molecular data. However, until recently, little attention has been paid to their potential usefulness for the conservation of armadillo, anteater and sloth species. Using examples from phylogenetic and phylogeographic studies, I will illustrate the utility of such approaches for prioritizing conservation decisions and defining conservation strategies. Firstly, I will present a reference phylogeny and timescale encompassing all living genera, including for the first time the endangered fairy armadillos *Chlamyphorus truncatus* and *Calyptophractus retusus*. Probabilistic phylogenetic analyses of a four gene dataset (12S rRNA, ND1, BRCA1, and VWF) provided evidence for the monophyly of fairy armadillos and their sister-group relationship with Tolypeutinae (Tolypeutes, Cabassous, and Priodontes). Furthermore, molecular dating analyses estimated a fairly ancient divergence date (ca. 18 million years) for the separation between the two fairy armadillo species, thereby supporting their taxonomic classification into distinct genera. This study revealed fairy armadillos as distinctive members of a major armadillo lineage with high conservation priority. Secondly, I will expose the results from a phylogeographic study of the most widespread xenarthroan species: the nine-banded armadillo (*Dasypus novemcinctus*). This case study uncovered a high degree of genetic differentiation over the species geographical range reflecting previously described subspecies. However, it also revealed unsuspected population differentiation in the Guianan shield and allowed retracing the colonization of Central and North-America by South-American populations. Such phylogeographic studies have the potential to enhance our understanding of historical factors that influenced the evolutionary history of xenarthroan species and help identifying conservation entities. Future work on conservation genetics of Xenarthra includes the reconstruction of a comprehensive species-level phylogeny and detailed phylogeographic and population genetic studies of its endangered species. This will allow further characterization of the genetic diversity of this peculiar placental order and provide guidance to conservation plans.

APPROACHING FOSSORIAL MAMMALS: THE PICHI AS A REGIONAL MODEL FOR XENARTHROAN CONSERVATION

Mariella Superina

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Armadillos (Dasypodidae) are a notoriously understudied taxon. The lack of solid data on their ecology and exact area of distribution makes the evaluation of their conservation status and the development of effective conservation strategies a challenging task. In Mendoza Province, central west Argentina, pichis (*Zaedyus pichiy*) are intensely sought after by illegal hunters who use them as a protein source. This depletion of wild populations led to the inclusion of *Z. pichiy* in the IUCN Red List of Threatened Species, where it is listed as Near Threatened, and called for the development of a conservation plan. Innovative ways to study the natural history and population health of pichis and unusual conservation strategies were sought to protect this elusive species. The establishment of a captive pichi colony facilitated studying the thermoregulation and reproduction of pichis by means of implanted dataloggers and non-invasive monitoring of their reproductive function, respectively. Close collaboration with the local authorities was key to carry out research on free-ranging pichis, sensitize rangers and inspectors on conservation issues, and increase protection for the wild populations. Samples collected from dead individuals confiscated from poachers

allowed studying the diet and population health of wild pichis without having to sacrifice any animals. The reproductive status of poached females was determined as part of the study. Based on this process, fines to poachers killing pregnant or lactating females were raised to a higher level. The identification of potentially zoonotic pathogens in free-ranging pichis is used as an argument to discourage poaching. Education programs are being developed to further reduce poaching. These actions represent a first approximation to understand the ecology of *Z. pichiy*, but it is clear that more research and conservation actions are needed to ensure the long-term survival of these fascinating mammals.

THE FIRST POPULATION VIABILITY ANALYSIS FOR THE ENDANGERED MANED SLOTH, *BRADYPUS TORQUATUS*

Adriano G Chiarello
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The maned sloth is the most endangered sloth species inhabiting mainland Central and South America. The present study modeled the population viability of this species in four areas located in lower-montane Espirito Santo, south-eastern Brazil, where native forest cover >60% of the landscape. Two scenarios were modeled, one conservative using the lowest sloth density (= poor quality habitat) and one non-conservative using the average value for density (= better quality habitat). The amount of remaining forest was estimated through the interpretation and classification of a SPOT 5 satellite image from 2004. The estimated densities were multiplied by the amount of remaining forest supposing that sloths are able to cross forest gaps up to 25 m or up to 50 m of distance (=buffer zones). VORTEX simulation results indicate that only the two largest areas (3565 – 8760 ha) presented viable populations in all scenarios (595 - 2216 individuals), in the temporal scale of 100 years. The population of the second smallest area (736 - 896 ha, population: 123 – 227 individuals) presented significant loss of genetic viability in the conservative scenario with low connectivity (25 m buffer zone). The population of the smallest area (184 – 265 ha; population: 31 – 146 individuals) was considered viable only in the non-conservative scenario with high connectivity (50 m buffer zone). Overall, results suggest that viable populations might exist only in the study region and, perhaps, also in the cocoa region of southern Bahia state, which possess the largest tracts of native forests within the geographic distribution of the species. However, this supposition is very dependent on variables that are still not well known, such as population densities, mortality rates and dispersion abilities through non-forest matrices. Future studies should prioritize the attainment of these parameters.

GETTING STARTED: ANTEATER CONSERVATION STRATEGIES IN BRAZIL

Flávia Miranda
Projeto Tamanduá and Wildlife Conservation Society, Brazil

Brazil is the country with the world's greatest biological diversity, containing about 14% of the planet's total biota. Human activity has the capacity to affect nature in order to satisfy its ever increasing needs and desires. Competition for space and resources causes ever rising tension and conflicts with other species. Intense exploitation of natural resources places the possibility of natural renewal at risk. Habitat loss and degradation due to human activity constitute the biggest threats to the existing terrestrial mammals in Brazil. Economic development generates an increase in the population density of human beings, which in turn raises the amount of extrinsic factors that lead to the population decline of other mammals. The immediate impact of environmental degradation generates a loss of biodiversity. The number of threatened species facing the risk of extinction increases as a result.

The rapid transformation of the Brazilian landscape into soy and sugar cane plantations has severely deteriorated the forested regions since 1990. Wildlife populations have been pressured through loss of habitat, forest fires, and vehicular trauma, among other factors. Three species of anteater exist in Brazil; the Giant anteater (*Myrmecophaga tridactyla*), the Lesser anteater (*Tamandua tetradactyla*) and the Silky anteater (*Cyclopes didactylus*). The Silky anteater was recently grouped in the new Order Pilosa. These species possess a compact conformation, and are distinguished by the presence of a long and conical snout that with a vermiform tongue which allows the animal to catch its food. Their feeding habits have led to unique anatomical adaptations. They basically feed off ants and termite larvae. Other characteristics are miniature ears, small black eyes, strong forelimbs and long claws which do not use plantar support. The claws are used both for defense and as tools for feeding.

Overall factors that may lead to the decline of anteaters have been identified. Primary among them are direct threats to their conservation, such as habitat loss and degradation, direct mortality due to large scale forest fires, vehicular trauma, poaching, and attacks by dogs. Infectious disease has a great effect on biodiversity conservation, and may push numerous wild species onto threatened or even extinct listing categories. In this context, we present the three species of anteaters and will approach the intrinsic and extrinsic factors that affect their populations in Brazil. A conservation plan is being developed by the Tamanduá Project for captive and wild populations.

WHAT, IF ANYTHING, CAN NINE-BANDED ARMADILLOS TELL US ABOUT THE CONSERVATION OF XENARTHANS?

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Nine-banded armadillos (*Dasypus novemcinctus*) are broadly distributed throughout the Americas and common in most of this range. Among xenarthrans they are without question the species of least conservation concern. However, they are also the best known scientifically. We argue that this makes nine-banded armadillos useful as a benchmark for evaluating other species of xenarthrans by highlighting areas where more information is needed, particularly as this relates to the development of potential management action plans. With this as a framework, we identify four fundamental areas in urgent need of more study: (1) Population demography; (2) Population genetics; (3) Space use; and (4) Reproductive biology. The methods developed in the study of nine-banded armadillos may prove useful in obtaining these data in other xenarthrans. Until such information is available for each species, it is difficult to envision how any effective conservation plans can be developed.

THE USE OF SATELLITE-BASED DATA IN ASSESSING ECOLOGICAL RESPONSES TO ENVIRONMENTAL CHANGE

CONVENER: **Nathalie Pettorelli**

WHEN SATELLITES HELP PREDICTING ANIMAL DISTRIBUTION, MOVEMENT AND PERFORMANCE

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Assessing how environmental changes affect the distributions and dynamics of vegetation and animal populations is becoming increasingly important to terrestrial ecologists. The ability to predict ecological responses to environmental change has however often been hampered by a rather limited understanding of the role of trophic interactions, and up to recently, linking climate, vegetation and wildlife has not been an easy task, partly because traditional field ecological data on plants are generally collected at small spatial scale, for only a few species and vary in their type and reliability. Remote sensing data and NDVI (Normalised Difference Vegetation Index) have recently changed this situation, and given ecologists a promising way to couple vegetation with herbivore distribution, movement, performance and dynamics. NDVI is defined as a normalised ratio between visible and near-infrared reflectance measurements ($NDVI = (NIR - VIS) / (NIR + VIS)$), where NIR is the Near Infrared Light reflected by the vegetation, and VIS the VISible light reflected by the vegetation), negative NDVI values corresponding to an absence of vegetation. Using examples based on topi *Damaliscus lunatus*, red deer *Cervus elaphus*, reindeer *Rangifer tarandus*, roe deer *Capreolus capreolus*, chacma baboon (*Papio ursinus*) and several African ungulates populations, I will here illustrate how NDVI can help quantify the relationships between vegetation dynamics, animal distribution, animal density, seasonal movements and individual performance in various ecosystems (spanning from tropical, to semi-desertic to arctic) at multiple spatial and temporal scales.

SMALL RODENT FLUCTUATIONS AND CLIMATE CHANGE: NATURAL LABORATORIES FOR TESTING POPULATION DYNAMICS THEORY

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The dramatic responses of food resources to climate variability in different ecosystems represent a unique opportunity for testing basic principles of population dynamic theory. In particular, small rodent fluctuations are natural laboratories for studying the relative importance of the feedback structure (intrinsic processes) and exogenous (climatic or environmental) factors in determining population dynamics. In this presentation, I review the findings from different ecosystems about the role of climate in determining population dynamics of small rodents. Previous studies using long-term data from small rodent monitoring in North and South America have applied simple theoretically based population dynamics models for understanding small rodent

fluctuations. The findings show that simple models can be useful in explaining and predicting the dynamics of natural populations, particularly when they are based on a sound theoretical framework. In particular, Royama's classification of exogenous perturbation effects has been extremely useful in population modeling. Using these models together with Royama's paradigm for classifying exogenous (climate) perturbations, it is possible to distinguish how climate influences the limiting factors (food) in small rodent populations. The remarkable simplicity and generality of the models used appear to be very successful in explaining rodent fluctuations at different ecosystems in North America and South America.

CLIMATE IMPACT ON PLAGUE RESERVOIR DYNAMICS IN CENTRAL ASIA —USING REMOTE SENSING IN INFERENCE AND PREDICTION

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The great gerbil (*Rhombomys opimus*) is one of the main hosts for the plague bacterium *Yersinia pestis* in central Asia. In order to prevent plague outbreaks, monitoring of the great gerbil, its fleas and the prevalence of plague within hosts population, has been carried out in Kazakhstan since the late 1940s. We use these monitoring data to demonstrate that climate forcing, measured by the normalized differentiated vegetation index (NDVI), synchronizes the dynamics of gerbils over large areas. As it is known that gerbil densities need to exceed a threshold level for plague to persist (Davis et al. 2004), synchrony in gerbil abundance across large geographical areas is likely to be a condition for plague outbreaks at similar large scales. We substantiate this proposition through autoregressive modelling involving the NDVI as a forcing covariate. Reconstructing the 1982-1995 NDVI back to 1949 using gridded SLP data, we validate our population model back in time (Kausrud et al. 2007). Then we attempt NDVI reconstruction further back in time and on a larger spatial scale with the aim of using paleoclimatic temperature and humidity reconstructions to explore historical plague dynamics. Likely consequences of climate change for the frequency and magnitude of plague epizootics –and thus human infection risk – following from these studies are discussed depending on changing temperature and precipitation patterns in arid central Asia over the coming century. Davis S., Begon M., De Bruyn L., Ageyev V., Viljugrein H., Stenseth N. & Leirs H. (2004). Predictive Thresholds for Plague in Kazakhstan. *Science*, 304, 736-738. Kausrud K.L., Viljugrein H., Frigessi A., Begon M., Davis S., Leirs H., Dubyanskiy V. & Stenseth N.C. (2007). Climatically-driven synchrony of gerbil populations allows large-scale plague outbreaks. *Proceedings of the Royal Society of London. B, Biological Sciences*, 274, 1963-1969.

QUANTIFYING INDIVIDUAL AND SPATIO-TEMPORAL DIFFERENCES IN MIGRATION AND DETECTING ENVIRONMENTAL VARIABILITY USING SATELLITE-BASED DATA

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Migration is an ecological phenomenon that has wide ranging consequences for species' life-history strategies, population dynamics and ecosystem management. To protect migratory species we need to be able to quantify their spatio-temporal movement behaviour, such as the start and end of the migration and the length of migration. While most studies make assumptions about the temporal and geographical extent of migration, we propose a new model-based approach, derived from animal movement theory and implemented using non-linear mixed effects models, to quantify animal migration patterns. We apply the approach to a GPS-collared migrating moose population in Scandinavia showing that a simple 3-parameter model captures up to 94% of the variation in individual migration patterns, with each model parameter having a biologically meaningful interpretation. By adding NDVI data to the migration model we further demonstrate how to identify the mechanisms by which environmental variability shapes spatio-temporal changes in migration patterns. Thus, we developed a rigorous and parsimonious approach that can easily be employed by scientists, managers and stakeholders.

ANIMAL DISTRIBUTIONS AND MOVEMENT BEHAVIORS IN RELATION TO RESOURCE DYNAMICS

Thomas Mueller
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We investigated population distributions and movements of Mongolian gazelles in relation to resource dynamics and contrasted the nomadic movement patterns of gazelles with those of migratory and range-resident large herbivores. Mongolia's Eastern Steppe is one of the world's largest remaining temperate grassland ecosystems and Mongolian gazelles are the dominant wild

large herbivore in this steppe habitat. We analyzed multi-season survey data of gazelle populations as well as tracking data of individual gazelle movements in relation to remotely sensed data of vegetation productivity (normalized difference vegetation index, NDVI). Gazelles preferred an intermediate range of vegetation productivity, which may illustrate a trade-off between forage quality and quantity: areas with low NDVI may be limited by low ingestion rates whereas areas with high NDVI may be limited by the low digestibility of mature forage. We found a high degree of spatiotemporal variability and unpredictability of gazelle habitat across broad spatial scales translating into large area requirements. The tracking data revealed that gazelle movements are wide ranging and show high inter-individual variation. Individuals marked at the same location moved in different directions with dissimilar patterns within weeks. Such irregular movement behavior is likely tied to the unpredictability of the foraging resources of gazelles. We define these irregular long distance movements as nomadism, in contrast to migration in which movements are regular to and from disjunct seasonal ranges, and range residents where individuals move at smaller scales and are dispersed from each other. Analyses of gazelle movements in comparison to other ungulates (caribou, moose, and guanacos) allow us to demonstrate the differences in movement patterns of migratory, resident, and nomadic species.

NDVI, FORAGE QUALITY AND VARIATION IN REPRODUCTIVE PATTERNS OF AFRICAN BUFFALO (*SYNCERUS CAFFER*) IN SOUTH AFRICA

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We examined variation and synchrony in birth timing and resource cues for African buffalo (*Syncerus caffer*), using 8 years of monthly birth, rainfall, and remotely sensed vegetation data (NDVI). Births correlated most strongly with NDVI and rain 12 and 13 months in the past, respectively, and synchrony of current year births corresponded most strongly to the previous year's NDVI distribution. Because buffalo gestation is around 11 months, these findings suggest that improved protein levels, occurring in the month after the first green-up of the wet season, either trigger conception or conception has evolved to be synchronous with environmental cues. In a second study, to characterize this resource response, we related fecal nitrogen (Nf) and phosphorus (Pf) concentrations to vegetation samples, and to female body condition scores (C), and all three (Nf, Pf, C) to NDVI. These data were collected across 2 years over a large spatial extent. We found large-scale landscape and seasonal effects on levels of Nf, Pf and NDVI. We found that body condition was most highly correlated with NDVI at time lags of 1 and 2 months, respectively, and with N-f at a time lag of 3 months, but no trend with Pf. We constructed models to predict N-f and Pf, in terms of NDVI, landscape and season. Using an information theoretic approach, we found the top-ranked models for Nf captured 53% of the variability in 2001 and 59% of the variability in 2002, and both models included NDVI. Top models for Pf did not contain NDVI and captured less variability (51% and 23%). Our results indicate that NDVI is strongly correlated with the nitrogen content of forage at a large scale for buffalo, and that this, in turn, is correlated with improved body condition, supporting the reproductive timing and protein availability relationship suggested in the first study.

ARE ARID/SEMARID SMALL MAMMAL COMMUNITIES IN THE SOUTHERN HEMISPHERE DIFFERENT? WHY OR WHY NOT? PATTERNS, EXPLANATIONS, AND CONTRASTS

CONVENERS: **Peter L. Meserve** and **Christopher Dickman**

SMALL MAMMALS OF THE MONTE DESERT: FROM REGIONAL TO LOCAL ASSEMBLAGES, ECOLOGY AND ADAPTATION

Ricardo Ojeda and Solana Tabeni
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A great part of our understanding of the ecology of desert small mammals is the result of years of ecological research on North American deserts. This have led to generalizations regarding the ecological, morphological, behavioral and physiological attributes of desert rodents (i.e. bipedal locomotion, granivory, seed hoarding) for desert existence. In comparisons with other deserts of the world, the temperate Monte Desert, was regarded, for more than two decades, as impoverished in terms of species richness and in the repertoire of xeric adaptations. With this background as a framework, we provide a characterization

of this long strip of heterogeneous climate and landscapes of shrublands, sandunes, salt pans and woodlands, and an overview of its small mammals. We review evidence on biogeographical, ecological, physiological, morphological and behavioral studies of small mammals of the South American drylands, and the temperate Monte Desert in particular. The assemblages of small mammals show a great diversity of niche types and attributes for desert existence. In particular, we analyze and discuss the degree of adaptation, convergence and the generalization of key processes. We point out the need to be precautionary when comparing heterogeneous arid ecosystems and emphasize on the role of the Monte Desert as a model for ecological research and understanding of the small mammals from southern hemisphere aridlands (*Partially supported through grants from CONICET, PIP 5944 and AGENCIA, PICT 11 768 and 25778*).

SMALL MAMMAL COMMUNITY STRUCTURE AND FLUCTUATIONS IN THE SIMPSON DESERT, CENTRAL AUSTRALIA

Christopher Dickman
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In this paper we describe the population and community dynamics of dasyurid marsupials and rodents over 19 years in the Simpson Desert, central Australia. In this extreme environment, productivity increases during short but spectacular boom periods that occur after heavy rainfall, and crashes during prolonged droughts. Small native rodents erupt 4-6 months after summer rains exceeding 200 mm, increasing recruitment by increased in situ reproduction and long distance movements from drought-stricken areas >10 km distant. Rains that exceed 300 mm allow eruptions of a large species of native rodent, the plague rat (*Rattus villosissimus*). In contrast, small dasyurid marsupials respond positively to moderate summer rains (<100 mm) but crash if rainfall is much heavier; these species rely exclusively on the burrows of other species, and appear to be flushed from cover if rainfall is too intense. One large species of dasyurid, the mulgara (*Dasycercus blythi*), shows a delayed numerical response to heavy rainfall; it digs and stoppers its own burrows, and preys upon rodents as they increase in numbers after rain. Broad-scale wildfires in 2001-2002 burnt >1 million hectares of desert and removed plant cover from more than half of our 5000 km² study area. Populations of all small mammals declined in the aftermath of fires, but remained intact in areas that were not burnt. Short-term (2-3 year) experimental manipulations of species abundances have indicated no obvious role for competition in structuring the communities of these desert small mammals, but there are strong depressive effects of predation from introduced red foxes (*Vulpes vulpes*) and feral cats (*Felis catus*) that drive post-fire or post-eruptive populations to low levels. Strong and interactive effects of wildfires and introduced predators are seldom reported as drivers of the population and community dynamics of desert mammals, and may suggest that Australian systems differ from those elsewhere.

RESOURCE PULSES, SPECIES-ENERGY THEORY, AND THE LOCAL SATURATION OF SMALL MAMMAL COMMUNITIES: ARE AFRICAN RODENTS EXCEPTIONAL?

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Species-energy theory provides a framework to investigate the importance of resource pulses and species interactions in controlling the biomass, energy flux, and richness of local communities. Whether such properties are regulated through time is contingent on the degree to which local communities are structured by extrinsic (i.e., regional) processes, intrinsic (i.e., local) processes, or some combination of both. We asked 1) what are the relative roles of resource pulses (i.e., seasonal rainfall) and competition in regulating biomass, energy flux, and local richness of small mammals in an East African savanna?; and 2) how does regulation of the savanna community compare to that of six other small mammal communities around the globe (C3 oldfield, desert shrubland, deciduous forest, oak woodland, semi-desert scrubland, tropical dry forest)? Using 12 years of data from an ongoing, large-scale ungulate exclusion experiment, we employed randomization methods to test the null hypothesis that changes in biomass, energy flux, and richness of savanna small mammals were driven entirely by extrinsic factors. Richness was the most constrained community property, and depended only weakly on the timing and magnitude of rainfall. Moreover, the strength of compensation in each community property depended on the occurrence of large ungulates, suggesting that local regulation of savanna small mammals was governed partly by interactions (likely interspecific competition) with larger, more conspicuous herbivores. The savanna community displayed an intermediate level of intrinsic regulation relative to the other small mammal communities. The desert shrubland exhibited the greatest degree of intrinsic regulation, while the oak woodland and semi-desert scrubland, both characterized by strong resource pulses, displayed relatively weak regulation. Size of the species pool was a poor predictor of the strength of intrinsic regulation. We propose a general framework for assessing the strength of intrinsic versus extrinsic forces in maintaining community properties between narrow limits through time.

ZERO-SUM DYNAMICS IN SMALL MAMMAL IN ARID ECOSYSTEMS: SHOULD WE EXPECT DIFFERENCES AMONG COMMUNITIES?

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Resource limitation can impose constraints on the dynamics of communities. One type of constraint that can emerge from resource limitation is a zero-sum dynamic. Zero-sum dynamics occur when resource limitation requires population increases in a species or group of species to be offset by decreases in other species. We have shown for an arid ecosystem in the southwestern United States, that zero-sum dynamics can occur in small mammal communities and can have important implications for the long-term dynamics in that system, including 1) creating tradeoffs between average size of an individual rodent and the abundance of rodents and 2) imposing conditions that create conditions for compensatory dynamics among species. However, at our study site precipitation – the primary limiting resource in desert ecosystems – is less variable than occurs in many other arid ecosystems, potentially resulting in more stable resource availability for our community. In contrast, research from Chile and Australia has demonstrated rodent community dynamics resulting from the highly spatially and/or temporally variable nature of precipitation in those systems that often differs from dynamics seen in our ecosystem. This raises the interesting and important question of whether zero-sum dynamics would be expected to occur in these more variable ecosystems. Here we explore how zero-sum dynamics would be expected to operate in ecosystems where resource variability is extremely high and compare the expected dynamics with those documented in other ecosystems.

TRENDS OF A LONG-TERM STUDY OF SEMIARID SMALL MAMMALS IN NORTH-CENTRAL CHILE

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Since 1989, we have studied small mammal populations at a semiarid site in north-central Chile with a large-scale live-trapping grid complex. Selective exclusions of vertebrate predators and/or putative small mammal competitors have yielded relatively small and/or mostly transitory effects on small mammal population dynamics and plant community composition. During the study period, there have been five El Niño/high rainfall episodes lasting 1-3 years. «Core» small mammals such as *Abrothrix olivaceus*, *Phyllotis darwini*, and *Octodon degus* experience dramatic fluctuations during and following rainfall pulses. On the other hand, «opportunistic» species such as *Oligoryzomys longicaudatus* and *Abrothrix longipilis* disappear from the thorn scrub for varying periods of time. All species persist in more mesic nearby habitats including stream courses («aguadas») and shallow depressions («quebradas»). Since 2000, mean annual rainfall has increased in this region; as a result, some core species (i.e., *O. degus*) now make up a more constant proportion of the small mammal biomass in the thorn scrub; in general, there also has been reduced variation in species diversity. We suggest that increased rainfall, a predicted consequence of global climatic change in this region, may be leading to changes in small mammal assemblage structure and composition, and will ultimately result in a more stable, less oscillatory assemblage in the thorn scrub. Additionally, invasive groups such as introduced lagomorphs and ephemeral plants may become more established in this community with higher rainfall. Therefore, long-term consequences of changes in rainfall patterns due to El Niño Southern Oscillations (ENSO) with important teleconnections to global-scale phenomena will lead to diverse changes at the community level here. Financial support provided by U.S. National Science Foundation, FONDECYT Chile, Institute of Ecology and Biodiversity, Santiago, Northern Illinois University, and the University of California, Davis.

RESOURCE PULSES AND MAMMALIAN DYNAMICS: CONCEPTUAL MODELS FOR HUMMOCK GRASSLANDS AND OTHER AUSTRALIAN DESERT HABITATS

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Resources are produced in pulses in many terrestrial environments, and have important effects on the population dynamics and assemblage structure of animals that consume them. Resource-pulsing is particularly dramatic in Australian desert environments owing to marked spatial and temporal variability in rainfall, and thus primary productivity. Here, we review how Australia's desert mammals respond to fluctuations in resource production, and evaluate the merits of three currently accepted models (the ecological refuge, predator refuge and fire-mosaic models) as explanations of the observed dynamics. We then integrate elements of these models into a novel state-and-transition model and apply it to well-studied small mammal assemblages that inhabit the vast hummock grassland, or spinifex, landscapes of the continental inland. The model has four states that are defined by differences in species composition and abundance, and eight transitions or processes that prompt shifts from one state to another. Using this model as a template, we construct three further models to explain mammalian dynamics in other

landscapes of arid Australia. As non-equilibrium concepts that recognise the strongly intermittent nature of resource pulsing in arid Australia, state-and-transition models provide useful descriptors of both spatial and temporal patterns in mammal assemblages. The models should help managers to identify when and where to implement interventions to conserve native mammals, such as control burns, reduced grazing or predator management. The models also should improve understanding of the potential effects of future climate change on mammal assemblages in arid environments in general. We conclude by proposing several tests that could be used to refine the models and guide further research.

COMPARATIVE ECOLOGY OF SMALL MAMMALS INHABITING ARID AND SEMIARID REGIONS IN NORTH AND SOUTH AMERICA: DEVELOPMENTS AND PROGRESS OVER THE LAST TWO DECADES

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A 1986 symposium on interactions between trophic levels in North and South America concluded with recognition that general comparisons were impeded by a lack of comparable data from South American systems. This was particularly evident for small mammals occupying arid and semiarid environments. Progress in the intervening 2 decades has been substantial on both continents, and the South American database is no longer in its infancy, allowing for more robust comparisons between the two continents. In particular, understanding of trophic interactions, habitat selection, and physiological ecology, further and more detailed assessments of behavioral ecology, and application of advanced modeling tools to population and community dynamics have paralleled comparative and experimental work on the influence of small mammals on plant community structure and composition and on the relative strength of biotic vs. abiotic influences on ecological structure and function. To further the dialog over the extent to which small mammal communities in the Northern and Southern Hemispheres are structured by ecological convergence vs. historical contingency I will summarize select developments from North and South American arid regions, summarizing the current state of knowledge and suggesting profitable areas of further investigation.

PATTERNS OF SMALL-MAMMAL COMMUNITY STRUCTURE IN THE SOUTHERN HEMISPHERE

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During the 1970's much of the research on small mammal communities in deserts focused upon North American deserts and heteromyids, although there were some notable exceptions. This produced an assumption that granivory should be predominant in «all» deserts leading to the most frequently asked question being framed along the lines of: Why was granivory so low in southern hemisphere communities? When detailed studies across many southern sites were compared in the 1970's, 1980's and 1990's researchers came to the conclusion that the question really should have been more along the lines of: «Why was granivory so prevalent in North American desert communities?» Accordingly, more recent research has focused upon other aspects of arid and semi-arid communities, such as species richness and structure, biomass and energy flux, rather than the assumption that granivory should predominate. This has led to greater emphasis being placed on other factors, both biotic (such as species interactions) and abiotic (such as resources available and the pattern of pulses in those resources), that might be influencing the patterns observed in small-mammal communities. Consequently our understanding of what may be driving the patterns observed has been improved. For most small mammal communities in the southern hemisphere the food resources available and the relative abundances of them play a major role. Pulses of resources, such as rainfall, have been shown to be significant factors, with predictability also being important. Wildfire, introduced predators and their interaction effects have substantial impact upon small mammal communities on the Australian continent.

NEOTROPICAL MAMMAL PARASITE BIODIVERSITY: ADVANCES AND PERSPECTIVES.

CONVENERS: **Graciela T. Navone** and **F. Agustín Jiménez**

DIVERSITY AND ECOLOGY OF NEMATODES IN WILD TERRESTRIAL MAMMALS: TWO DECADES OF RESEARCH IN ARGENTINA

Graciela Navone, Juliana Notarnicola, and Rosario Robles

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The presence of a parasite species in a particular host species is a process that may take several generations. Throughout the phylogenetic history of a group of host species, parasite species will be acquired or lost over time. Moreover, several ecological processes can influence the probabilities of parasite extinction, colonization, and even speciation within a given host population (parasite component community) or host species (parasite fauna). The nematodes are the endoparasite more ubiquitous that infecting all orders of mammals. During the 70th and the 80th, several host-nematode parasites associations were reported from wild mammals in Argentina. These studies described new species and most of them, new hosts and geographical records for Cavidae (Rodents), Dasypodidae (Xenarthra), and Didephidae (Marsupialia) with complete descriptions of their nematodes. Latter, the researches were focused on Cricetidae rodents since their populations are large, inhabiting vast territories, and representing an important element of the biodiversity in Argentina. In North and Central Argentina, cricetid rodents comprise more than 70 species. Before the 90th, in this area only 8 species of nematodes were known. Our contributions, from the 90th to the present, enlarge the list of nematodes to 35 species, the 77% of the parasite fauna known. Nematodes belong to 6 of 7 orders reported on small mammals as follows: Trichuridae (3), Capillariidae (5), Oxyuridae (2), Metastrongylidae (1), Nippostrongylinae (11), and Onchocercidae (5). Ours investigations considerably enlarge the knowledge of the nematode-host associations. The diversity of the host species examined and the complexity of the studied areas allowed to explain the variability observed on their parasite assemblage. More epidemiological studies carried out by our group of work will provide a new perspective on the diversity of parasite communities allowing predicting the conditions of a parasite species to persist in the host populations.

TAXONOMY AND ECOLOGY OF HELMINTHS IN WILD SMALL MAMMALS ACROSS BRAZIL

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VARYING LEVELS OF ECOLOGICAL AND PHYLOGENETIC CONCORDANCE AMONG TRICHOSTRONGYLID NEMATODES, LINSTOWIID CESTODES, AND THEIR MARSUPIAL (DIDELPHIOMORPHIA) HOSTS IN THE NEOTROPICS

Agustín Jiménez and Scott Gardner

SIU-Carbondale, USA. Harold W. Manter Lab, USA.

STUDIES ON THE HANTAVIRUSES (HANTAVIRUS, BUNYAVIRIDAE) IN SOUTH AMERICA AND CONTRIBUTIONS TO THE SYSTEMATIC AND BIOGEOGRAPHY OF SIGMODONTINES

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Accurate geographical distribution determination and taxonomy at a species level of many Neotropical rodents is particularly important regarding several zoonoses studies. Among the zoonoses haemorrhagic fevers, particularly hantaviruses (Hantavirus, Bunyaviridae), are exceptionally formidable considering their relatively recent discovery, high rates of morbidity / mortality and

worldwide evidence. Hantavirus manifest diverse biological and epidemiological characteristics depending upon the area of incidence. The host species involved, on the other hand, present different patterns of geographical distribution and habitat associations. The scope of hantaviruses and rates of rodent infection may be related to expansion or decrease of the distribution areas as well as changes in the dynamics of reservoir populations. Different hantavirus transmission regions may also be distinguished with respect to phylogenetic distance between the virus and its reservoirs. An important aspect of this disease lying within the bounds of Biogeography is host-viral variant species specificity. In the case of South American hantaviruses, i.e. Cardio-Pulmonary Hantavirus Syndrome (SCPH), the sigmodontines are the only confirmed reservoirs so far. This specificity which has its origin in the evolution of this rodent group, the correct identification of host species, the precise delineation of the geographical limits and the determination of environmental factors of species abundance contribute to enable estimation of potential disease areas. Similarly, understanding the associations of viral genotypes with their hosts has brought about significant contributions to sigmodontine taxonomy, especially for the genera *Calomys* and *Oligoryzomys*.

FLEAS AND MITES ON NEOTROPICAL RODENTS: STUDIES IN NORTHEASTERN ARGENTINA AND PERSPECTIVES FOR SOUTH AMERICA

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Most of the studies on fleas and mites ectoparasites of sigmodontine rodents in Argentina took place in Buenos Aires Province: component communities were studied, taxonomic revisions were carried out, and new geographic and host distributions were recorded. In recent years studies were undertaken in the northeast, an understudied area comprising Misiones, Corrientes and Entre Ríos Provinces. Herein preliminary results are presented. More abundant rodents sampled (N=107) were identified as the akodontines *Akodon azarae*, *Akodon montensis*, *Necomys lasiurus* and *Thaptomys nigrita*, and the oryzomines *Oligoryzomys flavescens* and *Oligoryzomys nigripes*. Ectoparasites were obtained from the pelage of their hosts, fixed in 96% ethanol, and prepared for their identification. Prevalence (P) and mean abundance (MA) were calculated. Fleas (*Rhopalopsyllidae*, *Rhopalopsyllinae*) (N=4; P= 2.80; MA= 0.04) were collected only from *A. montensis* and *O. nigripes* from Misiones, and *N. lasiurus* from Corrientes, while mites (*Laelapidae*, *Laelapinae*) (N=902; P=91.36%; MA=8.43) from every host and locality, with P=100% except on *A. montensis* from Misiones (P=70.83%). *Oligoryzomys* species were parasitized by the co-occurrence of the mites *Gigantolaelaps wolffsohni*, *Mysolaelaps* spp., *Laelaps paulistanensis* and *Laelaps manguinhos*. Concerning *Mysolaelaps* species, a replacement of *parvispinosus* by *microspinosus* was observed from north to south gradient. *Necomys lasiurus* was associated with the mite *Androlaelaps rotundus* in every locality. Every remaining akodontine was parasitized by a different undescribed species of *Androlaelaps* closely related to *A. rotundus*. *Androlaelaps fahrenheitsi*, a cosmopolitan composite species, was recorded for every host species and locality. Differences in P and MA between fleas and mites may be related to characteristics of every area. Comparatively, arid regions such as Patagonia and Chaco Seco, higher P and MA were observed in fleas; and species of *Craneopsyllinae* (*Stephanocircidae*) and *Parapsyllinae* (*Rhopalopsyllidae*) were dominant. All host-parasite associations recorded are in accordance with preliminary results along the geographical range of the rodents.

BIODIVERSITY OF NEOTROPICAL BAT FLIES: PATTERNS AND PROSPECTS

Carl Dick., Gracioli, Gustavo, and Guerrero, Ricardo
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Bat flies (Diptera: Streblidae and Nycteribiidae) are highly specialized ectoparasites that infest representatives of all 9 New World bat families. They are obligate blood-feeders, usually host-specific, and the reproductive cycle includes an off-host pupal stage. Parasitic adaptations include the reproductive strategy, reduction/loss of eyes and wings, elongation of legs, flattening of bodies, and development of holdfast structures. Meanwhile, bats constitute a single, extensive radiation of evolutionary lineages, highly variable in size, trophic strategies, roosting structures, colonial attributes, and social behaviors. The bat-bat fly system can inform many contemporary questions in ecology and evolution. This talk provides an overview of the taxonomy and host associations of Neotropical bat flies, and our understanding of the richness and diversity of the group. Distributional patterns are discussed, and placed in the context of the potential for undiscovered bat fly diversity and the problem of cryptic species. Bat flies comprise 505 described species, about 45% the number of described bat species. The Nycteribiidae comprise 12 genera and 275 species and are richest in the eastern hemisphere; 2 genera and 57 species infest American bats (*Vespertilionidae*, *Thyropteridae*, and *Phyllostomidae*). *Basilia*, the richest genus, comprises 53 species in five species-groups. Two groups are primarily Nearctic, two primarily Neotropical, and one widespread. New World nycteribiids range from Chile, Argentina, and Uruguay to Canada. The Streblidae comprise 33 genera and 230 species, about 65.5% the number of described New World bat species. They are richest in the western tropics; 26 genera and 158 species infest representatives of 8 of the 9 American bat families. New World streblids range from Chile, Argentina, and Uruguay to the USA. An estimated 50 new species of Streblidae are known yet undescribed, and although far less studied, we know of at least 15 undescribed Nycteribiidae.

EVOLUTIONARY ANALYSIS OF THE NEOTROPICAL ECTOPARASITIC BAT FLIES (STREBLIDAE)

Katharina Dittmar de la Cruz, Carl W. Dick, Matthew Gruwell, and Bruce D. Patterson
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Bat flies are obligate bloodsucking parasites of bats. They belong to a group of Diptera that are characterized by varying degrees of eye, and wing reduction, a highly modified dipteran bauplan, and viviparity. Taxonomically, they are currently placed in two families, the Nycteribiidae, and the Streblidae, although the monophyly of these groups has been challenged. The latter group has a high biodiversity in the Neotropics. Here, I explore for the first time the phylogenetic relationships of a majority of the neotropical genera, using molecular and morphological data. Specifically, I will speak about the evolutionary trajectory of convergent morphological features in the context of phylogenetic evidence. Furthermore, the evolutionary succession of ecological niche partitioning on bats will be elucidated.

CARNIVOROUS MAMMALS OF SOUTH AMERICA: EVOLUTION AND ECOLOGY

CONVENERS: **Analía Forasiepi; Francisco Juan Prevosti; Lars Werdelin**

PHYLOGEOGRAPHY, POPULATION GENETICS AND MOLECULAR ECOLOGY OF NEOTROPICAL CARNIVORES

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The Neotropical region harbors a diverse extant fauna of placental carnivores (order Carnivora), whose current genetic diversity harbors a rich record of the evolutionary history of these species in the region. In this talk I will review current work on the phylogeographic patterns observed in multiple Neotropical carnivores, and how their comparison may shed light onto the evolution of this ecological community, as well as allow inferences on relevant life history traits of each of the investigated species. I will also discuss examples of in-depth analyses at a regional or local level, which reveal processes of population isolation at different time frames, and in some cases allow inferences on spatial structure and social interactions among individuals. Finally, the talk will also show cases where molecular tools can be used to infer additional biological aspects of natural populations, such as the use of non-invasive sampling to identify species, individuals and coloration phenotypes relevant for ecological investigations of carnivores in the Neotropics.

MULTILOCUS DNA PHYLOGENY OF MUSTELIDAE AND THE ANCESTRY OF SOUTH AMERICAN SPECIES

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With 58 living species in 22 genera currently recognized (11 species in six genera are found in South America), the crown clade of weasels, polecats, minks, otters, martens, badgers, and allies (Mustelidae) is the most genus- and species-rich family in the placental mammalian order Carnivora. We present a complete genus-level and nearly complete species-level phylogeny of the extant Mustelidae inferred from parsimony and Bayesian analyses of a supermatrix with sequence data representing 29 segments of nuclear DNA and almost complete mitochondrial genome (altogether more than 32,000 base pairs). The phylogeny shows six major crown clades (which we refer to as the subfamilies of Mustelinae, Lutrinae, Ictonychinae, Helictidinae, Guloninae, and Melinae) and two separate lineages (which we treat as parts of the subfamilial total clades Mellivorinae and Taxidiinae). The South American species are contained in Mustelinae, Lutrinae, Ictonychinae, and Guloninae. Biogeographic evidence from fossil and contemporary mustelids point to Asia as the center of origin and evolutionary diversification of the family, with migrations on multiple occasions to Europe, Africa, North America, and from North to South America. Bayesian relaxed molecular-clock

analysis using combined information from five nuclear genes of mustelids and other carnivorans estimated the emergence of Mustelidae at 16.3 million years ago near the end of the Early Miocene and also indicated two periods of increased phylogenetic diversification: first within a late Middle to early Late Miocene interval when the stem lineages of all crown-clade subfamilies diverged, and second during a later Late Miocene to Middle Pleistocene interval when the present-day diversity of mustelid genera and species arose. A combination of prior and our molecular estimates of divergence times suggest that the Late Miocene to Middle Pleistocene interval was also the time when lineages leading to the South American mustelid clades and species originated.

THE FOSSIL RECORD OF THE PROCYONIDAE. CAN THE CONFLICT BETWEEN MOLECULES AND MORPHOLOGY BE RESOLVED?

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The Procyonidae have been present in North America since the early Miocene (18 Ma). Although scarce in the fossil record, they are represented there by 10 genera. The living genera *Bassariscus* (ringtails), *Procyon* (raccoons) and *Nasua* (coatis) are first known from North America at 15 Ma, 6 Ma, and 5 Ma respectively. *Cyonasua*, the earliest South American procyonid, appeared ca 8 Ma and gave rise to an endemic late Miocene to early Pleistocene radiation, including the bear-sized *Chapalmalania*. In South America, the only living procyonids with a fossil record are *Nasua* and *Procyon*, which occur in the late Pleistocene (*Nasua* may occur in the early Pleistocene of Bolivia). *Bassariscus* is known only from North and Central America. Comparative anatomy indicates that *Procyon* and *Nasua* are sister taxa. The North American late Clarendonian to early Hemphillian (9-7 Ma) *Paranasua* is ancestral to both *Procyon* and *Nasua*, which first appear in the late Hemphillian. There is strong molecular evidence that *Bassariscus* is the sister taxon of *Procyon*, and that *Nasua* is that of *Bassaricyon*. The molecular clock places the divergence of these two groups at 18-20 Ma. *Bassariscus* is dentally the most primitive procyonid. Two Miocene genera appear to be more closely related to *Potos* and *Bassaricyon*, although putative relationships among the four may be caused by dental simplification related to frugivory. Although dental similarities between *Potos* and *Bassaricyon* could be convergences, there are no dental synapomorphies uniting *Bassaricyon* with *Nasua* or *Bassariscus* with *Procyon*. The lineage from *Probassariscus* to *Procyon* and *Nasua* includes 10 dental synapomorphies not present in *Bassaricyon* or *Bassariscus*. An early Miocene divergence of *Procyon* and *Nasua* would mean that the highly derived dentitions of both *Procyon* and *Nasua* are the result of homoplasy, which has been shown in other families of carnivorans.

ANCIENT DNA STUDIES OF SOUTH AMERICAN MEGAFaUNA

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Genetic information recovered from ancient teeth and bones provides a unique means to record evolutionary processes in real time, and re-assess morphological taxonomic classifications of extinct taxa. By accessing DNA from large numbers of dated individuals, it is also possible to examine the timing and effects of population colonisations, extinctions, and bottlenecks in Quaternary populations. In South America, we have analysed mitochondrial DNA from ancient canids, felids, equids, ursids, and camelids and reconstructed both phylogenetic and population genetic relationships. Studies of molecular evolutionary rates using ancient DNA also confirm that the molecular clock has particular problems when used to date the recent past, and potentially gives misleadingly old results about the timing of Quaternary events, including issues in biological conservation, biogeography, domestication, and human evolution.

SABER-TOOTH THYLACOSMILIDAE (MAMMALIA, METATHERIA, SPARASSODONTA): A REVIEW OF DIVERSITY AND RELATIONSHIPS.

Analía Forasiepi

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Thylacosmilids (Mammalia, Metatheria, Sparassodonta) were one of the most bizarre native predators from the Tertiary of South America. The external appearance of the skull evidences anatomical resemblances with the saber-tooth felids (Eutheria, Felidae, Machairodontinae), mostly based on the acquisition of large hypertrophied upper canines. The family Thylacosmilidae was originally defined to include the genus *Thylacosmilus*, which currently comprises a unique species: *T. atrox* (=Achlysictis

lelongi) from the late Miocene- middle Pliocene (Huayquerian, Montehermosan, and Chapadmalalan) of Argentina and possibly the late Miocene (Huayquerian) of Uruguay. A second species, *Anachlysictis gracilis*, from the middle Miocene (Laventan) of Colombia was later described, with more generalized morphology with regard to *Thylacosmilus*. In addition to these two species, there are other materials tentatively assigned to *Thylacosmilidae*, such as a fragmentary specimen from the middle Miocene of Colombia and a single tooth from the early Miocene (Colhuehuapian) of Patagonia. Based on the latter, the time span for the group ranges from early Miocene to middle Pliocene (Colhuehuapian to Chapadmalalan ages). A new material that corresponds to a fragmentary skull from the middle Miocene (Colloncuran) of Patagonia is currently under study, and represents a new genus and species. The features on the dentition suggest that this new Patagonian taxon was probably closer to *Thylacosmilus* than *Anachlysictis*. *Thylacosmilids* were classically related to proborhyaenids, but the monophyletic nature of the latter is currently under debate. Instead and based on a recent analysis, *thylacosmilids* may represent the sister taxon of early Miocene borhyaenids (i.e., *Borhyaena* and *Arctodictis*) and a late Oligocene proborhyaenid (i.e., *Paraborhyaena*). Considering the known data from the fossil record, and if this hypothesis of relationships is correct, there is a ghost lineage of more than five million years for the family *Thylacosmilidae*.

RADIATION, INVASION, REPLACEMENT: CARNIVORE EVOLUTION IN SOUTH AMERICA AND AFRICA COMPARED

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Data on the Cenozoic fossil record of Creodonta and Carnivora in Africa and Sparassodonta and Carnivora in South America were compiled and diversity patterns between groups and continents compared. In South America, Sparassodonta appear in the Tiupampan LMA (64.5-64 Ma; early Danian Stage) and reach their peak diversity in the Santacrucian LMA (17.5-16.3 Ma; late Burdigalian Stage). Their LAD is in the Chapadmalalan LMA (5-3.3 Ma; Zanclean and early Piacenzian Stages). Carnivora appear in the Huayquerian LMA (8.6-6 Ma; Tortonian-Messinian Stages). The overlap is thus ca 5 Ma. Though the data are poor it seems clear that as soon as Carnivora were represented by more than a handful of taxa, i.e. around the time of the Great Interchange, the Sparassodonta rapidly became extinct. In Africa, Creodonta appear in the Thanetian Stage (58.7-55.8 Ma) and reach their peak (apparent) diversity in the Burdigalian-Langhian (20.4-13.8 Ma). Their LAD is in the Serravallian (13.6-11.6 Ma). Carnivora appear in the Burdigalian (20.4-16.0 Ma). The time of overlap is here ca. 9 Ma. Despite a rapid increase in carnivoran diversity, creodonts were only slightly affected. Looking in greater detail, the first carnivoran immigrants to Africa, and the first major radiation of carnivorans, is, with some exceptions, of small taxa (< ca. 5 kg). In the Burdigalian, there were a number of small creodonts. From the Langhian to the Serravallian, the remaining creodonts became on average larger through selective extinction of the smaller forms. Thus, it appears that creodonts could compete successfully with carnivorans in niches for large carnivores while among smaller taxa carnivorans were competitively superior. This does not seem to be the case with sparassodonts and their extinction was relatively more abrupt when carnivoran diversity increased significantly.

SPARASSODONTA VS. CARNIVORA: ECOLOGICAL RELATIONSHIPS BETWEEN CARNIVOROUS MAMMALS IN SOUTH AMERICA

Francisco J. Prevosti, Analía Forasiepi, Leopoldo Soibelzon, and Natalia Zimicz.

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South America was isolated from other continents during most of the Tertiary, developing a very particular mammalian fauna. In contrast to other continents, the carnivore adaptive zone was filled by crocodiles (Sebecidae), large snakes (Madtsoiidae), large birds (Phorusrhacidae), and metatherian mammals (Sparassodonta). Sparassodonta was diverse during the Tertiary and comprised a broad range of sizes (? 2-50 kg). This diversity decreased towards the late Miocene (Huayquerian) and the group became extinct at the middle Pliocene (? 3 Ma, Chapadmalalan). Several authors have suggested that the cause of this decline and extinction was the ingress of placental Carnivores to South America (about 6-7 Ma ago), because they putatively competed with the Sparassodonta. This hypothesis was criticized in recent years. With the intention of testing the hypothesis of «competitive displacement», we review the fossil record of South American Sparassodonta and Carnivora, collect data about diversity, first and last appearances, and estimate size and diet of the involved taxa. The diversity of Sparassodonta is low relative to that of Carnivora all along the Tertiary. The highest number is found in the early Miocene (Santacrucian), with more than 10 species. The fossil record shows overlap of groups during the late Miocene-middle Pliocene, and the Sparassodonta's richness curve declines since the first record of the Carnivora during the Huayquerian. Despite this overlap, carnivores were represented by 4 or less species during the late Miocene-Pliocene, and their diversity reached values of about 20 species only in the early

Pleistocene (Ensenadan). Moreover, Carnivora was first represented by small-sized, omnivore species, with large omnivores first appearing in the Chapadmalalan. During this period, Sparassodonta was represented by large and small hypercarnivores and a single large mesocarnivore species. These data suggest that factors other than competitive displacement may have caused the extinction of the Sparassodonta.

POSTCRANIAL ANATOMY, FUNCTIONAL SIGNIFICANCE AND PALEOBIOLOGY OF A HIGHLY PREDACEOUS PALEOGENE SPARASSODONTA (MAMMALIA, METATHERIA) FROM NORTHWESTERN ARGENTINA

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We present a functional analysis of the postcranial skeleton of *Callistoe vincei* (Mammalia, Sparassodonta, Borhyaenoidea), a very well-preserved predaceous metatherian from the Eocene of Northwestern Argentina. *Callistoe* is the only nearly complete Sparassodonta ever known coming from Paleogene outcrops of South America. The most outstanding feature of the axial skeleton is the presence of unusual transverse processes of the cervical vertebrae which suggest additional lateral attachments of the flexors of the neck. The anticlinal vertebra is a posterior thoracic, and the lumbar area is short and more mobile sagittally than laterally. Several features of the forelimb are compatible with primary terrestrial habits: absence of clavicle, shape of the shoulder and elbow joints suggesting movements restricted to near parasagittal flexion/extension, straight ulna with strong olecranon, non medially prominent entepicondyle and ovoid radial head. The capitulo-radial articulation is characterized by an accessory lateral facet on the radius indicating movements of extreme flexion of the forearm. The pollex is not reduced and, once articulated, stood slightly oblique to the rest of the hand. The shape of the anterior ungual phalanges suggests long claws, similar to those of some extant digging taxa. The morphology of the knee joint is indicative of a more parasagittal than abducted crus, which together with the astragalus shape are consistent with parasagittal flexion-extension. The hind foot is characterized by the slenderness of the first and fifth digits. Although weak, the hallux is present, divergent to the rest of the foot like the pollex. The claws were reduced in comparison to the hand. The morphology of the fore and hindlimb indicate that *Callistoe* was not a cursorial animal. According to the fossil record known so far *Callistoe* was the largest mammalian predator of its time, and likely preys included turtles and small to medium-sized mammals.

THE ROLE OF ALLOMETRIC SHAPE CHANGES IN CANIDAE SKULL EVOLUTION

Guilherme Garcia, Fabio A. Machado and Erika Hingst-Zaher

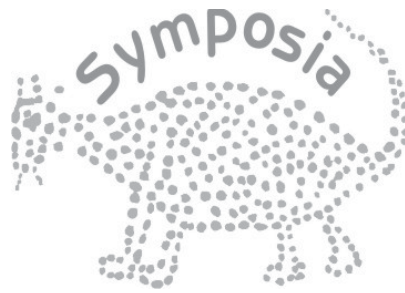
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Body size is an important factor in Carnivore biology, establishing energetic demands and influencing prey size and foraging area. Authors have considered size as one of Schluter's (1996) lines of least evolutionary resistance in mammalian evolution, especially when cranial shape is evaluated. Therefore, it is expected that size plays an important role in the evolution within each Carnivore clade. Here, we evaluate the role of allometric shape change in canid cranial evolution, with emphasis in the emergence of hypercarnivory within the clade. We used landmark data to represent cranial shape across 11 extant and 4 extinct Canidae genera, all represented in a recent phylogeny (Prevosti, in prep). Landmark data was translated into the CAC/RSC shape space described by Mitteroecker et al. (2004). Ancestral states of scores in these components were reconstructed using weighted squared parsimony; the phylogeny was then mapped into the CAC/RSC space and vectors depicting steps along the phylogeny were calculated. Pearson's correlation of each one of these vectors with the CAC and the first RSC were compared against a null distribution of correlations. Only the basal dichotomy between the Vulpinae and the rest of Canidae is significantly aligned to the CAC, and the dichotomy between *Chrysocyon* and the clade formed by *Speothos* and the South American fossil hypercarnivores is significantly aligned with the first RSC. Therefore, size evolution alone cannot explain the occupation of the hypercarnivore adaptive zone within the Canidae family, especially within the *Speothos/Chrysocyon* clade. The mechanics of meat processing are independent of skull size, and non-allometric evolution is the mechanism responsible for the occupation of the hypercarnivore adaptive zone by canids.

INFERRING PALEOECOLOGY OF EXTINCT TREMARCTINE BEARS IN THE AMERICAS VIA GEOMETRIC MORPHOMETRICS.

Borja Figueirido and Leopoldo H. Soibelzon

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Wednesday, August 12th

CAMERA TRAPS AND MAMMAL POPULATION DYNAMICS: ADVANCES IN ESTIMATION AND MODELING TECHNIQUES

CONVENER: **Allan F. O'Connell, Jr.**

HABITAT PREDICTORS, PREDATOR/PREY ACTIVITY LEVELS, AND OVERLAP INDICES FOR CO-OCCURRING FELIDS ACROSS STUDY SITES

Miranda L. Davis and Marcella J. Kelly
Virginia Tech

We surveyed 3 broadleaf and 1 pine forest site in Belize Central America, using 29-47 remote camera stations per site comprising a total 8515 trap nights. We collected habitat data through manual habitat sampling within a 200m radius of each trap site and through extraction of habitat variables from available GIS layers. We compared habitat variables and trap success rates of other predators/prey at camera sites with felids (jaguar, puma, and ocelot) present to those without felids through Student's t-tests and ANOVA. Where possible we use zero-inflated negative binomial regression and AIC model selection to build predictive models of felid trap success based on habitat features and predator/prey trapping rates. We estimated densities for felids using standard mark-recapture techniques and we used Sorensons and Piankas indices of similarity and overlap to compare patterns of felid co-occurrence. We found few habitat variables differed between felid present and absent sites and that prey species and other predators influenced felid presence and trap success across sites. Ocelots and jaguars showed particularly strong association with large avian prey while pumas appeared to be influenced by medium sized mammal prey. Population densities for jaguars and ocelots were substantially higher in the broadleaf versus the pine forest sites and these two felid densities were not negatively related as suggested by the mesopredator release hypothesis. The best model of ocelot trap success included jaguar trap success. In addition, overlap indices suggest that ocelots and jaguars overlap more than ocelots and pumas while results for jaguars and pumas were equivocal. Puma may compete more with ocelots resulting in some noted spatial separation which could imply that mesopredator release operates on multiple levels, but overlap between pumas and jaguars was relatively high and it does not appear that such an effect plays a strong role.

CAMERA TRAPS AND MARK-RESIGHT SAMPLING OF A COASTAL RACCOON (*PROCYON LOTOR*) POPULATION: EVALUATING ESTIMATES OF ABUNDANCE, DENSITY, SURVIVAL, AND SOURCES OF BIAS

Arielle H. Waldstein, Theodore R. Simons, Allan F. O'Connell, Jr., and Kenneth H. Pollock
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Camera traps are used to remotely sample animal populations and make inferences about a variety of population attributes. We used camera traps to re-sight artificially marked raccoons (*Procyon lotor*) on a (~5400 hectare) barrier island off the coast of North Carolina. We captured 131 animals and marked them with large numeric tags attached to a neck collar. We also established a transect of camera traps covering the entire island and collected photographic recaptures (~5000 trap nights) between May 2007 and August 2008. We then applied Lincoln Peterson and Cormack-Jolly-Seber models to the resight data to estimate raccoon survival and abundance on the island. We simultaneously used radio telemetry information from a subset of

44 radio collared animals to assess capture heterogeneity and the accuracy of our survival and abundance estimates. Although we assumed equal probability of capture in our initial estimates, we found that only 52% of animals known to be alive during the study were re-sighted by our camera-traps. Factors such as camera placement, variations in the home range of individual animals, habitat, and trap response, especially when cameras were baited, contributed to bias in our estimates. These findings suggest that investigators use caution in making assumptions about the probability of detection with camera traps, home range size, and in the application of camera trap data to estimates of survival, abundance and density.

CAMERA TRAPPING JAGUARS *PANTHERA ONCA* TO ESTIMATE POPULATION DENSITY

Andrew Noss, Leonardo Maffei, Scott C. Silver, and Marcella J. Kelly
Wildlife Conservation Society-Ecuador, Av. Eloy Alfaro N37-224 y Coremo, Quito, Ecuador

Since camera traps were first used to estimate the density of tiger (*Panthera tigris*) populations in India, in the Neotropics jaguars (*Panthera onca*) have probably received the most attention. To date, at least 83 different camera trapping efforts have been carried out to survey jaguars, in 14 countries from the United States to Argentina. Most of them were conducted inside designated Jaguar Conservation Units, covering national parks, biosphere reserves, state or provincial parks, private reserves, wildlife sanctuaries or management areas, indigenous territories, cattle ranches, forestry reserves or concessions, and private conservation concessions. Surveys are based upon the standard procedures used in mark and recapture sampling of closed populations using cameras in place of live traps, and using the natural markings of the jaguar to recognize individuals and «recaptures» in photographs. The classical but problematic way to estimate the sampling area is to calculate the mean maximum distance moved (MMDM, as a proxy for home range diameter), divide by two (radius) and apply this as a buffer around the camera traps. Both the camera trap polygons and the effective survey area (including a $\frac{1}{2}$ MMDM buffer around the camera traps) vary considerably across surveys, from 24-555 km² to 54-938 km² respectively. In the case of private reserves, cattle ranches, and relatively small reserves, the cameras can be distributed across 30-100% of the land use unit. But in vast national parks, camera may cover barely 1% of the park's land area. Density estimations also varied considerably across study areas: from 0 to > 11 individuals/100 km². Sex ratios vary across camera trap surveys, but most studies have recorded more males than females. Camera trap photos suggest that jaguars can be active at any time of day, but are principally crepuscular-nocturnal in their habits.

SPATIALLY-EXPLICIT HIERARCHICAL MODELING FOR CAMERA TRAPPING STUDIES

Beth Gardner and J. Andrew Royle
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Studies using camera trapping, DNA sampling, or other techniques based on a spatial array of devices produce encounter histories for individuals, and also yield auxiliary spatial information from the location of capture of each individual. Due to the movement of individuals on and off the trapping array during sampling, the effective trapping area is unknown, and so obtaining unbiased estimates of density has proved difficult. We propose a hierarchical spatial capture-recapture model which contains explicit models for the spatial point process governing the distribution of individuals and their exposure to (via movement) and detection by traps. Detection probability is modeled as a function of each individual's distance to the trap. In addition to accounting for geographically open populations, we will also present a model for demographically open populations. This extension provides not only estimates of density, but also vital rates of the population (i.e., survival and recruitment). We adopt a Bayesian framework for inference under this model using the method of data augmentation which is fully implemented in the software program WinBUGS. The Bayesian framework is particularly useful when analyzing data from studies of rare and elusive species which often results in small datasets for which conventional asymptotic inference methods based on likelihood are invalid. In addition to presenting the model description, we will provide applications for both the closed and open population models.

ESTIMATING ANIMAL DENSITY FROM PHOTO RATES AND ANIMAL MOVEMENT SPEEDS RECORDED IN CAMERA TRAP VIDEOS

Roland Kays, Bart Kranstauber, Patrick A. Jansen, Zhihai He, Zhongna Zhou, Chris Carbone, Marcus Rowcliffe.

New York State Museum, 3140 CEC, Albany, NY and the Smithsonian Tropical Research Institute, Republic of Panama

The Gas Model suggests camera trap photo rates will be a function of animal density and movement rate, and would allow density estimation for species without unique pelage patterns. However movement rate data are rarely available to parameterize this model. We show how camera trap videos can be used to estimate movement rates, and thus produce density estimates for a mammal community. These data come from camera traps at 789 sites on Barro Colorado Island, Panama. Cameras were moved to a new location every 8 days over one year and recorded 17266 animal detections. We quantified the instantaneous speed of 1388 animals recorded moving in videos by physically measuring their movement paths, using vegetation and rocks as landmarks. We also automated this process with an image analysis that replicates our field measurements with high precision. We fit a circular function to daily activity data to calculate the proportion of the day spent moving. Together, these estimates of speed and proportion of the day active can calculate the daily distance moved, which is then used to calibrate Gas Model estimates of animal density. We will present these estimates for 12 tropical mammal species and compare them with transect survey estimates.

MULTI-SCALE OCCUPANCY ESTIMATION AND MODELLING USING MULTIPLE DETECTION METHODS (THAT INCLUDE CAMERA TRAPS)

James D. Nichols, Larissa L. Bailey, Allan F. O'Connell, Jr., Neil W. Talancy, James W. Hines, Andrew T. Gilbert, and Elizabeth M. Annand

U. S. Geological Survey, Patuxent Wildlife Research Center, 10300 Baltimore Ave., Beltsville, MD 20705, USA

Occupancy estimation and modeling based on detection-nondetection data provide an effective way of exploring change in a species distribution across time and space in cases where the species is not always detected with certainty. The modeling approach presented here makes efficient use of detections from multiple methods to estimate occupancy probabilities at two spatial scales and to compare detection probabilities associated with different detection methods. We used trapping arrays that included camera traps, hair traps and covered track plates to sample a variety of carnivores and apply the models to data collected on striped skunks (*Mephitis mephitis*) to demonstrate their use. Our models permit simultaneous use of data from all methods for inference about method-specific detection probabilities. The approach permits estimation of occupancy at 2 spatial scales: the larger scale corresponding to species use of a sample unit, whereas the smaller scale corresponds to presence of the species at the local sample station or site. Large-scale occupancy estimates were consistent between two sampling seasons. Small-scale occupancy probabilities were slightly lower in the late winter/spring when skunks tend to conserve energy and movements are limited to males in search of females for breeding. There was strong evidence of method-specific detection probabilities. Increasingly, many studies are utilizing multiple detection methods at sampling locations. The models can be viewed as another variation of Pollock's robust design and may be applicable to a wide variety of scenarios where species occur in an area but are not always near the sampled locations.

SMALL CARNIVORE STUDY WITH CAMERA TRAPS ACROSS AN ECOLOGICAL GRADIENT IN THE BOLIVIAN CHACO

Leonardo Maffei and Andrew Noss

Wildlife Conservation Society

We studied small carnivores over a three-year period in three research camps with different precipitation levels and vegetation. We set between 20 and 34 pairs of camera traps trying to cover at least 50 km² at each site in order to estimate jaguar population density. Cameras were set along roads and trails opened for that objective (which were similar in all sites to avoid differences in capture probability). Animals were recorded 24 hours/day and we registered nine species of small carnivores, but we focused this study only on cats and foxes that are the most photographed. The other species (procyonids and mustelids) are rarely seen and captured with camera traps, so we obtained few photographs of these species. We found that ocelots (*Leopardus pardalis*) and black-footed foxes (*Cerdocyon thous*) are more common in wetter areas and become scarce in dryer areas, whereas in the latter areas Geoffroy's cats (*Leopardus geoffroyi*) and pampas fox (*Pseudalopex gymnocercus*) become more abundant. Differences could be due to habitat type (vegetation and structure) and more importantly precipitation.

INNOVATIVE PRACTICES IN MAMMALOGY EDUCATION

CONVENER: **Sam Zeveloff**

EVERY SEMESTER IS A NEW EXPERIMENT: APPLYING THE SCIENTIFIC METHOD TO TEACHING MAMMALOGY

Christopher J. Yahnke
University of Wisconsin - Stevens Point

The transition from graduate school to teaching a mammalogy course can be as dramatic as the transition from summer in central Wisconsin to winter in central Argentina. In graduate school, life is focused on research. Some graduate students may teach introductory biology labs or even mammalogy labs, but few teach an entire mammalogy course. Teaching involves learning a new language. Some terms like learning objectives and assessment pertain directly to the course whereas others like guided inquiry, backwards design, and scaffolding pertain more broadly to the Scholarship of Teaching and Learning (SoTL). This new language can make eyes glaze over until you realize that all of this is simply applying the scientific method to teaching mammalogy. Like good science, a good mammalogy course begins with curiosity and observation. Course objectives are testable hypotheses, what you do in the course correspond to methods, how you assess the course correspond to results, and how closely the objectives are met corresponds to the discussion and the basis for new observations. What you do in a mammalogy course and how you assess the course is ultimately guided by hypotheses (i.e. learning objectives). This approach to course design leads to a more dynamic course and the flexibility to try new things. Ultimately, I would like to see mammal societies dedicate a best practices in teaching series in professional journals in much the same way the Ecological Society of America does with its Pathways to Scientific Teaching series in *Frontiers in Ecology*. This would be a way for those teaching mammalogy to share ideas specific to the discipline, and papers submitted for this series would be peer reviewed and could be used for tenure and promotion. It would also send a message to graduate students that we value teaching as much as we value research.

TEACHING MAMMALOGY WITH LIMITED RESOURCES: LABORATORY STRATEGIES

Marina Silva
University of Prince Edward Island – Canada

MAMMALOGY AT A RURAL TIER 4 INSTITUTION: TAKING ADVANTAGE OF TECHNOLOGY

Jon A. Baskin
Texas A&M University – Kingsville

TAMUK, in rural South Texas, has about 5,000 students. It has been an essentially open enrollment institution, where faculty have a 12 hour/semester teaching load. Almost all the students in Mammalogy are wildlife majors (it is a required course), whose most frequent career goal is to manage a hunting lease. In the 14 years I have been teaching it, I have tried to alter the lectures to make them more relevant to them (by increasing the conservation biology component) without diminishing my expectations of what I require them to learn. The application of technology (i.e., PowerPoint and the internet) has many positive advantages. Incorporating short videos has been well received. The class website has links to other sites (The University of Michigan's Animal Diversity Web is my favorite), lecture outlines, copies of old exams, lab handouts, etc. A continuing significant problem is getting more students to take better notes during lecture. I have greatly benefitted from access to other websites, and while I do not place complete PowerPoints online, I have made them available to instructors who have contacted me. The practice of password protecting class websites is a trend I find bothersome.

CIVIC ENGAGEMENT EXERCISES FOR MAMMALOGY TERM PROJECTS

Sam Zeveloff

Weber State University

In this presentation, I discuss the value of using a civic engagement exercise for an extensive project in a mammalogy course. Such an exercise is valuable as many individuals are uncertain about how to participate in civic matters. For many, becoming engaged in issues pertaining to the management of natural resources appears to be particularly vexing. In this exercise, students are required to conduct an in-depth investigation of a mammalian conservation issue. This typically involves a subject of concern in a regional, state, or federally protected area. As an example, say a student decides to examine the conservation of the wolf in Yellowstone National Park and the surrounding area. After considering its history and its translocation there, the student must also become knowledgeable about its management by the federal government and those of the nearby states. They also gain familiarity with the various biological, political, and cultural issues pertinent to its conservation. Their investigations often involve communication with the principals affecting management decisions (e.g., biologists, politicians, and in this case, ranchers). Ultimately, the students are required to develop an informed opinion and provide input to a government agency or official that has a role in a species' management. Finally, they give presentations to their classmates on their projects, examples of which are provided herein.

ACTIVE EXPLORATION OF MAMMALIAN DIVERSITY WITH ONLINE TOOLS AND DATA: EXPANDING OPPORTUNITIES FOR ACTIVE LEARNING THROUGH THE ANIMAL DIVERSITY WEB

Phil Myers, Roger Espinosa, Tanya Dewey, Tricia Jones, and George Hammond

University of Michigan

In the Exploring Natural History project, the Animal Diversity Web (ADW) at the University of Michigan Museum of Zoology uses its structured database to develop powerful interactive tools for querying natural history data. With over 3,000 species accounts, 18,000 media files, and serving 5 million pages to half a million users a month, the ADW is one of the largest natural history databases online. Mammal content is the greatest strength of the ADW, with more than 1600 taxon accounts, representing almost 30% of all mammal species. The database includes 6300 live animal and 2500 specimen images that can also be included in queries to explore morphologies and behaviors. Although ADW accounts appear as narrative text online, the underlying data are highly structured, creating a unique opportunity to explore natural history patterns in animal taxa. The ADW team created an advanced search tool that allows users to combine text, keywords, and data field content in their searches. This tool is integrated with online course workspaces where students can save, modify, and report the results of their searches, and discuss what they mean (<http://animaldiversity.org/q>). The search tool also permits queries of specimen images and customizing the output for comparing important morphological and dental features. The utility of the search tool and associated course workspaces was tested at six undergraduate institutions representing a variety of biology courses and institutions, from small teaching colleges to research universities. Results suggest wide applicability of this tool to organismal biology courses. Enabling active student investigation into natural history patterns can enhance student-learning experiences, especially in undergraduate settings where opportunities for field courses are limited. A brief demonstration of the query tool and workspaces will be given and the results of our research on the effectiveness of this tool will be reported.

SCIENCE RESEARCH AS A SOURCE FOR DECISION- MAKING REGARDING VICUÑA CONSERVATION AND MANAGEMENT

COVENERS: **Bibiana Vila, Ph.D. & Catherine Sahley, PhD.**

DETERMINATION OF SUBSPECIES OF VICUÑAS AND THEIR IMPORTANCE IN CONSERVATION STATUS AND MANAGEMENT DECISIONS

Juan Carlos Marín, Ciara Casey, Miranda Kadwell, Katerine Yaya, Jorge Rodriguez, Domingo Hoces, Juan Olazabal, Raul Rosadio, Angel Spotorno, Michael Bruford and Jane Wheeler.

Laboratorio de Genómica y Biodiversidad, Departamento de Ciencias Básicas, Facultad de Ciencias, Universidad del Bio-Bío, Casilla 447 Chillán, Chile. <jcmarin@ubiobio.cl>

The vicuña (*Vicugna vicugna* Miller, 1924) is a conservation success story, having recovered from near extinction in the 1960's to current population levels estimated at 275,000, but lack of information about its demographic history and genetic diversity has limited both our understanding of its recovery and the development of science-based conservation measures. To examine the evolutionary and recent demographic history of the vicuña across its current range at the molecular level, and to assess its genetic variation and population structure, we sequenced mitochondrial DNA from the control region (CR) for 261 individuals from 29 populations across Peru, Chile and Argentina. Our results suggest that populations currently designated as *Vicugna vicugna vicugna* and *Vicugna vicugna mensalis* comprise separate mitochondrial lineages. The current population distribution appears to be the result of a recent demographic expansion associated with the last major glacial event of the Pleistocene in the northern (18 to 22° S) dry Andes 14-12,000 years ago, and the establishment of an extremely arid belt known as the «Dry Diagonal» to 29° S. Within the Dry Diagonal, small populations of *Vicugna vicugna vicugna* appear to have survived showing the genetic signature of demographic isolation, while to the north *Vicugna vicugna mensalis* populations underwent a rapid demographic expansion prior to recent anthropogenic impacts. The results from mtDNA analyses support the existence of a northern and southern vicuña taxa/ESU differing in morphological and genetic traits. Examination of past climatic events suggests a long geographic separation of these two forms resulting in their contrasting demographic histories. Consequently, we suggest that these two subspecies should be managed separately to preserve their local adaptations to differing habitats. On these grounds, we predict that intermediate populations might exhibit lower fitness than those further north and south. Thanks to MACS, MEL, FONDECYT.

THE UTILIZATION OF VICUÑAS SINCE HUMAN OCCUPATION OF THE ANDES: A ZOOARCHAEOLOGICAL AND HISTORICAL PERSPECTIVE

Hugo D. Yacobaccio

CONICET- Universidad de Buenos Aires-VICAM

The aim in this presentation is to analyze the relationship between people and vicuñas since the peopling of the Andes some 11,000 years ago. As with other human/animal interactions, understanding the historical background is not only useful for increasing our knowledge about the impact of humans on our wildlife resources, but also helpful in formulating guidelines for future management policies. Since prehistoric times, the use of the vicuña by people has been extensive not only by hunter-gatherers, but also by pastoralists and agriculturalists who killed vicuñas for meat and other by-products (fibre, skins, bones). During Inca-times vicuñas were exploited using chakus or royal hunts; it appears that this form of exploitation had insignificant impact on the vicuña population. However, the exploitation of vicuñas in historical times increased exponentially initiating a path towards near extinction. During the period 1663-1853 the skins of approximately 1.5 million vicuñas were supplied from Buenos Aires to the European markets. Spanish Colonial documents from mid-16th century onwards shows increased concern about declining vicuñas population in the Southern Andes

SOCIAL ORGANIZATION OF THE ANDEAN VICUÑA: UNIQUE, ADAPTATIVE AND REGULATING

William L. Franklin

Professor Emeritus, Dept. Natural Resource Ecology and Management. Iowa State University, USA.

The Andean vicuña has one of most unique social organizations among the ungulates of the world. Found in the central Andes at elevations from 12,000-16,000 ft., this small camelid occupies the alpine-*altiplano* ecosystem, a high altitude, equatorial grassland. Populations were socially divided into: Permanent Territorial Family Groups (PTFGs) of one-territorial male, females, and young <one-year old that occupied scarce but preferred habitat; Marginal Territorial Family Groups (MTFGs) of one territorial male, smaller number of females and young occupying non-preferred habitat; Solo Territorial Males (STMs) of a single adult male defending a territory but without females; wandering Mobile Family Groups (MFGs) of an adult male with 1-3 yearling females without a territorial; and nomadic Male Groups (MGs) that were aggregations of non-territorial, non-breeding males. Population distribution of populations was centered around a mosaic system of resource-defense polygyny in which females were attracted to food resources within year-round, permanent territories. Each PTFG had a feeding and separate sleeping territory. Before one year of age, both male and female young (crias) were expelled by the adult male from the territory, and forced to disperse before the next birth season. Female-family group members were prevented from leaving the group, and outside, new-adult females were more often than not prevented from entering. Family group size, territory size, and total-forage production within territories were significantly correlated, suggesting that territorial males were regulating group size in relationship to available food resources. Because of the annual expulsion of last year's young and the birth of this year's young, a marked-pulsating decrease and increase of local population density occurred.

THE IMPACT OF LIVE CAPTURE ON THE WELFARE OF WILD VICUÑAS

Marcoppido, Gisela; Vila, Bibiana

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After decades of protection in Argentina the number of vicuñas has increased to the level that fibre can be shorn from live animals. The International Vicuña Convention (1994) states that the sustainable use of vicuñas should be conducted by local communities. The management of wild vicuñas includes a holistic approach taking into account the ecology of the species, culture of the local communities, and the application of strict animal welfare standards. The current system of capture and release is patterned after the Inca tradition of vicuña management, with the inclusion of methodologies to minimize injuries and mortalities. Time of capture, distance and herding time, capture facilities, restraint time, and handling procedures have been incorporated and improved. We evaluated stress caused by capture as indicated by changes in physiological parameters, biochemical blood constituents, and animal behaviour.

Several animal welfare recommendations resulted from this study: the duration of the herding and restrain times should be minimized, the blindfolding of vicuñas during handling, and the immediate transfer of young (crias) to a pre-release corral. The sustainability of wild vicuñas management is highly dependent upon the consistent application of these welfare techniques.

IS THERE SPACE FOR VICUÑAS? HABITAT OVERLAP AND COMPETITION BETWEEN VICUÑAS AND LIVESTOCK IN LAGUNA BLANCA, CATAMARCA, ARGENTINA

Borgnia Mariela

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Spatial and diet interactions between vicuñas (*Vicugna vicugna vicugna*) and livestock (feral donkeys, cows, sheep and goats) were studied in Laguna Blanca Biosphere Reserve (Catamarca, Argentina) during 2002 and 2003. Abundance, distribution, and habitat use of each ungulate species were recorded in a fix wide transect survey, and feces collected for microhistological analysis of diet. Vicuñas had a broader distribution and were generalists in their use of habitat. They mainly used steppes distant from human settlements and utilized preferred habitat less than expected based upon foraging preference. Livestock was found grouped in richer areas (wet *vegas* and *salinas*) near human settlements where shepherds took them for grazing. Diet overlap between vicuñas and livestock was high, whereas overlap in habitat use was lower. The coexistence of vicuñas and livestock was founded upon the former occupying suboptimal habitat, facilitated by their adaptations for living in deserts and consuming poor quality forage. Spatial segregation was mainly related to human disturbance associated with pastoral

activity, and not to a direct effect of livestock interaction with vicuñas. Feral donkeys showed an intermediate pattern of habitat use and diet, and could be potential competitors for vicuñas and other livestock. Estimated carrying capacity of the reserve suggested conditions are adequate for sustaining the current vicuña population, but critical when all ungulates (wild and domestic) are included. This work suggests a negative impact on native wildlife by introduced exotic livestock to the reserve. It is one of the first studies to investigate interactions between the southern subspecies of vicunas and free-ranging, sympatric ungulates in their puna.

THE EFFECTS OF MANAGEMENT ON WILD VICUÑA: ECOLOGY AND BEHAVIOR AS INDICATORS OF BIOLOGICAL IMPACT

Dr. Yanina Arzamendia

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To achieve sustainability of vicuñas being managed for fibre production through live capture, it is critical to apply methods for assessing impacts on populations before and during the implementation of such management techniques. Management goals include the adaptation of procedures minimizing impacts on the species and its habitat, and maximizing the socioeconomic benefits for local Andean communities.

The response of wild vicuñas to the capture and shearing was evaluated by monitoring etho-ecological responses and demographic parameters before and after the disturbance. Field studies were conducted during spring at Cieneguillas in the Pozuelos Biosphere Reserve, Jujuy, Argentina, where vicuñas were captured, shorn, and returned to the wild. Five fixed-width, line-transect censuses were carried out from 1999 to 2005, as well as, seasonal etho-ecological studies using scan and focal animal sampling from 2002 to 2005. The effect of capture and shearing was evaluated by physiological, ethological and demographic parameters: proportion of young born to shorn and unshorn females, mortality rate, and number of vicuñas pre- and post-capture. The effect on behavior was evaluated by comparing captured (n=98) versus non-captured/shorn animals (n=100) during the 2 years after capture.

It was found that negative impacts of capture and shearing can be reduced by decreasing the speed and distance of the chase and handling time during captivity. No changes were observed in mortality and birth rates, social organization, and habitat distribution. Subtle and short-term changes, however, were observed in individual movement behavior due to thermal and behavioral stress. Changes were low-impact because of their short duration and equal magnitude of other changes produced by stochastic events (such as drought).

A SOCIAL SCIENCE PERSPECTIVE TOWARDS WILDLIFE CONSERVATION AND MANAGEMENT: WHAT DO ANDEAN VILLAGERS THINK ABOUT VICUÑAS?

Wawrzyk Ana Celeste

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Understanding sociocultural changes that affect society's perspectives about wildlife is an important aspect of comprehensive, effective wildlife management. A leading example is the South American vicuna. In order to accomplish a variety of management goals, it is essential to understand the attitude of Andean villagers towards vicuñas. These goals include, encouragement to participate in wildlife related activities, reducing conflict among wildlife stakeholders, educating people about management practices, and to be able to predict emerging issues. The vicuña is a strategic resource for the Andean people for its luxurious fiber that has high value in the international market. With the recovery of some vicuña populations in the Jujuy province in Argentina, various Andean communities have requested help to develop management plans to promote the use and conservation of this species as an alternative source of income for local development. However, not all the communities have the conditions to implement a vicuña management plan, for example, more than 9 vicuñas/ km², at least two years of scientific basic data on vicuña density and behavior, and a local community organization based on the participation and mutual cooperation between all the members of the community. We have studied the perception of Andean people towards wild vicuña in four communities that have different sociocultural organizations, land property, and density of vicuñas. Specific goals were to understand their attitudes, knowledge and interests towards wild vicuña, and to identify potential sites for future management.

THE QUALITY OF SUSTAINABLE UTILIZATION OF VICUÑAS: A CRITICAL ANALYSIS OF HOW DECISIONS ARE MADE FOR ITS CONSERVATION AND MANAGEMENT

Bibiana Vilá

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Although biological sustainability is an assumed condition for sustainable development of wild vicuña populations, the latter is not guaranteed even with state-of-the-art biological management. There are several environmental aspects to be taken into account before a management project can reduce epistemic uncertainty and be easily incorporated into locally required «management plan documents». Data on vicuña densities, social composition, behaviour, and landscape geomorphology are some of the essential aspects to be incorporated. In addition, community perception about vicuñas and local social groups can interact for generating a successful management system. Currently, most of the development projects consider that the economic benefits from the use of wildlife must return or stay within the local community in order to keep «room» for conservation of the species. In this presentation the Cieneguillas Vicuna Utilization Project of Argentina will be assessed by critically revisiting the range of different actors, interests and responsibilities assigned to government researchers and local community-associations. The required ecological background data will be reviewed, as well as, the difficulties local people have experienced in selling vicuna fiber. Adaptative management, precautionary recommendations, and welfare guidelines will be included in the presentation of a complete project incorporating environmental impact analysis and biological sustainability measures. Interdisciplinary science, formal (in practice teacher courses) and non-formal (meetings, films, and posters) environmental education practices, and bottom-up strategies appear to be the key factors in fulfilling the sustainable management of vicunas while minimizing poor decisions.



Thursday, August 13th

ECOLOGY OF MARSUPIALS AROUND THE WORLD: PATTERNS AND PROCESSES OF NEOTROPICAL AND AUSTRALASIAN SPECIES

CONVENERS: **Emerson M. Vieira** and **Marcus V. Vieira**

LONG-TERM DYNAMIC OF SOCIAL STRUCTURE OF LONG-NOSED BANDICOOTS IN SUBURBAN AUSTRALIA

Peter B. Banks, Nelika K Hughes, Andrew Lothian, Emeline Mourocq, Rachel W. Miller
University of New South Wales, Australia

Bandicoots are an enigmatic group of marsupials. Taxonomically, they sit between dasyurids and diprotodonts, and are characterized by rapid breeding and an ability to respond quickly to environmental change. Yet most species in Australia have undergone dramatic population declines since European settlement and four of the nine species are extinct on the mainland. In this paper, we report on a 12-year study into the population dynamics and social organization of an urban endangered population of long-nosed bandicoots (*Perameles nasuta*) which appears to be thriving on some aspects of urban living. Contrary to expectations, their numbers did not vary with climatic conditions, but remained quite stable through time despite high juvenile mortality. They show distinct preference for the gardens and lawns of suburban areas over natural areas of heath vegetation. These unnatural habitats appear to sustain the population, at least in the absence of important agents of mortality; predation by introduced predators and cars. Also contrary to popular belief, the long-nosed bandicoot is not solitary but shows predictable patterns in its socialization, which varies between the breeding and non-breeding seasons. Again the suburban landscape had a major influence on the nature of social structuring, and there is strong evidence for sexual segregations; some lawn patches have mostly males and others have mostly females. While there is no sign that breeding is limited, the cause of this distinct and persistent sexual segregation is perplexing. With such a strong affinity for urban areas, the fate of this population has become separate from the fate of their natural habitat, which creates problems in management, especially when different stakeholders own the land occupied by different bandicoot social groups. The findings of our research are compared to other bandicoots, and generalizations are drawn about general life history and dynamics of bandicoots.

WHY ARE ENDANGERED MARSUPIAL CARNIVORES STILL ABUNDANT IN SOME PARTS OF EASTERN AUSTRALIA?

Al Glen
CRC Dwellingup Research Centre, Australia

Large carnivorous marsupials such as the Tasmanian tiger and Tasmanian devil disappeared from mainland Australia before the arrival of Europeans, leaving the spotted-tailed quoll (*Dasyurus maculatus*) as the largest marsupial carnivore on the mainland. Since European settlement, quolls have also declined in abundance and distribution. Although *D. maculatus* is now listed as endangered, the species remains abundant in parts of north-eastern New South Wales. Based on a two-year field study, I discuss a number of factors that may account for this local abundance. My results emphasise the importance of hollow-bearing trees, which support abundant prey populations and provide den sites for *D. maculatus*. Other habitat attributes such as large

areas of continuous forest, abundant fallen logs and rock outcrops may also be important. I also hypothesise that the very low density of introduced red foxes (*Vulpes vulpes*) in my study area contributes to the high abundance of *D. maculatus*. Foxes are likely to limit quoll populations through competition. However, experiments are required to test this. I recommend that these should measure the short-term behavioural response of quolls to the removal of foxes.

SEXUAL SEGREGATION IN MACROPODID MARSUPIALS

Graeme Coulson

The University of Melbourne, Australia

In eutherians, the phenomenon of sexual segregation is most evident in ungulates, particularly amongst cervids and bovids. In marsupials, sexual segregation has been reported in a range of taxa, but is best known in macropodids (kangaroos and wallabies), which represent a parallel radiation of terrestrial herbivores. To date, seven macropodid species have been reported to segregate along social, diet, habitat and/or spatial dimensions. The synchrony and timing of breeding influences the magnitude and timing of sexual segregation in sympatric western grey kangaroos (*Macropus fuliginosus*) and red kangaroos (*M. rufus*) in north-west Victoria. Mating is synchronous in western grey kangaroos, so segregation peaks during autumn, when females are in lactational anoestrus. Mating is more continuous in red kangaroos, so segregation is weaker than in western grey kangaroos, but occurs throughout the year. The degree of social and spatial segregation in these two species is comparable to that in ungulates. Many hypotheses have been proposed to explain the evolution of sexual segregation in ungulates. As ecological analogues of ungulates, macropodids provide a test of the generality of these hypotheses. In accordance with the predation risk-reproductive strategy hypothesis, female western grey kangaroos accompanied by vulnerable young-at-foot, are over-represented in secure habitats, while large males, which are essentially immune to predation, occur more often than expected in nutrient-rich habitat. Contrary to the activity synchrony hypothesis, segregation occurs in the absence of any sex-specific differences in activity budgets. Consistent with the social affinity hypothesis, groups composed of individuals of the same sex, irrespective of body size, are over-represented during the non-breeding season. The fission/fusion dynamics of these groups depends on the individuals involved: all classes leave mixed-sex groups independent of group composition, whereas large males join male-only groups more frequently than expected, contributing to group cohesion and promoting segregation.

MARSUPIALS AS ECOSYSTEM ENGINEERS

Natalia Leiner, Dickman, Chris R.

Universidade Estadual de Campinas, Brazil

Ecosystem engineers are defined as organisms that are able to modulate resource availability, either directly or indirectly, by changing the physical state of biotic and abiotic materials. Here we review the role played by marsupials as ecosystem engineers, providing examples of engineering activities and discussing generalities in the processes that they control. We explore the similarities and differences in the engineering services provided by Australasian and American marsupials, and conclude with a discussion of the conservation implications of marsupial engineering activities and suggestions of future research. Our review confirms that many Australasian marsupials play important roles as allogenic and biotic engineers, especially via their burrowing and digging activities. These activities influence water distribution, organic matter accumulation and nutrient cycling in soil, thus enhancing ground-surface heterogeneity and plant establishment, especially in arid and semi-arid ecosystems. On the other hand, American marsupials are almost exclusively biotic engineers, contributing to pollination and especially to seed dispersal of plants. We propose that these functional differences between the two groups are related to their evolutionary history; Australasian marsupials radiated unchallenged into the spectrum of available niches, whereas the primarily small, scansorial, omnivorous South American species were denied access by large placental herbivores and burrowers. Because Australasian and American marsupials contribute to ecosystem processes from the microhabitat to the landscape level, and to habitat regeneration via spore and seed dispersal, we conclude that it is crucial to protect their populations and even invest in reintroduction efforts to help restore threatened and degraded habitats. Finally, we suggest that further progress in this area should employ controlled manipulative experiments to quantify the role of marsupial species as ecosystem engineers, and focus on studies related to the application of marsupial engineering services to ecosystem management and restoration.

THE ECOLOGY OF A UNIQUE MARSUPIAL - MISTLETOE INTERACTION

Guillermo Amico; Rivarola, Maria Daniela Carlo, Tomás Morales, Juan Manuel

Laboratorio Ecotono, INIBIOMA, CONICET-Universidad Nacional del Comahue; Quintral 1250, 8400 Bariloche, Río Negro, Argentina

The monito del monte (*Dromiciops gliroides*, Microbiotheriidae) is a nocturnal marsupial endemic to the northern portion of the

temperate forests of southern South America. *Monito del monte* is an omnivorous species; however, during the summers consumes mainly fruits. It has been reported that this marsupial is the only animal involved in the dispersal of the mistletoe *Tristerix corymbosus* (Loranthaceae). The passage of mistletoe seeds through the marsupial's gut is critical for germination. *Dromiciops* is a highly efficient disperser of the mistletoe's seeds, depositing most of them on host branches. Recent theoretical work suggest that in animal dispersed plants, the spatial configuration of fruit bearing individuals can have strong effects on both the rate of fruit removal and on the scale and shape of dispersal kernels. To test these ideas, we explored how fruit removal by *Dromiciops* was related to the abundance of ripe fruits on focal plants and to neighborhood density. Furthermore, we looked at marsupial movements associated with resource abundance in the area. We selected 22 mistletoe plants for which ripe fruit abundance and removal was weekly recorded. In addition, we estimated mistletoe density around each focal plant within a 5 m radius. To determine the marsupial movements, we placed 50 traps in two grids (50x50 m). The traps were placed during four consecutive days per month from December to April 2009. Captured animals were fitted with pit tags and radio transmitters were placed to 28 individuals. These were followed during nights as well as during the day to register their movement. Fruit removal rate was associated with fruit abundance and to a lesser degree with neighborhood density. *Dromiciops* movements revealed strong site fidelity but we found occasional forays up to 150 meters in a night. We discuss the potential implications of *Dromiciops* behavior for mistletoe population dynamics.

BETTING ON THE AVERAGE: THE ONSET OF REPRODUCTION OF SOUTH AMERICAN DIDELPHIDS

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Studies on the onset of reproduction of South American didelphid marsupials are reviewed. So far, the onset of reproduction seems to be controlled by the variation in the length of daylight. Rainfall and temperature actually occurring on the onset are not correlated with it, but average rainfall is. Reproductive strategies of South American didelphids may have evolved based on the average environmental conditions

INTERFERENCE BEHAVIOR AND SPACE USE BY DIDELPHID MARSUPIALS

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Predation risk and food availability play a central role in the social organization and mating system in mammals. Models for small mammals predict that territoriality in females would be favored if resources are scarce and patchy, and if predation risk falls mostly on young, either by actual predation or infanticide. This theory and predictions for small mammals were based mostly on rodents of temperate regions. I test such predictions in didelphid marsupials, reviewing recent studies on their space, possible mating systems supported, and interference by species of *Didelphis* - the largest species of didelphid. The large body size difference between species of *Didelphis* (ca. 1500-2500g) and other small mammals (< 700g), and the occasionally predatory habits of *Didelphis* makes them potential intraguild predators, and a predation risk for small mammals. Studies of space use by the didelphids indicate a common pattern, males with large and overlapping movement areas, and females with smaller, nonoverlapping movement areas. Territoriality in females is likely, but mostly by resource defense rather than young defense as suggest in studies of *D. aurita*, *M. paulensis*, and *M. incanus*. Exploitation competition with *D. aurita* was tested by the dynamic method, and interference by predation risk or competition was tested by the static method, both applied to two long term studies in Atlantic Forest Biome. Exploitation competition was not detected, but the interference of *D. aurita* was pervasive, affecting all small mammals studied in the two localities after removal of any variation associated with microhabitat factors. The clear avoidance of *D. aurita* by all small mammals tested in two localities of different physiognomies indicates that it functions as an intraguild predator, even if actual predation by *D. aurita* is an occasional event. Possible relationships between the interference of *Didelphis* and space use by females are discussed.

DAILY ACTIVITY PATTERNS OF NEOTROPICAL MARSUPIALS: FACTS AND GAPS

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Activity patterns of animals are a fundamental aspect of their biology. Timing of activity is crucial in determining encounters between neighboring territorial species, in determining predation risk, and also in influencing competition between species and their foraging success. The option for being active in the same environment at different times of the day exposes animals to

several environmental challenges, both biotic and abiotic. Besides the obvious difference in light availability during the 24-h cycle, there are also several other differences. These differences include ambient temperatures, humidity, food availability, predation risk, mates, and more. For small mammals, daily activity patterns may be categorized in at least five major groups: diurnal, nocturnal, crepuscular (activity peaks at dusk and dawn), noncircadian, and complex or acyclic. Although nocturnality is the most common pattern followed by most neotropical marsupials, diurnal activities occur in species of the genus *Monodelphis*. Nocturnal insectivorous-omnivorous species, such as *Thylamys velutinus*, generally show one activity peak just after dusk. Animal biological rhythms may only be understood against the background of changes in the environment. None the less, little is known about the relation between diel activity and abiotic environmental parameters. A study on such relation for the omnivorous *Gracilinanus microtarsus* indicated that this species presents seasonal changes in activity, with a peak between 2 and 4 h after dusk in non-reproductive season but a much more constant activity during the reproductive season. This marsupial shows a positive and significant relation between diel activity and ambient temperature during the mild seasons (spring and autumn) but not during summer or winter. The daily activity patterns of *G. microtarsus* and other neotropical marsupials seem to be determined by both abiotic (e.g. temperature) and biotic factors (e.g. food availability, reproductive condition).

OLD WORLD PIGS AND NEW WORLD PECCARIES — CONSERVATION STATUS, MANAGEMENT AND HEALTH

CONVENERS: **Andrew Taber, Mariana Altrichter, and Harald Beck**

A RANGE-WIDE CONSERVATION STATUS ASSESSMENT OF THE WHITE-LIPPED PECCARY (*TAYASSU PECARI*)

Altrichter, Mariana; et al.

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The distribution of White-lipped peccary (*Tayassu pecari*), with an historic range of 14,220,461 km², is amongst the largest of Neotropical mammals and extends from southern Mexico to northern Argentina. They are an ecological keystone species in the American tropics and subtropics. Also, they are an important food resource for subsistence hunters and are heavily harvested for the hide trade. We report on a GIS-based range-wide status assessment of this species using field data and expert opinion from 44 biologists in 14 range countries. The experts judged white-lipped peccaries extinct in 20.5% of its historic range, and with a low probability of survival in another ca. 22% of their distribution. Major range declines were reported in Argentina, Paraguay, S Brazil, NW South America (Colombia, Venezuela), NE Brazil and Mesoamerica. The importance of different threats to the species were estimated; and we analyze this species' status by eco-geographic region, major habitat type and country; with planning and action implemented at the level of the latter two judged most practical by the experts. We contrast our results with those from similar assessments of the largely sympatric jaguar (*Panther onca*) and Lowland tapir (*Tapirus terrestris*); and discuss implications for ecosystem function of the decline in White-lipped peccary range size and population status across the Neotropics.

CHALLENGES FOR THE RECOVERY OF THE MOST ENDANGERED SUIFORM, THE PYGMY HOG (*PORCULA SALVANIA*).

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Almost 27 years after its 'rediscovery' and 12 years after commencement of Pygmy Hog Conservation Programme, the pygmy hog (*Porcula salvania*) is showing some signs of recovery. The smallest and the most endangered of the world's wild suids, the pygmy hog is a highly specialised inhabitant of early successional alluvial grasslands of southern Himalayan foothills in the Indian subcontinent. Reduced to a single wild population of a few hundred individuals by early 1990s, the species is not yet out of danger, as attempts to reintroduce captive-bred hogs in a few shrinking grassland pockets is facing stiff challenges. The main threats to survival of pygmy hogs are loss and degradation of habitat due to expansion of agriculture and human settlements, commercial plantation, livestock grazing and indiscriminate dry-season burning of grass. The pygmy hog is a sensitive indicator of grassland habitat that is crucial for survival of other endangered species such as Bengal florican and hispid hare. The captive

population, started in 1996 with six wild founders caught from the last population in Manas NP, multiplied twelve times in five years and continues to provide animals for reintroduction. In 2008, 16 pygmy hogs were released in Sonai Rupai Wildlife Sanctuary after being 'pre-conditioned' in three social groups under minimum human contact at a 'pre-release' facility with simulated natural habitat. Ground surveys and camera-trapping reveal that up to two-third of the released hogs are thriving and a pregnant female had farrowed successfully in the wild. Three more groups of hogs are being released in Sonai Rupai in 2009 and subsequently similar series of releases into 'vacant' habitats within the known range of this species will be undertaken. Efforts to ensure survival of the species in Manas and reintroduction sites include grassland studies, capacity building of the Park staff for scientific habitat management, and socio-economic interventions and awareness generation in politically disturbed fringe villages.

PECCARY SYNECOLOGY: A HOLISTIC REVIEW OF THEIR INTERACTION WITH NEOTROPICAL FAUNA AND FLORA

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The members of the peccary family (Tayassuidae) includes Collared peccary (*Pecari tajacu*), White-lipped peccary (*Tayassu pecari*), and Chacoan peccary (*Catagonus wagneri*). The first species ranges from Texas to Argentina, white-lipped peccaries range from Mexico to Argentina, and the latter species is restricted to the dry shrub Chaco area of Argentina, Brazil, Bolivia, and Paraguay. A new peccary species has recently been proposed but additional genetic and morphological analyses are required to determine its taxonomic status. Collared and White-lipped peccaries utilize many different habitats ranging from deserts to tropical mountain forests. The former species lives in small family groups whereas White-lipped peccaries groups can be in the hundreds. In tropical forests, peccaries constitute the highest mammalian biomass thus their habitat and resources requirements should be higher than for other mammal species. A review on trophic-interaction reveals that peccaries consume fruits from over 200 plant species and preying upon 47% of those seeds, whereas only few species are dispersed. Non-trophic interactions (trampling) can affect seedling survival and thereby may influence future forest communities. By reducing fern densities, peccaries can indirectly affect seedling performance which negatively affects seedling growth. In area where peccaries are locally extinct trophic cascading effects have been recorded. Peccaries prey upon many small to mid-sized vertebrates are among the main prey species for jaguar (*Panthera onco*) and puma (*Puma concolor*) and are economically important key food resources for subsistence and commercial hunting. All three species, in particular Chacoan and White-lipped peccaries are threatened by human activities foremost overhunting, deforestation, and fragmentation. My overall conclusion Results highlight the crucial roles of these three species, but also challenge biologists to develop conservation strategies and action plans to maintain species diversity and reduce potential cascading effects.

PECCARIES AND ECOLOGICAL HEALTH IN THE NEOTROPICS: AN OVERVIEW OF PAST EVENTS AND FUTURE THREATS

Alessandra Nava

IPÊ, Brazil

AN OVERVIEW OF PECCARY GENETICS AND REASSESSMENT OF THE SYSTEMATICS OF THE FAMILY TAYASSUIDAE: RECENT BREAKTHROUGHS AND REMAINING QUESTIONS

Jaime Gongora, Cibele Biondo, Jennifer D. Cooper, Alexine Keuroghlian, Cristina Yumi Miyaki, Pedro Mayor, Mariana Altrichter, Peter Waser, J. Andrew DeWoody, Filomena Adega, Raquel Chaves, Henrique Guedes-Pinto and Amanda Yoon-Yee Chong

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Genetic research on the family Tayassuidae has provided interesting insights into its biology, diversity and behavior. Here we present an overview of the state-of-the-art findings on peccary cytogenetics, phylogeography, molecular ecology and immunogenetics from four international research teams. Chromosome and DNA sequence analyses contributed to the understanding of the evolutionary differences and relationships between the three extant peccary species. Interestingly, it was suggested that the Collared peccary consists of two major genetic lineages, which are as divergent as the White-lipped and the Chacoan peccaries. Molecular ecology studies contributed to the understanding of the population dynamics and social behaviour of this family. For instance, microsatellite DNA markers revealed that the dispersal pattern of the Collared peccary is male-

biased while in White-lipped peccary both sexes disperse. In addition, a immunogenetic study has started to characterise the peccary major histocompatibility complex genomic region to understand the association between immune response and diseases. Finally, we will discuss challenges and future research possibilities, focusing on the integration of these studies in order to increase understanding of the biology and evolution of peccaries and how to apply this knowledge to the conservation and sustainable use of the family.

ECOLOGY AND MANAGEMENT OF FERAL PIGS IN THE BRAZILIAN PANTANAL.

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Feral pigs (*Sus scrofa*) are one of the most successful invasive mammalian species in the world. Feral pigs were introduced to the Pantanal about 200 years ago. It is thought that domestic pigs escaped and became feral during the Paraguay War (1865–1870), when ranches in the Pantanal were devastated and abandoned. Today, they can be found throughout the floodplain. The ecological impact of this species in the Pantanal is still not well understood. It is thought they may compete with the native white lipped peccary (*Tayassu pecari*) and collared peccary (*Pecari tajacu*), but in a study on niche partitioning between the three species in the central Pantanal we found that overlap in food resources and habitat use between feral pigs and peccaries was lower than expected. It has been shown that in the Pantanal feral pigs may act as reservoirs for disease, predate eggs of ground nesting birds and reptiles and alter plant communities through their rooting activities. However, we have also found that feral pigs may act as potential seed dispersers. One of the positive outcomes of feral pig presence in the Pantanal is they are effectively acting as a replacement species for native wildlife hunting in the region. The Brazilian Pantanal is one of the only non-protected areas in the Neotropics where people live and rarely hunt native wildlife. One of the reasons for this, is that instead of hunting native wildlife local people hunt this introduced invasive species. Feral pigs provide a constant, culturally acceptable, legal, readily available free source of meat and oil to isolated ranches. Feral pigs are now an established component of the Pantanal fauna and the presence of this exotic species should be accepted for all its complexities, positive and negative outcomes.

THE FUTURE OF THE WORLD'S MAMMALS: THE IUCN RED LIST DATABASE AS A TOOL IN CONSERVATION MODELING AND PLANNING

CONVENERS: **Thomas Lacher, Carlo Rondinini and Jan Schipper**

WHERE? A HABITAT SUITABILITY ASSESSMENT FOR THE WORLD'S MAMMALS

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Despite the fact that mammals remain one of the best studied groups of species, detailed information on their distributions has often been lacking, thereby hindering their conservation. We used the information from the 2008 IUCN Red List of Threatened Species as a baseline for developing species-habitat suitability models for 5488 mammals, based on their species-habitat relationships. We focused on the following environmental variables: land cover, elevation, hydrological features, and soil types. Models were limited to within species' known limits of distribution, to avoid predicting species presence beyond their geographic ranges. Using these refined distribution ranges, we then conducted a global analysis of all terrestrial mammals to determine patterns of species richness, threat, endemism, and overlap with protected areas. This analysis refines our existing understanding of global mammal distribution patterns, and provides useful baseline data for large-scale conservation planning.

SCENARIOS FOR THE FUTURE OF MAMMALS IN SE ASIA

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Southeast Asia is one of the richest reservoirs of biodiversity on earth and home to one of the highest concentrations of endemic species. The region encompasses four hotspots, several of the most valuable eco-regions, and a mega-diversity country system composed by Indonesia, Malaysia and the Philippines. This extraordinary species richness encompasses all taxa, and mammals are no exception. In fact, roughly one quarter of the mammal species of the world occurs in the area, with many new families and species which have been discovered recently. The rapid and extensive destruction of habitats occurring worldwide across the tropical belt has not spared Southeast Asia, which indeed has one of the highest relative rates of deforestation among the major tropical regions. Its native biota is seriously threatened by forest conversion, forest fires, unsustainable subsistence hunting and wildlife trade. The same trend (probably magnified) is going to occur in the near future, further endangering many species. To evaluate the impact of land-use change for mammal species in the region, we developed 4 land use change scenarios based on the 4 global change scenarios developed in the Millennium Ecosystem Assessment. The land allocation procedure for each scenario followed the GLOBIO methodology, resulting in 4 maps depicting different scenarios of land-use change and 2050 with a 10km resolution. We used existing species-habitat relationships for almost 1000 species to develop deductive distribution models for 2000 and for 2050 and we measured the effect of habitat change considering different dispersal scenarios (from no-dispersal to unlimited dispersal). The results outline the importance of developing comprehensive and robust conservation planning strategies considering the entire region. While for some species land use change can potentially provide new opportunities, for many species of conservation concern only a coordinated conservation effort considering socio-economic as well as ecological factors can ensure long term viability.

HOW WELL ARE MAMMALS DOING IN RELATION WITH OTHER TAXONOMIC GROUPS?

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IUCN/SSC

The results of the 2008 Global Mammal Assessment indicate that 21% of mammals are threatened with extinction. This is much worse than the situation with Birds (12%), Groupers (12%) and Dragonflies (11%), but better than Amphibians (30%), Gymnosperms (33%) and Reef-building Corals (36%), and similar to Freshwater Crabs (18%), and Sharks and Rays (17%). The status of the world's mammals is deteriorating rapidly, though less fast than amphibians and corals, but much faster than birds. However, the rate of decline is particularly severe in tropical Asia due to overharvesting and habitat loss, where there is an extinction debt that will be paid over the next couple of decades unless urgent conservation measures are taken. In most places, the status of large mammals is deteriorating much faster than that of small mammals

BURNING BRIDGES: WHAT FUTURE FOR THE CENTRAL AMERICAN MAMMALS

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Central America and Mexico represents important biodiversity areas in the world and a critical cross-path between North and South America's faunas. However, because its historical heavy use and restricted area, severe threats are affecting mammal diversity. We evaluated the conservation status of all Mammals based in the 2008 Red List of Threatened Species through the Global Mammal Assessment. For Central America and Mexico, respectively, two and six species are declared Extinct (one shared) and a total of 40 and 104 species are under some threat category, while 36 and 28 species are considered Data Deficient, 262 and 367 Least Concern and 20 and 23 Near Threatened. From the threat categories 17 and 29 are Vulnerable, 13 and 44 Endangered and 10 and 31 Critically Endangered. The distribution of threatened species per country shows a considerable concentration for México –also related with total richness, followed by Panama, Guatemala and Costa Rica and the rest shares similar numbers (<10 spp.). Panama and Mexico are the countries with the highest number of DD species followed by Costa Rica, Nicaragua and Honduras. The number of threatened species shows a clear pattern from the highest values in both extremes (Panama and Mexico) towards the lowest in the center (Honduras, Nicaragua and Salvador). Probably low research and scarce information decrease the number of threatened species as result of «softer» assessments held on unknown countries. All the threatened species share in general the same threats, with slight differences, however accelerated deforestation and disturbing processes are endangering the future of regional mammals; Mexico still retains high richness of species, however the conservation-needed species numbers are continuously increasing. Research for DD and strong criteria

development for assessments are needed in order to ensure the persistence of these species in the region and maintain connectivity along the continent.

MAMMALIAN ENDEMISM, RANGE SIZE AND CONSERVATION STATUS IN THE SOUTHERN TEMPERATE ZONES

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The southern temperate zones harbor a unique flora and fauna. This is attributed to the long isolation from the northern temperate zones, and a complex history of tectonic movement that has resulted in a deep common history, punctuated by periods of dispersal and subsequent isolation for 10s of millions of years. The southern temperate zones lack the periods of recent connectivity that characterize the Holarctic region. Thus there are many species shared across the northern continents, but virtually none among the southern continents. Indeed, there are high levels of endemism at specific, generic, familial and ordinal levels in all southern temperate regions. In addition, tectonic shifts have formed three isolated temperate regions that taper toward the southern pole, becoming increasingly more narrow in land mass. We used data from the IUCN Global Mammal Assessment to generate data on conservation status, threat, and range size for north and south temperate zone mammals. Methods for collection of data follow Schipper et al. 2008. Temperate zones are heavily exploited for human activities, especially grazing and agriculture. The proportion of south temperate species under threat is less than the global average (11 % vs 21 %), and less than the northern temperate region (11 % vs 14 %). However, south temperate endemics are about 50 % (25 % vs 16 %) more threatened than northern temperate endemics. There is also a trend towards smaller range sizes in southern temperate zone mammals. The scenario now is one of regions of restricted range endemics under high potential threat from human activities.

MACROECOLOGICAL DETERMINANTS OF THE DISTRIBUTION OF NEOTROPICAL RODENTS: CONSERVATION IMPLICATIONS

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The range of 701 species (belonging to 159 genera and 15 families) of Neotropical rodents has been analysed with the aim to understand whether their distribution is affected by habitat quality and quantity on a continental scale. Distribution data (size of each species' range in Km²) and relative quantity of each macrohabitat type (in Km²) were obtained respectively from the Global Mammal Assessment data bank (IUCN Red List 2008), and the Global Land Cover 2000 (GLC 2000). We excluded primarily island species from analyses, whilst we included those species that occur in both islands and mainland. Habitats were grouped according to 7 categories (Shrubland, Forest, Grassland, Savannah, Wetlands, Desert, and Artificial/terrestrial). For species with two or more habitat categories, the interaction factor among the two habitats was considered. Overall, at the family level there was no evidence that any specific habitat type has driven the distribution of Neotropical rodents. However, distributions of some specific families were influenced by the availability of specific habitat types (Huge Balance Generalised Linear Model design): Caviidae range was influenced by shrubland and grassland availability, Cricetidae by grasslands and savannah, Echymidae by forest and artificial/terrestrial, Geomyidae by forests, grasslands and deserts, Heteromyidae by shrubland/grasslands, and Octodontidae by shrubland/grassland. Overall, shrubland/grasslands appeared to be the most important habitat type driving distribution of Neotropical rodents, despite their relatively low availability in the region (5,071,894 Km²) compared to forests (9,370,846 Km²). From these data we also generated hotspot maps for threatened and endemic species, and showed a mismatch between the hotspots in the two maps. The conservation implications of these patterns are also discussed.

FLYING INTO DANGER: THREATENED BATS OF THE WORLD

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TBA

The status of 1,150 bat species was assessed using the IUCN 2008 Red List Categories. In this assessment five bat species are confirmed as Extinct, and 177 species are threatened (Critically Endangered, Endangered or Vulnerable). The majority (145 species) of the threatened species are from forested habitats followed by 69 species from caves and subterranean habitats. Regions with more threatened species are Oceania (42 species, 23.7% of total), South and Southeast Asia (49 species, 13.3% of total), and Europe (6 species, 13.95% of total). In the lower risk categories, 77 species are categorized as Near Threatened and 687 as Least Concern. In most cases, the assessments were made with limited amount of information currently available.

Only few bat species have been studied in detail across their range. Many assessments were made by predicting status based upon knowledge of current threats to habitats or roosts. There are 204 bat species listed as Data Deficient. The main threats are biological resource use (hunting, logging, fishing and harvesting aquatic resources) (265 species), and agriculture and aquaculture (198 species). It is likely that assessments will change as more information becomes available. Detailed studies on biology, ecology, distribution and taxonomy are necessary for risk assessment and for designing conservation plans.

THE UTILITY OF TWO NOVEL BIOMARKERS IN THE ASSESSMENT OF MAMMALIAN REPRODUCTIVE POTENTIAL TO INFORM CONSERVATION MODELING AND PLANNING OF RED LISTED SPECIES: A CASE STUDY OF THE WEST INDIAN MANATEE

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Environmental stressors can affect wildlife populations in many ways. Some, such as impaired reproduction, are more critical than others. The IUCN Red List assesses the conservation status based on several criteria, including measures of reproductive status. It is important to understand whether reproduction is being impaired and, if possible, to mitigate stressors that cause the impairment. For marine mammals stressors or threats are identified, but their effects have been difficult to assess. The inability to demonstrate the effects of threats represents a significant impediment to conservation. Without such information, decision makers lack motivation to make changes. Biomarkers allow correlation of effects such as impaired reproduction with possible causes. Two recently-developed biomarkers (anti-Müllerian hormone [AMH] and Inhibin-B) provide ELISA-based analyses of gonadal function plus reproductive potential. Serum samples from West Indian manatees (*Trichechus manatus*) were assayed for these hormones. Linear regression analyses found: significant relationships between male AMH levels and body weight ($P < 0.01$) and total length ($P < 0.05$); a significant relationship ($P < 0.05$) between Inhibin-B levels and length of males; near significance for male body weight and Inhibin-B levels; and near significance for female AMH and Inhibin-B levels and weight and length. For both sexes, a few large individuals showed surprisingly low hormone titres. Validation using these manatees (for which age, reproductive performance, and health history are known) will allow us to assess fertility potential as a function of parameters including location, nutritional status, exposures to biotoxins/contaminants, injuries, disease, and future reproductive performance (for females). AMH and Inhibin-B assays react with serum from representatives of six mammalian orders and one avian order. Available hormone biomarkers may apply ubiquitously for mammalian conservation status assessments. Quantification of fertility potential promotes critical insights into (a) a species' appropriate Red List category, (b) focused and effective mitigation actions for recovery, and (c) realistic conservation and population models.

CARNIVORE CONSERVATION IN THE NEW WORLD

Jerry Belant, et al
Mississippi State University

PRESENT AND FUTURE IRREPLACEABLE SITES FOR MAMMAL CONSERVATION

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The present global system of protected areas is insufficient to ensure the conservation of the world's mammals. Here expert-based habitat suitability models are used to identify high-priority conservation areas for the world's mammals through systematic conservation planning. The dataset builds upon the IUCN-SSC Global Mammal Assessment (5487 species). For each species, the habitat preferences were assessed and used to generate habitat suitability models inside the geographic range, based on at least three environmental variables: type of land cover, elevation, distance to water. The suitable 300m grid cells inside geographic ranges provided an estimate of the area occupied by each species, which underwent an area selection analysis through the software MARXAN. Minimum sets of areas that achieved a variety of minimal conservation targets (for the world's mammals and for threatened mammals only, according to the 2008 IUCN Red List) were looked for. Depending on the scenario, the total area to be protected in order to achieve minimal conservation targets can be up to twice the existing protected areas.

ECOLOGICAL ASPECTS OF MAMMAL-PARASITE RELATIONSHIPS

CONVENERS: **Boris R. Krasnov** and **Serge Morand**

ARE THERE GENERAL RULES IN THE ECOLOGY OF MAMMAL-ECTOPARASITE INTERACTIONS?

Boris R. Krasnov

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Any scientific study revealing some patterns or processes still should answer the question: how general are these patterns and processes? The findings of a particular study should invariably be validated by studies in other geographic locations or on other taxa. Here, we present comparison of several studies that examined various patterns of the relationships between small mammals and different taxa of their arthropod ectoparasites (fleas, gamasid mites and ixodid ticks) and carried out in different geographic regions (Middle East, Central Europe, South Africa, Western Siberia). We conclude that, although general laws apply to the population level of parasite ecological studies, most patterns observed at the parasite community level are highly contingent and far from universal.

MAMMAL ORIGIN OF HUMAN PARASITES

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The determinants of parasite diversity have been largely investigated in the last decade. However, and particularly for mammals, there is still a need to explore more deeply the evolutionary ecology of interactions between mammals and their parasites. Parasite diversity per se has been rarely and only very recently used as a measure of the parasitic pressure on mammals. First, recent results showed that parasite species richness (ecto or endo-) in mammals is highly repeatable among populations of the same mammal host species at a regional scale. These results highlight the strong influence of mammal identity in parasite species richness. This is in favour of the hypothesis that parasite diversity is a key factor in the ecology and evolution of mammal hosts. Second, recent investigations have explored new determinants of parasite diversity with a special attention to the scale of observation (local, regional) and the metric used. Integrating the search of the determinants of parasite diversity in a framework is needed in order to improve database building, new surveys and experimental studies. Finally, recent arguments are given that support the hypothesis that parasite diversity per se exerts a strong selective pressure on mammal hosts. At the host genetic level, increase in parasite diversity is shown to be correlated with an increase in genetic diversity at genes of the Major Histocompatibility Complex (MHC) or to be associated with a strong investment in immunity. Even, in the field of behavioural ecology, parasite diversity may play a role.

COEVOLUTION BETWEEN MAMMALS AND PARASITES

Jean-Pierre Hugot

Museum National d'Histoire Naturelle

We reinvestigate the pattern of geographic distribution of human parasites, using the checklist of Ashford and Crew (1998): «The parasites of Homo sapiens: an annotated checklist of the protozoa, helminthes and arthropods for which we are home.» Liverpool School of Tropical Medicine. Using this list, we aimed at analyzing the distribution of these parasites in relation to parasite taxonomy, mammal hosts with which humans share parasites, and distribution of the parasites according to major biogeographical areas. We categorized the human parasites using the following criteria: i) parasite, which regular host is a non-human mammal; but in particular circumstances may switch on humans; ii) human-specific parasite, with the most closely related parasite species found in another mammalian group; iii) parasite transmitted to humans by the way of an intermediate (secondary) mammalian host; iv) generalist parasite, using humans and other mammalian species as hosts. We recorded as «human parasite» the parasites for which humans are the single and specific definitive host, and/or the main source of transmission to other humans. We distinguished these parasites from those defined as «primate parasite», which are encountered in primates and exceptionally in humans. We quantified the distribution of parasite species in the major biogeographic realms: Ethiopian, Oriental, Australian, Palearctic, Nearctic and Neotropical. Two types of counts were done. The first includes parasite species recorded in several different areas or in all listed areas (cosmopolitan parasites), with these parasites counted for each area.

The second is limited to parasite species present in a single area (endemic of this area). The results of these analyses are discussed taking under consideration the main historical events having influenced Human evolution and migrations. We also take into account the influences of the domestication processes.

HAEMORRHAGIC FEVER VIRUSES OF SOUTHEAST ASIAN RODENTS

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In recent years, much evidence of the circulation of hantaviruses in the rodent populations of Southeast Asia has been found. Many human cases have been reported from China and human hantavirus disease has also been recorded in many of the other countries in this region. At least four species of rodent-borne hantavirus (Seoul, Hantaan, Thailand and Serang viruses) have been identified, with at least three proven to cause human infection. A further two species (Thottapalayam and Cao Bang viruses) have been found in the region's insectivores. In contrast, very little work has been carried out on arenaviruses in Southeast Asia. The few reports that do exist indicate the presence of lymphocytic choriomeningitis virus (LCMV) in China and an unidentified arenavirus in Thailand (also supposed to be LCMV). Both virus groups are genetically diverse, often with more than one species co-existing in the same region, as has been found to some extent for hantaviruses in Southeast Asia. The confirmed presence of a single species of arenavirus is however surprising, particularly when the high biodiversity of rodents found in the region is considered. Both virus groups are thought to have co-evolved with their rodent hosts to some extent, so the high rodent biodiversity present in Southeast Asia suggests that there may be more species of virus yet to be found, a major target of this study. With rapid changes in land use in Southeast Asia, alongside climate change, the availability of habitats and distribution of many of the local rodent species is likely to change. If these rodent species are carriers of zoonotic hantaviruses or arenaviruses, this could cause significant human health problems in the future. It would therefore be prudent to investigate more thoroughly the present distribution of these viruses, so that predictions as to the future situation may be made.

TRADE-OFFS BETWEEN FORAGING EFFICIENCY AND PARASITE RISK: FIELD EXPERIMENTS WITH EASTERN GREY KANGAROOS *MACROPUS GIGANTEUS*

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In most foraging contexts, herbivores must balance foraging efficiency against an element of risk. As many herbivores defaecate on their foraging grounds, the risk of ingesting gastrointestinal parasites by foraging near faeces should constrain foraging efficiency. Domestic herbivores lower their exposure to gastrointestinal parasites by avoiding forage near faecal contamination. However, as faecal deposits are often associated with taller grass, herbivores face a conflict between the benefits of increased nutrient intake and increased risk of parasitism. The costs and benefits of these decisions may be more pronounced in free-ranging animals. The aims of our work were to investigate the anti-parasite response of free-ranging eastern grey kangaroos (*Macropus giganteus*) to faecal contamination of foraging patches, and the effects of patch quality on the expression of this response. We observed the behaviour of kangaroos as they foraged on replicate experimental plots at two sites in southern Victoria, Australia. Our experimental plots independently manipulated faecal contamination and grass height. Both sward height and faecal contamination affected the kangaroos' choice of foraging patches. While kangaroos preferred taller grass, they would not decrease faecal aversion to increase nutrient intake. Overall, parasite avoidance appeared to dictate kangaroo foraging behaviour. The greater the parasite risk, the greater the avoidance level; however, the greater a kangaroo's overall nutritional requirements, the lower the ability to be selective. This is the first study to experimentally manipulate the relationship between parasite risk and sward height in a free-ranging herbivore.

WHAT CAN MITES TELL US ABOUT THE PHYLOGEOGRAPHY OF THEIR BAT HOSTS?

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Phylogeographical history and population genetic structure of parasites that cannot disperse independently are affected by the spatial distribution of their hosts. We study mitochondrial variation in populations of the ectoparasitic mite *Spinturnix myoti* in an island-mainland system in the Mediterranean Basin and compared this pattern to the mitochondrial and nuclear variation of its host, the Maghrebian bat *Myotis punicus*. Besides *M. punicus*, *S. myoti* also infested the greater and lesser mouse-eared bats (*M. myotis* and *M. blythii*) in continental Europe. As host movements exclusively mediate mite dispersal, mite phylogeographic

pattern should mirror the one of its host, i.e. reduced over water dispersal compared to land dispersal. Mite haplotype network revealed three well supported clades corresponding to the three geographical landmasses (North Africa, Corsica and Sardinia) with no shared haplotypes between them. Moreover we found important and significant population differentiation between landmasses while populations within landmasses were fully panmictic. Mite mtDNA pattern of genetic variation was correlated with both host nuclear and mitochondrial one, suggesting that mite phylogeographic pattern is shaped by its host, with open water as main barrier for host and parasite dispersal. On mainland, this pattern contrasted with host mitochondrial one, suggesting mite dispersal during the mating season and/or at hibernacula. Finally, the unique presence of an European mite lineage in Corsica was inconsistent with host phylogeographical history and suggest the former presence of mouse-eared bats (*M. myotis* and/or *M. blythii*) in Corsica.

COMPARATIVE PHYLOGENY AND PHYLOGEOGRAPHY OF ANOPOCEPHALID CESTODES AND THEIR ARVICOLINE RODENT HOSTS IN THE HOLARCTIC

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We review the molecular phylogenetic analyses of anoplocephalid cestodes and their arvicoline hosts in the Holarctic region.

Paranoplocephala arctica and *P. alternata* are common host-specific parasites of *Dicrostonyx*. The main phylogenetic and distributional split of hosts at the Bering Strait (ca. 1 mya), as well as the subsequent splits in the Palearctic, are reflected in the phylogeographic structure of the parasite. However, in the Canadian Arctic and on the Wrangel Island there is no strict congruence between the host and parasite phylogenies.

Paranoplocephala omphalodes and related species are primarily parasites of *Microtus*. For the whole assemblage, no strict correspondence between the parasite and host phylogenies was observed. An intraspecific comparison of the Holarctic *Paranoplocephala jarrelli* and its main host *Microtus oeconomus* also did not reveal shared histories.

Anoplocephaloides dentata and related species are ubiquitous parasites of *Microtus*, *Chionomys*, *Lemmus* and *Synaptomys*. The interspecific phylogeny lacks evidence of coevolution between parasites and hosts, and suggests a sequential colonization among host species and genera as the main source of parasite divergence. In intraspecific comparisons, *Anoplocephaloides lemmi* shows a deep phylogeographic split corresponding to the main split of its hosts (*Lemmus* spp.) (ca. 2 mya, at Kolyma).

Microcephaloides (earlier *A. variabilis* group) are rare parasites of *Microtus*, *Chionomys* and *Dicrostonyx*. The molecular phylogenetic analysis suggests a high cryptic diversity and absence of clear evidence for cophylogeny.

Colonization of new host lineages has been the predominant mode of diversification. There is some evidence for allopatric divergence following host shifts, particularly in *Anoplocephaloides*. Within species or between closely related species, parasite divergence may or may not correspond to that of the hosts. High host specificity may have enhanced strict phyletic coevolution in some of the assemblages. Each anoplocephaline taxon in arvicolines shows an independent response to the host phylogeography, and there is no concerted common response.

ECOLOGY AND HOST ASSOCIATIONS OF ECTOPARASITIC BAT FLIES (DIPTERA: STREBLIDAE AND NYCTERIBIIDAE).

Carl Dick

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Bat flies (Diptera: Streblidae and Nycteribiidae) are highly specialized ectoparasites that infest representatives of all 9 New World bat families. They are obligate blood-feeders, usually host-specific, and the reproductive cycle includes an off-host pupal stage. Parasitic adaptations include the reproductive strategy, reduction/loss of eyes and wings, elongation of legs, flattening of bodies, and development of holdfast structures. Meanwhile, bats constitute a single, extensive radiation of evolutionary lineages, highly variable in size, trophic strategies, roosting structures, colonial attributes, and social behaviors. The bat-bat fly system can inform many contemporary questions in ecology and evolution. This talk provides an overview of the taxonomy and host associations of Neotropical bat flies, and our understanding of the richness and diversity of the group. Distributional patterns are discussed, and placed in the context of the potential for undiscovered bat fly diversity and the problem of cryptic species. Bat flies comprise 505 described species, about 45% the number of described bat species. The Nycteribiidae comprise 12 genera and 275 species and are richest in the eastern hemisphere; 2 genera and 57 species infest American bats (Vespertilionidae, Thyropteridae, and Phyllostomidae). *Basilia*, the richest genus, comprises 53 species in five species-groups. Two groups are primarily Nearctic, two primarily Neotropical, and one widespread. New World nycteribiids range from Chile, Argentina, and

Uruguay to Canada. The Streblidae comprise 33 genera and 230 species, about 65.5% the number of described New World bat species. They are richest in the western tropics; 26 genera and 158 species infest representatives of 8 of the 9 American bat families. New World streblids range from Chile, Argentina, and Uruguay to the USA. An estimated 50 new species of Streblidae are known yet undescribed, and although far less studied, we know of at least 15 undescribed Nycteribiidae.

OF LICE AND MEN: THE INFERENCE OF PAST ECOLOGICAL EVENTS IN COSPECIATION OF HOST AND PARASITES.

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Ectoparasitic lice (Insecta: Phthiraptera) are known to coevolve with their avian and mammalian hosts over long evolutionary timescales. These shared evolutionary histories begin as simple ecological interactions that often set in motion and then reinforce the evolutionary trend of cospeciation. Some ecological interactions such as high host specificity reinforce the process of cospeciation whereas others like host switching can eventually erode it. Reconstructing shared evolutionary histories permits us to glimpse past ecological interactions. My research focuses on primates and their sucking lice, which have been coevolving for over 25 million years. These hosts include humans, which carry two very different kinds of lice. The research I will present has uncovered host switching, parasite duplications, parasite extinctions, and habitat shifts that give us a much better understanding of primate and human evolutionary history and ecology. These studies allow us to infer the habitat of long-extinct gorilla lineages, contact between modern and archaic humans, and even the time at which humans first began wearing clothing.

DARWINIAN JOURNEYS

CONVENERS: **Paul T. Handford** and **Claudio Bidau**

DARWINIAN EVOLUTION: ADAPTIVE RADIATION AND SPECIATION OF BLIND SUBTERRANEAN RODENTS, *SPALAX EHRENBERGI*, IN ISRAEL

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The ecological-speciational trend of *S. ehrenbergi* into increasingly arid environments was initiated apparently peripatrically in small peripheral isolates by rapid nonrandom fixation of Robertsonian chromosomal mutations. This was followed by a gradual genic accumulation of positive assortative mating based on premating ethological species-specific isolating mechanisms involving olfaction, vocalization, seismic (vibrational), aggression, and mating (via bacular variation) cues. The speciation trend budded off a sequence of daughter species with increasingly higher diploid chromosome numbers ($2n$) toward the desert, each species displaying multiple adaptive strategies to *temporal*, *local*, and *regional* stresses southward to the following major challenges: (1) *temporal* (seasonal annual division into dry summer and wet winter); (2) *local* (subterranean ecotope with its stresses of low productivity, high burrowing energetics requirements, hypoxic-hypercapnic burrow atmosphere, total darkness, and high pathogenicity), and (3) *regional* (increasing aridity gradient and decreasing predictability southward) *S. galili* ' *S. carmeli* ' *S. judaei*, $2n=52$ ' 58 ' 60 , and eastward, *S. galili* ' *S. golani*, $2n=52$ - 54 .

S. ehrenbergi represents an adaptive evolutionary selective model associated with aridity stress. Speciation and adaptive radiation in *S. ehrenbergi* are intertwined and are explicable only by Darwinian evolution. Post- and premating reproductive isolating mechanisms evolved mostly allopatrically in this sequence as incidental adaptive differentiation. Speciation involved small genomic changes, rather than a genetic revolution and was gradual, not punctuational. The critical adaptationist program is indispensable in understanding the evolution of *S. ehrenbergi*. Natural selection, overshadowing stochastic processes, appears to be a major *Spalax* evolutionary architect. The evolution of *S. ehrenbergi* superspecies links micro- to macroevolution, corroborating the synthetic theory of Darwinian evolution. Future genomic studies of *Spalax* could resolve many open evolutionary problems and contribute substantially to revolutionize medicine.

FROM BAHIA TO MALDONADO: A TALE OF THINGS TO COME

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The first encounter of Charles Darwin with South America, after leaving Plymouth aboard the *Beagle* on December 27, 1831, making a geological stop at Cape Verde Islands (St. Jago, January 16-February 8, 1832) and a brief stop at St. Paul Rocks and Fernando de Noronha, was Baía de Todos os Santos (February 28, 1832) on the North side of which the present day city of Salvador (then Bahia), is placed. He was first enthralled by the vision of the beautiful old town and, the next Day by his first contact with a Brazilian forest: «...delight is...a weak term for such transports of pleasure.» The first days he collected geological specimens, beetles and other animals but a swollen knee confined him for two weeks to the *Beagle* observing marine life. Bahia was the background of a violent quarrel between Charles, who abominated slavery, and Fitz Roy that praised the practice. Rio de Janeiro, where the *Beagle* arrived at April 3, involved Darwin's longest and most productive stay in Brazilian territory, both in practical and intellectual senses. He hired a house in Botafogo and promptly organized a long horseback expedition to visit and collect in the present-day localities of Niteroi, Maricá, Saquarema, Araruama, São Pedro da Aldeia, Cabo Frio, Casimiro de Abreu, Macaé, Conceição de Macabu and Itaboraí. On July, 5 the *Beagle* left Brazil for (Montevideo and Buenos Aires (Charles would return next year to collect at Maldonado in present Day Uruguay. Leaving Brazil and the few months spent there were the prelude to Darwin's monumental challenge: to change biology and society for ever. I review what Darwin saw, collect and thought during those first months of his epoch-making voyage and take a look at the places He visited, as they are today.

DARWIN'S WANDERINGS IN ARGENTINA

Paul Handford

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This contribution illustrates and supports the view that the birthplace of Darwin's evolutionary worldview is to be found in continental South America, specifically in Argentina. The narrative follows the formative stages of Darwin's geographical and intellectual wanderings.

DARWIN AND TIERRA DEL FUEGO: MORE IMPORTANT THAN THE GALAPAGOS?

Michael Ruse

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Two stops on the *Beagle* voyage stand out as more important than any other. First, the stop at Tierra del Fuego, where Darwin encountered the natives and decided that the difference between animals and humans is just not that great. Second, the stop at the Galapagos archipelago, where Darwin encountered the tortoises and birds (finches and mocking birds) and was set on the route to evolution. Which was the more important? If we were talking about Darwin's older friend the geologist Charles Lyell or his younger friend the morphologist Thomas Henry Huxley, unhesitatingly I would say that it was the first stop in Argentina. Both Lyell and Huxley were obsessed with the question of «man's place in nature» – the latter accepting it and the former never accepting it. I never see this tension in Darwin. He was always quite easy with our animal status. So in respects, it does seem that it was the Galapagos stop that really counted. This led to the *Origin of Species*, whereas the Tierra del Fuego stop led to the lesser *Descent of Man*. But surely this is a little quick. Could Darwin have become the evolutionist that he was if he had not previously accepted our animal status? I argue that this acceptance freed Darwin from obsessions with progressive phylogenies showing our exalted status and let him get on with finding and promoting natural selection, the mechanism for which today he is deservedly celebrated. So, don't downplay the visit to the bottom of the world!

INVASIVES IN THE NEOTROPICS: COUNTRY REPORTS AND PROSPECTS FOR CONTROL

CONVENERS: **Marta Lizarralde** and **Fabián Jaksic**

INVASIVE MAMMALS IN ARGENTINA

Marta Lizarralde¹, Ricardo Ojeda², Werner Flueck³, M. Laura Guichón⁴ and Never Bonino⁵

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Introduction of wildlife have subsequently become established in ecosystems particularly vulnerable to invasive species and has become a serious problem in Argentina. Most species are from Eurasia, and recorded dates of introductions are mainly from the second and first half of the 19th and 20th centuries. Feral populations of 18 species of exotic mammals occur in Argentina. Examples of invasive mammals, their attributes and invaded habitats are synthesized. In Archipelago of Tierra del Fuego, colonization by beaver (*Castor canadensis*) has had a major ecological impact. Most fuegian watercourses are also inhabited by muskrats (*Ondatra zibethicus*). American mink (*Mustela vison*) was introduced for fur farming and established successfully from Neuquén to Tierra del Fuego while rabbits (*Oryctolagus cuniculus*) were released into several regions of Chile from where they spread and invaded the southwestern region of Argentina. European hare (*Lepus europaeus*) was introduced in the central region of the country and current distribution cover practically all of Argentina. No quantitative information exists on the effects of European hare on vegetation, except in forestry plantations. Red deer (*Cervus elaphus*), one of the most damaging and complicated invasive mammals, were brought to La Pampa and shortly after to the Andean cordillera. Wild boar (*Sus scrofa*) was introduced in La Pampa and Neuquén and current distribution includes several National parks and has been reported as having a detrimental impact on livestock, on agricultural activities. The Asiatic Red-Bellied squirrel (*Callosciurus erythraeus*) was introduced as a pet in 1970 and <5 animals originated a wild population. Squirrels cause economic damage in agricultural and urban areas, and may threaten native birds and disperse exotic vegetation. Management actions could be undertaken to eradicate isolated and small foci of invasions while control and mitigation can reduce damage in large populations. Guidelines for the best management options are needed.

INVASIVE MAMMALS IN BRAZIL: PROBLEMS ARISING FROM LIVESTOCK AND FROM THE ILLEGAL WILDLIFE TRADE

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This work presents an overview of invasive species of mammals in Brazil. We will present information from exotic introduced mammals and from native Brazilian species that have become introduced species. We used the data gathered nationwide through the TNC program supervised by the Hosus Institute and from our own surveys. Brazil has few introduced exotic mammals, most of them are domesticated species gone feral, but has a peculiar situation: the introduction of native wildlife to regions outside their historic range and the direct result of the illegal wildlife trade and the law enforcement efforts to combat it. Song birds and primates are the most common groups. When the introduced species in question is a primate the situation receives differentiated consideration, including considering the opportunity for studies of behavioral and ecological plasticity, and even as a potential for tourism. We discuss an invasive species scenario using the example of introduced common marmosets (*Callithrix* spp) in Brazil, specially in the São João river watershed. We will contrast the possible benefits and costs of these introductions in terms of biodiversity conservation, scientific research and ethical issues. The different management options and their ethical considerations will be discussed and a decision making key will be presented. We suggest that these cases of dislocated native species be treated under the framework of invasive species and the management decisions be based on the principle of what is best for biodiversity in general.

HOLES IN THE FENCE: MAMMALIAN INVADERS IN CHILE AND THE PERMEABILITY OF PRESUMED BIOGEOGRAPHICAL BARRIERS

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The extraordinary geography of Chile, surrounded by strong biogeographical barriers (Atacama Desert to the north, Andean Ranges to the east, Pacific Ocean to the west and south), challenges species dispersal, and has been deemed responsible for the country's high level of faunal endemism. This makes us expect that the resulting 'biogeographical island' should be relatively immune from attempted invasions, particularly from the arrival of naturalized terrestrial species such as non-volant mammals. However, when compared to other physiognomically similar regions (e.g. California), Chile shows a greater proportion of naturalized mammals. Further, with the exception of commensal rodents, livestock and domestic species, a common path of introduction to Chile involves (at least partially) the dispersion from Argentina, where they were previously introduced for either hunting purposes (*Lepus europaeus*, *Sus scrofa*, *Cervus elaphus*) or fur trade (*Castor canadensis*, *Ondatra zibethicus*, *Mustela vison*). In this respect, the lower Southern Andean Ranges and the open steppes in Patagonia seem particularly permeable to mammal dispersion. Similarly, species spreading from Chile out to neighboring countries also occur across both southern Patagonia (*Oryctolagus cuniculus*, *Lycalopex griseus*) and the Atacama Desert (*L. europaeus* crossing from Chile to Peru after invading from Argentina). Thus, the formerly assumed 'strong' biogeographical barriers between these countries do not seem to play a significant role in containing exotic mammalian invaders, highlighting the futility of management decisions not taken from a 'whole-region' perspective (e.g., the southern cone of South America).

DIVERSITY, COMPOSITION AND DISTRIBUTION OF THE INTRODUCED MAMMALS OF MÉXICO

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The introduction of exotic species to Mexico has been identified as a major threat to native species. Exotic species have been the main cause of extinction of vertebrates in the country. The impact of exotic mammals has been particularly severe on the flora and fauna of islands especially in the north and in arid and semiarid environments with vegetation types such as xerophilous scrub and grassland areas, which have done most of the introductions. Today, Mexico has well over 100 species of exotic vertebrates, excluding fish, established and interacting with the native biodiversity. 61 species of mammals, 29 birds, 11 reptiles and 5 amphibians have established populations in Mexico. The most severely affected ecosystems are the thorn scrubs of the north and pine-oak forest along the highlands and mountain ranges. Besides the usual commensals such as cats, dogs, rats, mice, and goats, which are present throughout the country, some species, such as the barbary sheep, axis deer, blackbuck, and fallow deer, have over 40 established populations primarily in the north of the country. Mexico is moving towards controlling populations of exotics primarily in islands, but it is crucial to have legislation in place to stop the advance and additional introduction of these and other exotic species.

EXOTIC MAMMALS IN PERÚ: WHAT DO WE KNOW ABOUT INVASIONS?

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Peru has high ecosystem heterogeneity. For instance, the coastal region has a gradient from Central America Rainforest to extreme Desert; the Andean region has both desert and pluvial basins (20 – 8000 mm), and the Amazonian region with high biodiversity. Hence, it is considered to be a mega diverse country, being the 5th country in number of mammal species (515 spp.). Nonetheless, Peru has less exotic mammal species than other countries in South America (14 spp.), most of these (10 spp.) were introduced as livestock or domestic during the Spanish colonial period (17th century). Six out of these 10 species have become naturalized, although naturalized populations are frequently used for hunting purposes by people. In addition, three Muridae species were unintentionally introduced through ports during the colonial period. In modern times, *Lepus europaeus* has spread from Bolivia and Chile to Peru unaided by humans. The National Biodiversity Strategy includes evaluating the potential impacts of exotic species to be introduced to the country and making inventories, monitoring and eradicating invasive species. There is a gap in detecting invasive species from neighboring countries that can be spread unaided by humans as in *L. europaeus* case. It is important to consider how to fill this gap with the purpose of avoiding future introductions of other species similar as those that have occurred from Argentina to Chile. Finally, we want to remark the lack of studies of the effects of naturalized mammal species in Peru, in order to identify which can be classified as invasive mammals.

CONSERVING MAMMALS IN FRAGMENTED LANDSCAPES

CONVENERS: **Daniel Brito** and **Flávia Souza Rocha**

IUCN RED LIST AND MAMMALS THREATENED BY HABITAT LOSS AND FRAGMENTATION

Jan Schipper

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Habitat loss and degradation negatively affect the conservation status of over 40% of the world's mammals. For many species, population declines are further compounded by hunting and collecting (affecting 17% of mammals), as habitat destruction and fragmentation can greatly facilitate access. The direct and indirect effects of fragmentation are difficult to measure and the impacts are both species specific and scale dependent. The IUCN Red List can directly measure fragmentation for species which are classified as threatened and which are «severely fragmented». In addition the IUCN Red List allows for species to be evaluated based on indirect effects of fragmentation using Categories A (population reduction), B (geographic range size), C (small population size and decline) and D (very small or restricted population) or E (quantitative analysis). There are a number of more direct tools one can use to evaluate threat from fragmentation; species classified as threatened in B Categories can be listed based on «severely fragmented» populations (entire species confined to only 1-10 fragments), and those in category D2 are found in less than 5 locations (often fragmented), for example. Currently 304 mammals (5%) are flagged as severely fragmented, 38 of which are Critically Endangered. Herein we present the current trends in the IUCN Red List and mammals threatened by habitat loss and fragmentation.

2009 ALLIANCE FOR ZERO EXTINCTION (AZE) UPDATE: IMPORTANCE OF THE 2008 IUCN GLOBAL MAMMAL ASSESSMENT DATA FOR PINPOINTING URGENT PRIORITIES FOR CONSERVATION ACTION

Matthew N. Foster

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The Alliance for Zero Extinction (AZE) is an alliance of over 60 biodiversity conservation organizations in 22 countries that collectively aim to avoid species extinctions by identifying and protecting the last remaining habitats of Earth's most threatened species. To date, the alliance has identified 595 sites worldwide (120 for mammals) where one or more Critically Endangered or Endangered species of mammal, bird, reptile, amphibian, or conifer (those taxa globally assessed by IUCN as of December 2005), find their last known refuge. The IUCN Red List process, including the recently updated Global Mammal Assessment, is a key dataset for identifying AZE trigger species and sites. In this presentation we illustrate how the Global Mammal Assessment information is feeding into the AZE update that is underway, and explain how experts can contribute information to improve the AZE dataset as we move toward a 2009 update.

INCLUDING SPECIES BIOLOGICAL TRAITS INTO AREA-SETTING METHODS FOR MAMMAL CONSERVATION IN THE NEOTROPICS

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Conservation planning analyses show a striking progression from endeavors targeted at single species or at individual sites, to the systematic assessment of entire taxa at large scales. These, in turn, inform wide-reaching conservation policies and financial investments. Prioritization schemes usually attribute high importance to areas with the highest species richness and endemism or where extensive habitat loss has already taken place. These approaches aim at minimizing biodiversity loss in regions where severe human disturbance to natural habitats has already occurred. However, species respond differently to threats and several factors can influence such responses. Hence, to be ecologically sound these schemes should also include species biological traits into area-setting methods. This can be achieved by mapping evolutionary, ecological, and life-history traits, which are used as constraints in prioritization analyses. This approach allows the construction of different conservation planning scenarios. For instance, one could imagine a scenario in which regions tend to aggregate species that are large-bodied, having at the same time small litter size, long interbirth period, small local population density as well as high phylogenetic diversity. Regions

harboring such species assemblages need an urgent intervention because these species are thought to be at imminent risk of extinction. Biological traits could be combined in different ways to generate other scenarios. The inclusion of biological traits into area-setting methods helps to increase the effectiveness of priority-area sets elucidating where conservation is likely to yield best returns at different spatial scales from an ecological perspective.

LAND-USE, FUNCTIONAL CONNECTIVITY AND THE CONSERVATION OF MAMMALS

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Many tropical forests, such as the Brazilian Atlantic Forest, are being target of massive deforestation. Consequently many fragments and protected areas can be found embebbbed in different types of matrix and sometimes isolated. Thus an important landscape variable is functional connectivity, and its consequences for viability of populations. Ideally, this viability must be maintained by a network of protected areas. Here we used a graph-theoretical approach to identify the connectivity among the protected areas of Brazilian Atlantic forest at Rio de Janeiro State, Brazil. This analysis takes into account the functional and structural connectivity among protected areas using data on the perceptual capacity of the New World marsupial *Micoureus paraguayanus*. It considers differences within types of matrixes surrounding the protected areas. In a previous study the minimum area of suitable habitat (MPV) needed to maintain a minimum viable population of *M. travassosi* in an isolated protected area was estimated at 3600 ha, and 62% of them were considered capable of retaining a MPV. Here our results based on functional connectivity, under a landscape perspective detected a greater net of connectivity between protected areas with 81% of them capable of maintaining the MPV of *M. paraguayanus*.

SMALL POPULATION SIZES AND MAMMAL VIABILITY

Daniel Brito

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A PVA was carried out for the marsupial *Micoureus paraguayanus* in eight small (1.5 to 15.0 ha) forest fragments in southeastern Brazil. Analysis was based on field data obtained through demographic studies carried out since 1995. Populations are small and connected by dispersing individuals, therefore forming a metapopulation. Frequency of catastrophic fires was estimated from the historical records. We used the computer package VORTEX to simulate the dynamics of the metapopulation. All populations and the metapopulation were found to be threatened within 100 years (extinction probability > 0.98). A sensitivity analysis was run varying six parameters: three demographic (sex ratio migration and mortality rates), two environmental (K, fire frequency) and one genetic (level of inbreeding depression). Genetics, K, mortality rates and sex ratio play major roles to population persistence, whereas catastrophes and migration rates had a secondary role.. *M. paraguayanus* can be used as a model species, improving the knowledge of how extinction-prone are populations of neotropical arboreal marsupials in forest fragments, and which management actions could decrease such risks. As metapopulation dynamics is thought to play an important role in the conservation of mammals, mainly due to the fragmentation process, I also evaluated the role of individual patches to the metapopulation persistence. The analysis indicates that the local populations may be divided into three groups: (1) the smallest and most isolated patches, which are the most threatened; (2) five circular shaped and relatively well connected patches and (3) the largest patch and most persistent local population. Knowledge of how specific individual patches influence metapopulation dynamics is an important tool in guiding management strategies, and it can be affected by factors like patch size and relative position. It seems that for this particular case, probability to metapopulation extinction, mean metapopulation size, heterozygosity and mean growth rate were the most informative measures to evaluate a patch's contribution to metapopulation persistence. Despite all controversies, metapopulation theory, when carefully and properly applied, is a valuable tool in conservation biology.

SMALL MAMMAL CONSERVATION IN FRAGMENTED LANDSCAPES: A CASE STUDY IN BRAZIL

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Changes in natural landscapes and habitat fragmentation are key processes that contribute to biodiversity decline and extinction. Knowing that there is close relation between species richness, composition and diversity and landscape structure, this study aimed to understand the effects of habitat fragmentation on small mammal communities. During 24 months, we studied six

forest fragments and three areas inside a State Park, on the Pontal do Paranapanema region (SP, Brazil). Marsupials were 98% of all captures, and *Didelphis albiventris* and *Micoureus paraguayanus* the most frequent. *D. albiventris* occurred in all fragments, being dominant in all communities, except in park. *M. paraguayanus* was absent in the smaller remnant. Some species were found only in the park, which is the most rich and diverse area. Smaller fragment has the lowest values for both indices. Landscape indices, simulated dispersal ability of species and multiple regression were used to investigate the relationship between landscape structure and community indices. We found strong species-area relationship, but proximity to other patches of the same type in a short distance is the factor that best explains variations on richness and diversity of small mammals on this system. The measure of isolation refers to movement between fragments and, due to their low dispersal ability, small arboreal marsupials are isolated. Our landscape is composed by small fragments separated by large open fields, easily crossed by large mammals, but effective barriers for small ones. We recommend restoration of fragment edges to increase effective areas and the decrease of the distance between patches with improvement of matrix permeability, using, for example, stepping-stones with trees in pastures, separated by short distances, to allow movements of individuals. Landscape management in a larger scale could effectively mitigate isolation effects for a wide array of species.

CONSERVATION GENETICS IN FRAGMENTED LANDSCAPES

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Habitat fragmentation is predicted to have considerable effects on the genetic and demographic viability of populations due to the combined effects of reduced population size and increased isolation. Assessing the diversity and genetic structure of fragmented populations is important to understand how these changes are occurring and for the design of effective conservation strategies. However, interpretation of the genetic variation patterns found is not a simple task, since these can be complicated by factors such as genetic drift, retention of ancestral polymorphism, selection and fluctuations in effective population size. Additionally, the consequences of habitat fragmentation on wildlife depends on the biological characteristics of the target species and the characteristics of the matrix surrounding fragments. Here we will present some results of studies that we have been conducted to evaluate the consequences of recent habitat fragmentation on diversity and genetic structure of the arboreal marsupial *Micoureus paraguayanus* and some felid species, in both micro and macro-geographical scale. Our finds indicate that recent habitat fragmentation (about 60 years) can be promoting changes in the genetic diversity and structure of the studied populations, what can compromise its viability in the long term.

CONSERVING MAMMALS IN A FRAGMENTED LANDSCAPE: THE ATLANTIC FOREST OF RIO DE JANEIRO AS A CASE STUDY

Helena Godoy Bergallo

Universidade do Estado do Rio de Janeiro, Brazil

ACOUSTIC COMMUNICATION IN BOTH TERRESTRIAL AND AQUATIC MAMMALS

CONVENERS: **Isabelle Charrier** and **Lilian Sander**

WHISTLES OF BOTTLENOSE DOLPHINS: GROUP REPERTOIRES AND GEOGRAPHIC VARIATIONS

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Many gregarious species have group-specific signaling, resulting from learning processes of its members. Such phenomena have been described for cetaceans, in whose groups the sign-specificity of individuals or populations frequently reflects the social system and the behavioral context of the studied species. The bottlenose dolphin (*Tursiops truncatus*) produces a wide repertoire of complex vocalizations, and the whistle - a narrowband, frequency-modulated sound - is one of the categories that

receive more attention due to the social context in which it occurs. The quantification of the structure and variability of the vocalizations are important aspects of studies evaluating repertoire differences between populations. Usually, the biggest differences in the whistle variations are found in populations of non adjacent areas. Whistle structure can also vary according to the environment, where the dolphins seem to alter some parameters in order to adapt to specific environmental noise levels. Pelagic species whistles show broader frequency ranges and increased frequency modulation compared to the coastal species. The absence of interfering obstacles in open waters seems to favor the use of higher frequencies and broader frequency ranges, given that such characteristics allow a better use of the binaural clues. This work will describe the geographic variability of bottlenose dolphin whistle repertoires in the Southwestern Atlantic Ocean. The acoustic data was collected from 2000 to 2009 from two distant populations: a coastal group inhabiting the Tramandaí Lagoon (29°58'S 50°07'W), Southern Brazil, and an oceanic group occurring in the surrounding waters of the Saint Peter, Saint Paul Archipelag, Northern Brazil (0°56'N 29°22'W). Different causal explanations for the geographic variations, like the higher values for the top frequency in whistles of the oceanic group, will be discussed considering ecologic, genetic, and social factors. Future comparisons with other groups can test the hypothesis presented and improve the current discussion about the theme.

ECOLOGICAL INFLUENCES SHAPING MOTHER- PUP RECOGNITION IN AUSTRALIAN SEALIONS

Ben Pitcher

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Parent-offspring recognition is important in species where offspring survival and development is dependent on parental care, and there is potential for confusion between related and unrelated individuals. Australian sea lions (*Neophoca cinerea*) are colonial breeders, giving birth to one pup and suckling it for 18 months. Mothers remain on shore for up to 14 days with the newborn pup before alternating periods at sea foraging with periods in the colony, reuniting with their pup every time they return. Analysis of both mother and pup vocalizations has revealed individual vocal signatures. Here we experimentally examine the development of the vocal recognition abilities of both mothers and pups and the role olfactory signaling in reunions using wild Australian sea lions. In contrast to other otariid species where pups can recognize their mother's voice before the end of the perinatal attendance period, Australian sea lion pups appear to take longer to learn their mother's voice and cannot recognize their mother before she leaves the colony to resume foraging. Mothers however begin to show recognition abilities within 24 hours of giving birth and can identify their pup by four days of age. It is possible that other sensory modalities, particularly olfactory, play a role in individual recognition. Observations suggest that the majority of natural reunions utilize olfactory cues and that some reunions occur without vocal cues. In a choice test when presented with the scent of their own pup and an alien pup 9/10 mothers correctly identified their own pup. We suggest that the individual recognition system of the Australian sea lion, and in particular the comparatively slow onset of pup recognition abilities, is the product of lower selective pressures (such as colony density), the rapid onset of the mother's abilities and the use of multiple sensory modalities.

MOTHER-YOUNG VOCAL RECOGNITION IN PINNIPEDS: REVIEW AND PERSPECTIVES

Isabelle Charrier

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In many mammals, mother and young have developed the ability to identify each other by voice inducing mutual fitness benefits. Such individual recognition is therefore crucial to reproductive success/offspring survival, especially for those species breeding in large groups where a mother's ability to locate its offspring is compromise, and for colonial species in which allo-nursing or fostering does not occur. Given the interest to understand the cognitive processes underlying maternal care, the mechanisms of mother-offspring vocal recognition are worthwhile to be compared between closely related species experiencing diverse social/ mating systems to see if general trends do exist. To answer this question, Pinnipeds (phocids, otariids and odobenids) are excellent models since (1) females come ashore (on land or on ice) to give birth and nurse their young, (2) individual vocal recognition between mother and young has been reported in several species, and (3) species exhibit different breeding density from solitary to highly colonial species. To assess the difference in their individual recognition systems, a particular attention was devoted to analyse the mother-young vocalisations and to identify the level of individual stereotypy in different species. However, only playback experiments on animals can confirm the occurrence of mother-young individual vocal recognition, and assess the period of establishment of such vocal identification. Up to now, there are very few studies investigating the individual vocal signature by using modified or synthetic signals. In the light of these results, some trends of communication can be found. By studying different pinnipeds species in regards to their different ecological and biological constraints, we aim to compare their individual recognition systems to those of colonial birds to assess some general rules of vocal communication in Vertebrates.

ROLE OF SONG IN THE ALTITUDINAL REPLACEMENT OF SINGING MICE (*SCOTINOMYS*)

Bret Pasch

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Understanding the role of abiotic and biotic factors in limiting species distributions is a fundamental goal in biology. On the highest mountains of Costa Rica and Panamá, the Chiriqui singing mouse (*Scotinomys xerampelinus*) abruptly replaces Alston's singing mouse (*S. teguina*). Comparative biogeographical surveys, reciprocal removal experiments, and interspecific behavioral trials demonstrate that *S. teguina* is limited by the presence of dominant heterospecifics, whereas *S. xerampelinus* is limited by abiotic factors. Response of male mice to reciprocal playbacks in the field and lab show that songs play a role in interspecific territoriality and reinforce ecological interactions. I highlight hormonal and neural underpinnings of song production and perception that mediate interspecific interactions and limit the altitudinal distributions of singing mice.

VOCAL COMMUNICATION IN SUBTERRANEAN RODENTS: WHY TUCO-TUCOS SEEM SO DIFFERENT?

Gabriel Francescoli

Seccion Etologia, Facultad de Ciencias, Montevideo, Uruguay

ECOLOGICAL PHYSIOLOGY OF SOUTHERN HEMISPHERE MAMMALS

CONVENERS: **Fritz Geiser** and **Ariovaldo Cruz-Neto**

THE PHYSIOLOGICAL BAUPLAN OF SOUTH AMERICAN AND AUSTRALIAN MARSUPIALS: ARE THEY DIFFERENT?

A. Cruz-Neto, Cooper, C.E. and Withers, P.C.

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One of the main paradigms concerning physiological adaptations in mammals is the notion that marsupials have lower values of standard physiological parameters than eutherian mammals. It has also been suggested that, compared to eutherians, marsupials are physiologically conservative, with little adaptive variation apparent in their physiology. This last statement, however, were based on comparative analysis that did not partitioning differences between South American marsupial and Australian marsupials. Given the 110-130 million years of separate evolution, one might expect differences in the physiology of the two groups and early works suggested that such difference reflects climatic and dietary adaptation. Here we used standard and phylogenetic based analysis to present a detailed comparison of physiological variables aiming to test whether South American marsupials indeed have lower values for standard physiological variables (BMR, EWL, Ta, Cwet and relative water economy) than their Australian relatives. Our analysis revealed that, as a group, there was little variability in these physiological parameters after controlling for the effects of body mass. Within the limited data available for South-American marsupials, we found that their physiological bauplan did not differ from the Australian marsupials, and seems to be sufficient to allow them to exploit a range of environmental and biological niches with only minimal adaptive change. It has been suggested that the pre-adaptation of marsupials to a low-energy niche reflects the phylogenetic history of the group and may explain the poor competitive record of marsupials with placentals. The fact that South American marsupials have persisted despite a much longer association with placental mammals, and without any difference in their physiological bauplan, suggested that it has not been necessary for them to differ physiologically from Australian marsupials to persist in the face of competition/predation from placentals. Financial support: FAPESP - Brazil, ARC - Australia

GUT SIZE FLEXIBILITY IN RODENTS: WHAT WE KNOW, AND DON'T KNOW, FOR SOUTHERN HEMISPHERE SPECIES

Daniel Naya

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Phenotypic plasticity comprises a central concept for understanding how organisms interact with their environment, and thus, is a central topic in ecology and evolution. A particular case of phenotypic plasticity is phenotypic flexibility, which refers to reversible change in organism traits due to changes in internal or external environmental conditions. Flexibility of digestive features can be understood considering the benefits of digestion, which links animal foraging to metabolizable energy and nutrient gain, and its costs, which are partly indexed by digestive tract tissue mass, which is one of the most expensive to maintain in terms of energy and protein metabolism. Studies in rodents on gut size flexibility have been developed for more than a century, mainly from two different areas of the biological sciences, physiology and ecology. However, as for several other topics related with physiological ecology, both kinds of studies largely developed along separate paths. In this talk I will bring together all information available on gut size flexibility in rodents, in order to evaluate what is known (and don't know) for Southern Hemisphere species. In addition, future directions for the study of digestive flexibility in vertebrate animals will be presented. Funded by Caseb (Chile) and CSIC (Uruguay).

HETEROTHERMY IN FREE-RANGING WOODLAND DORMICE *GRAPHIURUS MURINUS*

Nomakwezi Mzilikazi & R. Baxter

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Although the woodland dormouse *Graphiurus murinus* is a subtropical species it inhabits areas where winter temperatures often approach freezing during winter. It is small (ca. 30g), subsists largely on arthropods and these attributes are likely to present energetic constraints on the species during winter. One physiological mechanism that may potentially increase chances of survival through such energetically challenging times is the use of heterothermy (daily torpor and hibernation). In this study, we investigated the use of heterothermy in free ranging *G. murinus* captured in the Great Fish River Reserve, situated in the Eastern Cape, South Africa. The animals were implanted with pre-calibrated miniature dataloggers (iBBat, Alpha Mach Inc.) during the winter of 2008, for a month and a half. The use of heterothermy in the field was frequent and was observed for up to 98% of all measurement days. Multiple day torpor bouts lasting up to 96 hours were observed. The minimum body temperature measured was 2.5°C at an ambient temperature of 2.6°C. The rate of rewarming was very slow (0.044°C/min) and often took up to nine hours. Body temperatures closely tracked environmental temperatures measured in a nestbox. To our knowledge this is the lowest body temperature measured in a free-ranging small mammal in South Africa and represents the first record of hibernation on mainland Africa. This study highlights the possibility that the use of hibernation in Africa may be more widespread than is currently appreciated.

SOUTHERN HEMISPHERE MARSUPIALS: PALAEOCLIMATOLOGY, ECOPHYSIOLOGY AND A TEMPLATE FOR SEMELPARITY

Adrian Bradley

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South America and Antarctica separated 34 mya when Australian climates were seasonal and drying. The appearance of open forests was followed by increasing aridity in the Miocene (20 to 10 mya) and the appearance of grasslands. The appearance of this new habitat coincides with the radiation of the Macropodinae and the appearance of specialised reproductive and digestive systems. However associated with the persistence of wetter forest environments, which some have related to predictability of food resources, semelparous life history patterns appear to have been retained in some Australian and South American species. Accompanying semelparity of males, reproductive stimulation is initiated by photoperiod accompanied later by activation of the stress response. In reproductive males (*Antechinus stuartii*, *swainsonii*, *flavipes*, *subtropicus* and *Phascogale calura*) HPA activation occurs together with an elevation of plasma cortisol, androgen-mediated depression in corticosteroid binding globulin concentration, and an increase in free cortisol. Cortisol damages hippocampal neurons, reducing dendritic spine density and length, changes associated with impaired, but adaptively significant and beneficial, control of glucocorticoid feedback regulation. The resulting elevation in plasma free cortisol and androgen concentrations suppress the immune system enabling latent infection by pathogens and parasites to become overt. Damage to gastrointestinal and renal tissues may also occur. A proximate cause of the HPA activation in *A. subtropicus* is olfactory with reproductive males releasing urinary pyrazines that are potent stressors for males causing an elevation in cortisol and catecholamines. Functional MRI studies reveal large increases in

hippocampal blood flow following exposure to DMP or urine from intact but not castrate males. Reports of partial semelparity in *Monodelphis dimidiata* and *Marmosops incanus* have recently been followed by reports of semelparity in *Marmosops paulensis* and partial semelparity in *Gracilianus microtarsus* in SE Brazil. Will physiological and pathological changes in post-reproductive males resemble those changes described for certain Australian dasyurids?

AUSTRALIAN RODENTS AND CLIMATE INDUCED CHANGES IN THE ECO-PHYSIOLOGY OF A 'NEW ENDEMIC', THE BUSH RAT (*RATTUS FUSCIPES*)

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Cold environments demand increased heat production if endotherms are to maintain a stable body temperature (T_b) irrespective of environmental temperature (T_e). Small mammals that do not enter torpor may offset the increased energetic cost of survival in cold climates by slightly decreasing T_b and increasing metabolic heat production. We aimed to determine whether climate affects the body temperature, behaviour and metabolic regulation of small mammals by studying populations of native Australian rodents (bush rat, *Rattus fuscipes*) from four climates ranging from sub-tropical to alpine. In the wild, mean T_b of cold climate rats ($35.74^\circ\text{C} \pm 0.17$) was significantly lower than the T_b of warm climate rats ($36.73^\circ\text{C} \pm 0.13$), and T_b amplitude ($T_{b\text{max}} - T_{b\text{min}}$) was significantly greater in cold climate rats (4.02 ± 0.15) compared to warm climate rats (3.08 ± 0.14). The behaviour and morphology of rats was also affected by climate. Rats in cold climates nested communally, chose more insulated nest sites and had thicker fur. Heat transfer modelling showed that the decreased body temperature combined with increased fur thickness conferred a daily reduction in the amount of food required in cold climates. At the cellular level, mitochondrial bioenergetic activity varied significantly with climate, as did tissue specific aerobic and anaerobic capacity as indicated by the activity of key regulatory enzymes. The relative expression of uncoupling protein 1 (UCP1) and the key metabolic regulator, PGC1- α , was also significantly increased in brown adipose tissue (BAT) from cold climate rats. Rather than regulating to a fixed body temperature regardless of climate, small mammals regulate to a lower body temperature in cold climates, reducing the required daily food intake. Concurrent changes in biochemistry negate the thermodynamic effects of the lower body temperature and facilitate maintained activity.

TORPOR IN SOUTHERN HEMISPHERE MAMMALS

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Torpor is characterized by substantial reductions in body temperature (T_b) and metabolic rate (MR), is the most effective measure for energy conservation available to mammals, and is widely used in diverse species. For example in Australia, which is the continent where the largest proportion of mammals has been investigated, an estimated >43% of all terrestrial mammals are heterothermic (ie. employ torpor). Daily torpor is expressed in the 'daily heterotherms', which remain torpid for several hours/day, are unable to undergo multi-day torpor bouts, and usually forage between bouts of torpor. In contrast, the 'hibernators' can express multi-day torpor bouts lasting up to several weeks. In the southern hemisphere, daily torpor is used by didelphids (small opossums), dasyurids (dunnarts, antechinus, quolls), myrmecobiids (numbat), tarsipedids (honey-possum), petaurids (sugar glider), rodents (eg. pouched mice), insectivores (shrews), primates (mouse lemurs), and small pteropodid and phyllostomid bats. During daily torpor, T_b is on average reduced to $\sim 10\text{--}25^\circ\text{C}$ and MR is $\sim 30\%$ of the basal metabolic rate (BMR). Hibernation has been observed in the monotremes (echidna), microbiotheriids (*Dromiciops*) burramyids (pygmy-possums), acrobatids (feathertail glider), dasypodids (*Pichi*), rodents (eg. dormice), perhaps macroscelids (elephant shrews), insectivores (hedgehogs, tenrecs), primates (fat-tailed lemur), and insectivorous bats. During multi-day torpor, which often but not always occurs in winter, T_b is usually reduced to a minimum of $\sim 0\text{--}10^\circ\text{C}$, and the MR can be as little as 1-5% of the BMR permitting survival on stored body fat for months. Torpor in many southern hemisphere mammals appears to be opportunistic and not only important for survival of seasonally adverse conditions, but apparently also for dealing with unpredictable events at any time of the year. As torpor substantially reduces energy requirements its use in turn reduces the need for foraging and consequently exposure to predators. Thus, torpor use has implications for the conservation of mammals.

CLIMATE AND FAUNAL CHANGES: A LONG DISTANCE COMPARISON

CONVENERS: **Maria Rita Palombo** and **Jose Luis Prado**

CLIMATIC-ENVIRONMENTAL CHANGES AND BODY MASS EVOLUTION IN SOUTH AMERICAN MAMMALS: THE ABDERITIDAE'S CASE (MARSUPIALIA: PAUCITUBERCULATA)

María Alejandra Abello and Edgardo Ortiz Jaureguizar

LASBE (Facultad de Ciencias Naturales y Museo, UNLP, Paseo del Bosque S/Nº, B1900FWO, La Plata, Argentina)

The Abderitidae are a monophyletic group of small sized marsupials, recorded in South America during Late Oligocene-Middle Miocene. They are represented by three genera (i.e., Parabderites, Abderites, and Pitheculites) and eight species, all of them showing dental specializations (e.g., plagiaulacoid molariforms) convergent with those of other mammals (e.g., burramid marsupials, plagiaulacoid multituberculates, carpolestid plesiadapiforms). The objectives of this presentation are: (1) to understand the body mass evolution in the Abderitidae; and (2) to explore its possible linking with the climatic-environmental changes recorded in South America during the middle Cenozoic. Body mass was estimated from the area of the M2 using a linear regression equation derived from living marsupials. To understand its evolution, body mass was mapped on the Abderitidae's cladogram using the Line Parsimony Method (LPM) implemented in Mac Clade (version 4.02). The results show that: a) Parabderites has species of small (*P. minusculus*, 75 g) and medium size (*P. bicrispatus*, 572 g); b) all the species of Pitheculites has small size (*P. minimus*, 32 g; *P. rothi*, 52 g; and *P. chenche*, 94 g); c) the species of Abderites occupied the range of the medium (*A. crispus*, 232 g; and *A. meridionalis*, 450g) to medium-large size (*Abderites* sp., 720 g); (d) only Abderites shows a clear pattern of body mass evolution across the time (from lower to higher body mass species). All these body mass changes occurred during a lapse characterized by a progressive decrease in temperatures, and an increase of aridity, that produced a reduction of the warm and wet forested environments, and the initiation of the expansion of the more open, drier and colder ones (e.g., savannas, grasslands) in southern South America. As colophon, we discuss the probable influence of these climatic-environmental changes on the body mass evolution of the Abderitidae.

PLEISTOCENE MEXICAN MAMMALS CONTRIBUTION TOWARDS THE UNDERSTANDING OF THE GREAT AMERICAN BIOTIC INTERCHANGE

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The Great American Biotic Interchange was a Plio-Pleistocene event so important that it changed forever the faunal physiognomy of the whole Continent. México functioned as a two-way corridor between North and South America. Largely tropical species living then in southeastern Mexico-Central America were able to disperse north or south. Understanding México's role in the interchange now is greatly facilitated with the Mexican Quaternary Mammals database that allows an assessment of the Pleistocene biodiversity and zoogeography on a national basis. During the Pleistocene, the Mexican mammalian fauna was more diverse at order and family levels than at present. Currently, the 273 recorded species of terrestrial mammals for the Mexican Pleistocene pertain to 43 families and 12 orders. The neotropical Order Notoungulata reached its northernmost limit in the Trans-Mexican Volcanic Belt. Monkeys (Atelidae), tapirs (Tapiridae), and xenarthrans, including Glyptodontidae, Megalonychidae, Megatheriidae, and Mylodontidae, reached their northern limits in northern México-southern United States. The same applies to the rodent family Hydrochoeridae. At the same time, in México and Central America, several families reach their southernmost limits, not able to pass into South America. These families include Antilocapridae, Bovidae, Elephantidae, Herpestidae, and Mammutidae. Other families, such as Ursidae, exhibit a different pattern, whereby some South American genera (such as *Arctodus*) were able to pass into the US and Canada but northern genera reached their southern limits in México. A variety of environmental conditions in México allow co-occurrence of very diverse mammals, including megaherbivores and megacarnivores that functioned as community dominant groups. Climatic and ecological factors influence the biodiversity and zoogeographic distribution of mammalian taxa in México as well as which northern and southern forms extended their range beyond today's Mexican borders.

ANALYSIS OF PALEOECOLOGICAL EVIDENCE OF MICROMAMMALS AND MICROINVERTEBRATES OF CAMPO LABORDE ARCHAEOLOGICAL SITE (BUENOS AIRES PROVINCE, ARGENTINA)

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Studies of micromammals and microinvertebrates in archaeological and paleontological sites are related with environmental variations. Despite, micromammals record it can be subject to other dynamics such as exploitation of nutritional resource by hunter gatherer groups or natural predators (small mammals carnivores or prey birds). For this reason their analysis with others indicators, such as the microinvertebrate, is crucial to analyze the environmental dynamics.

The objectives of this work are: 1) Recognize the paleoenvironmental patterns during Pleistocene - Holocene transition (~12 - 8 kys BP) on the southwest of Interserrana area; 2) Identify the micromammals species introduced by humans and those that bring information about the ecological relations; 3) Evaluate the ecological characteristics of faunal assemblages recovered from the Campo Laborde and the Tapalqué streams profiles in relation to environmental changes.

The malacological evidence indicates arid conditions during Late Pleistocene, and an increase of humidity on the beginning of Early Holocene that was reflected on marshy (paludal) habitat on Campo Laborde site. The local evidence of stratigraphy, sediments and pollen confirm these conclusions.

The micromammals record shows the predominance of arid conditions on the Late Pleistocene and Early Holocene. The species identified are caviomorph rodents (*Ctenomys* sp.) and cricetid (*Reithrodon auritus*). Also the presence of armadillos like *Zaedyus pichiy* and *Chaetophractus villosus* confirm the arid conditions.

In the transition between the Late Pleistocene - Early Holocene were recognize differences in environmental variations accord the record of micromammals and microvertebrates of southwest of Interserrana area. Some of the bones of rodents in Campo Laborde presents evidences of predation. For this reason, these environmental markers would be cautiously evaluate considering the predators and preys ecological relations. The present work presents a synthesis of paleoenvironmental and paleoecological information for the area using alternatives ways of analysis.

CLIMATIC CHANGE AND BODY-SIZE IN THE LATE CENOZOIC LARGE MAMMALS IN THE NORTHWESTERN MEDITERRANEAN

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We have analysed body-size patterns in 12 families of mammals recorded in the Northwestern Mediterranean area from the late Miocene to the Holocene. Data were obtained from selected localities in Spain, France and Italy and mammalian records were ordered in nine successive time intervals. We used body mass, estimated from dental and post-cranial measurements, to represent body-size. Four major immigration and/or faunal turnover episodes took place in the Northwestern Mediterranean area from late Miocene to Holocene: the Ruscinian turnover, the Equus-elephant event, the «Wolf» event, and the Galerian turnover. Significant body-size changes occurred in at least two of these episodes. The emerging pattern suggests that a change in the mean body-size of groups was mainly the result of migration of new species of larger size. However, variations in body-size within evolutionary lines were coincident with periods of major climatic change, suggesting that climate, too, played an important role in body-size change. The data did not provide evidence for the existence of a common pattern of size change in the 12 mammalian families studied. The pattern of body-size distribution remained constant throughout the late Turolian and Ruscinian (around 6 to 4 Ma), probably due to climate stability and the predominance of subtropical conditions. A significant change in body-size occurred during the early Villafranchian (around 3 Ma) and at the beginning of the Galerian (around 1 Ma).

NEW TOOLS AND APPROACHES TO DISCERN THE CAUSES OF FAUNAL TURNOVER

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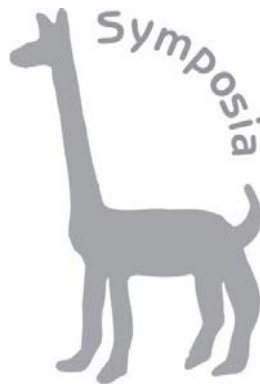
Climate change, modifications of geographic barriers and intrinsic biological factors are currently recognized as main factors promoting temporal faunal turnover. Although GIS-based analytical tools are routinely used to analyze the influence of geography and climate on the current species distributions, their use in palaeontology is still incipient. Here we show some examples of the application of GIS-based analysis to paleontological data in order to illustrate how they can improve our ability to discern the causes of faunal turnovers. First, the combined use of niche modelization techniques and paleoclimate maps allows new approaches to track past changes in the geographic distribution of species. Consequently, the appealing results of these models could help us to evaluate the influence of past climatic changes on the distribution of species, and ultimately on their extinctions. But not only climate could be included in the models, but also changes in connectivity between landmasses. Connectivity is usually considered as a binary variable (connected vs not connected), and rarely measured as a continuous variable. However, GIS techniques make possible to overcome this problem transforming palaeogeographic maps into a continuous scale. Eventually, the so obtained faunal distribution predictions could be compared with the indexes of faunal turnover based on palaeontological data. Since this approach has rendered very interesting results when applied to the late Pleistocene, it would be desirable to extend its use deeper in time. However, widening this approach to older periods could have three main drawbacks, because it requires 1) a data set of accurately dated occurrences 2) good resolution Paleoclimate maps for the periods of interest, and 3) proper estimations of land masses and sea level through time. For all these reasons, a straight cooperation between Paleoclimatologists, Palaeontologists and Geochronologists is utterly needed in order to develop this promising approach.

WAS CLIMATE CHANGE A MAJOR DRIVER OF THE EARLY TO MIDDLE PLEISTOCENE FAUNAL TURNOVER?

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It is well known that the transition from Early to Middle Pleistocene (Mid-Pleistocene Revolution from about 1.2 to 0.6 Ma) marks a fundamental change in the Earth's climate system and represents a major episode in mammalian fauna reorganisation over the course of the Plio-Pleistocene. Whether evolutionary changes and ecological turnovers developed on a backdrop of climatic change (long-term warming or cooling trends) and correlated phenomena (including sea level changes) or as an effect of intrinsic biological factors, it remains an unanswered question. To contribute to the debate, the European large mammal fossil record has been analysed with the aim of delineating the main biological events affecting the structure of faunal complexes at the Early to Middle Pleistocene transition. The response of biota to climate changes was regionally diverse, sometimes synchronous but often diachronous. Since at least 1.3 Ma BP, scattered bioevents (dispersal of large herbivores, which also persisted throughout the Middle Pleistocene and turnover phases) led to a progressive reconstruction of mammalian faunal complexes that came to an end during the beginning of the Middle Pleistocene. Although the extent and accomplishment of the Early to Middle Pleistocene «faunal revolution» greatly varied, similar patterns of faunal changes could be detected in different regions. The obtained results support the argument that, at least with regard to the North-Western Mediterranean regions, the Early to Middle Pleistocene climatic and physical changes (noticeably shift towards cooler/colder oscillations) were a determining factor especially as regards mammal dispersal, whereas diachroneity in local reconstruction of faunal complexes might also depend on internal dynamics of competition/coevolution.



Friday, August 14th

SYSTEMATICS OF NEW WORLD MARSUPIALS: RECENT PROGRESS AND FUTURE PROSPECTS

CONVENERS: Robert S. Voss and Sharon A. Jansa

PHYLOGENETIC RELATIONSHIPS OF DIDELPHID MARSUPIALS: A FRAMEWORK FOR TAXONOMIC, BIOGEOGRAPHIC, AND EVOLUTIONARY RESEARCH

Sharon A. Jansa¹, R.S. Voss², and D.A. Flores³

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New World marsupials include three major clades, two of which (caenolestids and microbiotheriids) contain just a few species restricted to wet-temperate and montane-forest habitats of South America. By contrast, didelphids (opossums) consist of at least 100 living species that occupy many terrestrial biomes from Patagonia to Canada. Recent research based on morphology and nuclear gene sequences from 44 exemplar species in 18 didelphid genera has produced an almost completely resolved opossum phylogeny with strong support at most nodes. Optimizations of habitat on geography on this topology suggest that the early radiation of didelphids was confined to South American rain forests, from which several lineages subsequently invaded nonforest and dry-forest habitats. Diversification analyses provide compelling evidence for a mid-Tertiary extinction event that was preceded and followed by intervals of approximately linear lineage accumulation. Because rainforest faunas are poorly represented in the fossil record, opossum phylogenies provide a useful window from which hitherto obscure aspects of South America's «splendid isolation» may be glimpsed. However, extending our preliminary results to test relevant hypotheses about the impact of tectonic and climatic events on the rainforest biota will require much more densely taxon-sampled trees. Obtaining a complete species-level opossum phylogeny is a daunting goal because many didelphid genera remain unrevised and because new species are still being discovered. Happily, much important revisionary work is now underway, as evidenced by other talks and posters in this symposium.

THE IMPORTANCE OF MORPHOLOGICAL CHARACTER VARIATION FOR SPECIES TAXONOMY: LESSONS FROM *MARMOSA*

Rogério V. Rossi

Universidade Federal do Mato Grosso, Brazil

Species of the didelphid marsupial subgenus *Marmosa* (sensu Voss and Jansa 2009) inhabit tropical and subtropical forests from Mexico to central Bolivia and Brazil. Nine species are currently recognized, but there are reasons to believe that additional valid species may be concealed among the synonyms of widespread polytypic forms - they exhibit a surprising degree of morphological variation, have never been supported by morphological data analyses, and as shown by molecular analyses for *Marmosa murina*, may represent species complexes. Aiming to review the taxonomy of the subgenus, I examined 2,575 specimens housed in several museums. After assigning each specimen to a sex and age category, I searched for patterns of congruent characters and measurements of external and craniodental traits that could indicate the existence of taxonomic units. I recognized 14 species, most of them with significant sexual and ontogenetic variation even after reaching dental maturity. They can be distinguished by features of the dorsal and ventral pelage, tail scales and hairs, rostral process of the premaxillae, palatine

fenestrae, orbitosphenoid extension, tympanic processes of the alisphenoid and ectotympanic, and supraorbital and temporal ridges. The latter, traditionally used for diagnosing species-level taxa within *Marmosa*, were strongly associated with specimen sex and age.

SPECIATION AND BIOGEOGRAPHY IN THE GENUS *MARMOSA*: IMPLICATIONS OF RECENT REVISIONARY WORK AND GENE SEQUENCING

Eliécer E. Gutiérrez¹, R.S. Voss², and S.A. Jansa³

¹City University of New York, USA. ²American Museum of Natural History, USA. ³ University of Minnesota, USA

Although the species-level taxonomy of most didelphid genera is still poorly known, a recent morphological revision (Rossi, 2005) has made the genus *Marmosa* an exception. To test the validity of the species recognized by Rossi, we conducted phylogenetic analyses of cytochrome-b sequences of 66 specimens representing 12 morphologically-defined species of *Marmosa* and four of *Micoureus*. We used maximum parsimony (MP), maximum likelihood (ML), and Bayesian inference (BI), assessing nodal support with bootstrap values (MP, ML) and posterior probabilities (BI). Our results convincingly support the genetic distinctness of all of the species recognized by Rossi, but they additionally suggest that two of Rossi's species, *M. mexicana* and *M. robinsoni*, might be composite. In particular, Guatemalan highland sequences of *M. mexicana* show surprisingly large genetic distances from sequences of all other trans-Andean species, suggesting the existence of an undescribed species lurking in the Guatemalan Highlands. In the case of *Marmosa robinsoni*, a haplotype from northwestern Venezuela shows relatively high genetic distances with respect to Panamanian sequences of *M. robinsoni*, suggesting the possibility that two nominal taxa (casta Thomas, 1911, and mitis Bangs, 1898), currently treated as junior synonyms of *M. robinsoni*, might be valid taxa. Our results also suggest that the trans-Andean species of *Marmosa* (sensu Rossi) might form a monophyletic group, and that cis-Andean species (including the type species of the genus, *M. murina*) might be more closely related to the genus *Micoureus* than to the trans-Andean species of *Marmosa*. Future directions of this research will include phylogenetic analyses of nuclear markers, and denser taxonomic and geographic sampling.

MOLECULAR SYSTEMATICS AND BIOGEOGRAPHY OF THE MOUSE OPOSSUMS OF THE GENUS *THYLAMYS*

Palma, R. Eduardo; Cancino, Ricardo; Flores, David., Pardiñas, Ulyses; Rodriguez-Serrano, Enrique; Boric-Bargetto, Dusan; Ramos, Sebastián; Zeballos, Horacio; Alfaro, Fernando, Jayat, Pablo
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Currently, 10 species of mouse opossums of the genus *Thylamys* are recognized in the southern cone of South America (Wilson & Reeder 2005). These species are distributed on and at both sides of the Cordillera de los Andes and they characterize for occurring in open and semi-arid environments. Previous work using molecular systematic approaches have considered some of the species currently recognized. We evaluated the phylogenetic and biogeographic relationships in 60 specimens of *Thylamys* belonging to 9 of the recognized species by sequencing mitochondrial and nuclear genes. The reconstructed phylogeny showed that *T. karimii* from the Brazilian Cerrado is the most basal form, whereas the Andean *T. pallidior* and the Pacific coastal desert *T. elegans* are the most derived forms. We recovered additional well supported clades, representing the other species currently recognized. In addition, we are validating *T. tatei* from the higlands and lowlands of the Peruvian coast, as well as some other forms from the Argentinean Chaco. Not only species are recognized within the genus, but also subspecies, as is the case of *T. elegans* in its north and south distributional range, as well as in *T. pallidior* in both, the Andes and Patagonia. We suggest that succesive founder events from east (the Brazilian Cerrado) to west (the Andes-Pacific) in southern South America would account for the evolutionary history of this genus of mouse opossums.

SYSTEMATICS AND TAXONOMY OF *MONODELPHIS* (DIDELPHIDAE) BASED ON PHYLOGENETIC ANALYSES OF MTDNA SEQUENCES, WITH AN EMPHASIS ON AMAZONIAN AND ANDEAN TAXA

Sergio Solari
Universidad de Antioquia, Colombia

As currently understood, the genus *Monodelphis* includes more than 23 species and is the most diverse genus of opossums (Didelphimorphia). No complete evaluation of the species' systematic relationships has been attempted, despite the fact that

several species groups and even genus-level groups have been proposed based on morphology, and that some of them are limited to recognized biogeographic regions. Genealogic relationships among 15 species were assessed based on phylogenetic analyses of 60 individual sequences (801 base pairs of the mitochondrial cytochrome b gene). The analyses neither confirmed nor rejected monophyly of *Monodelphis*, but included taxa were consistently discriminated into four clades: (a) «*brevicaudata*» group, (b) «*adusta*» group, (c) «*dimidiata*» group, and (d) «*theresa*» group, plus four single-species lineages: (e) *emiliae*, (f) *kunsi*, (g) *americana*, and (h) an undescribed dorsal-striped species from Peru. Genetic divergence between species within lineages ranges from 0.5 to 13%, and among lineages it goes from 15.6 to 20.2%. Further analyses in some clades show congruence of molecular patterns with morphological characters and geographic distribution, thus supporting taxonomic decisions. Although the cytochrome b gene may diverge too fast to evaluate relationships among older taxa in the genus, the use of a wide and denser taxon sampling allows for an independent test of hypotheses based on non-molecular characters. Congruent patterns offer a starting point for developing a sound taxonomy for *Monodelphis* and more robust hypotheses in regard to its diversification over many diverse Neotropical habitats.

PHYLOGENETIC RELATIONSHIPS AND BIOGEOGRAPHY OF THE GENUS *MONODELPHIS* BURNETT, 1830 (DIDELPHIMORPHIA: DIDELPHIDAE) IN THE ATLANTIC FOREST DOMAIN

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Monodelphis is the most diversified genus of New World didelphids, ranging from Panama to Argentina, throughout the Andean, Amazonian and Atlantic forests. Despite its ubiquity, it is a poorly known genus concerning species limits particularly in the Atlantic Forest. Our study aims to 1) identify and define distinct evolutionary units within the Atlantic Forest representatives of *Monodelphis* by means of molecular approaches; 2) define the morphological and geographic limits among these units; 3) relate, in morphological grounds, these units to available names; 4) propose phylogenetic hypotheses for the species based on mitochondrial and nuclear genes. Finally, 5) to correlate cladogeneses and time divergence estimates, with geoclimatic events possibly related to the differentiation of Atlantic Forest phytophysiognomies. Analyses include estimation of genetic distances, Neighbor-Joining cluster analysis and Parsimony, Likelihood and Bayesian inferences based primarily on Cytochrome b but also in nuclear genes *IRBP*, *DMP1* and *GHR*. Preliminary results based on Cytochrome b allow recognition of at least five diagnosable species from the Atlantic Forest. Phylogenetic relationships recovered by Maximum Likelihood, Parsimony and Bayesian inferences were partially congruent but some groups were weakly supported due to missing data of incomplete sequences.

SPECIATION AND SPECIES LIMITS IN SMALL MAMMALS

CONVENERS: **Patricia Mirol** and **Jeremy Searle**

SPECIATION AND SPECIES LIMITS IN SMALL MAMMALS

Jeremy Searle

University of York, York, UK

The terrestrial small mammals such as the Rodentia and Soricomorpha are highly speciose and much of that diversity can be shown to be recent. They are a wonderful group for understanding the processes that generate new species. They are relatively easily studied in nature and captivity, and have a rich diversity of traits that may be involved in species isolation. As with other groups there are debates on how to define species, but small mammals are particularly amenable to sophisticated molecular, morphological and karyotypic analysis, which can help identify likely species. In terms of understanding speciation in small mammals, there are several species or species complexes that have been valuable models and which have good future prospects. Ideal are systems where there are both closely related forms that have recently become species and forms within species (races, subspecies) that have the potential to become species. This allows both a top-down and bottom-up approach to speciation. One small mammal, the house mouse *Mus musculus*, is the classic vertebrate model organism, and therefore there are huge genomic resources to dissect speciation. Increasingly, genomes for other species of small mammal will also become available.

In such cases, the role of specific genes or groups of genes in species isolation can be examined. Speciation also needs to be considered at a more ecological and biogeographic scale, this holds the key as to why there are so many species of small mammal. In this talk I will review these various topics and also illustrate the key concepts with specific examples from my own work and that of others.

OPERATIONAL SPECIES CRITERIA AND PROBLEMS ASSOCIATED WITH SPECIES LISTS

Robert Baker and Peter Larsen
Texas Tech University, Lubbock, Texas, USA

Lists of mammalian species are commonly produced but generally without extensive comment or evaluation of the data used to recognize species. Across any species list the data justifying recognition of a species is variable. Proposed mechanisms or models of speciation i.e. allopatric, centrifugal, parapatric, peripatric, sympatric, ecological, reticulated and transgressive segregation are complicated and messy to apply. Operational data that supports specific status are desirable. Species concept employed, and operational criteria for recognition are crucial and need to be well defined especially where different criteria or concepts are required in a single list. Examples of such data are sister taxon status, sympatry, evidence of reciprocal monophyly in genomic, nuclear or mitochondrial genes, genetic distance values, conflicts between species trees and gene trees, hybridization, introgression, gene pool integrity, karyotypic uniqueness, allozyme distinctiveness, morphological distinctness (size vs. shape or unique characters or presence of unique diagnostic characters), pheromones, biogeographic distribution, phylogroups, vocalizations, pre and postmating isolating mechanisms, methods of analysis (i.e. statistical support and assumptions) niche or micro habitat utilization are some of the data that could be provided in such a database or species description. We evaluate and discuss criteria for such data. A standardized searchable list of species and associated criteria would assist in understanding biodiversity, data gaps, and selecting groups of species for model studies. We conclude that the process of speciation is so variable and complex and the data for justification of recognition of species are so messy that no solution is without substantial problems.

APPLYING GENETIC SPECIES CONCEPT ON RODENTS FROM THE BALKANS, THE NEAR EAST AND SOUTHERN AFRICA

Boris Kryštufek and Elena Bučan
University of Primorska, Koper, Slovenia

Phylogenetic analysis of mitochondrial DNA has revolutionized research on pattern of evolutionary diversification in hundreds of species, including mammals. Over the last two decades, when genetic techniques entered daily routine in mammalian systematic, number of mammal species recognized increased dramatically from 4,629 in 1993 to 5,416 in 2005, and further >2,000 species of mammals are probably unrecognized currently. Our work on molecular screening of small non-volant mammals of the Balkans, the Near East and southern Africa repeatedly resulted in unexpected genetic architecture of species and lineages. In several cases we had to judge whether deeply divergent phylogenetic groups consist of more than a single species. To our surprise we found a shallow genetic divergence between widely accepted species (e.g. *Grammomys cometes* and *G. dolichurus*), and on the other hand, unexpectedly deep genetic divergences within a species which were not detected by traditionally oriented taxonomists (e.g. *Graphiurus murinus*, *Dryomys nitedula*, *Dinaromys bogdanovi*). According to various authors, species is a separately evolving lineage, however, the cut-off in the process of divergence is a matter of disputes. As a starting point we adopted the genetic species concept as formulated by Baker and Bradley (J. Mammalogy, 87: 643-662, 2006). However, partial overlap between intraspecific and interspecific divergences suggest the need of combination of DNA sequence and other types of data (e.g., morphology, area of distribution, fossils, ecology, chromosomes). While in some cases these attempts resulted in more holistic evolutionary scenarios or at least strengthened taxonomic conclusions, several puzzles remained unresolved. Such puzzles are nearly invariably hampered with shortage of information, e.g. incomplete geographic sampling, shortage of supplementary evidence and so forth. While Baker and Bradley correctly claim that the genetic revolution should remain voucher specimen-based, data other than molecular remain largely understudied, at least in European mammalogy. As a consequence DNA sequence data are not consistently translated to taxonomy.

CHROMOSOMAL AND ECOLOGICAL PROCESSES IN THE CLADOGENESIS OF TWO SIBLING SPECIES OF *GRAOMYS* (RODENTIA, CRICETIDAE)

Noemi Gardenal, Juan J. Martínez, Gerardo R. Theiler and Raúl E. González Ittig
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The sibling species *Graomys centralis* ($2n=42$) and *Graomys griseoflavus* ($2n=34-38$) would have initiated their divergence by chromosomal rearrangements involving Robertsonian fusions from the ancestral karyotype ($2n=42$). Individuals of the complex $2n=34-38$ preferably inhabit the arid temperate Monte and Patagonic steppe eco-regions; *G. centralis* occurs in areas of xerophytic woodlands called Chaco and Espinal. Although asymmetric post-zygotic isolation of the two forms was demonstrated in laboratory tests, interspecific hybrids have not been detected in nature. Pre-zygotic isolation mechanisms involving olfactory discrimination in females were also described. In *G. centralis*, this discrimination ability is significantly higher in a population close to the area of contact with that of the other species, suggesting stronger selective pressures to promote reinforcement mechanisms. Population genetic studies using allozymic data revealed high levels of heterozygosity and allelic richness in both the ancestral and the derived species, indicating that the cladogenesis would have been a rapid and relatively recent process, with absence of severe genetic bottlenecks. In order to evaluate this proposal using a phylogeographic approach, we investigated the relationships among D-loop mitochondrial haplotypes of individuals belonging to *G. centralis* and *G. griseoflavus* from central-western Argentina. The average nucleotide divergence between the species was relatively low, with a marked overlap with the ranges of intraspecific genetic distances. The phylogenetic network showed two well-defined clusters, one for each species, connected by two haplotypes from relatively nearby localities, one belonging to the Monte eco-region and the other, to the Chaco. The mismatch distribution analyses and the lack of an isolation by distance pattern supported the idea of a recent and fast expansion of *G. griseoflavus* in the Monte. The colonization of the new environment could have favored a rapid speciation as a by-product of adaptation to divergent selective pressures.

HOMOPLOID HYBRID RADIATION: THE BEGINNING OF SPECIATION?

Mabel Giménez, Thadsin Panithanarak, Heidi C. Hauffe, and Jeremy B. Searle
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Hybrid speciation is extensive in plants and evidence is also accumulating for the process in animals. In plants hybrid speciation often involves generation of new chromosomal forms, particularly through polyploidy. New hybrid chromosomal forms may also be generated through the alternative process of homoploid hybrid speciation which does not involve a change in the genome ploidy. Here, as a first stage to hybrid speciation, we demonstrate homoploid hybrid radiation in an animal: the western European subspecies of house mouse *Mus musculus domesticus*. This subspecies shows extraordinary chromosomal subdivision, with at least 100 chromosomally distinctive races with diploid numbers varying from 22 to 40. These chromosomal races are characterised by sets of race-specific metacentrics formed by the centromeric fusion of ancestral acrocentric chromosomes and/or by whole-arm reciprocal translocation. There are many such races clustered around the Alps in Italy and Switzerland. In particular in Valtellina there are four distinctive chromosomal races characterised by different metacentric chromosomes: the Poschiavo (CHPO, $2n = 26$), Mid-Valtellina (IMVA, $2n = 24$), Upper Valtellina (IUVA, $2n = 24$) and Lower Valtellina (ILVA, $2n = 22$) races. Karyological and computer simulation studies suggest that IMVA and IUVA could be homoploid hybrid products of the other two races. Here we use centromeric microsatellite markers on race-specific metacentrics to confirm this process. This is the first unequivocal demonstration of hybrid radiation involving chromosomal races in animals. Once hybrid races are generated they have the potential to become reproductively isolated from other chromosomal races and there is evidence for this process in Valtellina.

EVOLUTIONARY RELATIONSHIPS AND CONSERVATION OF GOLDEN MOLES (AFROSORICIDA; CHRYSOCHLORIDAE) FROM SUB-SAHARAN AFRICA

Sarita Maree, Bronner Gary, Bennett Nigel, Oosthuizen Carel, Asher Robert, Hofreiter Michael & Bloomer Paulette

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Golden moles belong to the ancient Afrotherian clade of placental mammals and are one of Africa's most elusive and endangered mammalian families. The group comprises two subfamilies, nine genera and 21 species of which 11 species are considered threatened (IUCN 2008), but the delineation of certain taxa based on morphology and cytogenetics remain obtuse. Since a sound taxonomy forms an essential baseline for conservation planning, a comprehensive molecular phylogeny was constructed

based on a suite of five mitochondrial and nuclear genes. Combined analyses of all the sequence data allowed the formulation of a sound phylogenetic hypothesis for golden moles. The inferred evolutionary relationships questioned some taxonomic subdivisions in current use and revealed that distinct evolutionary lineages are clearly contained within at least two of the 9 genera and three of 21 recognized species, a finding that has profound implications for conservation planning. Molecular data were also analyzed in combination with 17 discrete morphological characters, some of which revealed opposing evolutionary trends. Due to the novelty of this mammalian family and the insights that the group can offer into the radiation of an old but range restricted clade across the African continent, molecular dating was implemented (Bayesian approach) for the consideration of the radiation of the genera and species within a temporal and associated biogeographic framework. Thus, here, for the first time, a molecular phylogenetic hypothesis for golden moles are presented and interpreted in light of biogeographical factors that may have shaped their evolutionary history.

MITOCHONDRIAL DNA DIFFERENTIATION WITHIN THE EASTERN KALAHARI BUSHVELD LINEAGE OF *MICAELAMYS NAMAQUENSIS* (RODENTIA: MURIDAE)

Russo, Isa-Rita M., Chimimba, Christian T. and Bloomer, Paulette

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Here we demonstrate that the understanding of population dynamics critically depends on exploring species history at different temporal and spatial scales. The Namaqua rock mouse *Micaelamys namaquensis* Smith, 1834, is widely distributed in southern Africa and although catholic in its habitat requirements, prefers rocky outcrops or boulder-strewn hillsides. Phylogenetic analyses uncovered 14 divergent lineages in what is currently recognised as a single species. Preliminary analyses further show contrasting phylogeographic structuring within the independent lineages suggestive of different underlying microevolutionary processes. For example, although several lineages are present in the western, semi-arid parts of southern Africa (the Nama-Karoo, Succulent Karoo and Namib Desert biomes), variation in each appears to be fairly homogeneous even over large geographical distances. We conducted a more detailed phylogeographic analysis among 10 localities of the Eastern Kalahari Bushveld lineage based on mitochondrial cytochrome *b* sequences. A genetic pattern of phylogenetic continuity with a lack of spatial separation was observed. Despite the restricted number of samples (for some localities), the mismatch distribution analysis suggests that the lineage has expanded its population size, and the geographical expansion may have followed environmental changes associated with habitat modification in the recent past. Dispersal is greatly influenced by landscape heterogeneity, resource distribution and population densities and in turn determines the genetic structure of populations. A value above one migrant per generation is considered to be sufficient to overcome genetic divergence among populations caused by drift. Therefore, the estimates of female gene flow resulting from the present study suggest some level of connectivity among localities (some localities might act as sinks and others as sources). The description of the genetic structure within this lineage is fundamental in understanding the history and evolutionary potential of the species and also with regards to its conservation.

HISTORICAL BIOGEOGRAPHY OF NEOTROPICAL MAMMALS: THE SETTING

CONVENER: **Bruce D. Patterson**

ORIGINS, EARLY RADIATIONS, AND DISTRIBUTION OF SOUTH AMERICAN MAMMALS: FROM GREENHOUSE TO ICEHOUSE WORLDS

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Two major factors preclude a better understanding of the evolution of mammals in South America: first, the still extremely scarce Mesozoic fossil record; second, the fact that most of the Mesozoic, and very much of the Cenozoic, mammalian fossils are known from a single region: Patagonia. This region, as well as part of the Andean Range, is better understood in biogeographical terms as part of the Austral Kingdom, distinct from the Neotropical Region (Holotropical Kingdom); the former can be traced back deeply into Mesozoic times. At least five successive phases in South American mammalian evolution can be envisaged, being the oldest one largely hypothetical: (1) Early Gondwanian (?late Triassic-early Cretaceous): its mammals are of Pangeic

(triconodontids with amphilestid affinities) and Gondwanian origins (australosphenids). (2) Late Gondwanian (late Cretaceous-medial Paleocene): strong endemism in most lineages of Pangeic (Dryolestida) and Gondwanian (Gondwanatheria) origins, and first records of therians. (3) Early South American (late Paleocene-latest Eocene): strong radiations within Metatheria and Eutheria. (4) Late South American (early Oligocene-late Miocene): standardization of relatively few lineages among metatherians, strong radiation of hyposodont types among South American native «ungulates». Finally (5) Interamerican (late Miocene-Recent): mixture of North and South American therian lineages, progressive decline of native faunas. Among the biotic and abiotic events that triggered these phases there are: the last global warming event at the beginning of the late Cretaceous (between phases 1 and 2); an intermittent bridge between North and South America by the late Cretaceous, favoring the First American Biotic Interchange (FABI), and the K-T extinction event (between 2 and 3); global cooling and full widening of the Circumpolar Antarctic Current, and arrival of platyrrhines and caviomorphs (between 3 and 4), and the beginning of the Great American Biotic Interchange (GABI) and full influence of the Andean uplift (between 4 and 5).

CENOZOIC ANDEAN FAUNAS: SHEDDING NEW LIGHT ON SOUTH AMERICAN MAMMAL EVOLUTION, BIOGEOGRAPHY, ENVIRONMENTS, AND TECTONICS

John J. Flynn, Charrier, Reynaldo Croft, Darin A. Wyss, Andre R.

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For almost 200 years, knowledge of South American fossil mammals was derived largely from the remarkable, but gap-riddled record from Argentine lowland, high-latitude sites. This sequence led to a picture of a few dramatic changes punctuating a generally steady series of evolutionary and environmental transitions (G.G. Simpson's «3-stratum» concept). There is growing evidence, however, of greater complexity than had been envisioned in the responses of Cenozoic mammal faunas to global and regional biogeographic, climatic, tectonic, sea level, ecological, and environmental changes. Broader availability of data from tectonically active regions like the Andes, as well as the tropics, are leading to greater understanding of both regional and continent-wide patterns of change and possible causal processes. Important Tertiary mammal faunas from the Andean highlands are now known from Chile, Bolivia, Colombia, Ecuador and elsewhere. Examples of these range in age across the early Paleocene (Tiupampa, Bolivia), Eocene to middle Miocene (a series of sites in the Abanico Formation, central Chile), early Oligocene (Salla, Bolivia; with other Miocene-Pliocene sites elsewhere in the Bolivian Altiplano), early Miocene (Pampa Castillo [Patagonia] and Chucal [Altiplano], Chile), and middle Miocene (La Venta, Colombia). In contrast to many lowland temperate sequences, some of these are precisely dated because of their Andean setting and associated volcanoclastics, and some include paleobotanical, sedimentological and stable isotope evidence complementing mammal-based environmental inferences. Here we review biogeographic, paleoenvironmental and tectonic implications of early to middle Cenozoic Andean mammal faunas, emphasizing those from Chile. For example, the ~ 31.5 Ma Tinguiririca Fauna, representing an entirely new South American Land Mammal «Age», contains the oldest known caviomorph rodents and provides the earliest global evidence of open grassland habitats. Evidence from both Tinguiririca caviomorphs and the 20.1 Ma platyrrhine primate *Chilecebus* from central Chile support African origins for these two autochthonous South American immigrant clades.

ON THE EVOLUTION OF LARGE SIZE IN MAMMALIAN HERBIVORES OF CENOZOIC FAUNAS OF SOUTH AMERICA

Sergio Vizcaino, Guillermo Cassini, Néstor Toledo and Susana Bargo

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One of the major features of the continental Cenozoic faunas of South America is the presence of native lineages of herbivorous mammals, and among them the largest representatives of each fauna. Here, we analyze the evolution of the large body size of these mammals in relation to their taxonomic richness. During the Casamayoran Age (middle Eocene), notoungulates exhibit the greatest diversity of genera with forms larger than 100 kg. During the Deseadan (late Oligocene), notoungulates, astrapotheres and pyrotheres are roughly equally represented (33% each), and only pyrotheres surpassed 500 kg. During the Santacrucian (early-middle Miocene) notoungulates dominated large-bodied forms (66%) and only astrapotheres surpassed 500 kg. During the Laventan (late Miocene), some xenarthrans (Tardigrada) equaled notoungulates and astrapotheres (all 33%), but only tardigrades and astrapotheres included members above 500 kg (50% each). During the Ensenadan and Lujanian (Pleistocene) native ungulates declined notably (ca. 10% of the overall diversity), xenarthrans (Tardigrada and Cingulata) exceeded 40% and 50% of the large-bodied forms in each age, most of them being strict megamammals (i.e. above 1000 kg). The remaining taxa are caviomorph rodents and lineages of boreal provenance (proboscideans, artiodactyls and perissodactyls). In general, but particularly for those faunas in which xenarthrans are dominant, the abundance of megamammals distantly related to living counterparts raises problems in interpreting their paleobiology. Particularly for the Pleistocene, communities dominated by megamammals of very low metabolism (xenarthrans) have no counterpart in living faunas. Hence, paleoecological reconstructions lack strict analogues and alternative approaches must be used.

EVOLUTION OF THE SOUTH AMERICAN CARNIVORES (MAMMALIA, CARNIVORA): A PALEONTOLOGICAL PERSPECTIVE

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Although the short history of placental carnivores (Order Carnivora) in South America they are a successful and diverse group. Carnivores like many other taxa entered South America from North America in the event called «Great American Biotic Interchange» (GABI). Most families, genera and species were recorded since the early Pleistocene (? 1.8 Ma), but the oldest records are represented by procyonids founded in Late Miocene levels (6-7 Ma), followed by mustelids and canids recorded from the Late Pliocene (? 2.5 Ma). We review the fossil record of South American carnivores using recent taxonomic, phylogenetic and biostratigraphic studies, in order to analyze the patterns of its origin and diversification. During the Miocene-Pliocene times carnivores' diversity was low than in the Plesitocene, most species were small sized and omnivorous, but in the Lower Pleistocene the diversity increased reaching levels somewhat lower than in the present. Size and diet disparity also augmented in the Lower Pleistocene, there were hypercarnivore, omnivore, mesocarnivore and piscivore species of different sizes (ranging between 1 to 900 kg). The lack of records or the low diversity observed at several ages (eg. Barrancalobian, Bonaerian and Platan) are mostly related to taphonomic or analytic biases. The megabias against tropical areas is a key problem in the South American record. On this sense, almost all pre-Late Pleistocene record came form the southern part of the continent. Beyond this bias, the available information suggests that recent and fossil carnivores invaded South America from Central America through several independent events, even within each family or genera in some cases, but local South American radiation events produced many of the species and several genera.

A MOLECULAR VIEW ON THE EVOLUTIONARY HISTORY AND BIOGEOGRAPHY OF NEOTROPICAL CARNIVORES (MAMMALIA, CARNIVORA)

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The mammalian order Carnivora exhibits great ecomorphological diversity and a rather rich fossil record from which one can glean interesting evolutionary and biogeographic patterns. Recent analyses based on large molecular data sets have revealed a detailed picture of the evolution of extant carnivoran lineages, starting from the phylogenetic positioning of the order relative to other eutherians, moving into the resolution of inter-familial relationships among carnivores, and on to the investigation of recent radiations of genera and species. In this talk I will focus on the current view on carnivoran diversification in the Neotropics, reviewing recent studies employing molecular data sets for phylogenetic and molecular divergence dating inferences. Most of the examples will cover inter-familial and inter-generic divergences, with a discussion of the implication of molecular-derived divergence dates for the interpretation of biogeographic patterns. In some cases the discussion will be extended to intra-generic diversification processes, contrasting clades that show recent divergences post-dating the Great American Biotic Interchange, with others that seem to have a more ancient history in the continent. Overall, the talk aims to highlight the usefulness of carnivores as a model group for investigating the diversity of biogeographic patterns and processes that characterize the history of the Neotropics.

WEST INDIAN MAMMALS: THE OLD, THE NEW, AND THE RECENTLY EXTINCT

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A synthesis explaining the patterns of diversity and distribution of West Indian mammals in a historical framework has not emerged despite the growing number of quantitative analyses on their age, origins, and phylogenetic relationships. We review recent phylogenetic, population genetic, and radio carbon dating analyses, and explore the processes underlying colonization, speciation and extinction in this area of endemism. Our study shows that the mammalian biota is older than presumed as recently as a decade ago, with many ancient, independently-evolving lineages, even among highly vagile organisms such as bats. Conversely, the deglaciation of the last 15,000 years has facilitated the colonization of multiple lineages formerly absent from insular biota. Environmental changes associated with both climate change and, more recently, anthropogenic impacts appear to be responsible for extinction and extirpation events across the region.

BIOGEOGRAPHY OF CENTRAL AMERICAN TERRESTRIAL MAMMALS: PATTERNS AND PROCESSES

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We review the biogeography and current status of terrestrial mammals inhabiting Mesoamerica, including Central America and the Mexican state of Chiapas, a region that includes 335 species of mammals, representing 135 genera, in 39 families and 14 Orders. Due to its geological complexity and corresponding biodiversity, Mesoamerica is recognized as one of the most diverse regions of the world. Also, this region is considered a mammalian hotspot for endemism and unfortunately, endangered species. Central America alone has roughly 94 endemic species and together with Mexico, the number of endemic mammal species approaches 250. Most of this biodiversity has been hypothesized to be due to overlap between the Nearctic and Neotropical biotas as a result of the formation of the Panamanian land bridge 2.7-3.0 Ma. This is evident in the reduction of species that are related to groups that originated in South America in Panama and Costa Rica compared to Mexico. Unfortunately, Mesoamerica is experiencing some of the highest deforestation rates in the world, with recent estimates that barely 20% of the original vegetation remains intact. Currently, only 12.6% of the region is afforded some level of protection, with an average of only 3% under strict protection. However, the establishment of permanent study sites in protected areas within Mesoamerica has been an important factor contributing to the understanding of these Tropical forests. For example, more than 2,300 articles have been published since Barro Colorado Island Natural Monument in Panama was established in 1940. Since the creation of the biological field station «La Selva» in Costa Rica, 1,600 scientific articles have been publishing related to research at the station. These biological stations possess high species richness for mammals. La Selva in Costa Rica, with only 1,536 ha, hosts 119 mammal species, including one endemic to Costa Rica, and with 15% of these mammals restricted to Central America. Likewise, the 1,500 ha Barro Colorado Island, has more than 102 species of mammals, and the reserve of the Montes Azules in Chiapas, Mexico, hosts mammal species, and represents the last large remnant of Rainforest ecosystem in the Country.

MIDDLE-SIZED CARNIVORES IN AGRICULTURAL LANDSCAPES

CONVENERS: **Luís Miguel Rosalino** and **Carla Gheler-Costa**

FACTORS AFFECTING SMALL CARNIVORE OCCURENCE AND ABUNDANCE IN MEDITERRANEAN AGRICULTURAL LANDSCAPES. CASE STUDIES IN SOUTHERN PORTUGAL

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Carnivores have a key role in ecosystems and their populations are declining at an increasing rate. Habitat loss and degradation through agricultural practices are among the most serious menaces affecting carnivore survival. Agricultural landscapes are dominant in Western Europe and in several places worldwide are changing quickly into more intensive practices. Therefore, it is important to understand how small carnivore occurrence and abundance is affected by these changes in order to find ways to manage agricultural and grazing systems in a sustainable way, allowing both biodiversity and production to co-exist. We present three case studies in Natura 2000 areas, mainly covered by private agricultural land (livestock, cereal crops, oak, pine and eucalyptus plantations) in southern Portugal. In areas of dominant traditional agro-silvo-pastoral systems (montado) small and middle-sized carnivores tend to occur in a mosaic of montado and shrubs. We found that the occurrence of one of the forest species was positively related with the density of trees and shrubs, soil organic matter content, and Shannon's index of vegetation vertical diversity. The presence of livestock and extension of game-estate areas also seem to influence carnivore occurrence. In areas of extensive cereal crops, the presence of shrubs and age of forest plantations play an important positive role for the carnivore community. Mainly our results suggest that maintaining a sustainable mosaic embracing montado, shrubland and open land areas, may allow higher species richness and abundance by enhancing connectivity between crucial areas. The

implementation of this kind of agricultural practices considering the landowners needs is the key issue to achieve the main carnivore conservation goals in Southern Portugal.

ECOLOGY OF EURASIAN BADGERS (*MELES MELES*) IN RURAL AREAS OF WESTERN SWITZERLAND

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Due to its evolutionary history, the Eurasian badger (*Meles meles*) is generally regarded as adapted to woodlands in which this mustelid forages, shelters and raises its offspring in burrows known as «setts». In Europe, however, the amount of forest surfaces has decreased drastically over the past centuries, essentially due to human building and farming activities. As a result, both food and sett site availabilities in human-shaped habitats might considerably differ from the ones found in the more pristine, forest environments, with potentially detrimental effects on badger numbers. However, studies conducted in pasture-dominated landscapes revealed that badgers appear to have adapted particularly well to the anthropogenic transformation of woodlands into field-forest mosaics, with even higher population densities reached in such habitats as compared to forest ecosystems. Since the 1960s, rural practices have changed substantially in several European countries, with meadows and pastures being increasingly replaced by cereal crops. In this paper, we review published and unpublished data on the ecology of badgers in four different agricultural areas of western Switzerland located at different altitudes and characterised by varying climatic conditions and intensity of land use by people. Our aim was to establish whether cereals, and particularly maize, influence badger behavioural ecology. Reviewed data on diet, habitat use and activity patterns were determined by means of scat analysis and radio-tracking, respectively. Our results indicate that, once again, badger cope very well with these new feeding conditions; maize and other cereals are indeed the dominant food items. Accordingly, during each season badgers select food rich habitats, particularly maize, wheat and rape crops. In one area, the activity level of badgers during the night was negatively, and the duration of nightly resting periods positively, correlated with the consumption of maize. The situation regarding sheltering possibilities remains, however, unchanged. Field surveys indicated that badger breeding setts are invariably located in wooded areas, suggesting that the availability of favourable sett sites constitutes a prerequisite for the conservation of badger populations living in modern European agricultural landscapes.

USING GENETIC METHODS TO TEST HABITAT-SPECIFICITY IN BADGER DISPERSAL: EVIDENCE FROM POPULATIONS IN TWO DIFFERENT AGRICULTURAL LANDSCAPES IN EUROPE

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Understanding the dispersal behaviour of a species is important for understanding its ecology and evolution as well as for devising effective management strategies. Dispersal in the Eurasian badger (*Meles meles*) is believed to be very limited, with social groups forming primarily through the retention of offspring. However, most of our knowledge of dispersal in this species comes from studies of high-density populations in the UK, where badgers are atypical in their behaviour, physiology, ecology and prey specialization. Here, we use genetic methods to compare dispersal patterns in two differing agricultural areas in British and Switzerland where the badger populations differ in their ecology and demography. We present well-supported evidence that badgers disperse much further in the low-density continental population, where dispersal may also be female-biased. Limited dispersal thus appears not be an intrinsic behavioural characteristic of the species. Rather, dispersal patterns appear to vary depending on population demography and, ultimately, habitat quality and characteristics. This could have important management consequences, since dispersal can affect the impact of local extinction and host dispersal plays a particularly important role in disease transmission. Even though concentrated studies of a species in a single location may not provide representative data for the species, there are few mammalian studies that compare demography and dispersal patterns across contrasting habitats. Our results provide an example of phenotypic plasticity and suggests that dispersal is determined by the interaction of individual, social and environmental factors that may differ between populations.

FRUITS AND MESO-CARNIVORES IN MEDITERRANEAN EUROPE

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Mediterranean environments are characterised by strong fluctuations in food resources' composition and abundance. Moreover, due to a human long-lasting landscape shaping of this region, a surplus of non-native resources is available to faunal communities. In such environments, fruits assume particular importance as food resources to wide-ranging generalist mesocarnivores and the functional link established with fruit-producing species is further enhanced by the fact that carnivores disperse the seeds of nearly 40% of the fleshy-fruited plants in the region. Furthermore, in some Mediterranean areas, the spatial structure of generalist carnivore populations appears to be influenced by the occurrence of fruit-rich patches. These relationships suggest that a more detailed analysis of the role of fruits as a food resource for Mediterranean carnivores would be an important step in conservation planning, particularly in the anthropogenic landscapes of southern European regions. In our study we describe the Mediterranean fruits consumed by mammalian meso-predators, assess the role of meso-carnivores as effective fruit dispersers in southern Europe, and evaluated the factor(s) enhancing/constraining fruits germination rate. Seventy-nine different fruits were included in the diet of mesocarnivores in Mediterranean Europe, with special relevance for fleshy fruits. The consumption was species-specific, with four carnivores showing a strong frugivorous character (red fox, stone marten, Eurasian badger and common genet), including more than 30 fruit species in their diet. Overall, a longitudinal pattern was detected in fruit consumption within the Mediterranean, which increased towards the eastern Mediterranean. Moreover, while several species had a positive effect on the seed germination rate of, at least, one species, stone marten showed deleterious effects on all seeds, and genets had a neutral effect on wine grape seeds. As expected, seed size (e.g. weight, width, etc.) is correlated with seed survival, germination time and germination rate.

DETERMINANTS OF MID-SIZED CARNIVORE PERSISTENCE AND ABUNDANCE IN AN AGRICULTURAL FRONTIER OF SOUTHERN BRAZILIAN AMAZONIA

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Carnivores are thought to be particularly vulnerable to local extinction in fragmented landscapes as they have relatively large home ranges, low population densities, and are often subjected to direct human persecution. Here, I examined the effects of landscape structure and levels of anthropogenic disturbance on the patterns of species diversity and abundance of mid-sized carnivores in an agricultural frontier in the Southern Brazilian Amazonia. Carnivores were surveyed with complementary non-invasive techniques (interviews with local landowners, line-transect census, tracks identification, camera trapping, and DNA extraction from scats) from 2001 to 2009 in 150 forest patches, 18 riparian corridors, 13 pasture areas and 17 continuous forest sites in Alta Floresta region, Mato Grosso, Brazil. A total effort of 185 interviews, 1740 km of census, 6721 camera trap/days and 108 carnivore faeces were obtained, providing data on 11 terrestrial species. Tayras (*Eira barbara*), coatis (*Nasua nasua*), and ocelots (*Leopardus pardalis*) were the most common species recorded in forested sites independent of technique. Crab-eating foxes (*Cerdocyon thous*) were recorded by camera trapping only along forest edges and in pasture. In general, patch area was the strongest predictor of species occurrence, explaining 55% of the overall variation in carnivore species richness across all forest patches. Anthropogenic disturbance including surface wildfires, timber extraction and hunting had detrimental effects on the persistence and abundance of some species. Although mid-sized carnivores were found in all habitat types, occupied patches were significantly larger than unoccupied patches for ocelots and crab-eating raccoons (*Procyon cancrivorus*). Some opportunistic species that can subsidise their diet from orchards and small livestock did not appear to be consistently sensitive to forest loss. However, current levels of anthropogenic disturbance can inflate the spatial requirements of isolated populations, so that privately owned fragments protected from extractive activities are more likely to retain a full complement of species.

**MIDDLE-SIZED CARNIVORES (MAMMALIA: CARNIVORA)
IN AGRICULTURAL LANDSCAPES OF MEDITERRANEAN EUROPE
AND SOUTHEASTERN SOUTH AMERICA: MESOPREDATORS RELEASE
OR INCREASED CARRYING CAPACITY?**

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Mesopredators have been considered to expand their population density because of the extinction of large predators such as jaguars and wolves. However, in agricultural landscapes of Mediterranean Europe and Southeastern South America mesopredators such as middle-sized canids and felids seem to have their habitats' carrying capacity increased due to an increase in their food resources. Some species of rodents may become more abundant in agricultural landscapes independently of the extinction of large predators. These rodents might serve as preys for mesopredators. These pattern results in simpler trophic chain in agricultural landscapes in relation to pristine habitats although with some conservation value. However, the return of large predators in agricultural landscapes of Mediterranean Europe and Southeastern South America might be possible if the various agricultural impacts are controlled.

**GLOBAL PATTERNS OF MAMMAL SPECIES DISTRIBUTION:
AN OVERVIEW**

CONVENERS: **Gerardo Ceballos, Pablo Ortega and Ricardo Ojeda**

**GLOBAL PATTERNS OF MAMMAL SPECIES DISTRIBUTION:
IMPLICATIONS FOR MACROECOLOGY AND CONSERVATION**

Gerardo Ceballos

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Research on population and species extinctions shows an accelerating decay of contemporary biodiversity. However, even for charismatic taxa, until recently we lacked a global view of patterns of species distributions useful for establishing conservation priorities. Recently, I compiled with my coauthors a new global database on the distribution of all mammals of the World. Here I present a global conservation analysis for an entire «flagship» taxon, land mammals. A combination of rarity, anthropogenic impacts, and political endemism put about a quarter of terrestrial mammal species, and a larger fraction of their populations, at risk of extinction. The results have been extremely interesting.

Complementarity analysis for selecting priority areas for conservation shows that some 11% of Earth's land surface should be managed for conservation to preserve at least 10% of terrestrial mammal geographic ranges. Different approaches, from protection (or establishment) of reserves to countryside biogeographic enhancement of human-dominated landscapes, will be required to approach this minimal goal.

GLOBAL DISTRIBUTION AND CONSERVATION OF MARINE MAMMALS

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We present a global conservation analysis based on the geographic ranges of all 128 marine mammal species (pinnipeds, cetaceans, sirenians, two species of otters, and the polar bear). Species at risk are found throughout the oceans, but they are concentrated at higher latitudes. We identified nine hotspots, consisting of the top 2.5% cells with highest species richness (1,155 from a total of 46,184 1°x1° grid cells of nearly 10,000 km²). Hotspots are distributed in all oceans and freshwater bodies of all continents, mostly in temperate latitudes, and they hold 74% of marine mammal species. We also identified 11 species-poor regions (coldspots) where marine mammals not found in hotspots occurred. Six of these coldspot areas are continental (rivers and lakes) and 5 are marine. The combination of hotspots and key coldspot areas allow the representation of all marine mammal species in 42 determined priority cells (ranging up to 4704 km²) to provide new criteria for their conservation.

GLOBAL PATTERNS OF CARNIVORE DISTRIBUTION: CURRENT CONSERVATION PRIORITIES

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The availability of global databases for complete vertebrate taxa in recent years has primed analysis on global conservation priorities for a whole class of even for all terrestrial vertebrates. A natural next step is to focus on higher taxonomic levels in order to generate more specific conservation actions. Carnivora represents one of the most successful vertebrate families, occupying most earth and marine ecosystems, where many species fulfill ecologically keystone roles, increasing biodiversity and maintaining ecosystem stability, while at the same time includes species considered competitors of human interest, which has resulted in persecution, and extinction of some species. Based on the IUCN global database of carnivore distribution range and conservation status, all hotspot of carnivore richness are found within the tropical belt, and include the lowlands and foothills of the Himalayas north of the Bay of Bengal, most of the Indochinese Peninsula, portions of eastern Africa, and the Angola-Namibia border region. In the Americas, the high Amazon Basin of western Bolivia and Peru, western Colombia and southern Mexico have the highest species richness. Not surprisingly, some of the areas with more carnivore species at risk coincide with the areas of greatest richness (Southeast Asia), but southwestern India and Sumatra also have a many species at risk. The area with more species with restricted distribution is the lower Cavalla River between Liberia and Ivory Coast, but about one-third of Africa maintains species with restricted distribution. Elsewhere, there are few small regions, which include carnivores with restricted distribution. Within the areas with greatest species richness, Southeast Asia and eastern Africa have the greatest human footprint, which also includes the areas with more species at risk in Southeast Asia.

MULTIPLE ECOLOGICAL PATHWAYS TO EXTINCTION IN MAMMALS

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As human population and resource demands continue to grow, biodiversity conservation has never been more critical. About one-quarter of all mammals are in danger of extinction, and over half of all mammal populations are in decline. A major priority for conservation science is to understand the ecological traits that predict extinction risk, and the interactions among those predictors that make certain species more vulnerable than others. Here, using a new database of nearly 4,500 mammal species, we use decision tree models to quantify the multiple interacting factors associated with extinction risk. We show that the correlates of extinction risk vary widely across mammals, and that there are unique pathways to extinction for species with different lifestyles and combinations of traits. We find that risk is relative, and that all kinds of mammals, across all body sizes, can be at risk depending on their specific ecologies. Our results increase understanding of extinction processes, generate simple rules of thumb that identify species at greatest risk, and highlight the potential of decision tree analyses to inform conservation efforts.

WHICH CHARACTERISTICS MAKE INDICATOR GROUPS BETTER SURROGATES?: A SPOTLIGHT ON LAND MAMMALS

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In the last years significantly advances have been made to elaborate global databases of distributions. This has had a great impact on macroecology and conservation. Some of their advantages are related to the possibility of testing general hypothesis and evaluate its regional variation. Here, we present the first global-scale analysis on performance of taxonomic groups as surrogate for a major taxon, all extant species of land mammals. This analysis relevance lies on that the selection of better surrogates must be as simple as possible. In this sense the surrogate defined on taxonomy base has a greater advantage. We evaluated if the surrogate (taxonomic group: mammal order) performance depends on the species richness and number rare species and if it varies regionally. We analyzed the behaviour of different orders comparing the mammal diversity proportion present in the areas selected based on each order. To analyse the effects of species richness on surrogate performance, the species composition of each order was modified, while to evaluate the effects of rare species number the proportion of this species was changed in each order. The performance of each order was evaluated at global and regional scale (e.g. biogeographic

regions). The use of orders as surrogate is limited by order global distribution. Some of them can only be used in tropical regions (e.g. Primates) or in certain continents (e.g. Didelphimorphia), while others can be widely used (e.g. Rodentia). The performance of different mammal orders varied. The species richness and rarity level explain this variation. Thus, diverse taxonomic groups with high rarity level act as the best surrogate.

HIGH ANDEAN MAMMALS, RESEARCH STATUS AND CONSERVATION ACTIONS

CONVENERS: **Agustín Iriarte** and **Lilian Villalba**

MOLECULAR ECOLOGY OF VICUGNA (*VICUGNA VICUGNA*) IN THE HIGH ANDES OF CHILE

Marín, JC and B. González, Sarno, Ronald J., Johnson, Warren E., Bruford, Michael W., Wheeler, Jane C., Weinstock, Jaco

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Vicugna is the sister genera with Lama that currently inhabits South America. This group evolved from the extinct Hemiauchenia that arrived from North America about 3 mya. Recently, the molecular ecology of vicuñas has been investigated in order to answer questions regarding evolution, taxonomy, diversity, and conservation. Therefore, our objective is to summarize the primary results based on mitochondrial and nuclear genetic (microsatellites) markers. Molecular evidence suggests that vicuñas lived as far south as the Patagonia at the end of the Pleistocene. Phylogenetically, current Vicugna vicugna populations are classified into two subspecies, *V. v. mensalis* and *V. v. vicugna*, which are found from 9° 30' to 29° S. Investigations into phylogeography and population genetics describe the northern subspecies with lower genetic diversity than the lesser abundant southern subspecies. As a result of genetic connectivity at the population level, distinct Management Units have been proposed for northern Chile and Bolivia. This pattern of population genetic structure may be a combination of reproductive ecology and the absence of long-range dispersal. The Family Group, one of the primary social units of vicuñas, is composed of one territorial male, various adult females and their offspring, however Family Group stability and juvenile dispersal has not been assessed to date. It is likely that molecular tools can play an important role in combination with other techniques to elucidate relationships among individuals within and between groups. From a conservation and management perspective, genetic evidence of group disruption has been detected during herding of vicuñas for wool production in Chile, but long-term population-level consequences remain unknown. Thanks to MACS, MEL, FONDECYT.

ECOLOGY AND CONSERVATION OF THE ANDEAN CAT (*LEOPARDUS JACOBITA*) AND PAMPAS CAT (*L. COLOCOLO*) IN NORTHERN CHILE

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The study was centered in the high Andes of the Tarapacá and Antofagasta regions in northern Chile above 3,000 m. The purpose of this study is to use molecular genetics analyses combined with ecological and physiographic variables to describe how the Andean mountain cat and the Pampas cat (*L. colocolo*) coexist in the high Andean ecosystem. We extracted DNA samples from 489 carnivore scats and 2 skulls. We analyzed and identified undigested remains in feces. Small mammal availability was studied by capture-recapture methods using Sherman traps. Finally, we set 45 camera traps in 115 sites. To assess the spatial distribution of both species and their overlap, we characterized the location where scats and photos were collected by topography and distance to nearest vegetated area, water sources, roads and villages. 108 samples were identified as pampas cat, 34 as Andean mountain cat, 59 as domestic dog (*Canis familiaris*), 19 as puma (*Puma concolor*), and 68 as culpeo fox (*Lycalopex culpaeus*). The main component of the diet of both pampas cat and Andean mountain cat was rodents (71.0 and 82.0% respectively), followed by birds (27.5 and 18.0%). Food niche overlap between the 2 cats was extensive (0.82), indicative of low prey partitioning. These results show that both felids preyed on both diurnal/crepuscular species like the

viscacha, as well as more nocturnal prey such as the leaf-eared mice. The probability of finding pampas cat decreased with altitude, while the opposite trend was observed for the Andean mountain cat. Using the formula for estimating the carrying capacity of the altiplano habitat for Andean mountain cats (0.6 kg/km²) and a conservative body mass of 5 kg, 30 individuals could theoretically inhabit the core study area.

THE ANDEAN HAIRY ARMADILLO IN BOLIVIA: CURRENT KNOWLEDGE AND CONSERVATION

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The Andean Hairy Armadillo (*Chaetophractus nationi*) is one of the most poorly known mammal species in the Neotropics. Moreover, this species has been exploited and used in large numbers for traditional purposes in Bolivia (e.g. musical instruments, traditional dances, souvenirs). These reasons, added to a specific habitat requirements, are the main causes for its inception in red lists, being considered as Vulnerable (globally, IUCN 2008) or Endangered (locally in Bolivia). The critical situation of this species has been severely increased in the last decades due to the intensification of its use and misconceptions, based mostly in the lack of knowledge of key aspects of its natural history, such as abundance, reproduction and ecology. Recently, some researchers began to conceive projects to obtain the first relevant information of the species. Here we share the initial attempts and efforts to contribute to knowledge of this species conducted by some researchers in Bolivia. We report data on basic aspects of its habitat use and roosting behaviour. Additionally, we discuss necessary short and long term actions to orient the conservation of this endangered species in Bolivia.

DISTRIBUTION AND DIET OF TWO SYMPATRIC CAT SPECIES *LEOPARDUS JACOBITA* AND *L. COLOCOLO*, IN THE BOLIVIAN HIGH ANDES

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Andean Cat Alliance, Cochabamba Bolivia

In Bolivia prior to year 2002, only 10 records were reported for the Andean cat (*Leopardus jacobita*) and 27 records for the pampas cat (*L. colocolo*). Between 2002 and 2008 the number of records increased to 54 for the Andean cat and to 77 for the pampas cat in the Andean ecosystem, based on: the remains of skins, photos, and faecal samples identified genetically. With the present information the Andean cat is distributed between 3850 and 5050 meters above sea level, in four of the six departments that have the high Andean ecosystem in Bolivia, while the pampas cat is distributed in five of the six departments considering the high Andean and Puna ecosystems in Bolivia, between 3300 and 5020 m.a.s.l., although for the latter species there are records for the eastern region of Bolivia and at a lower altitudes. For diet analysis a total of 165 faecal samples were analyzed, 40 correspond to Andean cat and 125 to pampas cat. This analysis was performed by identifying the mammalian food items based primarily on hair and dental remains. The percentage of occurrence of the items shows that the Andean cat eats predominantly *Lagidium viscaccia* 85% to 48%, and *Auliscomys sublimis* 16% to 4%; vegetal material constituted 27% to 16%, and the remaining 19% to 32% divided in other 6 items. The pampas cat presented the following food items: *L. viscaccia* 30% to 20%, *Phyllotis osilae* 30% to 4%, *Auliscomys sublimis*, birds and unidentified vegetal material 14% to 4%, the remaining 41% was distributed in others 16 items. This results shows that vizcachas (*L. viscaccia*) were the most important food item consumed by both species, and the more important for the Andean cat.

PHYLOGEOGRAPHY AND CONSERVATION OF THE RAREST FELID OF THE AMERICAS: THE ANDEAN CAT (*LEOPARDUS JACOBITA*)

Cossios, D., M. Ruiz-Garcia, M. Lucherini and B. Angers

Université de Montréal

The Andean cat is considered as one of the rarest felids of the world. In order to maintain the genetic integrity of the species, conservation units were assessed from genetic variability, population structure and evolutionary history. Due to the extreme scarcity of this species, most of the DNA samples were obtained from faeces collected during habitat surveys. Results confirmed that Andean cat populations harbour extremely low mitochondrial and nuclear genetic diversity. Comparison with pampas cat indicates historical bottleneck and low effective population size as responsible of the low diversity of Andean cat. The geographic repartition of the genetic diversity is very strong, but contrast with the one of other Andean species. Discrepancies may be explained by populations isolated in high-altitude islands, as well as the use of high-altitude corridors unavailable to other

species. The particular structure lead the recognition of two evolutionarily significant units (ESUs), with a latitudinal separation between 26°S and 35°S. In addition, two genetically distinct groups within the northern ESU could be considered separated management units (MUs).

HISTORICAL BIOGEOGRAPHY OF NEOTROPICAL MAMMALS: THE PATTERNS

CONVENER: **Leonora P. Costa**

BIOGEOGRAPHY OF MAMMALS FROM THE GUIANAS OF SOUTH AMERICA

Burton K. Lim

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The Guianas of northern South America consists of French Guiana, Suriname, Guyana, and southeastern Venezuela, including the states of Delta Amacuro, Bolivar, and Amazonas. This region is geographically bounded on the south by the mountains that separate the northward coastal drainage from the Amazon basin, and it covers almost 1 million square kilometres. There are 282 species of mammals currently documented from the Guianas. Over half of the species (148) are bats with rodents accounting for about 20 percent and other orders each representing less than 10 percent of the mammalian biodiversity. Approximately one-third (104) of the species are found in all 6 political units (countries or states of Venezuela) and are considered widely distributed in the region. There are 31 species that are endemic to the Guianas, of which most (18) are rodents with the other orders being represented by 6 species of bats, 5 species of marsupials, and 2 species of primates. Six of the endemic species occur only in highland areas over 500 m in elevation, 15 species occur only in lowland areas, and 10 species are found in both areas. Of the 15 lowland endemics, 7 species are restricted to the western portion and 2 species are restricted to the eastern portion. The Pakaraima highlands of Venezuela and Guyana are the most prominent biogeographic feature in the Guianas that has influenced diversification of mammals in this region.

THE ATLANTIC FOREST, A HOTSPOT BIOME DIVIDED IN TWO

Leonora P. Costa and Yuri Leite

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The Atlantic Forest is regarded as one of the 32 biodiversity hotspots in the world, a condition that reflects its high levels of plant and animal richness, endemism and threat status. Traditional biogeographical studies, based mainly upon plants and some vertebrate groups, such as lizards, have long pointed out the singularities of this area, as well as provided indications of a marked distinction between north and south components in the Atlantic Forest. This evidence, somehow neglected for a while, has gathered more attention recently, due to results coming from historical biogeographical works using molecular markers. Here we provide information from our own work and from the literature, in order to better situate the limits and understand this biogeographic neotropical break. Phylogeographic studies have documented and reinforced the general pattern of southern and northern components for many taxonomic groups, including mammals. Evidence comes from a variety of mammal lineages, such as rodents, marsupials, carnivores and xenarthrans. A recurrent phylogeographic break is located in the southeastern area of Brazil, more specifically in the region encompassing southern Bahia and northern Espírito Santo, both included in an area established as the Central Corridor of the Atlantic Forest for conservation purposes. Funding: Fundação de Apoio à Ciência e Tecnologia do Espírito Santo (FAPES), Fundo de Apoio à Ciência e Tecnologia do Município de Vitória (FACITEC), Critical Ecosystem Partnership Fund (CEPF).

AMAZONIAN ZOOGEOGRAPHY AND THE ROLE OF BLACK WATER RIVERS IN MAMMALIAN DIVERSITY: THE CASE OF RIO NEGRO, AMAZONAS STATE, BRAZIL

Cibele Bonvicino

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Although rivers have been considered to play an important role as geographic barriers and several molecular studies provided support to this hypothesis, other studies have questioned their role as major drivers of Amazonian diversification. The Amazonian basin is characterized by three mainly rivers types: (1) white rivers with clay sediments, with unstable course due to meanders, (2) clear waters rivers, with few clay sediments; and (3) black rivers with organic material. It has been postulated that black rivers generally constitute efficient geographic barriers, contrary to white rivers whose meanders prevent them to establishing stable barriers. Studies of non-volant mammals carried out in several localities at both margins of Rio Negro, a black water river, provided additional evidence to this question. This river is an apparent barrier to some genera restricted to one margin, like *Chiropotes* (Primates), *Zygodontomys* (Rodentia), and *Bassaricyon* (Carnivora), as well as to genera with one species in each margin, like *Alouatta* and *Cebus* (Primates) and *Makalata* (Rodentia). This river also constitutes a barrier to species distributed at both river margins, but with geographically structured populations, like *Pecari tajacu* (Artiodactyla), *Callicebus lugens* (Primates), and *Potos flavus* (Carnivora). However, for same taxa, the Rio Negro does not apparently represent a barrier, because geographically unstructured populations occur in both margins. This is the likely case of the primate *Cebus* (*Sapajous*) *apella*, the arboreal rodents *Isothrix negrensis* and *Mesomys hispidus*, and the artiodactyl *Tayassu pecari*. This scenario shows that the Rio Negro plays different roles as a geographic barrier, although the efficiency of black rivers as geographic barriers to non-volant mammals was confirmed.

THE ROLE OF CERRADO AND CAATINGA ON MAMMALIAN DIVERSIFICATION

Alfredo Langguth

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CRADLES, MUSEUMS, AND DIVERSITY PUMPS: THE BIOGEOGRAPHY OF ANDEAN MAMMALS

Bruce Patterson and Sergio Solari

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The Andes are the world's largest mountain chain and simultaneously present dispersal corridors to montane species and formidable barriers for lowland forms. Steep environmental and climatic gradients along Andean slopes cause most distributions to be far longer (N-S) than they are wide (E-W). The historical development of the Andes has indelibly marked the divergence of many tropical lowland taxa with basal splits into trans-Andean and cis-Andean components. In addition to defining the margins of lowland centers of endemism along its length, the Andes house three distinctive biotas—the Eastern Versant, the Altiplano, and the Western Slope—populated by taxa of various ages. Speciation appears to have been recent and rapid on the Eastern Versant and in the Altiplano, while the Western Slope has a relictual character, at least for bats. In some cases, Andean radiations are rooted in the tropical lowlands while in others, lowland radiations appear to have Andean (or proto-Andean) ancestry. Although few Andean mammals can be considered well known, recent transect studies have identified middle elevations of the Eastern Slope as critical for historical reconstructions of many mammal groups.

PATTERNS OF GENETIC DIVERSITY AND THE HISTORY OF SIGMODONTINE RODENTS IN PATAGONIA

Enrique P. Lessa, Guillermo D'Elía and Ulyses F. J. Pardiñas

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Genetic studies of continental species of mammals at high latitudes have generally revealed complex histories, including phases of geographical isolation in glacial refugia and subsequent colonization during interglacial phases. Our understanding of such process in the Patagonian-Fueguian region is based on a limited number of studies. We present results of a survey of 14 species of sigmodontine rodents, which represent an important component of the mammalian fauna of the region, on the basis

of DNA sequences of the mitochondrial cytochrome b gene and of two nuclear introns. At least 10 of these species show evidence of demographic expansion, presumably from source areas more restricted than their current distributions. However, in several cases the estimated timing of such events of demographic expansion is older than expected for populations that have expanded subsequent to the last glacial maximum. In addition, several species show marked phylogeographic structure that suggests differentiation in more than one geographical area. More generally, although several species may be relatively recent colonizers of the Patagonian region, others show evidence of a deeper history within the region that has included opportunities for in situ differentiation.

MAMMAL DISEASE ECOLOGY: INFECTION AND HOST POPULATION DYNAMICS

CONVENERS: **Pablo Beldomenico** and **Heikki Henttonen**

THE ECOLOGY OF PUUMALA HANTAVIRUS IN EUROPE

Heikki Henttonen and the EDEN Rodent Team

Finnish Forest Research Institute, Vantaa Unit, POB 18, FI-01301 Vantaa, Finland

Puumala hantavirus (PUUV) and its reservoir host *Myodes glareolus* are widely spread over most of Europe. Still, the abundance and dynamics of PUUV, as well as the human epidemiology due to this virus, differ greatly in various parts of Europe. This allows for interesting comparison of viral ecology in its reservoir in the varying European biogeographical and climatological conditions. Three main factors (at least) can be identified to account for the observed biogeographic differences. (i) Population dynamics of the host species differ greatly among various parts of Europe. The main difference is the pronounced cyclicity in the boreal zone of northern Europe, while more seasonal patterns characterize the forest rodents in the temperate zone, though mast driven rodent outbreaks affect strongly the human epidemiology in the latter. (ii) Landscape configuration (homogeneity versus fragmentation) affects the capacity of rodents and their pathogens to disperse in the environment, and thus the landscape patterns contribute to the human epidemiology. (iii) It is possible that bank voles from different parts of Europe react differently to PUUV. In addition, PUUV survival outside the host depends on temperature and moisture, thus possibly resulting in climate related geographic differences. One virus in one host, both well-known, and not too dangerous to study, but with contrasting epidemiological patterns related to biomes and biogeography allows for interesting insights in epidemiology.

HOSTS, INFECTIONS, COINFECTIONS, AND VICIOUS CIRCLES

Michael Begon, Sandra Telfer and Pablo Beldomenico

University of Liverpool, UK

The University of Liverpool Infectious diseases of wild mammals have been neglected generally, but even more thoroughly neglected has been an acknowledgement that hosts are often coinfecting by a range of pathogens and parasites. Indeed, these coinfecting pathogens may interact with one another, and the effects of these infections and coinfections may themselves depend on the underlying condition of the host. Here patterns of coinfection are examined in natural populations of field voles, *Microtus agrestis*, the mechanisms underlying these patterns are explored, and a vicious circle between host condition and infection elaborated.

PREVALENCE AND TRANSMISSION OF ZOONOTIC PATHOGENS IN NATURAL HOSTS: EXAMPLES FROM THE RODENT-BORNE HEMORRHAGIC FEVERS

James N. Mills

Centers for Disease Control and Prevention, Atlanta, Georgia, USA

Prevalence and transmission rates of rodent-borne pathogens within natural host populations vary in time and space and among host/pathogen systems. An understanding of the causes of this variation will lead to a better understanding of changes in risk for disease in both wildlife and human populations. Factors that contribute to prevalence and transmission («regulators»)

are numerous and varied, and often interact, making risk prediction difficult. These regulators fall into five major classes: (1) Environmental regulators such as weather and food supply affect transmission rates through their effect on reproductive success and population densities. (2) Anthropogenic factors such as disturbance may lead to ecosystem simplification and decreased diversity. These changes favor opportunistic species which are frequently reservoirs for zoonotic viruses. Ecosystem disturbances likely contributed to the initial emergence of several hemorrhagic fevers. (3) Genetic factors may influence the susceptibility of individual mice to infection or the capacity for chronic shedding and may be related to population cycling in some host species. (4) Behavioral factors have an important influence on the transmission of viruses. For example, aggression, especially inflicting of bite wounds, increases risk of transmission of hantaviruses and some arenaviruses among hosts and results in different patterns of infection between male and female mice. Communal nesting may result in overwinter transmission of virus among some hantavirus host species in colder climates. Finally (5) physiologic factors of individual rodents control the host response to infection and the length of time that an infected host remains infectious. These factors often interact and the relative importance of each varies according to the specific situation — host species, season, year, and geographic location. The sum of these factors defines the «ecology» of each host/virus system. The development of accurate predictive models of risk for wildlife and humans will require a thorough understanding of the ecology of each system, and may require that models be host- and place-specific.

EUROPEAN HARBOUR SEAL MASS-MORTALITIES—CAUSES AND CONSEQUENCES

Karin Harding

Göteborg University, Department of Marine Ecology, Göteborg University, Sweden

The harbour seal has a high degree of site fidelity and spend their days in the vicinity of small islands where the sun bath and rest. Since islands are distributed along the European coast in a patchy pattern the harbour seal form an elongated metapopulation. Twice has the population been hit by the Phocine Distemper Virus, with mortality rates varying between 5% and 65% among different regions. Empirical data on many basic life history parameters have been collected in the search for clues about which factors govern the PDV outbreaks. Age dependent seasonal behavior is one factor that seems to have impacted mortality rates.

RABIES OUTBREAKS AND POPULATION DYNAMICS IN ENDANGERED ETHIOPIAN WOLVES

Claudio Sillero-Subiri, Hemson, Graham; Marino, Jorgelina; Shiferaw, Fekadu; Edea, Leta; van Kesteren, Freya; Laurenson, L. Karen

Wildlife Conservation Research Unit (WildCRU), University of Oxford. Tubney House, Tubney OX13 5QL, United Kingdom

Infectious diseases pose an important extinction risk for a number of threatened carnivore populations and wild canids are particularly susceptible to generalist pathogens often transmitted from domestic dogs – the most abundant reservoir for diseases in many parts of the world. With approximately 500 individuals remaining in seven isolated Afroalpine ranges in the Ethiopian highlands, Ethiopian wolves (*Canis simensis*) are arguably the rarest canid in the world. They are ultimately threatened by habitat loss due to expanding human and livestock populations. However, canid diseases, particularly rabies, have been identified as the most potent and immediate threat to the persistence of remnant populations. Rabies outbreaks among Ethiopian wolves in 1990, 1992, 2003 and 2008 in the Bale Mountains of south-eastern Ethiopia were responsible for 50-75% mortality of known individuals in affected subpopulations. In 2003 and 2008 emergency vaccination of Ethiopian wolves successfully curtailed the spread of the disease. In addition, the Ethiopian Wolf Conservation Programme (EWCP) vaccinates domestic dogs in and around wolf habitat to reduce the risk of disease transmission to the wolves. We review the 2008 epizootic and subsequent intervention. We assess the combined value of long-term population monitoring, disease surveillance, rabies prophylaxis in domestic dogs and emergency vaccination in wolves. The high resolution data obtained by the EWCP makes this one of the best studied disease situations among carnivores, assisting the development of an integrated disease management strategy for this highly endangered canid, as well as informing disease control strategies in other threatened species.

LIVING IN A DEFAUNATED WORLD: THE ROLE OF LARGE MAMMALS IN KEY ECOLOGICAL PROCESSES

CONVENERS: **Harald Beck**

PREHISTORIC MEGAFaUNAL EXTINCTIONS AND THE COLLAPSE OF ECOSYSTEMS

Chris Johnson
James Cook University, Australia

Large herbivorous vertebrates have strong effects on vegetation. Living large herbivores are a small remnant of the assemblages of giants that existed in most terrestrial ecosystems 50,000 years ago. The extinction of so many large herbivores may well have triggered large changes in plant communities. There is evidence for such changes, but paleoecologists have usually attributed them to climate and other environmental factors. This paper reviews three major ecosystem transitions in the Quaternary paleoecological record - vegetation simplification in inland Australia 50,000 years ago, the steppe-tundra transformation in northern Eurasia, and the ecological disruption signaled by the 'black mats' at the Pleistocene/Holocene boundary in North America - and argues that these are most parsimoniously explained by direct effects of extinction of giant mammalian herbivores. I argue that these extinctions had much larger effects on vegetation dynamics than has been recognized.

DAVID AND GOLIATH: ANT SYMBIONTS BUFFER AGAINST MEGAHERBIVORE- INDUCED LANDSCAPE CHANGE IN AN AFRICAN SAVANNA

Jacob R. Goheen
University of British Columbia, Canada

Across savannas worldwide, tree cover underlies a host of ecosystem rates and properties including nutrient cycling, soil-water relations, and patterns of biodiversity. In sub-Saharan Africa, elephants and other large herbivores often suppress the growth and survival of adult trees, thereby creating landscape heterogeneity by maintaining tree-grass mixtures. In the absence of large herbivores, trees may encroach and convert savannas to closed-canopy woodlands; however, anti-herbivore defenses can reduce plant palatability, potentially offsetting herbivory as a demographic filter to tree populations. Combining long-term herbivore manipulations, cafeteria-style feeding trials with elephants, and satellite imagery of temporal changes in tree cover, we show that ant symbionts effectively protect their host plant (the whistling-thorn tree, *Acacia drepanolobium*) from top-down regulation, and in so doing buffer against tree encroachment following the simulated extinction of megaherbivores. *Acacia drepanolobium* incurred significantly more browsing from elephants following *in situ* reductions in numbers of plant-ants and, after controlling for ant occupancy, elephants did not distinguish between *A. drepanolobium* and a congener (*A. mellifera*) that does not employ ants as an anti-herbivore defense. Cover of *Acacia drepanolobium* from remotely-sensed data did not differ significantly over six years of megaherbivore exclusion, while cover in communities comprised of trees undefended by ants differed by >14% inside versus outside megaherbivore exclusions. Our findings reveal that ant symbionts deter catastrophic herbivory by elephants on host trees, thus decelerating landscape change following the extinction of megaherbivores. Further, our results highlight the fact that mutualisms may stabilize tree growth and associated rates of biomass accumulation in savanna ecosystems.

THE IMPACTS OF TROPHIC EFFECTS AND ECOLOGICAL ENGINEERING BY WHITE-LIPPED PECCARIES IN THE NEOTROPICS

Alexine Keroughlian
WCS, Brazil

White-lipped peccaries (*Tayassu pecari*) are large-bodied, abundant, and highly frugivorous mammals in Neotropical forests. They are the only tropical forest ungulates that form large herds (50-300 individuals), so their effects on forest habitats may be dramatic. Based on long-term studies of fruit dynamics and peccary frugivory, as well as fruit removal and mammalian exclusion experiments, I describe a range of interactions between *T. pecari* and their principal fruit sources in the highly-fragmented Atlantic Forest of southeastern Brazil and in the naturally-patchy forests of the Pantanal flood plain in central-western Brazil. I

compare the biomes with respect to the importance of *T. pecari*-palm interactions and fruit scarcity. Finally, I describe how trophic effects and ecological engineering by *T. pecari* in *Euterpe edulis* palm swamps of the Atlantic Forest affect soil conditions, seedling dynamics, plant community composition, *E. edulis* population dynamics and fruit availability, long-term persistence of *E. edulis* swamps, and water balance.

TROPHIC AND NON-TROPHIC -ECOSYSTEM ENGINEERING- INTERACTIONS OF PECCARIES (TAYASSUIDAE)

Harald Beck

Towson University, USA

The ghost of the past can be witnessed anywhere in the Amazon, cannonball-sized fruits are rotting on the forest floor while dagger-sized spines on palm trunks provide a window into historic mega mammal-plant interactions. Now these past evolutionary adaptations appear as wasteful luxury that nevertheless still challenges science. One might expect that contemporary extinctions of large mammals will also leave their marks, but do we understand or can predict how their vanishings will affect a single species or even whole ecosystems? Within this century, peccaries have been reduced through most of their geographic distributions and yet our understanding of their interactions with other species and the resulting ecological consequences of their extinctions are very limited. Here I will first highlight some trophic peccary-plant interactions, next outline some non-trophic interactions between peccaries and seedling communities. Then I will discuss whether peccaries function as ecosystem engineers by creating and maintaining wallows that could be critical aquatic habitat and breeding sites for numerous orders including insects, frogs, and fishes. The results might highlight how ecosystem engineering can directly affect the distribution, density, and species richness by physically modulating the environment. These non-trophic interactions are neither captured with theoretical food web approaches, nor with energy flow models. Without more research on the ecological role of large mammals and their trophic and non-trophic interactions with other species we certain will lose incredible ecological wisdom and more than «just those large mammal species».



Sunday, August 9th

**IUCN TRAINING WORKSHOPS:
USE OF THE RED LIST CATEGORIES AND CRITERIA
AND SPECIES INFORMATION SERVICE (SIS)
(PART I)**

Red List Training: **Caroline Pollock**. Sis training: **Jim Ragle**



Wednesday, August 12th

BEAVER ECOLOGY AND BEAVER MANAGEMENT: A MODEL OF RECONCILIATION ECOLOGY?

CONVENERS: **Peter E. Busher, Goran Hartman and Marta Lizarralde**

BEAVER BIOLOGY, BEAVER MANAGEMENT AND RECONCILIATION ECOLOGY –INTRODUCTION

Peter E. Busher

College of General Studies and Center for Ecology and Conservation Biology, Boston University, USA

The two extant beaver species, *Castor fiber* (Eurasian Beaver) and *C. Canadensis* (North American Beaver) evolved in and are naturally distributed across the Holarctic biogeographic region. Both species are semi-aquatic, living in all forms of natural and anthropogenic modified freshwater systems. Both species are keystone species and are often called ecosystem engineers due to the modifications made to the riparian systems (both in community structure and in biogeochemical components) they inhabit. Wetlands of all types, but especially freshwater systems also are extensively used and modified by humans, which often brings beavers and humans into direct conflict. In this introductory paper I will summarize key aspects of beaver biology and population dynamics and document the many benefits of beaver activities to wetland ecosystems and to humans. I use the model of reconciliation ecology to suggest ways to reduce beaver-human conflicts and illustrate how both species can use these critical freshwater ecosystems. Additionally, the problems associated with managing beaver populations across their natural range (Holarctic), as well as the major issue of managing populations introduced into non-native habitats will be summarized. This paper introduces key issues in beaver ecology and management and provides a focus for the workshop, which is designed to bring scientists together to discuss beaver biology and the special problems of managing species whose behavior brings them into conflict with humans.

BEAVER ECOLOGY: AN OVERVIEW WITH AN EMPHASIS ON EXISTING AND POTENTIAL BEAVER-HUMAN CONFLICTS

Göran Hartman

Swedish University of Agricultural Sciences, Sweden

CURRENT STATUS OF INVASIVE BEAVER IN ARCHIPELAGO OF TIERRA DEL FUEGO: ARGENTINE AND CHILE BI-NATIONAL PERSPECTIVES

Marta Lizarralde¹, Petra Wallem², and Adrián Schiavini³

¹Centro Regional de Estudios Genómicos, Universidad Nacional de La Plata, F. Varela, Argentina; ² Center for Advanced Studies in Ecology and Biodiversity, Pontificia Universidad Católica, Santiago, Chile; ³Consejo Nacional de Investigaciones Científicas y Técnicas, Centro Austral de Investigaciones Científicas, Houssay 200, Ushuaia, Argentina

Twenty-five pairs of North American beavers (*Castor canadensis*) were introduced in the Isla Grande de Tierra del Fuego

(Argentina) in 1946. The founder population found optimal conditions given the absence of natural enemies and abundant availability of resources, which facilitated its expansion and current invasion in the Southern Hemisphere. Beavers actual distribution includes neighboring islands of Navarino, Hoste, Dawson, and recently the Chilean mainland at Brunswick Peninsula. They have colonized approximately 98% of the watersheds on Tierra del Fuego Island, with colony densities ranging from 0.2 to 5.85 colonies/km². This species is considered a keystone and archetype ecosystem engineer, due to the way it modifies stream morphology and hydrology. For the Fueguian Archipelago this invasion constitutes one of the largest landscape-level alteration of sub-Antarctic forests since the last ice age approximately 10.000 years ago; constituting a major management problem in southern regions of Patagonia. Large extends of riparian forests are being degraded and transformed into meadows which persist long after beaver abandoned them. On this basis, Argentina and Chile convened a Bi-National Strategy with the future vision of an ecosystem free of beaver also to protect and restore environments affected by them. At present experts of both countries are developing a program for beaver eradication and restoration of southern beech forests (*Nothofagus* sp.) of Patagonia. Furthermore, given the nature of the subantarctic landscape, streams are expected to respond more quickly than riparian ecosystems to restoration efforts.

ECOSYSTEM IMPACTS AND MANAGEMENT NEEDS FOR RESTORATION OF HABITATS AFFECTED BY INVASIVE BEAVER IN KARUKINKA, CHILE

Martín Funes, Cristóbal Briceño, Claudio Moraga, Cristóbal Pizarro, Andrés Novaro & Barbara Saavedra
Wildlife Conservation Society

The impact of invasive beavers (*Castor canadensis*) is currently the greatest threat to conservation in the subantarctic forests of southern South America. The goals of the project are to inform the ecosystem recovery efforts that will need to be undertaken in Karukinka, in the island of Tierra del Fuego, and elsewhere in the region and to develop tools to monitor the success of the recovery in the long term. We are assessing the main impacts of beavers on riverine *Nothofagus* forests and aquatic systems to understand how they respond after beavers are removed and determine what interventions are needed to facilitate recovery. We are performing beaver removal at the scale of colonies and streams aiming to detect changes on riparian and aquatic systems. Simultaneously, we are monitoring the responses to beaver removal in recently invaded forests along streams and in beaver meadows inside forests, measuring the effectiveness and efficiency of the experimental removal, and developing techniques to monitor the success of removal. Beaver-colony density in the experimental area has declined from 1.21 (+0.22) colonies / km of stream in 2006 to 0.51 (+0.12) colonies / km in 2009. We present baseline data characterizing vegetation for different scenarios of beaver removal, with variables that include species richness of herbaceous and exotic plants, canopy cover, *Nothofagus* sapling density, and biomass of trees. These data provide key information needed to guide beaver eradication efforts and restore subantarctic ecosystems affected by this exotic rodent.

CURRENT CHALLENGES AND OPPORTUNITIES FOR SOUTH AMERICAN CAMELID CONSERVATION

CONVENERS: **Gabriela Lichtenstein** and **Pablo Carmanchahi**

IUCN TRAINING WORKSHOPS: USE OF THE RED LIST CATEGORIES AND CRITERIA AND SPECIES INFORMATION SERVICE (SIS) (PART II)

Red List Training: **Caroline Pollock**. Sis training: **Jim Ragle**



Thursday, August 13th

BATS CONSERVATION IN LATIN AMERICA

CONVENERS: **Luis Aguirre** and **M. Mónica Díaz**

SCIENTIFIC RESEARCH AS A BACKGROUND FOR CONSERVATION OF BATS IN ARGENTINA

Mónica Díaz and Rubén Barquez

PIDBA (Programa de Investigaciones de Biodiversidad Argentina), Facultad de Ciencias Naturales e IML, Universidad Nacional de Tucumán. Programa de Conservación de los Murciélagos de Argentina (PCMA)

The studies on bats developed in Argentina along the last 30 years, has allowed us to know reasonably well the systematic and distribution of the species, as well as the most important problems affecting their survival in natural and anthropic habitats, and the factors disturbing their natural populations by human actions. These activities and results were used as foundational criterions to impulse the creation of a national program of conservation, the PCMA (Programa de Conservación de los Murciélagos de Argentina) (Program for Conservation of the Bats of Argentina). Currently the program is distributed in most parts of the country, with provincial branches, consisting of members who work with agencies to guide and promote the implementation of legislation to protect the species. The PCMA includes researchers, students and citizens interested in preserving species and committed to donate their time and efforts voluntarily to achieve the objectives. Educational activities at all levels of public education are also being carried out. We here present the most important achievements of the program, and the potential problems for the conservation of the species. An overview of the harmful and beneficial species (non problematic) of Argentina will be presented, as well as the differences of judgments to protect them and the possibilities to implement some conservation strategies. The current situation will be tested trying to understand why a government can possibly support studies related to harmful species, but not of species that cause non-visible benefits. Finally, another aspect to discuss is the necessity to stimulate a South American integrated system for the general protection of the species, with particular interest in the migratory ones.

ADVANCEMENT IN THE KNOWLEDGE AND CONSERVATION OF BOLIVIAN BATS

Luis F. Aguirre^{1,2} & M. Isabel Galarza²

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Despite the fact that bats play critical roles in maintaining fundamental ecological process, and thus the persistence of biodiversity in places where they are present, they suffer several threats that put their persistence in peril. Among these threats, habitat destruction and public misconceptions are the worst. Negative practices are related to vampire bat and rabies control campaigns that includes the destruction of natural roosts and the elimination of beneficial bats. To face these problems, in 1998 was created the Bolivian Bat Conservation Program (PCMB), where education, public outreach and research are the main components to change people's attitude toward bats and increase the knowledge of their role in Bolivian ecosystems. Since its creation, education activities had reached more than 15,000 people through school visits, museums exhibits, and vampire workshops, among others. On the other hand, since the beginning of PCMB activities the number of known bats for Bolivia has risen from 106 in 1998, to 125 in 2009, including the rediscovery of *Lonchorhina aurita* after 74 years of first discovery in the country. The PCMB has promoted the re-categorization of conservation status of Bolivian bats and currently are recognized 7 threatened and 5 near threatened species. For this species, Action Plans are being produced and more research and education activities are being planned for the coming years.

THE PROGRAM FOR CONSERVATION OF MEXICAN BATS: SUCCESSFUL COLLABORATION FOR CHIROPTERAN CONSERVATION.

Rodrigo A. Medellín, Joaquín Arroyo, Osiris Gaona, Laura Navarro, and Jorge Ortega, Instituto de Ecología, UNAM, <medellin@miranda.ecologia.unam.mx>. Instituto Nacional de Antropología e Historia, <aromatu5@yahoo.com.mx>. Instituto de Ecología, UNAM. Programa para la Conservación de los Murciélagos Mexicanos, <laurannmx@yahoo.com.mx>. <artibeus2@aol.com>

The Program for the Conservation of Migratory Bats (PCMM for its acronym in Spanish) is a collaborative binational initiative headed by the Instituto de Ecología, National University of Mexico with the participation of over 10 additional institutions. Its primary objective is to protect bats across Mexico. Through a network of 22 states of Mexico, the PCMM protects these bats, their roosts and habitats using a three-pronged binational strategy: research, environmental education, and conservation actions. Research is focused on studying migration patterns and factors that affect them, ecosystem services, and conservation needs, with molecular genetics, stable carbon isotopes, and multidisciplinary approaches. We identify priority caves by colony size, role in the migration process, or severity of threats. In these caves, we educate local inhabitants, monitor bat population sizes, and establish conservation programs and management plans for the creation of protected areas in collaboration with Mexico's Federal Government. In fourteen years of work, the PCMM has shown stability or recovery of bat populations in more than 20 priority caves and 10 new protected areas will be created in the short term. We have also rediscovered a species of endemic bat that was supposed to be extinct, and work on three additional endemic, threatened species to prepare recovery programs sanctioned by the Federal Government. Only through national and international collaboration and data sharing with many institutions in both countries is this task possible. This program is being replicated and adapted in several other countries, and a continent-wide alliance is emerging, which promises further successes in the conservation of this group.

CURRENT CONSERVATION STATUS OF BRAZILIAN BATS AND THE SPECIAL CASE OF DEKEYSER'S NECTAR BAT (*Lonchophylla dekeyseri*)

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Bats compose an important group in Neotropical region, where they can be represented up to 50% of all mammals species found in an area. Brazil is considered the most diverse country in the world and this statement can be also true for Chiroptera Order. There are 155 bat species recorded for Brazil, but according to the 2008 IUCN red list there is only 1 species considered threatened with extinction (*Neonycteris pusilla*). This situation is very different from the situation of 1996, when 16 bat species were considered Vulnerable or Endangered. The existence of only one threatened species among the Bats is also different from the situation of all Brazilian Mammals. Considering the 2008 red list, around 12.6% of 649 mammals species are considered threatened with extinction, but the number of threatened bat species is much less than one should be expected by chance ($\chi^2=17.052$, $p<0.001$). The changes observed between 1996 and 2008 red lists are not restricted to decrease the conservation status of previously threatened species, but 96% were classified as Least Concern or Data Deficient (in contrast with 69% in 1996 for the same categories). We present here some analysis that should be conducted with all bat species in Brazil in order to re-evaluate current conservation status of bat species. As mentioned above, current conservation status of Brazilian bats is completely different from the Brazilian and even the World pattern of threatened mammals. We used the case of Dekeyser's Nectar bat (*Lonchophylla dekeyseri*) to illustrate possible analyses that could be easily conducted using only a list of point localities. Dekeyser's Nectar bat used to be considered a Vulnerable species but its status was recently changed to Near Threatened. This particular species is endemic to the Brazilian Cerrado and known by 36 localities. We used ecological niche models to extrapolate this information to estimate the total area of occurrence and based on land use maps for 2002, we calculate the amount of natural vegetation removed along its potential distribution. By crossing known point localities with a shape of micro-watershed, we also estimate the potential area of occupancy of Dekeyser's Nectar bat. Finally, we grouped point localities by using a distance matrix and a cluster analysis as a surrogate to represent different sub-populations for the species. The results indicate that Dekeyser's Nectar bat loses 51% of natural vegetation areas along its potential distribution; the species occupies only 1,488 km² along this area and there are only 7 sub-populations identified. Considering these results, *Lonchophylla dekeyseri* should be considered Vulnerable by the criteria A1a, B2bii or B2a.

PROGRAM FOR THE CONSERVATION OF BATS OF COSTA RICA (PCMCR)

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Costa Rica has a great bat diversity, with 110 species (11% of the world's total) in only 52.000 km². However, it has suffered an accelerated deforestation which has led to the loss of 60% of its forest coverage in the last 50 years. From this arises the urgent need to study and protect the bats of the country. Thus, the Program for the Conservation of Bats of Costa Rica (PCMCR) was created in 2001 with two main components: education and research. The education component consists on workshops addressed initially to children in the 4th grade, with 3 years of follow-up. A different character is dealt with each year, in representation of different types of bats: pollinators, disperser frugivores, insectivores, and vampires. The educational material used is a production of PCMM. From the second workshop year on, an evaluation is conducted to assess the children's knowledge acquisition. These activities are developed jointly with governmental and private organizations. In 2006, we reached 530 students from 15 rural and urban schools.

As a result of our research efforts, we have determined two new species records for Costa Rica. Also, we developed roost ecology and behavioural studies, and we are generating detailed maps of species distribution for the country.

We have now constituted an Association, and we are funding ourselves through donations and activities of educational ecotourism associated to private organizations such as La Tirimbina Biological Reserve. Now we are writing a new children's book with a Central American approach. The book is entitled «Albita» and it deals with roost selection conflicts, with the white bat (*E. alba*) as its main character.



Friday, August 14th

CANID CONSERVATION IN THE NEOTROPICS

CONVENERS: **Claudio Sillero, Andrés Novaro** and **Karen DeMatteo**

ECOLOGICAL VARIABILITY AND ADAPTABILITY TO ANTHROPOGENIC ALTERATIONS IN PAMPAS FOXES

Nicolas Caruso, Estela Luengos Vidal, Mauro Lucherini, Ariel Farias, Diego Birochio, and Emma Casanave
CONICET, ECM, and Universidad Nacional del Sur, Argentina

The Pampas fox, *Lycalopex gymnocercus*, is a medium-sized South American fox, widely distributed and actively persecuted by men for preying upon livestock. Until a few years ago the information about it was scarce; its taxonomic situation continues uncertain and management measures are based on poor population monitoring. Recently several studies have been carried out on Pampas foxes in Buenos Aires Province, one of the most modified regions of Argentina. Our objective is to review the state of knowledge on the species and, considering the typical ecological plasticity of canids, analyze the variations in its diet, habitat use, activity patterns and spatial organization. We reviewed data from five areas. Trophic ecology was the most analyzed topic (all sites) and fox diet showed similarities between areas with a similar degree of modification. The principal prey items were rodents, orthoptera, coleoptera and birds; carrion was important in two areas (providing a supplementary food of anthropic origin). In the four areas where habitat use was studied foxes tended to prefer natural habitats in spite of the fact that these were, in some cases, densely vegetated (ej: *Celtis tala* woodland). Foxes were most nocturnal in modified areas, and their activity patterns (analyzed only in two areas) appeared to be affected more by human disturbance than by seasonal patterns or prey activities. Home range size ($213,3 \pm 136.8$ ha) did not vary between two areas with different human impact, although some variation was observed in its use and in the size of spatial groups, which ranged from pairs to small groups. Although the information about Pampas foxes is not abundant, these results show its capacity of adjusting behaviorally and ecologically to the environmental variations introduced by men. On the other hand, the preference for natural habitats suggests that there may be a limit to its flexibility.

TRIBULATIONS OF LONG-TERM AND LARGE-SCALE MONITORING OF HUNTED CANIDS IN THE DEVELOPING WORLD

Andres Novaro, M. Funes, A. Travaini, D. Birochio, and G. Porini
WCS-CONICET, Argentina

Large scale monitoring of population trends is necessary to assess the status of species, determine effectiveness of conservation and management measures, and adapt these measures when necessary. For species that are hunted for commercial purposes, monitoring must be maintained through time, beyond periods of intense hunting, because populations can decline even after commercial hunting pressure is removed and also because monitoring provides a baseline for when intense hunting is resumed. We assess factors associated with success of long-term monitoring programs of canids and other wildlife around the world and report on a monitoring system implemented during the last 20 years for canids in Argentina, which are also hunted due to conflicts with livestock. Successful monitoring has been implemented when financial mechanisms are formally established by government agencies and leaders of these agencies can develop long-term policies that outlast their positions. Canid fur exports from Argentina during the last 30 years have ranged between 1.2 million and a few thousand a year, driven mostly by changes in the demand for fur. Canid monitoring in Argentina was funded by local governments and research institutions in the 1980s and 1990s. In 2006 a legal mechanism was established by the federal government to fund monitoring of canid densities with resources from fur exports allocated to a trust fund. This system can be maintained when fur exports are high. We discuss alternative mechanisms to implement long-term monitoring of hunted canids that can be sustained in spite of market changes.

ON THE ORIGIN OF THE CRITICALLY ENDANGERED DARWIN'S FOX (*PSEUDALOPEX FULVIPES*) BY MEANS OF GENETIC MOLECULAR TOOLS

Cristóbal Briceño, Stephan M. Funk, Arnaud Bataille, Jaime Jiménez, and Leslie A. Knapp
University of Cambridge, UK

COMPARATIVE ECOLOGY OF THE HOARY FOX AND THE CRAB-EATING FOX IN THE BRAZILIAN CERRADO

Frederico Gemesio Lemos, Fernanda Cavalcanti de Azevedo, Nucharin Songsasen, Kátia Gome Facure, Hugo Cardoso M. Costa, and Joares A. May Junior
Federal University of Goiás, Brazil

The hoary fox (*Pseudalopex vetulus*) is a small canid (2.5 – 4 kg), endemic to open landscapes of Cerrado. In contrast, the crab-eating fox (*Cerdocyon thous*) is larger (5 – 8 kg) and presents a wider distribution. We studied foraging group size, parental behavior, and food habits of these species in cattle farms in Goiás State, Center-West Brazil. Foraging group size and parental behavior were studied by direct observation of wild animals, and food habits through scat analysis, from January 2003 to November 2008. Crab-eating foxes foraged in pairs or family groups more frequently in the wet season and individually more frequently in the dry season whereas hoary foxes foraged mostly individually throughout the year. Crab-eating foxes presented a more diversified diet that included seasonally available food items such as fruit, insects (Orthoptera and Coleoptera) and vertebrates (Cricetidae and Squamata), while hoary foxes ate predominantly termites (Isoptera). Two families of crab-eating foxes and five families of hoary foxes were found along the study. Crab-eating foxes never allowed observations for long periods during parental care, but in hoary foxes, parents were observed chasing away intruders (domestic dogs and people) from the nest and males were observed bringing food (fruit and vertebrates) to the cubs. The seasonal variation in foraging group size of crab-eating foxes may be related to food resources availability and distribution and to the exploration of different food items in each season. The predominantly insectivorous diet of adult hoary foxes does not constrain providing food for the cubs, once parents bring larger food items to the nest. Presently, we aim to capture and monitorate foxes to know their home-range and juvenile dispersal period, and to describe the influence of domestic dogs on their ecology/health. Until now, six crab-eating foxes and one hoary fox were captured, but no one is being monitored.

POPULATION ECOLOGY OF THE MANED WOLF OF CENTRAL BRAZIL

Rahel Sollmann, Leandro Silveira, Anah Jácomo, Natália M. Tôres, and Mariana M. Furtado
Jaguar Conservation Fund, Brazil and Leibniz Institute for Zoo and Wildlife Research, Germany

The maned wolf inhabits the savannah-like Cerrado of Brazil. Although the large degree of conversion and degradation of Cerrado habitat poses a threat to this wide-ranging carnivore, little is known about maned wolf population ecology. Emas National Park (ENP) and its agricultural surroundings harbour a key maned wolf population for central Brazil. Here, we captured maned wolves and monitored them using radio-telemetry in ENP over a 13-year period. We used live capture data in combination with closed mark-recapture models to obtain estimates of population density. Radio-telemetry data yielded information about spatial organization of the population. Based on being located alive or dead over the years, we used open population mark-recapture models to obtain the first systematic estimate of survival rate for the species. With 5.19 individuals/100 km², ENP supported 60 to 70 adult maned wolves. While adults were organized in mating pairs with common territories of approximately 80km², members showed little intra-pair sociality, maintaining a mean distance of >0.5 km when located simultaneously. Mean survival rate of adult maned wolves was 0.64 (SE=0.05). Survival rate fluctuated over time, but it did not differ between sexes, nor was it significantly different from sub-adult survival rate of 0.63 (SE=0.15). The maned wolf population of ENP and its surroundings seems well adapted to the mosaic of natural and agricultural landscapes characteristic of the region. However, the expansion of sugarcane poses unknown threats to this open habitat species. Generally occurring at low population densities, even relatively large reserves alone do not protect long-term viable maned wolf populations. Therefore, long-term conservation of the species depends on land management outside of reserves. Information on demographic rates allows for well-informed population viability analyses to predict the maned wolf's future under different land use change scenarios.

MANED WOLF CONSERVATION STRATEGIES IN THE SERRA DA CANASTRA REGION, BRAZIL

Rogério Cunha de Paula, Flávio Henrique G. Rodrigues, Ronaldo G. Morato, Eduardo Eizirik, Nucharin Songsasen, Jean Pierre Santos, Joares A. May Junior, Fernanda C. de Azevedo, Fabiana L. Rocha, Ricardo Corassa Arrais, and Marcelo Bizerril

Instituto Pró-Carnívoros, Brazil

The data obtained from the Maned Wolf Project in the Serra da Canastra region, southeast of Brazil have been used for ongoing conservation practices. As a first step, we conducted a general evaluation in order to define the conservation actions more suitable for the region and to address the main threats to the species survival locally. Within this analysis, we aim to observe how local people perceive their environment and the wolves. Thus we identified three 'necessities' to address in order to conduct a wildlife conservation program: (1) prevention of domestic dogs diseases; (2) management of livestock depredation by maned wolves; (3) people awareness improvement towards environmental themes. We collected samples from domestic dogs, tested for the main diseases and later vaccinated 500 dogs yearly, over three years, in the rural areas. Since this number represents only a part of their population, we concentrate our efforts on areas of higher density of dogs. Concerning conflicts, we learned that the percentage of losses by depredation varied among farms as well as the landowners' tolerance to the wolves. We installed chicken coops to prove the effectiveness of preventive methods against predators, lowering on 80% the depredation rate after installing the units. To motivate people to discuss their own problems in order to raise their awareness, we provide opportunities for debating local environmental issues. Thus, we conducted a collective book production on the region and implemented the 'Cine-Lobo'. The «Community Book» consisted of a gathering of 30 locals that worked together writing about their culture, history, environment, and economy. The 'Cine-Lobo' consists in the exhibition of 15-minutes films produced by the project on the wolf, local nature and conflicts, presented at schools, farms, and villages. and followed by circuit movies and a general discussion. We presented 30 sessions gathering over 2,200 people in the region.

MATRIX MATTERS: AGRICULTURAL EXPANSION AND THE PLIGHT OF THE MANED WOLF IN BRAZIL

Carly Vynne, Jader Soares Marinho-Filho, Ricardo A.B. Machado, Leandro Silveira, and Sam Wasser
University of Washington, USA

Emas National Park (ENP), Brazil, has historically been considered a stronghold for the survival of the maned wolf *Chrysocyon brachyurus*, which is endemic to the grasslands of central South America. Land clearing and agricultural intensification outside of ENP have been rapid and expansive and the Park now stands as a virtual island in a sea of agriculture. This project seeks to assess how these land use practices are affecting this critical population of maned wolves. We employ a number of novel, noninvasive methods to examine the population status and physiological health of the wolves in ENP and the surrounding region. Specially-trained detection dogs were used to non-invasively acquire more than 800 scat samples of maned wolves across a diversity of habitat conditions. DNA analysis of the samples was used to positively identify the species, gender, and number of unique individuals in the population. Spatial analyses and resource selection functions were applied to understand ranging behavior and habitat preferences. Steroid and thyroid hormones extracted from the samples are enabling us to establish profiles of the stress, reproductive, and nutritional health of the wolves in relation to their distance from the park, habitat use, diet, and parasite load. Together, these novel methods are providing critical information on the status and physiological health of an at-risk species on a scale that has rarely been achievable for wildlife. Such information will contribute to the conservation and management of maned wolves, simultaneously providing an important model for similar applications to other free-living, threatened or endangered species.

WHAT'S NEW WITH THE RARE AND ELUSIVE BUSH DOG (*SPEOTHOS VENATICUS*)?

Karen DeMatteo

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Lacking knowledge of the basic ecological requirements of the bush dog (*Speothos venaticus*) has meant that developing conservation strategies for this small, social, neotropical canid has been impossible. While a few field studies have successfully studied the bush dog either directly or indirectly, the majority of information about the species' ecology is based on opportunistic field observations. These observations and knowledge from carnivore conservationists allowed for the first comprehensive analysis of the bush dog's current distribution, basic ecology, abundance and status, current public and governmental attitudes towards the species, and identification of species-specific conservation efforts. The complexity of the bush dog's ecology,

vulnerability to disease and poaching, and association with partially or fragmented habitat (20% of locations) suggest that widespread destruction of natural resources and lack of legal reinforcement are the greatest threats facing the bush dog. Long-term survival of the bush dog will likely depend on increased protection, public education campaigns, and additional field data. With the latter, efforts to collect detailed ecological data on the bush dog continue with researchers using both standard field techniques, such as radio collars, and innovative noninvasive techniques, such as detection dogs, genetics, and GIS analyses. The use of noninvasive techniques has tremendous potential with rare species because it eliminates the dependence of target species visitation rate and switches the focus to locating evidence, such as scat, associated with the natural behaviour and movement patterns of the species. Initial trials using noninvasive techniques have demonstrated that they can provide species-specific data on the bush dog despite the rugged terrain and dense forest vegetation they may occupy. The ability to effectively gather much needed ecological data over large areas would allow comprehensive conservation strategies to be developed for the bush dog.

THE ECOLOGY OF THE BUSH DOG: CRITICAL INFORMATION FOR SPECIES-SPECIFIC CONSERVATION STRATEGIES AND PROPOSITION OF NEW CONSERVATION AREAS IN THE MATO GROSSO STATE, BRAZIL

Edson De Souza Lima, Maria Luisa S.P. Jorge, Rodrigo Jorge, and Ronaldo Morato
Vanderbilt University, USA

The bush dog (*Speothos venaticus*) is considered threatened by Brazilian authorities and listed as Vulnerable by CITES – Appendix I. It is naturally rare and elusive and there is a lack of information from wild populations of this species. In the present study, we present data from a group of bush dogs that has been radio-tracked weekly since May 2008. It was captured at Água Boa (East Mato Grosso, Brazil) where most of the native vegetation (Cerrado) has been replaced by soy crops and cattle farms. At capture, the group was composed by ten individuals: two alpha adults (male and female), three young adults (one male and two females), and five juveniles (four males and one female). Over ten months, four individuals died (one young female, two juvenile males and one juvenile female) and three puppies were born (apparently all females). We have accumulated 136 exact locations of the group and its home range has reached astonishingly large values (MCP 100% and 95%: 617 km² and 524 km²; Fixed Kernel, 95%, 75% and 50%: 549 km², 149 km² and 38 km²). These values are larger than those estimated for the largest Neotropical carnivore, the jaguar, and also larger than values estimated for two other bush dog groups tracked previously in the vicinities. Two factors could explain the larger home range of the present group: (1) greater number of individuals; (2) greater level of habitat fragmentation of the area that they occupy. Finally, the group presents a semi-nomadic pattern of movement, staying in one location for 1-2 months and then moving to a new location. *S. venaticus* seems to be able to survive in highly fragmented areas, but needs extremely large areas for that, which may possibly make this species even rarer in the scenario of intense habitat fragmentation.

SETTING UP CONSERVATION PRIORITIES FOR THREATENED NEOTROPICAL CANIDS

Claudio Sillero
University of Oxford, UK

Contemporary canids are the most widely distributed family of the Carnivora, with members on every continent besides Antarctica. The Neotropics support 11 out of 35 extant canid species, of which nine species, and four genera (*Chrysocyon*, *Otocyon*, *Pseudalopex*, *Speothos*), are restricted to South America. Another South American endemic, the Malvinas fox (*Dusicyon australis*), was the only Canidae to go extinct in recent history. While most Neotropical canids are widely distributed, several *Pseudalopex* species in the Southern Cone are persecuted as livestock raiders, others have very restricted distributions. The Darwin's fox (*Pseudalopex fulvipes*) is endemic to coastal forests in southern Chile, the hoary fox (*P. vetulus*) is endemic to Brazil's cerrado, whereas the Sechuran fox (*P. sechurae*) is restricted to the coastal deserts of north Peru and south Ecuador. Due to its small population size and disjunct distribution the Darwin's fox is listed as Critically Endangered by the IUCN, and four species are listed as Near Threatened. The short-eared fox (*Atelocynus microtis*) and bush dog (*Speothos venaticus*) are two forest specialists of particular concern, due to the rapid fragmentation of their forest habitats and our insufficient understanding of their biology. This review will set the scene for a debate on research and conservation priorities for these threatened species in the Canid Conservation in the Neotropics Workshop.



Tuesday, August 11th

**ASSESSING EXTINCTION RISK: AND INTRODUCTION TO
THE *IUCN RED LIST OF THREATENED SPECIES***

Caroline Pollock

(Programme Officer, IUCN Red List Unit, Cambridge, United Kingdom)



Monday, August 10th

ANATOMY, MORPHOLOGY AND PHYSIOLOGY

1 BITE FORCE VARIATION IN DIDELPHID MARSUPIALS

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The Didelphidae are composed of more than 85 species that have a two-fold body size range and diets that vary from mostly frugivores to mostly carnivores. The purpose of this work was to calculate and compare the bite force for 17 genera of didelphids, representative of the taxonomic and ecologic diversity of this family. Bite forces were based on the mechanic potential (MP) of the mandible and the volume of the adductor musculature. MPs were estimated for 881 specimens from the relative proportions and orientations of the muscle and the resistance moment arms and the main orientation of the adductor musculature, and its volume was estimated from the insertion area of this muscle mass in the coronoid process. Distances and orientations were obtained from landmarks established on digital images of mandibles (on the articular condyle, the apex of the coronoid process and the base of the teeth) and skulls in lateral view (for muscle orientation estimates). Bite forces were calculated for the canine, first and fourth molars, standardized to remove size effect and compared among taxa. Three separate groups of phylogenetically or ecologically unrelated taxa were obtained: 1) the big-bodied *Caluromys*, *Caluromys* spp., *Chironectes*, *Philander*, *Lutreolina* and *Didelphis*; 2) the medium-sized *Micoureus*, *Metachirus* and *Monodelphis*; and 3) the small-bodied *Gracilinanus*, *Thylamys*, *Tlacuatzin*, *Marmosa* and *Marmosops*. Results from *Lestodelphys*, *Hyladelphys* and *Glironia* are inconclusive, possibly due to the small samples available. No relationship between diets and standardized bite force was found, as different feeding habits are found in each of these groups. Although size was removed, the groups obtained are still clearly related to size, regardless of their ecology or phylogenetic affinities. These results indicate that bite force has a great allometric component, and size appears to be the main factor determining bite force in the Didelphidae.

2 CAN LEUKOCYTE VARIATION IN GUANACOS (*LAMA GUANICOE*) REVEAL LONG-TERM STRESS AFTER HABITAT MODIFICATION BY FIRE?

Gaete, M.G.*; Venegas, X.; Gonzalez, B.A.; Ramirez A.M. & Zapata B.

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After brush fires, animal populations can react by recolonizing burned areas, migrating, or changing their demographic dynamic, but individual stress has been less studied, especially when animals return to an altered habitat. In summer of 2005 (February), a human-caused fire devastated near 12,000 ha of native shrublands and steppe in Torres del Paine National Park in southern Chile, a characteristic habitat for guanacos in the region. Opportunistic blood sampling of 8 chemically captured guanacos using medetomidine/ketamine/atipamezole combination, before the fire (January 2005), and 10 more animals after the fire (January 2006) were analyzed for serum cortisol and neutrophil:lymphocyte ratio (N:L). After the fire, serum cortisol increased 2.5-fold (35.4 ± 15 nmol/L in summer 2005, 88.22 ± 27.68 nmol/L in 2006), while N:L decreased 64% (1.68 ± 1.45 in summer 2005, 0.61 ± 0.73 in 2006), but still was positively correlated with serum cortisol ($P=0.67$, $p<0.05$). Medetomidine may be inducing an artificial rise in serum cortisol before the fire compared with other studies in guanacos, where the baseline ranged between 16-20 nmol/L. Even so, cortisol after the fire is close to the highest level reported for the species (92 nmol/L). The alteration in the N:L ratio after the fire (compared with summer 2005 and other studies) reflects lymphocytosis and/or neutropenia that have not been described in wild ungulates. Possible explanations for these results include chronic stress due to increased intra-specific competition for food or territories during reproductive season, and/or an increase in guanaco densities in burned areas, since the N:L ratio observed is not attributable to any infectious diseases and cortisol levels are not entirely related with the injected drugs and/or capture procedure. Further studies are necessary to address the issue of chronic stress by environmental disturbances in ungulates during long periods of time. Thanks to CONICYT, CONAF and SAG.

3 DIDELPHIS MARSUPIALIS (DIDELPHIDAE) IN THE SHAPE SPACE: SEXUAL DIMORPHISM AND POSTWEANING ONTOGENY.

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Size and shape changes in the ventral view of skull of north South American common opossum *Didelphis marsupialis* was accessed using geometric morphometrics analysis. Seven post weaning age classes were recognised by tooth's eruption and wear. The size and shape were compared between sexes and among ages. Although the populations on central tram of la Cordillera de la Costa (Venezuela) was reported as sexual invariant, we report here moderated differences between sexes of this opossum. On the order hand, form differences among age classes were conspicuous. Complex changes in the palatal region are associated to apparition of molars and orders adaptations to achieve definitive feeding habits.

4 RUBIDIUM-86: A NOVEL TOOL FOR THE MEASUREMENT OF FMR - A CASE STUDY IN WESTERN AUSTRALIAN DUNNARTS.

Sean Tomlinson, Philip Withers, Shane Maloney & Ariovaldo Cruz-Neto

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The doubly-labelled water method (DLW) is a widespread technique of measuring the field metabolism (FMR) in free-ranging animals. However, there are limitations to its application, where it becomes problematic in species with high water efflux relative to metabolism, and best results are gathered in very short turnover periods in small animals (usually less than 36 hours). This short interval may provide very little accurate information concerning their daily requirements free of capture and experimental procedures. The stress of required repetitive bleeding may also influence the metabolism of the subjects, and the isotopes can be prohibitively expensive to procure and analyse. Here we validate the use of rubidium-86 (⁸⁶Rb), a gamma-emitting radio-isotope, turnovers to infer metabolism in two small mammals, the marsupial dunnarts (*Sminthopsis* spp.). There was a strong correlation between VCO₂ measured by flow-through respirometry and ⁸⁶Rb biological turnovers by linear and RMA regression. When compared to previous studies of ⁸⁶Rb turnovers, there is a strong relationship ($r^2 = 0.91$) between metabolism and ⁸⁶Rb turnover. This suggests that ⁸⁶Rb turnovers are a useful and reliable analogue by which to infer FMR. Further, it might be a useful technique to correct FMR overestimates under a range of conditions, such as in nectarivores or diving species, or in groups which have been too small to permit DLW studies (such as insects). The advantages of the ⁸⁶Rb technique to infer FMR include lower cost, lower equipment requirements and technical expertise and obviation of the need to bleed the animals to make measurements, and the longer time span during which effective measurements can be made. Where the ⁸⁶Rb technique is to be used in the field, costs and ethical limitations of can be reduced by the use of flow-through respirometry in the laboratory to provide the requisite validation of ⁸⁶Rb turnover to VCO₂.

5 THERMAL BEHAVIOUR OF CREVICES USED BY *OCTOMYS MIMAX* AT THE ISCHIGUALASTO PROVINCIAL PARK (ARGENTINA).

Campos, Valeria; Borghi, Carlos; Sanabria, Eduardo; Beninato, Verónica; Lambruschi, Daniel & Giannoni, Stella.

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Many rodents are able to survive in desert environment because use crevices in rocks to protect them from extreme temperatures. The insulating ability of rocks to moderate fluctuations in temperature can help them to properly thermoregulate. The aims were: - assess the insulating ability of crevices used of *O. mimax*; - assess if the color of the rocks influences their thermal behaviour. We selected 11 active crevices of sedimentary dark-coloured rocks and 11 light-coloured rocks. The temperature were record every 3 hours during 3 days, in summer. Inside the crevices, temperatures were recorded: in soil (entrance, inside the crevice: 10 cm, 30 and 50 cm), on the rock and in the air. Outside the crevices: on the soil, on the rock and in the air. For statistical analysis we used multiple comparisons among variances and MANOVA. We found differences in the variances on the soil, in dark crevices (inside: 36.59; outside: 101.03) and in light crevices (inside: 25.75; outside: 125.09). Ranges were different, in dark crevices ($F(1, 18) = 5.74$, $p = 0.028$) and in light crevices ($F(1, 18) = 12.296$, $p = 0.003$). The temperature means on the soil were: inside 25.47 ± 5.83 and outside: 29.06 ± 13.29 . Were differences between the variance on the rock outside and inside in the light crevices (inside: 23.59; outside: 112.42). The maximum and minimum temperature inside the crevices were 29.5 ± 0.79 and 24.9 ± 0.49 respectively, and outside 37.06 ± 0.49 and 21.47 ± 0.94 . Air temperature outside and inside was similar. To compare temperature within each type of crevice, we grouped: entrance with 10 cm inside the crevice, and 30 cm with 50 cm inside. Differences were found between the variances in light crevice (35.08 and 23.51, respectively) but no in dark crevices. These temperature differences indicate that crevice provide *O. mimax* with more thermally stable microhabitats. Apparently dark rocks provide a homogenous thermal environment inside the crevices.

6 THERMAL, METABOLIC AND HYGRIC PHYSIOLOGY OF FIVE WALLABY SPECIES FROM WESTERN AUSTRALIA (MACROPODOIDEA)

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There are 13 genera and 47 species of extant Australian macropod marsupials (kangaroos and wallabies), with a body mass range

of 0.5-80kg. Despite their diversity, basic physiological data, such as body temperature (Tb), metabolic rate (MR), evaporative water loss (EWL) and thermal conductance (C), is only available for 5-9 species. We measured the thermal, metabolic and hygric physiology of further 5 species of macropod from 5 different genera using flow-through respirometry. Here we discuss their physiological characteristics in comparison to macropods previously measured and other marsupials. We calculated the first estimates of relative water economy (RWE) and evaporative quotients (EQ) for macropod marsupials to compare with the limited data currently available for marsupials. Tb, BMR, EWL and Cwet for all 5 species, Brushtail bettong (BrB; *Bettongia penicillata*), Burrowing bettong (BuB; *Bettongia lesueuri*), Rufous hare-wallaby (RHW; *Lagorchestes hirsutus*), Banded hare-wallaby (BHW; *Lagostrophus fasciatus*), and Black-flanked rock-wallaby (RW; *Petrogale lateralis lateralis*) generally conformed to values predicted for marsupials based on mass. All species increased MR below thermoneutrality and increased EWL and Cwet at high Ta. Tb values were between 100% (BHW) and 106% (BrB) of those predicted. BMR ranged from 76% (BHW) to 125% (RW) of predicted values. In all five species standard EWL was lower than predicted but fell within the 95% prediction limits of the allometry, ranging from 47% (BHW) to 65% (BrB) of predicted values. Cwet values ranged from 62% (BHW) to 110% (RW) of those predicted.

7 TOWARDS AN HOMOLGY-BASED NOMENCLATURE FOR THE CUSPS OF BUNODONT MOLARS IN UNGULATES

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Despite the weightiness of molecular data in ungulates phylogenetic analyses, the diversity of extinct groups, only available for their study through the fossil record, demand the use of morphological characters. Teeth are commonly used in diagnosis, due to their large number of characters. Among ungulates, the bunodont molar is not the prevailing type of dentition, but it was present in the stem group of most lineages and, currently, is retained in several specialized omnivorous forms. To search for the phylogenetic relationships between extant and extinct ungulates, the accurate identification of primary homologies of molar cusps is necessary. However the use of different names for homologous cusps, and the same denomination for non homologous one, went against the proper analysis of ungulates phylogenetic relationships, and the pondering of their molar variation. Wild boar (*Sus scrofa*) a species with an extensive geographic range and ecological tolerance, is well known for their anatomy and physiology. Its tribosphenic pattern is modified and the bunodont structure specialized, cusps are divided by internal folds, and new cusps are added, particularly in m3. This complex pattern derived in a mainly descriptive cusp nomenclature, rather than homology-based one. We discuss a hypothesis on cusp homologies of the m3, which have three large lobes. Our observations led as to the following preliminary conclusions: (1) the more mesial corresponds to the trigonid, where the metaconid and the protoconid are divided each one in four minor portions. (2) the middle lobe corresponds to the talonid which has hypoconid and entoconid divided in four and two portions respectively, and, a low structure with the mayor axis labio-lingual oriented, interpreted as the remnant of the cristid obliqua. The hypoconulid is usually undivided. Finally (3) the distal lobe is homologous to the postcingulid, has at least four large blunt cusps separated by furrows.

BEHAVIOUR

8 ACOUSTIC PROPERTIES OF VICUNA (*VICUGNA VICUGNA*) VOCALIZATIONS

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The vicuna, an autochthonous South American camelid found on high Andean plains, lives in families consisting of a territorial male with 4-7 females and juveniles or in non-territorial bachelor male groups. Little is known about its acoustic communication. The objective of this study was to record, analyze and characterize physically the calls produced by this species. Vicunas were tape recorded using a directional microphone at the Campo Experimental de Altura, INTA Abra Pampa, Jujuy, where they are raised in large pastures, and in wild vicunas in Laguna Blanca Biosphere Reserve, Catamarca, Argentina. Recordings were made of free animals and those captured for treatment or shearing. The calls were analyzed with Spectrogram 11.0. Of the 9 calls identified, 4 were tonal and 5 atonal. The tonal calls included Bleat 1 and Bleat 2, differing in number of harmonics and duration (8-12 and more than 13 harmonics, 1 ± 0.1 sec and 1.8 ± 0.3 sec in duration, respectively) used by juveniles; Moan, a low amplitude, short duration (0.180 ± 0.13 sec), repetitive call used in mother-young communication, and the Alarm trill (3 ± 0.2 sec), consisting of up to 8 tonal notes, emitted by adult males. The atonal calls were Bellow 1, Bellow 2, differing in bandwidth (266-6356 Hz for the first, 350-10516 Hz for the second), Murmur (200-2000 Hz) and Snort (390-4000 Hz). Threat calls, the most intense calls used by adults, have resonant frequencies at 600 and 1000 Hz. Nonlinear phenomena, such as subharmonics, biphonation and deterministic chaos, are present too. The calls are not discrete but form a continuum, seen particularly clearly as a series from bellow 1 to bellow 2 to threat call, where the intensity increases and the pulsed quality diminishes. This continuum is probably related to excitement levels, and the presence of formants and non linear phenomena may provide information about fitness.

9 AGGRESSIVITY IN COMMON DORMOUSE *MUSCARDINUS AVELLANARIUS* (L.) AND ITS ECOLOGICAL IMPLICATIONS

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The common dormouse, *Muscardinus avellanarius* (L.) as a specialized species needs a good habitat to live in. As such places are

often hard to find, a great deal of competition exists among the individuals cohabiting a given territory. This density related competition for space and resources is acting like a regulator controlling reproduction and so the optimal density for a specific habitat. The intraspecific competition is done by the means of aggressive behavior. The aggressivity in this species may be sometimes very intense and for the safety of the individuals is directed towards the tail of the opponent. So the tail loss in many individuals observed in the field is likely to be caused by these aggressive encounters between the dormice and rarely due to predator-prey relations. Under laboratory conditions the consequences of agonistic behavior were that the submissive individuals got injuries on the tail and even lost parts of it, modified their foraging behavior and lost weight being less fit compared to the dominant ones. These facts explain why the youngsters have different periods of activity than the adults and also why in a population of common dormice not all individuals are reproducing in one year. Only the dominant females are probably breeding. Once the dominance is established on one territory just the olfactory cues may be enough to inhibit reproduction in submissive individuals.

10 EFFECTS OF CAPTURE AND SHEARING ON SOCIAL STRUCTURE OF VICUÑAS IN CAPTIVITY

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Wild vicunas (*Vicugna vicugna*) live in one male harems and male bachelor groups and are territorial year round in high Andean plains. Many vicunas are now raised on fenced ranches and sheared annually for their wool. Vicunas raised at INTA Abra Pampa, Jujuy Province, Argentina are captured twice yearly and sheared at the second capture. Males and females are sheared in alternate years such that each animal is sheared biannually. The social structure of vicunas in captivity in one fenced pasture of this institution was previously found to differ from wild vicunas in that they are not territorial and families appear to be more labile and often larger. The objective of this investigation was to determine the effects of capture and shearing on home range and group size in this pasture. Radiocollars (10 males, 5 females) and colored collars (50 females) were placed at the semiannual captures; vicunas were localized with radiotelemetry using 3 fixed stations with peak-null antennas and opportunistic visual observations. Home ranges were determined using 95% kernels for 7 males in periods without capture, before and after capture. Home ranges did not differ in location ($81 \pm 4.1\%$ overlap) or size with capture ($24 \pm 3.9\text{ha}$ before; $22.3 \pm 2.9\text{ha}$ after). The number of females per family group was the same without capture and after capture without shearing (6.7 ± 0.4 without capture; 6.7 ± 0.5 after capture), but was significantly smaller after shearing of females (3.5 ± 0.5 ; $p < 0.001$, t test). Reproductive rates in the fenced pasture were similar to that observed in the wild (23-53% captivity; 38% wild). Thus, capture does not alter the home range structure in males, the reproductive rate or family composition, but shearing of the females disrupts the families for at least 4 days afterwards.

11 FORAGING AND VIGILANT BUDGETS IN VICUÑAS *VICUGNA VICUGNA*: HABITAT TYPE OVERRIDES GROUP SIZE

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Several studies assessed the effect of group size on vigilant and foraging behavior; however, the effects of habitat type and associated risk of predation on such behaviors remain poorly known. It has been well established for ungulates that increasing group size negatively affects individual vigilance, thereby increasing foraging time. Likewise, in systems where the predator is an ambusher, prey individuals spend more time vigilant in risky habitats (e.g. with complex vegetation structure). We investigated vicuña foraging and vigilant behaviors under puma *Puma concolor* predation at San Guillermo National Park, NW Argentina, in two habitats with different vegetation structure. Meadows [risky] were characterized by tall grasses (18.8 cm [95% CI = 16.2-21.3]) and high vegetation cover (75% [66-83]) whereas flat plains with short grasses (5.3 [4.3-6.2]) and low vegetation cover (13 [11-15]) were considered safe habitat. We used linear regression models to investigate the influence of habitat and group size on vicuña behavior. Our full model contained all predictor variables and interaction terms: $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_1 x_2 + \epsilon$, where y corresponded to different response variables (individual and group foraging and vigilant behavior), x_1 to group size, x_2 to habitat type (meadow=0 and flat plains=1) and $x_1 x_2$ to the interaction term. From this model we derived 5 reduced models with different variable combinations. We ran all 6 models and ranked them based on the corrected Akaike's Information Criterion (AICc). Models including habitat as the sole variable presented the smallest AICc values and therefore ranked consistently higher (first or second) and explained more variance than those with group size as the sole predictor. Our preliminary results suggest that in predator prey systems where the predator is an ambusher and prey moves between radically different habitat types, the latter rather than group size appears to drive prey choices between vigilance and foraging.

12 HABITAT SUITABILITY MODEL, DISPERSAL CORRIDORS, AND POPULATION GENETICS OF WOLVES *CANIS LUPUS* IN POLAND

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Numbers and occurrence of wolves *Canis lupus* in whole Poland were estimated in 2000-2006, during a national census conducted in cooperation with forestry services and national parks. Wolves occur mainly in eastern Poland; their total population size is about 570-770 individuals (120-150 packs). Large-scale analysis of habitat (in GIS techniques) showed that wolves prefer regions with good forest cover (over 40% area) and avoid areas with dense network of settlements and major roads. Based on that analysis, habitat suitability model for wolves was built, and potential habitats for the species were mapped in the whole country. The estimated number of wolves that could live in habitats predicted by the model is nearly 3 times bigger than the present population size. Studies

on population genetics using molecular techniques showed that Polish wolves belong to 3 genetically distinct subpopulations (NE Poland, mid-eastern part of the country, and SE Poland). Wolves recolonising western Poland originate mostly from north-eastern woodlands. The major threat to wolf conservation in Poland is fragmentation of suitable habitats due to development of human settlements and agriculture, increasing road traffic, and planned construction of new highways. Protection and reforestation of migratory (ecological) corridors would improve the chances of long-term survival of large predators. Results of the studies conducted in Poland were compared to the European-scale research in wolf population genetics. An attempt to delimit pan-European dispersal corridors for wolves has been undertaken.

13 **HABITAT USE BY VICUÑAS (*VICUGNA VICUGNA*, MOLINA 1782) IN THE LOS ANDES PROTECTED AREA (SALTA, ARGENTINA)**

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Topography, food and water availability, and social structure can influence habitat use by vicuñas. Families, bachelor groups and solitary vicuñas, habitat type and distance from water were studied in the Los Andes Reserve, during summer and winter 2006. Scan sampling was applied from 8 am to 5 pm. Shrubby slopes and foothills predominate in the study area, complemented by a wetland, grassy foothills and slopes. Correspondence analyses were used to detect associations between social and habitat variables. The χ^2 goodness-of-fit test and Bailey's index allowed detecting habitat selectivity by vicuña groups. In both seasons, groups were associated with habitat type and distance from water, once the time of day was included in the analysis. In summer, vicuñas were associated with shrubby slopes during morning and afternoon hours and with shrubby foothills at midday. In winter, vicuñas were associated with shrubby and grassy slopes in the early morning, shrubby and grassy foothills at midday, and shrubby foothills in the afternoon. Vicuñas were far away, near and at intermediate distance from water during the morning, midday and afternoon, respectively, in both seasons. All social groups preferred shrubby foothills in summer, whereas family and bachelor groups avoided grassy foothills during the morning, and families and solitaires avoided shrubby slopes in the afternoon. All groups preferred grassy slopes in winter, solitaires also preferred shrubby slopes and avoided shrubby foothills in the afternoon. The association of vicuña groups with shrubby habitats, preferring foothills in summer, could be attributed to their high availability of the most preferred grass (*Poa* sp.). The winter associations also with grassy habitats, and the non-selective use of most habitats by families and bachelor groups, suggest greater displacement to search for food because of low food availability. Association with water at midday had already been observed in other vicuña populations.

14 **HUDDLING BEHAVIOR DURING TORPOR: PROXIMAL MECHANISMS AND ECOLOGICAL CONSEQUENCES IN AN ANCESTRAL MARSUPIAL – THE MONITO DE MONTE (*DROMICIOPS GLIROIDES*)»**

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Mammals living in seasonal environments are exposed to high costs of thermoregulation. To counteract this negative feature, an alternative has been to enter into physiological dormancy or torpor despite of physiological and ecological costs, which are decreased by huddling. This energy storing suggests some benefits during the activity period in terms of survival and reproduction. We studied the ancient marsupial, monito del monte (*Dromiciops gliroides*) because its evolutionary characteristics provides insight into the ancestral physiological and behavioral features of basal mammals. Our aims were: (1) to establish the patterns of huddling of *D. gliroides* during the torpor and the period of activity, (2) to determine the importance of huddling in the avoidance or reduction in condition of torpor, and (3) to determine the ecological and behavioral consequences in the activity period of *D. gliroides*. The study was made in selected areas from Valdivian Temperate Rainforest. 200 nest boxes were placed and checked monthly and, the individuals found were marked and measured. Then, fifteen individuals were radiotracked with transmitters (0.9 g) to determine the social organization. Also, we used metabolic measurements to determine the effect of huddling on metabolism. The results suggest that *D. gliroides* is resident throughout the year and presents torpor cycles during ca. three days, presenting both daily torpor and hibernation. Likewise, the huddling and groups until 5 individuals including one female post-reproductive and juveniles, were more frequent during summer and early autumn, suggest that the kinship in the huddling is important for this species. During winter, we observed a higher frequency of single individuals and small groups into torpor condition. Therefore, these mechanisms of energy storing are not excluding between. Finally, we founded that *D. gliroides* is not territorial and has a gregarious behavior during the activity period.

15 **MODULATION OF GUANACO (*LAMA GUANICOE*) FLIGHT BEHAVIOUR BY TOURIST USE IN TORRES DEL PAINE REGION**

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Tourism in protected areas may be detrimental for wildlife. Therefore, it is advisable to analyze the response of wildlife to large

numbers of tourists. During winter and summer 2008 the response of guanacos to people in Torres del Paine National Park (Chile) and surroundings was monitored. Herds were located, and herd structure and response to vehicles and pedestrians were observed. Flight response to the presence of vehicles and pedestrians were modeled by GLZs. Variables included in models were number of animals in a herd, distance to vehicle/pedestrian, season, location (inside vs. outside the Park), distance to the center of the Park and traffic intensity of the area. Flight response to vehicle presence was infrequent (9%, N=381). The distance at which guanacos reacted to vehicles (average 30-170 m) was 47% greater outside the Park and also greater during winter. Flight distance from pedestrians was low (72.7 ± 6.1 m, N=280). Guanacos permitted hikers a closer approach during summer, inside the Park (and the more so the closer to the center of it) and in areas with more traffic. In the core of the Park this distance may be less than 10 m with little or no apparent disturbance to animals. Guanaco behaviour is strongly influenced by exposure to tourists. There is a non-linear response to the frequency of encounters with tourists and to the differential attitudes shown by people inside and outside of the Park. We conclude that guanacos in TdP National Park exhibit a noticeable tolerance to tourists and they apparently do not change their location or activity in response to them. This behaviour is also found in the surroundings of the Park and it extinguishes with distance and in areas with fewer visitors. Thanks to AECID-Spain and CONAF-Chile.

16 SHIFT IN MICROHABITAT USE ALLOWS COEXISTENCE OF EGYPTIAN MONGOOSE AND ITS INTRAGUILD PREDATOR

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Intraguild predation is common in mammalian carnivores, and it has been hypothesised that shift to more protective habitats or refuges of the victim species may be the behaviour that allow for coexistence at local scales. However, no clear empirical data support this prediction. Egyptian mongooses (*Herpestes ichneumon* L.) are known to be excluded from areas where Iberian lynx (*Lynx pardinus* Temminck) attain high density, but both species may coexist at low lynx densities. We examined whether coexistence between the subordinate Egyptian mongoose with its intraguild predator, the Iberian lynx, may be promoted by shifts in microhabitat use. We expect that within lynx home ranges mongooses will strongly select thick vegetation, while this selection might be relaxed outside lynx home ranges. We studied microhabitat use of Egyptian mongooses in winter 2007 by measuring vegetation structure around mongoose tracks and around points without them in the Doñana Biological Reserve (SW Spain), a flat sandy area. Space use of lynx was studied by radio-tracking all individuals that used the study area during the same period. A total of 965 mongoose tracks were found. Inside lynx home ranges, mongoose tracks were located in thicker vegetation than outside them. We also looked for differences in microhabitat use for mongooses in core areas and boundaries of lynx home ranges, but no difference was found. Availability of vegetation thickness was similar in areas used and not used by lynx. Our results show how a subordinate predator shifts its habitat use as a response to the presence of the dominant one. Mongooses selected higher scrub cover under increased risk of predation by its intraguild predator. Our results also suggest that this behavioural shift works as a "all or nothing" response, instead of a gradual reaction to increasing intensity in the use of space by lynx.

17 THE HOME RANGE OF HEDGEHOG (*ERINACEUS EUROPAEUS*) IN EASTERN FINLAND

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The hedgehog (*Erinaceus europaeus*) is a key species in studies of urban fauna in Europe. It is common across Europe, but is mainly studied in Middle Europe, and even the general ecology of the species is poorly known in the northernmost parts of its range. The aims of this study were to determine the home range sizes and their overlap in the European hedgehog in Finland. The data were collected between spring 2004 and autumn 2006 in the town of Joensuu in eastern Finland (n = 29). The principal method used was radio tracking and the data were analysed by Ranges 6. There was a sex difference in the seasonal home range size. Males were found to have larger seasonal home ranges (mean \pm SD) (95% Kernel 80.4 ± 2.1 ha, n = 4) than those of females (95% Kernel 30.3 ± 12.0 ha, n = 3). Also the core areas of males (50% Kernel 16.4 ± 4.5 ha, n = 4) were larger than those of females (50% Kernel 5.4 ± 1.7 ha, n = 3). In addition, changes were observed in the size of the home range during the hedgehog's active season (hibernation in winter time). Males had their largest home ranges in the spring and the difference in home range size between sexes was greatest during the mating season. Towards the autumn, the size of female home ranges increased and the size of male home ranges decreased. Home ranges overlapped between hedgehog individuals. This clearly shows that the hedgehogs are not territorial, which confirms the observation of former studies. The home range of hedgehogs seems to be larger in the north compared to the more southern latitudes. However, the result comparison is rather difficult because somewhat different methods have been used in recent studies.

BIOGEOGRAPHY

18 ASSESSING THE IMPORTANCE OF NATURAL AND HUMAN FACTORS IN PREDICTIVE MODELS OF GUANACO IN SOUTHERN PATAGONIA

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Predictive models have become a useful tool for identifying conflicts between human activities and biodiversity conservation. Human activities such as sheep ranching and hunting have been regarded as the main cause of contraction in the geographic range of guanaco (*Lama guanicoe*) during the last century. Since a combination of natural and human predictors seem to influence guanaco distribution, our aim was to assess the relative importance of these factors using predictive models. We present a procedure that classifies guanaco habitat in four categories, hypothetically related with different population dynamics. We performed guanaco censuses from vehicles across Santa Cruz province, Argentina. To analyze the relationship between guanaco occurrence and predictors, we built GAMs using a binomial error. The AUC of the ROC plot was computed to assess the predictive power of the models. We generated two separate models, one with natural factors and another with human factors as explanatory variables. Predictions of these models were translated into spatial probability maps and simplified into two classes: the human model was split up into low and high human disturbance, and the natural model into favorable and unfavorable habitat. The combination of predictions in the resulting maps were hypothesized to delineate the spatial boundaries of areas where guanacos could exhibit four types of dynamics: source (favorable habitats with low human disturbance), sink (unfavorable habitats with high human disturbance), attractive sink (favorable habitats with high human disturbance), and refuge (unfavorable habitats with low human disturbance). We found that potential sinks for guanaco populations were predominated in the north and west of Santa Cruz, associated mainly with cities. Attractive sinks occur in the south, related with more productive areas that are devoted to sheep ranching. Potential sources were scattered through the province associated with the Andean slopes in the west, and with productive valleys in the center.

19 CAMERA TRAP SURVEY OF MEDIUM AND LARGE MAMMALS IN A MONTANE RAINFOREST OF NORTHERN PERU

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Camera traps have proved to be a powerful tool for inventorying elusive and rare species. In Peru, several surveys have been carried out in lowland Amazonia, but never in montane forests or Yungas. This study is the first carried out in a Peruvian montane cloud forest. The study area is located near the village Querocoto (Chota, Cajamarca), on the headwater of the Paltic river, affluent of the Marañón river, and just south of the well known barrier, the Huancabamba Depression. The study was performed during the wet (October to November) and dry season (July to September) in two localities: The Pagaibamba Protection Forest and San Lorenzo forest. We used 15 Reconyx and 10 Cuddeback digital camera traps, placed on animal trails or where mammals' signs were found. Cameras were set up to an average height of 40 cm above ground, and programmed to take three photos per trigger (Reconyx), or one (Cuddeback). Cameras operated 24h per day recording date and time of each photograph. We obtained a sampling effort of 1912 (dry season) and 1264 (wet season) camera-trap-days for both localities. In total we recorded 8 of 13 large/medium mammals reported by interviews. These include six carnivores (*Tremarctos ornatus*, *Leopardus pardalis*, *Lycalopex culpaeus*, *Conepatus chinga*, *Eira barbara*, and *Mustela frenata*), a rodent (*Cuniculus taczanowskii*), and one deer (*Odocoileus peruvianus*). In the dry season, we obtained 68 (91.9%) independent events whereas in wet season records drop to only 6 (8.1%). *C. taczanowskii* was the most commonly photographed species, with 18.82 and 1.58 capture frequency for dry and wet season respectively. Activity patterns suggest that *C. taczanowskii* and *C. chinga* are nocturnal, while *T. ornatus* and *E. barbara* are diurnal in the study area. We report the highest known record for *Leopardus pardalis*, recorded at 3379 masl, in the Pagaibamba Protection Forest, a place that deserve a higher protection status.

20 DISTRIBUTION MODELING AND STATISTICAL PHYLOGEOGRAPHY OF THE WESTERN JUMPING MOUSE (*ZAPUS PRINCEPS*): ADMIXTURE VS. VICARIANCE

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Geographic variation was assessed in the western jumping mouse, *Zapus princeps*, a species that occurs in the highly disjunct montane and mesic habitats of western North America. Ecological Niche Models were developed and hypotheses of Last Glacial Maximum distributions were analyzed using the mitochondrial cytochrome-b gene. Specifically we tested alternative models of admixture versus vicariance as methods of population structuring. Phylogeographic relationships of *Z. princeps* revealed 5 distinct and reciprocally monophyletic lineages (Boreal, Uinta, Southern Rockies, Northern Sierras, and Mid-Sierras). Divergence estimates among these major lineages were about 10% and comparable to interspecific differences often observed among sister species in other rodents. The 2 lineages detected in the Sierra Nevadas of California (Northern Sierras and Mid-Sierras) were more closely allied to *Z. trinotatus* than to other populations of *Z. princeps*. Four of these lineages have relatively limited geographic distributions in the southwestern United States and occur in habitats that are critically threatened by anthropomorphic and environmental modifications such as livestock grazing, development, and drought. Further, we demonstrate evidence, via the coalescent, that these populations have experienced a lack of population admixture since the Last Glacial Maximum.

21 DIVERSITY OF MAMMALS ASSOCIATED WITH THE EVERGREEN NEOTROPICAL FORESTS OF THE AMAZONIAN AND GUYANA

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It was evaluated the available information on the diversity of mammals for nineteen (19) locations associated with Evergreen Forests of the Amazonian and Guyana with the purpose to review the methods of inventory, document and discuss the species composition

with the objective to determine diversity patterns at different regions of Evergreen Neotropical Forest. We made a Cluster Analysis by using NTSY pc 2.1 software with information taken from faunistic inventory of the 19 regions with similar environmental characteristics. As far as similarity patterns found in the cluster analysis a marked difference can be observed between Amazonian and Guyanese regions when association based only in the locations represented by more than 80 species, the contrary when it was realized with the 19 locations independently of the number of species or the intensity of the sample. The locations are concentrated in two main groups: the Madre de Dios, Kutuku, AAYPM (western Amazon) and Cunucunuma, Kanuku, Rio Jauperi, Manacos and which are clearly related as far as composition and species refers and intermediate locations: Amazon Guyanese-Reserve, Manaus (Northern Amazon), with Guyanese locations: Paracou, Arataye, Suriname, and Iwokrama, Kartabo, except Xingu locations to the East of Amazonian. To performance intensive inventory in mammal communities with similar habitats could be a tool to define and characterize the biogeography limits of Evergreen Guyanese and Amazonian Forests in the Neotropical region as well as for evaluations of the research and conservation priorities in Central and South America.

22 GENETIC DIFFERENTIATION IN THE PATAGONIAN-FUEGUIAN RODENTS *ABROTHRIX OLIVACEUS* AND *A. LONGIPILIS* (RODENTIA: CRICETIDAE).

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The Pleistocene glaciations are thought to have had a profound impact on the distribution of endemic biota both in the Northern and Southern hemispheres, leading to important changes in the historical demography and phylogeography of many species of small mammals. Here, we assess the phylogeographic patterns in the widespread species of Patagonian-Fuegian sigmodontine rodents *Abrothrix olivaceus* and *A. longipilis*, assessing if current genetic diversity have been associated to an isolation in one or more historical Patagonian refuges. We used nuclear DNA sequence data of the entire intron-7 of α -fibrinogen (FGB-680bp) and a partial fragment of the intron-2 of alcohol dehydrogenase (ADH1-630bp) for 50 individuals of each species from 5 to 10 different populations distributed across four Argentinean provinces and one Chilean region in Patagonia. At the global level, both genetic markers showed high population substructure among different populations of *A. longipilis*. In contrast, *A. olivaceus* presented lower genetic differentiation among populations than *A. longipilis*, showing a polyphyletic arrangement of their haplotypes across the study area. While *A. longipilis* seems to be at equilibrium between mutation and genetic drift, as suggest by the Tajima's D, *A. olivaceus* seems to have suffered recent historical population range expansions. At local level, ADH1 data support the idea of two sites as centers of population range expansions for *A. olivaceus* (in North Patagonia and Tierra del Fuego). Summarizing, our main finding is that phylogeographic genetic subdivision in *A. olivaceus* is weaker than in *A. longipilis*, which shows a stronger phylogeographical signal, most probably in agreement with the hypothesis of differentiation in isolation during Pleistocene climatic events. *A. olivaceus* shows stronger signals of historical changes in population size. The biogeography of Patagonian sigmodontines is discussed in the light of new data and novel hypotheses. Financing: NGS7813-05/CONICET-PIP6179/FONDECYT11070157.

23 GENETIC POPULATION STRUCTURE OF THE YELLOW-NECKED MOUSE *APODEMUS FLAVICOLLIS* IN DENMARK

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The yellow necked mouse *Apodemus flavicollis* probably reached Denmark from southern refugias, approx. 11.000 years ago, at a time when most Danish islands were part of the European mainland. Today, *A. flavicollis* has a very wide distribution in Denmark, presently increasing its range, and including the larger islands, however, it only occurs on a few of the smaller islands. The objectives of the study were to estimate the population structure between Danish yellow necked mice on different island and the mainland, and to analyse the migration directions using genetic information. A total of 199 individuals representing 10 different sampling sites were analysed for 14 microsatellites, and D-loop sequences of a subsample (N=193) of the individuals were determined. A pronounced population structure was observed using both microsatellite and D-loop variation dividing the localities into 10 genetically different populations more or less connected. Geographically proximate populations were more closely related compared to populations situated on islands further away. Recent migration in terms of gene flow was indicated between geographically nearby population in Jutland. Very little migration was indicated between the populations situated more than 10 kilometres apart. The phylogeny analysis of the haplotypes indicated that populations on the mainland Jutland probably were founded by Polish yellow necked mice, while populations on the south easterly islands had been founded by yellow necked mice from Estonia. The N. Zealand population showed haplotypes derived from Polish haplotypes and much more distantly from the Estonian haplotype.

24 GENETIC STRUCTURE AND DIFFERENTIATION PROCESSES OF POPULATIONS OF *LOXODONTOMYS MICROPUS* (RODENTIA: SIGMODONTINAE)

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Genetic structure and differentiation processes of populations of *Loxodontomys micropus* (Rodentia: Sigmodontinae) Cañón Carola*, D'Elía Guillermo, Pardiñas Ulyses F.J. & Lessa Enrique P. Departamento de Zoología, Universidad de Concepción, Chile. carolacanon@udec.cl. *Loxodontomys micropus* is a medium-sized sigmodontine rodent that has a wide distribution in southern Chile and southwestern Argentina. The fossil record shows that the distribution of this species has changed significantly during the Quaternary. Up to now the pattern of genetic variation of *L. micropus*, and the agents that have molded it are unknown. The major goal of this study was to examine the phylogeographic pattern, level of genetic variation, and recent biogeographic history of this

phyllotine along its distributional range. We used an 801 bp fragment of the protein-coding cytochrome b gene of 78 specimens from 18 localities of Chile and Argentina. The genealogic analysis shows four geographic clades, differentiated in latitudinal sense, suggesting that the Andean mountain have not served as a major barrier in molding the genetic variation of the species. The neutrality tests of Tajima and Fu for each one of the main clades evidence recent populational expansion. Taken as a whole, these results suggest that current genetic diversity of *L. micropus* would have originated in more than one refugial area; this contradicts previous models posited to explain the diversity of other codistributed sigmodontines. Finally, it is worth to note that an haplotype recovered from a specimen of *Loxodontomys pikumche* does not differ from those of *L. micropus*, questioning the existence of two species of *Loxodontomys*. Financing: NGS 7813-05, CONICET PIP 6179, FONDECYT 11070157.

25 GLOBAL CHANGES AND EVOLUTIONARY SHIFTS AMONG NEOTROPICAL NECTARIVOROUS BATS

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Nectarivory imposes extreme co-adaptations on animals and plants for the success of both and high degree of specificity required by coevolutionary syndromes is further complicated by niche partitioning. Nonetheless, morphological adaptations to nectar consumption characterize 30 % (48 /158) of the extant species of Neotropical bats within the family Phyllostomidae. We studied the geographic structure accompanying this successful diversification. Such closely linked evolutionary diversification would be predicted to share geographic structure, likely to be determined by plant ecological limiting factors. Molecular analyses support the natural placement of continental nectar-feeding bat species into three monophyletic groups that show geographic structure as well as ecological exclusion into independent areas correlated with three Neotropical geographic domains (Andean, Central American-, and Chocoan), each one including plants for which chiropterophyllic syndromes have been documented. Divergence time estimates among nectarivorous forms indicated that diversification among nectarivorous species took place during the Mid Tertiary characterizing a time of global decrease in temperature and profound effects on floristic composition. Our results show intricate ecological processes in the Neotropics and the relationship of global changes to major mammalian evolutionary diversification.

26 MAMMALIAN NON-VOLANT SPECIES DIVERSITY ALONG THE PARNAÍBA RIVER IN THE BRAZILIAN MID-NORTH: PRELIMINARY RESULTS

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Located in the Brazilian mid-north, the states of Maranhão and Piauí are located where the three major biomes of Brazil converge, the Amazon rainforest from the north, the Cerrado (savannas) from the center and the semi-arid Caatinga from the northeast. This transitional and rather interesting area is very poorly known regarding its biological diversity. This biologically diverse area is also under enormous pressure from agricultural expansion and industrialization. In this analysis we intend to characterize the non-volant mammalian fauna along the Parnaíba River located between these two states. Data was gathered from September 2008 to April 2009 from 104 sampling units covering all physiognomies present. Small mammals were sampled by live-traps and pitfalls and medium-large mammals by direct observation, tracks and camera trapping. We collected 674 records of mammals after 1,700 trap-nights, 5,355 bucket-nights, and a camera trapping effort of 640 trap-days. A total of 61 species of 25 families and nine orders were detected. Of these, 18% were listed as threatened with extinction by Brazilian authorities. The mammalian fauna was typical of the Cerrado biome of Central Brazil, with a few species characteristic of the Amazon region and only one that is more commonly associated with the semi-arid scrub of the Caatinga. We expected a stronger influence of the Caatinga domain, as noted for birds, lizards and amphibians. This study highlights the importance of this area for the conservation and maintenance of the mammalian diversity in the northern Cerrado of Brazil.

27 MODELLING THE POTENTIAL DISTRIBUTION OF THE MARSUPIAL *PHILANDER FRENATUS* USING A MAXIMUM ENTROPY ALGORITHM

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The taxonomy of the genus *Philander* is still being revised and species distribution limits are unclear. *Philander frenatus* is known to occurs in eastern Brazil, southern Paraguay and Argentina and some populations of central Brazil are taxonomically problematic and should belong to *P. frenatus* or to *P. opossum* group. In order to better understand the limits and the determinants of the distribution of *P. frenatus* we modelled the potential distribution of this species. Localities of central Brazil are not included here and must be better investigated. The aims of this study are: (1) to test the importance of climate, vegetation and topography as determinants of geographic distributions (2) to assess which kind of variables produce better models; (3) to define the most important variables for the potential distribution of *P. frenatus*. We used a maximum entropy algorithm (Maxent) to modeling with three kinds of variables: (A) climatic (bioclimatic variables), (B) topographic (slope, aspect and elevation) and (C) vegetation (ecoregion) data, totaling 23 variables. Experiments were conducted with seven variables sets (A; A+B; A+C; B; B+C; C; A+B+C). All models but the topographic alone got AUCs higher than 0.9 indicating excellent performance. The best models get AUCs equal or higher than 0.98, except the vegetation set alone (AUC=0.93). Models with combined sets of data showed better results. Climate, vegetation and topography proved to be

important determinants to the species distribution and variables that most contributed were vegetation (most important in all models), temperature seasonality, precipitation of warmest quarter, aspect and isothermality. In all models, vegetation appears to have the most useful information by itself, and isothermality has the most information that wasn't present in the other variables. The distribution maps were well adjusted to the localities and predicted higher probabilities in Serra do Mar ecoregion, corroborating what was expected.

28 PHYLOGEOGRAPHY OF THE OPOSSUM *DIDELPHIS AURITA*: INVESTIGATING THE BIOGEOGRAPHICAL HISTORY OF THE ATLANTIC FOREST

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The Atlantic Forest (AF) is the second largest rainforest of the Neotropics, spanning 25° of latitude in the Brazilian coast from the northeast to the south. We studied patterns of genetic diversity of the opossum *Didelphis aurita*, a widespread and endemic species of the AF, in order to investigate its biogeographical history. Two molecular markers, the cytochrome B mitochondrial gene (cytB, 600pb) and the 4th to 6th intron of the glucose-6-phosphatase nuclear gene (G6PD, 1057pb), were sequenced in 128 and 17 samples, respectively, covering a large part of the forest distribution. The cytB showed a higher number of polymorphic sites (41; nucleotide diversity $\pi = 0.005$, haplotypic diversity $H_d = 0.903$), whereas G6PD had ten ($\pi = 0.002$, $H_d = 0.93$), a pattern expected not only by the difference in sample size, but also because of the smaller effective population size and higher mutation rate of mitochondrial markers. The large number of unique haplotypes influenced Fu's F_s neutrality test, significant for both genes (cytB $F_s = -32.96$, G6PD $F_s = -9.65$, $P < 0.001$). Tajima's D test, however, was significant only for cytB ($D = -1.90$, $P < 0.05$). Furthermore, no clear geographic structure was found for both genes, except for a marked difference from the samples of Alagoas state. These samples most likely belong to the sister Amazonian species *D. marsupialis*. Despite the great sampling difference, both genes recovered the same patterns, showing that in a species with large dispersion capacity, like opossums, the great latitudinal range of the AF has little or no effect over the distribution of the genetic diversity, characterizing them as nearly panmictic populations. The data also gives evidence for a recent demographic expansion event, but more analysis are needed to determine when this expansion happened, and to which historical event it can be related with.

CONSERVATION

29 A RANGE-WIDE ASSESSMENT OF THE CONSERVATION STATUS OF LOWLAND TAPIR (*TAPIRUS TERRESTRIS*) IN SOUTH AMERICA

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Lowland tapirs (*Tapirus terrestris*) range from northern South America to northern Argentina (historic range: 13,129,874 km²). They are a keystone species critical for maintaining ecological functionality in a wide range of tropical and subtropical habitats. They are particularly vulnerable to direct and indirect threats due to their low reproductive rate. We report on a GIS-based range-wide assessment using field data (1,213 record points) and expert opinion from 40 biologists in 11 range countries. Experts judged this species extinct in 14.1% of their historic range; and considered them to have a high probability of survival in only 51.9% of the current range. They are most at risk in Argentina, where their range has declined by 46% with populations small and highly fragmented. Major range declines were also reported in Colombia and Venezuela. We analyze the status of this species by eco-geographic region, major habitat type and country. Fifty-one Tapir Conservation Units (TCU) were identified covering 40% of its current distribution. The experts considered the major habitat types and conservation units as the most realistic targets for conservation planning. The importance of different threats were estimated with the principal direct risks coming from habitat loss and hunting. Conservation efforts must focus not only on protected areas, but also on communal and private lands, to maintain this species as a functional part of ecosystems at the landscape scale. We contrast our results with those from similar assessments of the largely sympatric jaguar (*Panthera onca*) and White-lipped peccary (*Tayassu pecari*).

30 ABUNDANCE ESTIMATES FOR A SEVEN-YEAR MONITORED POPULATION OF GUIANA DOLPHINS (*SOTALIA GUIANENSIS*) IN NORTHEASTERN BRAZIL

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Assessment of population size is essential for the definition of species conservation status and, thus, for establishing efficient conservation strategies. The Guiana dolphin (*Sotalia guianensis*) is restricted to the western Atlantic Ocean and inhabits coastal areas, usually exposed to several human disturbances. In order to monitor the population of Guiana dolphins in the Caravelas River Estuary in eastern Brazil, we estimated abundance for seven different years (2002-08) from a long-term boat-based study. We used capture-recapture methods through photo-identification of individuals with long-lasting marks, and a correction for non-identifiable dolphins. All assumptions were validated to consider the population closed. Darroch's Mt and Chao's Mth models were applied since they incorporate time variation and individual heterogeneity in capture probabilities, which is expected for dolphins. We considered four consecutive field days as a sampling occasion, in order to increase the capture probability. Mth model with theta correction produced abundance estimates (95% Confidence Interval) of 84 (67-106), 91 (74-112), 126 (59-270), 151 (87-262), 87 (39-194), 287 (141-584) and 105 (62-178) dolphins from 2002 to 2008, respectively, while Mt indicated 67 (65-70), 79 (76-81), 92 (62-137), 68 (62-75), 54 (37-79), 115 (86-154) and 71 (58-85) dolphins. The estimates were different for each model: Mth produced abundances 1.2 to 2.5 higher than Mt, indicating that there is individual heterogeneity of capture probabilities. Therefore, the Mth model is probably more appropriate for this population. Few other Guiana dolphin populations have abundance estimates, which were calculated by methods other than capture-recapture. Results of both models indicated a small population size, which is in accordance with the majority of other studied populations of this species. There were no apparent populational trend along the years monitored, but broader photo-identification effort is recommended to address this issue with more certainty. Financial support: CAPES, Cetacean Society International, Animal Behavior Society, Aracruz Celulose.

31 A MULTI-FACETED RESEARCH PROGRAMME DECIPHERS THE MECHANISM OF DECLINE OF A RARE EUROPEAN BAT

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Many bat species have suffered dramatic declines over the past decades, especially in the Western world, which has been attributed to major land-use changes in farmland and woodland. This has led to widespread local bat population decreases if not extinctions. In Europe, the lesser horseshoe bat *Rhinolophus hipposideros* is probably the bat species that has undergone the most dramatic population collapse since World War II. The causes of its decline have remained largely speculative, which impedes conservationists from taking appropriate restoration action. We launched an integrated conservation biological programme («Rhippos») aiming at evaluating the contributions of different factors to that phenomenon. Based on a first appraisal of the most probable causes of decline by bat experts, we formulated a series of hypotheses that we tested in different research modules, from investigations of species' basic ecological requirements to dispersal capacity. We present here the outcome of these different modules, concluding that the massive use of organochlorinated pesticides (DDT and allied) in the second half of the 20th century was the most likely cause involved. The banning of these pesticides in the seventies is probably the reason why most populations now show signs of progressive recovery. Targeted restoration measures are proposed for accelerating the recolonisation of species' historical range.

32 AN EVALUATION OF SMALL MAMMALS FAUNA OF THE RESERVA NATURAL MOROMBI, CANINDEYU-PARAGUAY.

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The Atlantic Forest of Eastern Paraguay has faced severe landscape changes primarily due to the cattle and soy plantation. After multiple small mammal surveys at the Reserva Privada Morombí we report the initial lists of species found there in. Although other studies have worked towards documenting the vertebrate fauna this is the first study focused on the small mammal fauna inhabiting this reserve. Morombí is located in the Department of Canindeyu, in eastern most Paraguay, containing a mosaic of forest, natural grassland, wetlands, artificial pasture lands for cattle grazing, and cropland. Our survey consisted of 4 separate expeditions which incorporated a total of 10 grids made up of 4 traplines with 24 stations each and a 100 m pitfall trap each. Each station was equipped with 2 sherman live traps and 2 snap traps, one on the ground and one at least one meter above the ground. Furthermore, traplines were systematically baited with three different baits including oats and peanut butter, apple, and sardine. Ten bat nets were set up for one night. We report a 8 non-volant species and 5 bats species for a total of 13 species. It is noteworthy to high light the capture of the second record of *Juliomys pictipes* for Paraguay, pinpointing a considerable range extension northwest for the species. Additionally, records of *Gracilinanus agilis*, *Micoureus paraguayanus*, and *Cryptonanus chacoensis* are the first for the reserve. With the very limited sampling which has been done we can already tell that this reserve harbors valuable and rare species and preserving this reserve will high importance.

33 ASSESSMENT OF POTENTIAL DISTRIBUTION OF NEOTROPICAL CAT SPECIES BY ECOLOGICAL NICHE MODELING

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Considering the status and conservation needs of Neotropical felids this study aimed to elaborate potential distribution maps for Neotropical region by Ecological Niche Modeling (ENM). ENM procedures incorporated environmental variables and presence records of the 10 Neotropical cat species (*Oreailurus jacobita*, *Oncifelis colocolo*, *Oncifelis geoffroyi*, *Oncifelis guigna*, *Herpailurus yagouaroundi*, *Leopardus weidii*, *Leopardus pardalis*, *Leopardus tigrinus*, *Puma concolor*, *Panthera onca*) provided by cat specialists participating in the International Conference and Workshop Status and Conservation of the Neotropical Felids, co-organized by the IUCN/SSC Cat Specialist Group and the South American Cat Conservation Alliance SACCA in Brazil in 2005 and by the CatSG GIS Archives. The ENM were generated by Maxent algorithm with independent data (bootstrapping methods with 10 random partitions with replacement) with 70% of dataset for training and 30% for testing models. Threshold-independent assessment was considered for the training minimum presence resulting in models with suitable and unsuitable area for the species modeled. Model performance evaluation was assessed by AUC (Area Under Curve) value and by binomial proportional test. In general, models presented low omission errors and were all statistically highly significant. Most models were representative for distribution and habitat preferences of the respective species, while some did not performed so well due to presence data bias and/or lack of species information. The poorer results however allowed identification of gaps in distribution data collection or biological knowledge, indicating key areas for further surveys. The species potential distribution models, combined with a comparative assessment of present, historical, and potential distribution will help to advance the assessment of the conservation status of the Neotropical cats and could serve as a basis to set research priorities and develop conservation strategies for these cat species. Furthermore, targeted research would allow model validation in the field in order to improve its accuracy. Keywords: cat conservation, ecological niche models, Maxent, Neotropical felids.

34 ATTRACTIVENESS OF HIGH GRASS BIOMASS PATCHES TO WILD DEER

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Attractiveness of high grass biomass patches to wild deer *Toshikatsu Kamei 1, Ken-ichi Takeda 2, Kazuhiko Ihara 2, Fumiko Sakakibara 2, Katsuki Koh 2, Shigeyuki Izumiyama 2 and Kouji Ohshima 2 1 Interdisciplinary Graduate School of Science and Technology of the Shinshu University, Nagano, Japan 2 Faculty of Agriculture, Shinshu University, Nagano, Japan *Toshikatsu Kamei, Faculty of Agriculture, Shinshu University, 8304 Mianami-minowa, Kami-ina, Nagano 399-4598, Japan. Email: s07t505@shinshu-u.ac.jp It is necessary to control the Sika deer (*Cervus nippon*; hereafter, deer) population, but the number of hunters who control the deer population have decreased dramatically in Japan. Therefore, it is necessary to develop an efficient method to control the deer population. We propose the use of a large capture trap to control the deer population. In a previous study, we showed that many deer frequent pastures, but it is difficult to capture deer in a large pasture. This study investigated whether high grass biomass patches could attract deer to a large capture trap. The study was conducted near a large capture trap (26 a), which was placed in a communal pasture (33 ha) for grazing beef cattle in Nagano, Japan. Six attractive patches (3.5 m × 5 m), which were high grass biomass, and three control patches (3.5 m × 5 m), which were low grass biomass, were placed in the pasture from October 26 to November 9, 2008. Each patch was dominated by Kentucky bluegrass (*Poa pratensis* L.). Deer that utilized the patches were photographed using remote digital cameras with a built in infrared motion sensor. The number of deer that utilized the attractive patches during the survey period was four times larger than that of control patches (Student's t-test, $P = 0.057$), and the ratio of deer that grazed in the attractive patches was significantly higher than in control patches (chi square test of independence, $P < 0.01$). Moreover, there was a significant correlation between the number of deer that utilized each patch and the plant lengths of each patch (Pearson's correlation coefficient, $r = 0.78$, $P < 0.05$). The results showed that the high grass biomass patches attracted deer, suggesting the use of high grass biomass patches as a deer attractant for large capture trap.

35 BIRDS OF A FEATHER: EXAMINING INTERACTIONS OF RED COLOBUS MONKEYS THROUGH MOLECULAR AND OBSERVATIONAL DATA

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36 DECLINE IN GEOGRAPHIC DISTRIBUTION OF THE BLACK-TAILED PRAIRIE DOG (*CYOMYS LUDOVICIANUS*) IN MEXICO

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The change in the distribution and decline of wild populations by human activities is one of the most severe environmental problems in our time. In Mexico the black-tailed prairie dog (*Cynomys ludovicianus*) is not the exception; the destruction and fragmentation of its habitat have reduced gradually its original geographic distribution and also have increased risk of extinction due to demographic factors, genetic, stochastic events and emerging diseases. We've been studying the prairie dog distribution since 1988 and we observed the complex encompassed 55,178 ha and an estimated prairie dog population of one million individuals. This was the largest continuous prairie dog complex in North America. By 2000 the prairie dog distribution was reduced in 46%, whereas the area occupied by prairie dog towns was reduced in 60%; we registered a total 45 prairie dog towns ranging in size from 1 to 15,076 ha, and covering an area of over 20,000 ha. Twelve new towns were registered. The towns in northern part of the complex were smaller,

more isolated, and less connected as compared to 1996. By 2005 we registered a total of 33 prairie dog towns ranging in size from 1 to 5,248 ha and covering an area over 14,797 ha it means a reduction of the 73% of the original distribution in 1988. Thus, although several colonies of dogs were joined there was a reduction in the total number of colonies and a smaller area occupied by prairie dogs. The changes observed in the last 21 years on the distribution and size of the prairie dog colonies is dramatic. The reduction on the area occupied by prairie dogs has been mainly the result of the cattle ranching, the conversion to agriculture (with a greater impact in the ecosystem) and the prairie dog eradication by poisoning. Removal of prairie dogs has resulted in the fragmentation of towns with the consequent invasion of bushes and mesquite scrub over former grassland. The preservation of this area is an unparalleled opportunity to conserve regional and hemispheric biodiversity, native ecosystems and maintain ecological and evolutionary processes in one of the few native grasslands left in North America.

37 **DEMOGRAPHY AND VIABILITY OF A GUANACO POPULATION (*LAMA GUANICOE*) IN RÍO NEGRO PROVINCE, ARGENTINA. A PRELIMINARY ANALYSIS.**

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The guanaco (*Lama guanicoe*) is the most common and widespread arid lands, wild camelid in South America. Despite its key role in these ecosystems, there are very few studies of demographic behavior of populations over time. We analyzed demographic parameters (proportion of sexes and ages, birth and survival rates) and developed a preliminary demographic PVA (population viability analysis) for a guanaco population that inhabits a 40,000 ha ranch, in Río Negro province (Argentina). We used data from shearing in 2005, 2006, 2007 and 2008, as well as field surveys during the end of reproductive season (March-April) along 50 km of transects in 2007 and 2008. We identified three age classes: chulengos (individuals between birth and 1 year old), juveniles (1-2 years) and breeding adults (2 years or more). We used a binomial statistical test to analyze proportion of sexes, and deterministic and stochastic projection matrix models for structured populations, by calculating the elasticity of population growth rate. Environmental stochasticity was incorporated through variability in birth rate (probability of breeding). Proportion of sexes was 50:50 for chulengos, but 61:39 in favor of adult females, which would indicate a differential mortality for adult males. The proportion of age was 76:8:15,3 for adults, juveniles and chulengos, respectively. Both arithmetic (non stochastic) and geometric (stochastic) growth rates resulted in values less than unity, indicating that the population decreases, even under the assumption of no environmental variability. To ensure the population avoids extinction, it will be not enough to achieve maximum fertility. This could be because the vital rate that most contribute to population growth is not the birth rate but the survival of adult females. However, more years of continuous population sampling will be necessary to improve the estimation of such models.

38 **DENSITY AND MIGRATION PATTERNS OF GUANACO (*LAMA GUANICOE*) IN TIERRA DEL FUEGO, CHILE**

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Wild large herbivores migration is a declining process worldwide. In the southern cone of South America, native ungulates such as guanaco have lost most of their ecological functionality, as their populations have been reduced in range and density due to hunting, habitat degradation and competition with domestic livestock. In this scenario, the Chilean guanaco population is endangered in most of its actual distribution with the exception of the population inhabiting southern Patagonia, especially in the Island of Tierra del Fuego (TDF). This population inhabits a gradient of habitats including lowland steppe, steppe-forest ecotone and mountain forest to the south of the Island. Throughout most of its range, guanacos share habitat with livestock. We studied the effect of habitat, season and livestock ranching on guanaco density from 2006 to 2008. We focused our study on southern TDF, where steppe-forest ecotone and mountain forests dominate the landscape, including a protected area without livestock and adjacent livestock ranches. Our results show significant differences in guanaco density according to habitat type. Density was greater in the lowland steppe/forest ecotone (15.6 ± 4.4 ind./km²) compared to mountain forest (1.3 ± 0.7 ind./km²). However, density in mountain forest showed a marked seasonality, being lower in the winter due to increased snow cover. Our data also show spatial segregation between sheep and guanacos in steppe-forest ecotone. Observed guanaco distribution patterns evidence the maintenance of seasonal migration processes in TDF. This has been confirmed through radiotelemetry tracking of two family groups, showing a migration of ca. 40 km in consecutive years. Additionally, we observed that ranching lands are used as corridors and feeding grounds during winter migration. Our long-term goal is to thoroughly understand this population of guanacos, and determine population and land management needs that allow this process to be maintained in the future.

39 **DIET ANALYSIS OF BOBCAT *LYNX RUFUS* IN THE MAPIMI BIOSPHERE RESERVE, CHIHUAHUA DESERT**

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From 2005 to 2007 we studied the bobcat's diet at Chihuahuan Desert, considering two main types of habitat: grassland and shrubland in the Mapimí Biosphere Reserve, Durango, México. The objective was to test the hypothesis that the main preys are lagomorphs, particularly jackrabbits (*Lepus californicus*). We analyzed bobcat scats, the remains of vertebrate preys were identified

comparing with voucher specimens deposited in collections of Cordados Terrestres Laboratory, I.P.N. M?xico. We estimated diet, frequency of appearance (AF) and percent of appearance (AP), plus biomass by prey represented in scats, evaluating which are most consumed and could be considered as principal. The more consumed preys were different for grassland than for shrubland. In AF and in AP, rodents were more important in shrubland and lagomorphs in grassland; in both habitats, the most importantly represented in biomass were jackrabbits, followed by rabbits and in third place deer. For shrubland *N. albigula* was more important: AF = 57.7, AP = 26.8 followed by *L. californicus* AF = 30.8, AP = 14.3 and for *S. audubonii* AF = 26.9, AP = 12.5, other species have low percent values (≤ 7.1). For grassland, *L. californicus* presented AF = 46.2, AP = 33.3 followed by *N. albigula* AF = 36.3, AP = 26.2 other species have lower values (AF ≤ 14.3, AP ≤ 10.3). If we evaluate all together AF and AP, plus the consumed biomass, the main prey are jackrabbits, which AF and AP proportions are consumed bigger than expected (for grassland $G = 47.897$, $P = 3.98E-12$ and for shrubland $G = 33.496$, $P = 6.55E-9$). The knowledge about main prey of bobcats is important to evaluate the habitat use for those predators and their prey in desert system, related to predation risk in a Landscape of Fear.

40 DIVERSITY OF SMALL MAMMAL TERRESTRIAL IN LOW EARTH FORESTS IN TRINIDAD, DEPARTMENT OF CASANARE, COLOMBIA

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After 48 days of sampling, with an effort of 7.128 trap-nights and a success of 3.70% in low territories forests of the Municipality of Trinidad, Casanare-Colombia. The alpha diversity of small terrestrial mammals is compared, in two zones of low earth forests, in this case of forests gallery with different intervention degree in the Municipality of Trinidad, Casanare, Colombia. The sampling carried out between the months of August and October of 2008. It was found that abundance species data in the village of Los Chochos, Las Plumas showed a normal distribution ($KS = 0.357$, $n = 11$, $P = 0.0073$) and randomness ($Z = 0.908$, $df = 10$, $p = 0.364$), just as in La Cañada, La Palmita, data showed normal distribution ($KS = 0.244$, $n = 7$, $P = 0.795$) and randomness ($Z = 0.456$, $df = 6$, $P = 0.648$). A total of 9 species of small mammals were recorded in the two study sites, the species accumulation curves show a different pattern for each site. Suggesting a strong human intervention and fragmentation of habitat in this area. Key Words: Small terrestrial mammals, Diversity alpha, Trinidad, insane forest, Casanare, Colombia.

41 EFFECTIVENESS OF PROTECTED AREAS IN CONSERVING MIGRATORY GUANACO (*LAMA GUANICOE*) POPULATION IN WESTERN ARGENTINA

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Effectiveness of protected areas in conserving migratory guanaco (*Lama guanicoe*) population in western Argentina Wurstten, Alvaro*; Walker, R. Susan y Andrés J. Novaro E-mail: alvarowurstten@gmail.com CEAN, Junín de los Andes, CP 8371, Neuquén, Argentina Even large reserves are often not effective to protect highly mobile animals. The San Guillermo and Laguna Brava reserves in western Argentina encompass 1.4 million hectares and were created to protect a largely intact high-Andean ecosystem that includes as dominant herbivores perhaps the most abundant sympatric populations of vicuñas and guanacos in South America. Both reserves are above 3,500 masl. Vicuñas are mostly sedentary and occur within the limits of the reserves, but guanacos are presumed to be migratory and leave the reserves seasonally, though no accurate data are available. To assess guanaco movement patterns and the degree of protection provided by these reserves we studied seasonal distribution of guanacos using line transect counts at five altitudinal strata between 2,000 and 4,500 masl inside and in the vicinity of the reserves. We surveyed 1888 km of transects on randomly selected sections of existing trails and counted 399 guanaco groups in 2007-9. Throughout the year, 73% of guanacos counted occurred outside of the reserves, mostly at 3,000-3,500 masl, with 6.8 guanacos/km in winter and 1.6 guanacos/km in summer. Guanacos at 2,000-2,500 masl were most abundant in winter and at 4,000-4,500 masl were most abundant in summer. We are studying patterns of plant productivity and snow cover to determine factors that explain seasonal movements. Our data suggest that at least part of the population moves altitudinally throughout the year, and that most guanacos are not protected by these reserves, particularly in winter. Measures should be taken to reduce poaching and limit competition from livestock in low areas.

42 GIS-BASED MODELING OF VOLCANO RABBIT (*ROMEROLAGUS DIAZI*) DISTRIBUTION AND ABUNDANCE

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The volcano rabbit is an endemic species considered endangered because of its limited distribution and specialized habitat requirements. As part of a monitoring program of this lagomorph in the Corredor Biológico Chichinautzin (COBIO), a natural protected area on the Mexican Transvolcanic Belt, we investigated its distribution and abundance in the area. From June to November 2006 we surveyed 115 randomly selected squares of 50 x 50 m, in areas located 2800 m above sea level. In each square we counted the number of letrins/m² as a presence record and abundance index. The results showed that the volcano rabbit was present only in 64 squares, with abundance ranging from 0.2 to 6 letrins /m². We develop a Geographic Information System (GIS) for modeling its distribution and abundance on the COBIO, combining the presence/absence and abundance observations with environmental layers such as altitude above sea level, orientation, aspect, temperature, current vegetation cover, presence of grassland, fire incidence

and soil types. Using a Generalized Linear Model we developed a model and projected it on the GIS to create a series of maps of the COBIO showing probability of occurrence and abundance. These maps will be useful to help in the identification of priority areas for volcano rabbit conservation on the COBIO.

43 GUANACO DISTRIBUTION AND ABUNDANCE IN CENTRAL TIERRA DEL FUEGO, ARGENTINA

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We present preliminary data on the distribution and density of guanacos of central Isla Grande de Tierra del Fuego, assessed during February 2008. The environment is a forest-steppe transitional zone, from the forested range to the Magellan steppe and is characterized by patches of forest interspersed with relatively flat river valleys covered with grass (vegas). The study area was divided in four strata: Forest, Ecotone, Steppe and inside the Provincial Reserve Corazón de la Isla. The survey was performed following a strip transect methodology, as animals move towards the vegas during noon and early afternoon. We flew along the vegas to record all animals in a strip of 1,400m width, using a Robinson 44 helicopter, during February 14th 2008. We recorded presence and group size of guanaco, from pictures taken from the helicopter using a digital camera. Position of records was build from the trackline registered by a GPS, which clock was synchronized with that of the camera. The trackline of the flight was split in transects of 550 long (based on territory size of guanacos) for analytical purposes in a GIS framework. Density was estimated using DISTANCE software. Overall guanaco density (\pm SD) was 2.05 (\pm 0.30) guanacos/km², in accordance with existing previous information. Density did not differ significantly among strata ($p < 0.01$): Forest (2.32 ± 0.85), Ecotone (2.70 ± 0.63), Steppe (2.80 ± 0.96) and Provincial Reserve (1.19 ± 0.31). The overall guanaco abundance for the area was estimated in 9445 ± 1382 animals. Guanacos were spread from the steppe to the forested range. These results contradict the knowledge about seasonal movements of guanacos, that would move from the low coastal areas to the Andean range in summer. A discussion on the relationship of the distribution and abundance of guanaco with cattle and sheep is also presented.

44 HABITAT DISTRIBUTION OF RACCOON DOGS AND BADGERS IDENTIFIED BASED ON FECAL DNA

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Raccoon dogs and Japanese badgers are omnivorous medium-sized mammals that inhabit Japanese forests near human habitation. In this study, in a region sympatrically inhabited by raccoon dogs and badgers, the individual animals that use the research site and their distribution were identified by using an identification method based on fecal DNA. In Satsumasendai city, Kagoshima prefecture, an area of 165 ha from the low grounds along the coast to the mountain land was set up as the research site, and field sign research based on exhaustive exploration was implemented in November 2006. Of the found feces, only fresh feces were collected and DNA was extracted. As a result of identification by microsatellite DNA typing, raccoon dogs were identified from 19 feces, and inhabitation of 10 raccoon dogs was confirmed; as for badgers, 30 were confirmed from 68 feces, and it became clear that a larger number of badgers than raccoon dogs inhabited this research site. Distribution of confirmed individuals indicated that raccoon dogs mostly inhabited the relatively low grounds while badgers mostly inhabited the mountain land. Also, a suitability evaluation of burrows and food resources of badgers, conducted along with this study in this research site, indicated a high evaluation for the mountain land with evergreen broad-leaved trees; also, the high density in the number of individual badgers on the mountain land reflected a suitable native habitat for badgers

45 IN THE PROTECTED AREA OF PENÍNSULA VALDÉS: ARE GUANACOS WHERE THEY WANT TO BE OR WHERE THEY CAN BE?

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The guanaco (*Lama guanicoe*) population has declined during the last century as a result of human activities. Competition with sheep for forage, poaching and habitat degradation are the main activities responsible for its decrease. In Península Valdés (PV) Protected Area there are more than 80 private ranches with sheep rearing as the only activity being developed, whereas few ranches also carry out an alternative activity to wool production (e. g. tourism). The objective of this study was to describe the relationship between guanaco and sheep abundances, and their responses to the paddock size, paddock primary productivity and management (sheep rearing or sheep rearing/tourism) in PV. Surveys consisted in counts of the number of guanacos detected from the roads. Interviews to ranch residents were conducted to obtain sheep abundance per paddock and its management. Paddock sizes were obtained from digitalized maps, and Enhanced Vegetation Index (EVI) derived from MODIS satellite images was used to estimate paddock primary productivity. Our results showed: 1) an inverse relationship between primary productivity and paddock size, 2) sheep densities were higher in more productive (smaller) paddocks, whereas 3) guanacos were more abundant in larger (poorer) paddocks in ranches where the main activity was sheep rearing; with the exception of those ranches where livestock production was combined with other management practices. The positive relationship between guanaco abundance and paddock size in sheep-rearing ranches could be the result of lower exposure to poaching through reduced access from the roads and/or increased stocking rates imposed by profitability restrictions in smaller ranches. Alternative activities combined with traditional practices, which have been suggested to improve incomes in small ranches, seem to favor guanaco occurrence in PV protected area.

46 NICHE PARTITIONING BETWEEN OTTER (*LONTRA PROVOCA*) AND ALIEN MINK (*NEOVISON VISON*) IN SOUTHERN CHILE

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Competition can be observed when one or both affected species vary their habitat use in the presence of the other. Competing species can relieve their conflict by modified their resource use patterns. In North America, mink and otter (*Lontra canadensis*) do not compete. In Europe it appears that Eurasian otters (*Lutra lutra*) affect minks. In Patagonia previous publications do not support the hypothesis of southern river otter and mink niche partitioning in freshwater habitats. However, these studies are non-conclusive, as low prey diversity and human disturbances in freshwater habitats make it difficult to test this hypothesis. Thus, since 2007 our research team has been assessing otter and mink interactions in the southern archipelago, Chile (marine habitat), by means of diet (665 scats analyzed) and frequency of visits by presence/absence (IRR) of both species in six different study sites. The first main component of southern river otter's diet was crustaceans (81% Frequency Occurrence), the second was fish 63% (FO) followed by bivalves (1%), sea urchin (1%) and gastropods (1%). Instead minks first component was crustaceans 58% (FO), the second rodents 30% (FO) followed by fish (19%), insects (13%), birds (6%) and amphibians (2%). Results of the IRR demonstrated that the most visited site by mink was the least visited by otters, instead the other five sites which were highly use by otters were less used by mink. Indeed, both species recorded similar overall IRR (mink: 3.05; otter: 3.48) but significant difference in their IRR overlap, otters recorded a total overlap of 1.58 of the mink's IRR, and mink a 0.6 of the otter's IRR. These results support the hypotheses that there is niche partitioning between southern river otter and mink. Further analysis of site use overlap will be assessed by static interaction analysis and avoidance by Spearman's coefficient of rank correlation.

47 OSTEOMETRIC ANALYSIS OF SEXUAL DIMORPHISM IN *LAMA GUANICOE GUANICOE* (MÜLLER 1776)

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In wild-living populations adult camelids are mainly sexed by observing their social and reproductive behavior, and on occasion, their genitalia (first order sexually dimorphic traits). Both biologists and archaeologists usually assume the absence of clearly identifiable sexually dimorphic somatic and skeletal traits among adult guanaco (*Lama guanicoe guanicoe*; Müller 1776) specimens. The relatively few studies that evaluate the osteological differences between sexes in this species, had been carried out using qualitative morphological traits from a rather limited set of skeletal elements, like the skull and pelvis. Therefore, the main objective of this paper is to contribute to the development of methodological tools aimed to accurately discriminate between sexes using morphometric techniques on a wider range of skeletal elements. In addition, we assess in this paper the existence and magnitude of the cranial and postcranial sex-related morphometric differences in a sample of modern guanaco specimens from Cinco Chañares, Río Negro, northern Patagonia, Argentina. The sample was composed by 32 individuals (8 males and 24 females) older than 2.75 years at the age of death. A standardized set of measurement was performed on 109 upper and lower canines, 66 lower hemimaxillae, 51 hemipelvis, 40 humeri, 39 radioulnae, 40 femora, and 41 tibiae. The obtained results show that the main morphometric differences between sexes are related to size variation in canines (second order dimorphic traits), and size and shape variation in the whole pelvis and acetabulum (third order dimorphic traits). In the appendicular skeleton no statistically significant differences between sexes were found, but this ought to be reevaluated increasing sample sizes, particularly that of male specimens.

48 PAMPAS DEER HABITAT USE PATTERNS: CONSERVATION IMPLICATIONS

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The process of pampas deer (*Ozotoceros bezoarticus* Linneus, 1758) decline is clearly visible in Uruguay, which is home to two endemic subspecies: *O. b. arerunguensis*, represented by a population with around 1000 individuals in north of the country and *O. b. uruguayensis*, with less than 350 individuals, located at Los Ajos in southeastern. Los Ajos population is located in several livestock ranches being interesting to study the spatial interactions and analyze the habitat use, home range size to design guidelines to conserve the pampas deer in the agroecosystems. We have nine radio tagged animals (four males and five females) and monitored during two years period. We located each individual by triangulation using "LOCATE II". Each individual location was mapped in the area using Arc View 3.3. Home-range size was estimated using the minimum convex polygon method in the Animal Movement 2.0 Extension for ArcView. The total occupation area in the ranch was 26 Km², being correlate with livestock density and food supply. The home range sizes showed wide inter individual variability (0,1 to 5,7 Km²; average $2,54 \pm 1,9$), being the males who had less variation ($1,82 \pm 1,83$ Km²), and the females who exhibited greater variation ($3,12 \pm 2,00$ Km²). This variation was related with the social structure, the males and females hierarchies, and as if the breeding season and reproductive condition. All the radio-collared females got pregnant or with fawns in the capture time. During the first and second year, we have seen four of the five females pregnant (80% of the studied sample). Our survey showed the pampas deer spatial use is closely related to land management and carrying capacity, being compatible the pampas deer survival in agroecosystems, not exceeding 0.5 cow per hectarea, and leaving some enclosures without ovine.

49 POPULATION DYNAMICS OF REINTRODUCED GUANACOS (*LAMA GUANICOE*) IN THE QUEBRADA DEL CONDORITO NATIONAL PARK, ARGENTINA

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In 2007 a population of 113 guanacos (*Lama guanicoe*) was reintroduced to the Quebrada del Condorito National Park (PNQC), in the mountains of central Argentina. Throughout two years of monitoring using radio-telemetry and conducting field observations we investigated the population dynamics of reintroduced guanacos and modeled their future projection by means of specific software (Vortex 9). Over 80% of the individuals died during the first three weeks after the release, primarily due to predation by pumas (*Felis concolor*) (43.8%) and factors associated with generalized weakness or infections (34.4%). Males died more than females (61% vs. 39%) and older more than younger adults (60% vs. 40%). Whereas, 22 individuals who exceeded the critical post-liberation period, successfully established three breeding groups or harems in their new habitat and produced 4 newborn "chulengos" in 2007 and 5 in 2008. Three out of the four chulengos born in 2007 died from weakness, and one due to puma predation, hence none survived over two months of life. Instead, two out of the five chulengos born in 2008 survived to the juvenile stage, while one died from weakness, one due to the entangled in a wire fence, and the other was killed by pumas. Our results on population projection suggest that the establishment of a viable guanaco population in PNQC depends on the reinforcement of the current population with further reintroduced individuals. It is also important to make specific management decisions to reduce the initial high mortality, including the introduction of more females than males, and the implementation of a "softer" release with a longer period of adaptation to the new environment. Thus, the success of the first reintroduction of guanacos in Argentina largely depends on properly planned actions.

50 THE *VICUGNA VICUGNA* INDIVIDUAL TRAITS, SEX RATIOS AND PHYSIOLOGY UNDER DIFFERENT ECOLOGICAL AND MANAGEMENT CONDITIONS

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In the Andean countries of South America, the vicuña is of interest because its adaptations are extreme amongst camelids and because its sustainable use is a conservation priority. Data on body size, sex ratios, age structure, blood biochemistry, hormone profiles and group composition are necessary to underpin both topics. These parameters were measured in 408 wild vicuña captured in Bolivia (n=91) and Chile (n = 317). Group size and structure are described for the captured animals in autumn and spring in Chile and only spring in Bolivia. Measurements including body weight, girth size, total body length and wither height were taken from all animals. Average body weight of vicuña in each age category was compared between countries (spring only); had lower mean body weight in Bolivia than in Chile. This paper summarises the main profiles of captured vicunas under different methods and ecological constraints

ECOLOGY AND EVOLUTION

51 A RODENT OUTBREAK FOLLOWING THE FLOWERING OF BAMBOO (*MERASTACHYS* SP.) IN SOUTH BRAZIL

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The phenomenon popularly known as "ratada" is an exception to population cycles. This phenomenon is characterized by the population outbreak of some rodent species associated with bamboo flowering. The bamboo (*Merastachys* sp.) is abundant in the fragment studied and its flowering was observed during the year of 2005 and beginning of 2006. Reproductive activity of rodents in the area continued into the subsequent autumn and winter, when rodent numbers reached peak levels and predators' populations (mostly snakes) increased in numbers. Six rodents were captured, *Oligoryzomys nigripes*, *Oligoryzomys flavescens*, *Akodon montensis*, *Sooretamys angouya*, *Euryoryzomys russatus* and *Thaptomys nigrita*. From these, just the three first species increased in numbers following the bamboo bloom and the total success of capture was 10%. The population suffered a reduction of 68.75% after winter, although the number of marked animals remained almost the same. The "ratada" event may not be cyclic as presumed, but rather triggered by exogenous factors such as bamboo blooms and rainfall peaks. Because of geographical and climatic regional differences, it would appear as if Brazil is affected chiefly by bamboo-associated. These observations led to infer that the seed abundance of bamboo caused the increase on rodent populations, suggesting that the food availability is one of the main factors that limit the rodent's abundance in forest systems.

52 ACCOUNTING FOR ECOLOGICAL DYNAMICS IN RESOURCE SELECTION FUNCTIONS FOR MAMMAL POPULATIONS

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A resource selection function (RSF) is defined by characteristics measured on resource units such that its value for a unit is proportional to the probability of that unit being used by an organism. It is solved using a variety of techniques, particularly via the binomial

generalized linear model. Observing dynamics in a RSF—obtaining substantially different functions at different times or places for the same species—alerts us to the varying ecological processes that underlie resource selection. We outline a suite of factors likely to govern ecologically based variation in a RSF for mammal populations. In particular, we draw attention to density-dependent habitat selection, the role of predation, longitudinal changes in resource availability, and functional responses in resource use. How best to incorporate governing factors in a RSF is currently in a state of development; however, we see promise in the inclusion of random as well as fixed effects in resource selection models, and matched case-control logistic regression. Investigating the basis of ecological variation in a RSF will allow us to develop more robust models when applied to forecasting spatial distribution. It may also further our understanding of the relative importance of ecological interactions on the distribution and abundance of mammals.

53 **ACTIVITY PATTERNS OF THE WATER OPOSSUM *CHIRONECTES MINIMUS* IN ATLANTIC FOREST STREAMS, SOUTHEASTERN BRAZIL**

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Activity patterns of the water opossum *Chironectes minimus* were studied through radiotracking in Atlantic Forest streams, southeastern Brazil. This study aimed to describe the daily activity rhythms of the species and to compare it with studies showing rhythms of other marsupials. Between July 2005 and October 2008, 13 animals were fitted with radio collars and monitored continuously from sunset to sunrise. Individuals were classified as active or inactive depending on the variation or constancy of the strength of the radio signal. In general, water opossums presented a unimodal activity pattern, with an activity peak in the first hours of the night, just like the majority of the neotropical marsupial studied, indicating a strong influence of phylogeny on the circadian rhythms. Individual differences in the activity patterns were observed ($X^2 = 267.485$; g.l. = 3; $P < 0.001$), that seems to be connected to a flexibility in the animals daily activity. Males and females showed distinct activity patterns ($G = 20.9$; g.l. = 3; $P < 0.0001$), but did not differ regarding either the length of the activity period or the timing of its beginning. The results of a multiple regression between activity length, animal body mass and night length ($R^2 = 0.68$; $F_{2,8} = 7.495$; $P = 0.01$) indicated a positive relation only with the night length ($P = 0.008$), which accounted for differences in the timing of activity among seasons. The times of activity beginning were correlated with sunset time for females in both seasons ($r_s = 0.705$; $n = 13$; $P = 0.007$) and for males only in the rainy season ($r_s = 0.664$; $n = 11$; $P = 0.025$), suggesting different time allocation between males and females. The differences found in the activity patterns between sexes are probably caused by differences in behavior, once only females were territorial.

54 **ADDITIONAL ADVANTAGE OF ENDOZOOCHORY BY MAMMALS: DISINFESTATION OF PARASITIZED SEEDS**

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In some arid ecosystems, large mammalian herbivores disperse and facilitate germination of many Fabaceae species by scarifying the seeds. Additionally, herbivores may reduce bruchid infestation by the action of digestive fluids that penetrate through the larval entry hole. Lastly, they may prevent reinfestation of seeds by simply removing them from the parent plant. In the Monte Desert *Prosopis flexuosa* is a key species; its pods are highly attractive to several insects and vertebrates. *P. flexuosa* depends on mammals for dispersal and germination of seeds. Before dispersion, seeds are attacked by bruchid beetles. The larva consumes a seed entirely if it completes the cycle, but scarified seeds containing early larval stages can germinate. We ask whether and to what extent different medium-size mammals in the Monte Desert disinfest parasitized *P. flexuosa* seeds. During secondary dispersal of *P. flexuosa* seeds, we collected recent feces of Patagonian hare (*Dolichotis patagona*), gray fox (*Lycalopex griseus*), and exotic European hare (*Lepus europaeus*) in Ñacuñan MaB Reserve. Every sample was analyzed separately to extract all the seeds and discard those that had already been depredated. Seeds were observed under the dissecting scope to determine non-infested and disinfested seeds (those with dead bruchids at different stages). We germinated disinfested seeds to determine their viability. The number and percentage of non-infested seeds per fecal sample was similar for fox (14 seeds, 69%) and Patagonian hare (12 seeds, 65%), but lower for the European hare (6 seeds, 68%). Seed damage by chewing was very low and similar for the three mammal species. Foxes disinfest 68% of bruchid-infested seeds, of which 13% germinate. Patagonian hares disinfest 64.4%, of which 11.3% germinate, and European hares disinfest 91.1%, of which 20% germinate. In conclusion, Patagonian hare and gray fox are highly effective in the dispersal and disinfestation of *P. flexuosa* seeds.

55 **AGE STRUCTURE OF FIVE DIDELPHID MARSUPIALS IN THE ATLANTIC RAINFOREST, RIO DE JANEIRO STATE, BRAZIL**

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Approaches on age structure of small mammals are usually limited to its description. Our study tests seasonality patterns in age structure of five didelphid marsupials of the Atlantic Forest. A capture-mark-recapture study was carried out every two months in the locality of Garrafão (22°28'28"S, 42°59'86"W), Rio de Janeiro State, from April 1997 to February 2009. Four age classes (II: juveniles, III: subadults, IV: adults and V: seniles) were estimated according to the eruption of the last molar. Circular statistics (Program ORIANA) was used to test the seasonality in age structure using Rayleigh's Uniformity Test (Z). A pattern of seasonality was significant for all classes of *Didelphis aurita* and *Marmosops incanus*. *Micoureus paraguayanus* showed significant concentration in the first three classes. *Metachirus nudicaudatus* and *Philander frenatus*, only in classes II and III. Our results denote a progressive substitution of age classes during the year as a consequence of seasonal reproduction, which is reported for these marsupials. *D. aurita* and *M.*

incanus were the most seasonal species probably because of their well-known marked breeding periods. *M. nudicaudatus* and *P. frenatus* were the least seasonal species, with classes IV and V present throughout the study. Some studies on *Philander* demonstrate a longer reproductive season or even continuous breeding. There seems to be a gradient of seasonality, with *D. aurita* and *M. incanus* at one end, *M. nudicaudatus* and *P. frenatus* at the other, and *M. paraguayanus* in between.

56 AGE-SPECIFIC CONTRIBUTIONS OF SURVIVAL AND FECUNDITY TO POPULATION GROWTH RATE OF A MARSUPIAL, *PHILANDER FRENATUS*

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Most studies on life history variation among mammals focus on eutherians, while marsupials have been largely overlooked. However, marsupials demonstrate a wide range of life-history tactics, spanning the slow-fast continuum. We analysed the life history of a didelphid marsupial *P. frenatus* (Olfers, 1818) and detected which age class most contributes to the population growth rate (λ), a major fitness component. A capture-mark-recapture study was conducted every other month in Cachoeiras de Macacu (22°31'15"S, 42°50'10"W), Atlantic Forest, Southeastern Brazil, from July 2007 to March 2009. Individuals were classified into five classes according to the eruption of the last molar (I: pouch youngs, II: juveniles, III: subadults, IV: adults and V: seniles). In each class, individuals have a specific probability of surviving and only the last three can reproduce. Sensitivity and elasticity analyses of population growth rate (λ) were calculated for every transition in life-cycle graph of *P. frenatus*. Sensitivity reveals how small changes in survival and fecundity will affect λ . Elasticity estimates the effect of proportional change in the vital rates on λ allowing comparison between survival and fecundity. The sensitivity of λ to changes in survival was greater in the class I (0.558), which means pouch young's class exerts more influence on λ because weaned individuals are vulnerable to predation and infanticide. The sensitivity of λ to changes in fecundity was greater in the transition from III to II (0.028), showing the importance of early reproduction. The energetic cost of the first reproduction may reduce future reproduction success, which makes contributions of subadults more important to λ . The elasticity of λ was greater in the first two transitions (0.196). Therefore, the individuals in the lactation and weaned periods should be under major selection pressure in this population of *P. frenatus*.

57 AGOUTIS AND SEEDS OF *ARAUCARIA ANGUSTIFOLIA* (ARAUCARIACEAE) IN SOUTHERN BRAZIL: REMOVAL DISTANCE, MICROHABITAT SELECTION FOR SCATTERHOARDING AND CUES FOR SEED RECOVERY.

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The behavior of scatterhoarding rodents can affect their role as seed dispersers of neotropical trees and has implications for seedling germination and survival. In this study, we investigated the relation between agoutis (*Dasyprocta azarae*) and *Araucaria angustifolia* seeds in Araucaria forest. We used spool-and-line techniques for comparing removal distance of cached and uncached seeds in seed-trial experiments. We also evaluated selection of specific microhabitat characteristics for caching or consuming seeds and also the potential use of visual landmarks by the agoutis for detection and recovery of buried seeds. We conducted fieldwork in a forest fragment (200 ha) in both summer (no availability of *A. angustifolia* seeds) and winter (seeds were available). Two-way ANOVA showed that seed fate and season ($F=6.44$, $P=0.011$) significantly affected removal distance (Winter – cached: $X=15.67$ m, $SD=2.01$ m; consumed: $X=2.10$ m, $SD=0.19$ m; Summer – cached: $X=10.26$ m, $SD=0.63$ m; consumed: $X=2.08$ m, $SD=0.20$ m) with significant interaction between both factors ($F=6.36$, $P=0.012$, $DF=1302$). For the scatterhoarding of seeds, agoutis selected sites with higher canopy cover, higher density of herbaceous cover and closer to trees in relation to randomly selected points. Ignorant agoutis found experimentally buried seeds using olfactory cues and not landmarks. However, the number of small trees and fallen logs was significantly higher close to buried seeds, indicating that agoutis could be using such characteristics as landmarks for recovering their own cached seeds. Such pattern was reinforced by fact that seedling occurrence was negatively related to these same possible landmarks. Since removal distance of cached seeds is positively related to seed density, the efficiency of agoutis as seed dispersers potentially increases during high-density periods. Additionally, the observed patterns of microhabitat selection for seed-burial sites might also alter the effectiveness of agoutis as seed dispersers of *A. angustifolia*.

58 *ALOUATTA SENICULUS* AS SEED DISPERSER IN FOREST FRAGMENTS AT THE EASTERN LLANO'S PIEDMONT, COLOMBIA

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At the eastern flank of the eastern mountain range (llano's piedmont) in Colombia, animal husbandry and crop systems have caused high levels of fragmentation and habitat loss. These, as a consequence, have produced local extinctions of some primate populations which are considered important in ecological processes such as seed dispersal. Understanding of the effects of this loss on forest dynamics and regeneration processes within the region is essential for management purposes. In comparison with other frugivorous primate species, *Alouatta seniculus* populations show great adaptive plasticity that allows them to persist in fragmented habitats. In spite of their folivorous behavior, these primates also include fruits and seeds in their diet which, as more important frugivores disappear, increases their value as seed dispersers. The role of this species as a seed disperser was evaluated (from December 2008 to March 2009) in 5 forest fragments of different size, at a cattle farm (Municipio de San Martín, Departamento del Meta). Fecal

samples were collected at the study site and processed in the laboratory to gather all seeds contained in the samples. These seeds, together with seeds obtained directly from fruit samples, were used to perform germination tests. Twenty-six plant species were found to be potentially dispersed by *Alouatta seniculus*. Germination times and capability varied among the different plant species. Based on resultant data, the role and importance of *Alouatta seniculus* as a seed disperser in fragmented forests at the llano's piedmont is assessed and discussed.

59 AN ARMADILLO IS NOT AN ARMADILLO IS NOT AN ARMADILLO: PHYLOGEOGRAPHY OF *DASYPUS NOVEMCINCTUS* IN MÉXICO

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Widely distributed species such as the Nine-banded armadillo (*Dasypos novemcinctus*) can occupy a variety of habitats across the landscape leading to the possibility of differentiation, by physical separation or ecological reasons. Phylogeography can reveal crucial gene lineage patterns in species with this type of distributions. The goal of this study was to determine the level and distribution of genetic diversity of armadillo populations in Mexico by means of sequencing the mitochondrial control region. The samples were obtained from field and museum specimens collected throughout Mexico ($n=110$). We detected high levels of nucleotide ($Pi=0.028$) and haplotype diversity ($H=0.95$) in this region. Also, we found differentiation between two lineages ($F_{st}=0.75$) that do not share haplotypes. These two lineages showed an allopatric distribution along the main mountains suggesting that the geographic distribution of the armadillo is partly determined by topography that could limit present and past dispersion. Finally, environmental niche models found differences among lineages proposing that climate conditions help to explain the pattern. Our data indicate that the nine-banded armadillo's populations in Mexico are result of two independent evolutionary histories, probably influenced by topographic and climatic factors. The divergent lineages found in Mexico, are informative about the historical colonization process of this species after the linkage of North and South America, during the late Tertiary period.

60 ARTIFICIAL NESTS AS AN ALTERNATIVE TO THE STUDY OF ARBORICOLOUS SMALL MAMMAL COMMUNITIES

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Small marsupials (*Didelphimorphia*, *Didelphidae*) comprehend 10% of mammal species in the Atlantic forest. When studying this group usually mark-recapture methods (MR) with live traps are used, which limits the analysis of less abundant species. We develop monthly, since June 2003, the artificial nest method (AN), using only bamboos to simulate small trees cavities. AN method was efficient in recording the less abundant species, easy-installing and maintaining, cheap and accessible to smaller grants when compared to MR method. The study was carried in an Atlantic forest area at Rio de Janeiro State, Serra dos Órgãos National Park (22°28'S, 42°59'W), Brazil. We also developed a small mammal population study since April 1997, in the same study area, every two months in five-night sections each. We use three 0.64 ha capture grids, with 25 trap stations each, 20 m apart (total MR effort=76,035 trap-nights; success=3.5%). The bamboos ($N=189$) have a 51 mm diameter entrance and were placed at 0, 2.5 and 5m high on 21 nest-stations, overlapping MR grids, a total effort of 9798 nest-inspections (success=5.2%). We recorded biometric measures and all individuals were marked with numbered tags. The MR program captured 109 individuals from 8 species and the NA method recorded 118 individuals (243 events) from 7 species. Only 22% of the NA recorded individuals were also by MR method. *Caluromys philander* and *Gracilinanus microtarsus* were only recorded in the AN, about 50% of the *Micoureus paraguayanus* and nearly 25% of *Marmosops incanus* were only recorded in MR. The AN method, besides innovative, revealed that approximately 78% of individuals present in the study area were not captured by conventional MR traps. It turns the method not only relevant in small mammal field studies but also as a possible test to probabilistic methods, recently used in population estimates.

61 BIOLOGY OF THE CHINCHILLA RATS *ABROCOMA SCHISTACEA* AND *A. USPALLATA* (CAVIOMORPHA, ABROCOMIDAE): AN ECO-MORPHOLOGICAL-BEHAVIORAL APPROACH

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The family Abrocomidae is endemic to South America, distributed over the central West, from Southern Peru to central Argentina; and includes six rock-specialist rodent species. The objectives of the present study were to characterize habitat, behaviour and morphology of populations of *A. schistacea* (31°45'24''S, 69°13'28''W, El Leoncito, San Juan Province) and *A. uspallata* (32°37'216''S, 69°17'93''W, Uspallata, Mendoza Province). We carried out live-trapping, tagging and recapture during 2006-2008. Standard body measurements, sex and age were determined for 10 *A. schistacea* and one *A. uspallata*. Burrows and vegetation were described. Diet composition was defined through micro-histological analyses of fresh faeces ($N=27$). The activity of *A. schistacea* was recorded by 17 footprint traps and 6 camera traps. Both species inhabit rock crevices along the pre-Andean foothills of the Monte desert. We found that *A. schistacea* lives in groups of 3-4 individuals, one male and two females or two males and two females ($N=3$). Some of their specializations for saxicolous life, such as morphology, foot pads for better traction on rocky surfaces and reduced nails are convergent with those of other saxicolous species. Both species appear to be at least nocturnal and crepuscular, if not occasionally

diurnal. The *A. schistacea* population showed a density of 0.15 ± 0.06 ind/ha. Dietary results of both species suggest trophic specialization due to a high proportion of creosotebush (*Larrea* sp., 30-90%). Width of the trophic niche was greater at El Leoncito (0.61 ± 0.01 , poor offer of trophic items) than Uspallata (0.42 ± 0.06 , higher cover and diversity of plant species) as expected from the theory that herbivores become more selective in richer trophic environments. The threats to these species are unknown and they are data deficient on the IUCN Red List. Protection of their populations should be undertaken because of their low abundance, restricted distribution and high level of habitat and food specialization. (Partially supported by CONICET, PIP 5944, Agencia, PICT 11768, Idea Wild and Conservación Argentina)

62 CDNA CLONING AND EXPRESSION OF ERYTHROPOIETIN IN THE PLATEAU ZOKOR (*MYOSPALAX BAILEY*) ON QINGHAI-TIBETAN PLATEAU

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Erythropoietin (EPO), produced by the kidney, stimulates the formation of red blood cells in bone marrow. The Plateau zokor (*Myospalax baileyi*), an endemic and keystone species living underground only at 2800–4200 m above sea level on Qinghai-Tibet Plateau, is a typical high hypoxia tolerant mammal with high ratio of oxygen utilization to cope with harsh plateau environment. To explore the molecular mechanism of ecological acclimation to altitude in the plateau zokor, we first cloned zokor EPO cDNA and compared its mRNA expression at sixteen different altitudes using real-time RTPCR (Taqman probe) technology. The full-length zokor EPO mRNA was 579 bp encoding the precursor peptide of 191 amino acids including 26 residues of signal peptide. Zokor EPO was 81-91% homologous to that of other species and had similar structural characteristics to other species. Zokor-specific genetic diversity in EPO sequence occurred at three sites. The expression of EPO mRNA in liver ($r=0.79$) and kidney ($r=0.78$) increased significantly with altitude but not with mean annual temperature (T_m , °C) or mean annual rainfall (R_n , mm). Our results indicated that EPO is sensitive to hypoxia and may play an important role in the zokor's adaptation to the high altitude plateau environment. Keywords: Erythropoietin; cDNA cloning; Plateau zokor; mRNA expression in different altitudes

63 CHARACTERIZATION OF THE CARNIVORE COMMUNITY OF A NAMIBIAN SAVANNAH USING DNA SEQUENCES FROM FAECAL SAMPLES

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Although carnivores are the focus of various studies, many basic aspects of their biology remain unknown. Such knowledge gaps include the definition of the precise geographic distribution and habitat associations of each species, and the resulting composition of carnivore guilds in the world's ecosystems. One approach to bridge this gap is to employ standardized molecular assays to rapidly survey the presence of carnivore species in a given area using field-collected faeces. We have developed a DNA sequence-based assay for this purpose, which targets a 172 bp segment of the mtDNA ATP6 gene. Given the promising results presented by this assay in Brazilian biomes, we are testing its performance in other areas, where the carnivore community should be totally different. The present study aims to survey the composition of the carnivore community in a savannah area of Namibia, and to assess the performance of our molecular assay in an African biome. Of 92 scat samples collected from June/2008 to November/2008, so far 50 have been identified, representing a minimum success rate of 54%. These sequences were compared to a database of carnivore reference samples, allowing the identification of cheetah (*Acinonyx jubatus*), leopard (*Panthera pardus*) and caracal (*Caracal caracal*) scats. Two additional well-supported phylogenetic clusters were observed, one representing a canid (likely *Canis mesomelas*) and another containing domestic cats and wildcats (*Felis silvestris*). It is likely that the latter represent African wildcats, as there is no current evidence of domestic cats in the study site. Finally, one of the samples revealed a distinct carnivore sequence that does not match any entry of our present database, likely representing a mongoose, genet or civet. Future steps in this project include an expansion of the sampling effort in southwestern Africa, as well as an improvement in the coverage of African species in our reference database.

64 COMMUNITIES OF MEDIUM-SIZED AND LARGE MAMMALS IN THREE PROTECTED AREAS IN THE FEDERAL DISTRICT, BRAZIL

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The process of fragmentation and habitat loss in the cerrado of Central Brazil has intensified in recent decades. In the last 47 years, around 60% of the natural vegetation cover was lost in the Federal District region, the largest remaining fragments almost entirely isolated within a dense urbanization matrix. The goal of this study was to assess the richness and abundance of wild mammal species in three protected areas: the Gama-Cabeça de Veado Environment Protection Area (EPA), with 25,000 ha, the Brasília National Park, with 42,329 ha and the Águas Emendadas Ecological Station, with 10,500 ha. Twenty-four camera traps were placed at intervals of approximately 2.5 km in each of the three areas and they functioned for a total period of six months: approximately three months in the dry season, and three months in the rainy season. A rarefaction analysis for the comparison of species richness and abundance showed no significant difference among the areas. However, the complementarity analysis performed, indicated strong differences in the composition of species among the areas: between the EPA and the Ecological Station, there was a complementarity of 68%, and between the other pairs, of 61%. The relatively few species recorded in each area may be related to an insufficient

sampling effort for registering rare species. The strong dissimilarity of species composition may indicate that relatively small reserves can only protect small sets of species, depending on particular ecological aspects of the area and the species' ecological demands. The dissimilarity may also suggest that the areas are isolated and the unfavourable matrix is effectively preventing the flux of animals.

65 COMPARATIVE PHYLOGEOGRAPHY OF SOUTH AMERICAN MARINE OTTER (*LONTRA FELINA*) AND SOUTHERN RIVER OTTER (*LONTRA PROVOCAX*)

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L. felina is a small otter species (4 Kg) distributed along the exposed rocky sea shore from Peru to Southern Chile (6°S-56°S latitude) while *L. provocax* is larger (12 Kg) and has the smallest geographical range of all otter species, found from 39°S to 56°S. Most of *L. provocax* distribution is south of 42°S and sympatric with *L. felina*, conversely they occupy different habitats. *L. felina* is found on islands and continental exposed rocky seashores while *L. provocax* is found in rivers and southern seashore channels and islands. This area was impacted by glacial cycles, which led to the extinction of many marine and terrestrial species. To study the phylogeographic pattern of *L. felina* and *L. provocax* we used mitochondrial DNA control region, cythochrome b and NDH5 sequences from non invasive samples (feces) of *L. felina* (n=162) and 53 samples of *L. provocax* along their distribution. Both species present high haplotypic diversity and reduced nucleotide diversity due their recent origin in South America. *L. felina* and *L. provocax* are closely related, being *L. felina* the most recently evolved. The basal haplotypes of *L. felina* found in Peru indicate the divergence between both species in this area and the colonization pattern towards the south. Glaciation cycles left signatures of reduced genetic diversity due to founder effect south of 42°S in *L. felina*; however, *L. provocax* maintained the diversity probably due to a distinctive glacial refuge.

66 COMPARING HABITAT QUALITY WITHIN AND BETWEEN ENVIRONMENTS USING GIVING-UP-DENSITIES

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We have developed a model, using the precepts of optimal patch use, which allows us to use deer feeding behaviour to compare habitat quality both within and between environments. Specifically we compare giving up densities (GUDs) with and without the presence of supplemental food in the environment in order to draw inferences about the relative quality of either habitats within an environment or distinct environments. We use our model to evaluate the impact of alterations to the winter habitat of deer in two distinct winter habitats. At Mont Rigaud, winter habitat is surrounded by farm land and gradually-expanding suburbs. Predators are rare and food is available in winter either in farm fields or around private houses. At Calumet, humans have less impact on the habitat, predators tracks are often found in the deer yard and there are neither farm fields nor private homes offering supplemental food near our study area. We offered food to deer in four habitats per site (forest, forest edge, clearing, clearing edge) with four to six replicates per site and measured the amount of food remaining after 24 h (the GUD). Analysis of these data, interpreted according to our model shows that deer are more sensitive to predation risk at Calumet rather than the additional food at Mont Rigaud. Within habitats, deer at Mont Rigaud do not react to clearings in their winter habitat but do treat areas where snow does not support them well as areas of high predation risk. At Calumet, deer have the same reaction to snow which does not support them well and clearings are treated as areas where the metabolic cost of foraging is high.

67 CONSEQUENCES OF EXTREME DROUGHT AND FLOODING EVENTS ON *MYOCASTOR COYPUS* IN THE DELTA REGION (ARGENTINA)

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The effects of extreme events of drought (EED) and flood (EEF) were evaluated on a coypu population (*Myocastor coypus*) and on related hunting activities in the Paraná River Delta (Argentina). Three representative years of EED (2006), EES (2007) and normal (2001) were compared according to their hydrological features. Six population parameters and four hunting activity indexes were estimated. The EED caused deterioration on coypu physical condition, a reduction in numbers and a small proportion of mature animals (probably due to emigration). They did not affect the sex proportion but the pregnancy rates and gross reproductive productivity were low. The EED would diminish the coypu reproductive capacity with variable consequences according to the time lapsed from the last event. The EEF also affected negatively most of these parameters but in a low proportion. Nevertheless, they would contribute to population recovery if a succession of previous EED took place. EEF events caused a delay in reproductive activity but did not affect the population viability. Both events would have synergistic or compensatory effects on hunting activity and vice versa. None of them influence the hunter's efficiency but contribute to harvest a larger proportion of the population, affecting the resource sustainability. When EED or EEF occur, we suggest reducing the authorized hunting season length, avoiding the activity in the nearby months and in those that parturition peaks take place. We propose to sample more areas during longer periods and to supplement the obtained results with information on dispersive and migratory movements of the species, source and sink areas, effects of variations in the related commercial activities and of changes in other economical activities. We also suggest the elaboration of models to predict coypu responses to these climatic changes and to use this species as an indicator of such events at landscape and regional scales.

68 CONSERVATION GENETICS AND EVOLUTION OF BIGHORN SHEEP (*OVIS CANADENSIS*) IN MEXICO.

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The economic significance of bighorn sheep in Mexico has avoided its orderly and rational management. Activities such as poaching, growth of urban settlements and the spread of diseases associated with cattle, have substantially impacted their natural populations. However, there have been efforts to reproduce and reintroduce individuals to wild populations but without a depth knowledge on the population genetics of the species, nor a study that provides information about the genetic diversity of the reintroduced individuals. The main objective of this study is to carry out an analysis of population genetics and molecular evolution of bighorn sheep in Mexico, to bring a genetic-based background for management, breeding and introduction. We have obtained hair, jaws and tissue samples (the two last obtained from regulated hunting) from 360 individuals belonging to several populations of Sonora (including 60 samples from Tiburon Island) and two populations of Baja California Sur. We genotyped 10 dinucleotide microsatellite and amplified 550 bp of the mitochondrial control region. Our findings show low genetic diversity on wild populations and lack of structure among them (but high among States). The levels of genetic diversity in captive populations were even lower, suggesting that management may have an impact on the genetic pool of bighorn sheep in Mexico.

69 CONSTRAINED ENERGY BUDGET AND DIGESTIVE PHENOTYPIC PLASTICITY IN THE RARE MONITO DEL MONTE (*DROMICIOPS GLIROIDES*)

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The relict marsupial *Dromiciops gliroides* inhabits the temperate forests of the Southern hemisphere, facing seasonal nutritional and energetic bottlenecks due to its apparently facultative insectivory/frugivory. Previous studies have shown that marsupials, contrarily with eutherians, do not exhibit phenotypic plasticity in intestinal morphology and function. We studied the morpho-physiological changes that *D. gliroides* exhibits after diet acclimation, in a sample of 24 wild-caught individuals fed during 1 month (1) only with fruits, (2) only with insects and (3) with a mix of insects and fruits. Based on simultaneous measurements of oxygen consumption (VO₂) and carbon dioxide production (VCO₂), we computed their respiratory quotient (RQ). This measure, together with body mass changes during acclimation, suggests that *D. gliroides* cannot fulfil its nutrient requirements only from insects or fruits. It needs a mixed diet to maintain body mass and energy balance. Based on enzyme assays (sucrase, maltase, trehalase and aminopeptidase-N) and measurements of organ morphology, we found that *D. gliroides* exhibits phenotypic plasticity in intestine form and function in response to diet acclimation. This study suggests that *D. gliroides*, the only living representative of the Microbiotheria order, exhibits adaptive phenotypic plasticity to a generalist diet, providing the first evidence of such a case in marsupials.

70 CROSS-TAXON COMMUNITY SIMILARITY

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Measures of community similarity have found broad application for examining changes in species composition. In habitat restoration, for example, success may be measured by increased similarity between restored areas and reference habitats, which represent a desired future condition. Examination of the response of multiple taxa (e.g., small mammals, butterflies) is usually recommended for evaluating the effects of habitat restoration efforts. If the responses are congruent across taxa, however, sampling efforts can be redirected. This paper examines how measures of community similarity co-vary across three different taxonomic groups. We calculated Chao-Jaccard similarities for small mammals, song birds, and herbaceous vegetation on 42 sampling areas in riparian-influenced habitats in northeastern Washington and adjacent Idaho, USA. Eight areas that represent reference conditions for four habitats (emergent wetland, wetland meadow, riparian shrub, and riparian forest) were monitored for 3 consecutive years to determine temporal variability. Areas under restoration were sampled at 3-year intervals. We used Mantel tests to evaluate the congruence of pairs of taxonomic groups. General congruence in community similarity for the three taxa was observed. This result is consistent with the few other studies that have looked at correlations in community similarity across taxa. This pattern, however, obscured differences associated with the level of habitat structure, the effects of disturbance, and overall species richness. We suggest that considerably more analysis be done before concluding that one taxon can adequately represent the response of another.

71 MOVEMENT AND DENSITY OF *PHYLLOTIS LIMATUS* (THOMAS 1912), A RODENT IN ATACAMA DESERT

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Phyllotis limatus es un habitante del desierto de Atacama, donde se distribuye en las costas áridas y pendientes andinas del Pacífico, alcanzando hasta los 4000 msnm. Con motivo de la ejecución de un rescate de fauna en un área de la prepuna chilena, tuvimos la oportunidad de capturar y marcar micromamíferos (marcajes con microchip), los que fueron relocalizados y monitoreados. A partir de esos registros estudiamos el desplazamiento y densidad de la especie en un ambiente semidesértico de altura. Pudimos registrar desplazamientos que alcanzaron hasta 2,5 kms en un individuo relocalizado y 1,2 kms en un individuo residente. Del

mismo modo podemos señalar que las densidades de *Phyllotis* en estos ambientes extremos son muy bajas y probablemente corresponda a un área marginal de su distribución. La información generada pretende aportar nuevos antecedentes ecológicos de uno de los habitantes del desierto más árido del mundo.

72 DIET AND FORAGING BY ATTWATER'S POCKET GOPHER (*GEOMYS ATTWATERI*) IN AN AREA OF RESTRICTED DICOTS

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Diets of Attwater's pocket gopher (*Geomys attwateri*) contain both monocots and dicots in a bunchgrass-annual forb community in Texas. In our earlier studies, breeding by females and population density declined when dicots were experimentally reduced and burrow systems were larger in areas of low dicot abundance. These effects may be caused by inadequate nutrition since dicots are an important source of nutrients. In the current study, we analyzed diet of Attwater's pocket gopher on plots where dicots were experimentally reduced. Preference for dicots increased with the result that dicot consumption was the same on dicot-removed plots as on control plots. Dicots were important to the diet because they contained more protein, lipid, soluble carbohydrate, Na, Mg, K, Ca, and P than monocots. Monocots may be ingested to balance protein: fiber ratio since amount of protein in diets overall was low. Since alteration in foraging compensated for lower availability of dicots in experimental areas, increased intraspecific interactions resulting from larger foraging areas may explain lower density and reproduction of *G. attwateri* in areas with lower availability of dicots.

73 DIET OF *PHILANDER OPOSSUM* (LINNAEUS, 1758) IN THREE TYPES OF HABITAT IN THE NORTHEASTERN OF PERU

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The Gray Four-eyed Opossum *Philander opossum*, one of the most common marsupials in the Peruvian Amazonian lowland is still poorly known. This study has the aim to analyze the diet of this species in three types of habitat (e.g., forest, purma, and chacra) from the Iquitos-Nauta area, Loreto, Peru. To capture the specimens we used a standard grid system with 70 stations per habitat using Tomahawk, Victor, and Sherman traps; obtaining a total of 19 stomachs. Stomach contents were divided in the following eight food categories, which mean volumen content for forest, purma and chacra are noted respectively: Chilopoda (23.00, 3.17, 1.20), Insecta (28.86, 23.61, 27.31), Chelicerata (2.09, 6.03, 3.28), Mollusca (0.00, 1.11, 0.34), Vertebrata (5.19, 13.93, 26.09), Fungi (1.00, 0.00, 1.42), Vegetal (21.71, 8.60, 15.04), and Seeds (1.15, 12.64, 5.89). The ANOVA showed significant differences between percentages of volumes from different food categories ($p < 0.05$), and Insecta was the category most consumed among all habitats according to the LSD Test. However, no significant differences were found among food categories per type of habitat (ANOVA $p > 0.05$); suggesting that habitat types are not relevant for the food category preferences consumed by *Philander opossum*.

74 DIET OF THREE SYMPATRIC NEOTROPICAL FELIDS IN SOUTHERN BRAZIL

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The quantification and comparison of the diet of sympatric species may help to elucidate some coexistence strategies in ecological communities. The aim of this study was to describe and compare the diets of three sympatric felids (ocelot *Leopardus pardalis*, oncilla *Leopardus tigrinus* and jaguarondi *Puma yagouaroundi*) in Natural Grasslands and Araucaria Pine Forest of southern Brazil. Fecal samples were collected monthly (12 mo) and identified through microscopic analysis of hairs. Food items were represented as frequency of occurrence (FO), percentage of occurrence (PO) and relative biomass. We calculated Levins standardized index (Bp) to assess niche breadth and Pianka's niche overlap index (S). We analyzed 63 ocelot scats, 36 oncilla scats and 51 jaguarondi scats. Both oncilla and jaguarondi had the greatest FO and PO represented by small mammals (mostly Cricetidae rodents), and birds secondly. These cats also had the highest relative biomass represented by cricetid rodents. The ocelot consumed more frequently small mammals (PO and FO), although medium-sized mammals (>1000 g) (mainly *Alouatta guariba clamitans*, *Dasyprocta* sp., and *Sphiggurus villosus*) were more representative in relative biomass. Oncilla had the lowest niche breadth index (Bp=0.102), followed by jaguarondi (Bp=0.115) and ocelot (Bp=0.138). Pianka's niche overlap indexes were high among these species (ocelot-oncilla S=0.993; ocelot-jaguarondi S=0.995; oncilla-jaguarondi S=0.999). Not only the low niche breadth indexes but also the high niche overlap indexes observed may have been influenced by (1) the low heterogeneity of the prey community in the study site and (2) the constraints of the level of prey identification. High food niche overlap suggests no clear ecological partition of these resources, although: (1) solely the ocelot consumed differently the prey category >1000 g, supporting the predator/prey body size relationship; (2) and some prey species were differently consumed by the three felids.

75 DIFFERENTIAL DEFAUNATION AND TOP-DOWN EFFECTS ON PLANT COMMUNITY IN BRAZIL'S ATLANTIC FOREST

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Large herbivorous mammals may exert top-down effects on recruitment and diversity of plants in tropical forests. Here, we investigate

the effects of large mammals abundance and biomass, and microhabitat conditions on species richness, diversity and biomass of seedlings in the Atlantic forest. In two nearby sites with identical species composition of large mammals but with marked differences in mammalian biomass, we placed 15 experimental stations (= EE) in each site; EE = control/excluded plots (15 m² each). All vegetation was removed at the beginning of the experiment. In each plot we set up six adjacent 1 m² quadrants to estimate: species richness, diversity and biomass of emerging seedlings (three quadrants) and trampling intensity (three quadrants). Unique pairs of quadrants (seedlings/trampling) were sampled at 6th, 12th, and 18th month after the beginning. To estimate trampling intensity we placed 33-34 artificial seedlings (flagged pieces of wire with 30 cm height) per quadrant, totalizing 100/plot. Artificial seedlings knocked down to below 50% of its height was counted as "death". Microhabitat conditions (canopy cover, litter, and bamboo, palmitos and tree densities) were summarized in the scores of a principal component analysis (PCA). The effects of mammalian on parameters of plants communities were modeled with a nested mixed effects approach (fixed: site/EE/treatment; and random: PCA-scores of microhabitat variables and trampling within each plot as an estimate of mammal activity). We found that after 18 months the biomass, species richness and diversity of seedlings were significantly different between sites but not between treatments. The parameters of plants communities were negatively affected by the mammals, mainly on the biomass, but their effects covaried with that of microhabitat. We conclude that microhabitat variables work together with the top-down role play by large mammals in the modeling plants communities in the Atlantic forest.

76 DYNAMICS OF A RODENT COMMUNITY IN AN ARAUCARIA FOREST OF SOUTHERN BRAZIL: PARTIAL RESULTS

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The Araucaria forests are found in cooler regions (subtropical) and are less complex and with fewer plant species than tropical forests of central and northern South America. The community of small mammals present in these forests could therefore show similar patterns to forests occurring in other temperate regions of the planet. Herein, we present partial results from a study of the dynamics of a rodent community in an Araucaria forest (National Forest of Passo Fundo, RS) in southern Brazil. Density was estimated by monthly mark-recapture trapping sessions lasting 6 days (from November 2008 to April 2009) on a grid of 231 trap stations, separated by 10 m (2.0 ha). Rodents from seven species were captured, *Oligoryzomys nigripes*, *Oligoryzomys flavescens*, *Akodon montensis*, *Sooretamys angouya*, *Euryoryzomys russatus*, *Thaptomys nigrita* and *Mus musculus*. The most abundant species was *Akodon montensis*, but the density of all species varied with season. The majority of the individuals captured were males in all species and seasons, except for *Mus musculus* and *Oligoryzomys flavescens*, where just a female were captured in the early summer. Simpson's diversity indices and trap success varied throughout the study, but with the summer and spring tending to be more diverse and higher, respectively. Further studies are necessary to determine the relative abundance and diversity of small mammals species in Araucaria forests, and understand the importance of dispersal, dynamics of potential food resources, and provide the data necessary to draw inferences about the community dynamics of small mammals.

77 DYNAMICS OF A SIKA DEER POPULATION IN HOKKAIDO, JAPAN - POPULATION RECONSTRUCTION USING KILL-AT-AGE DATA.

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We analyzed a dynamics of a sika deer population during 12 years (1990-2001) with changing killing (hunting and pest control) intensity from low to high. The population (yearlings and older) was reconstructed from sex- and age-specific numbers of kill data using cohort analysis. We defined the number of yearlings just after birth season as recruitment. We first examined relative contribution of killing rate and recruitment rate on annual changes in population growth rate. Second, we examined factors accounting for variation in number of recruitment. The population increased from 1990 to 1998, although the population growth decelerated after 1995. The key-factor was recruitment rate contributing 60% to annual change in population growth rate. The fecundity rate little varied during the period and couldn't explain annual variation in recruitment. The most realistic model for the number of recruitment included number of birth as a covariate and several factors that were population size in the previous two years and killing intensity of adult females (two years and older) accounting for juvenile survival rate. In other words, the population growth was density-dependently lowered. Nevertheless, the population size was not reduced by self-regulatory mechanism: population size was finally reduced, when hunting regulation for adult females was greatly relaxed. Negative effect of killing intensity of adult females on recruitment may support a previous study in white-tailed deer that orphaned fawns survived less than unorphaned. Thus, we conclude that killing adult females is a powerful mechanism to limit the population growth of deer.

78 EDGE EFFECTS ON SMALL MAMMALS IN SOUTHERN BRAZILIAN FORESTS: VARIATION ACROSS AREAS AND RELATIONSHIP WITH ARBOREALITY

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The increase of forest edges is part of the influence of the fragmentation on forest remnants and may affect mammal communities. For evaluating such edge effects we sampled five areas (> 200 ha) representative of South-Brazilian forests. In each of them we evaluated the abundance, richness, and diversity of small mammals in four habitats: matrix (> 60 m of the forest), edge (up to 15 m to the forest interior), intermediate zone (60 m to the interior), and forest interior (150 m). We also evaluated the availability of food

resources and structural characteristics of the vegetation. For a total of 446 individuals (20 species) captured, the results did not indicate evident edge effects for any of the community metrics. Such pattern may be explained by the lack of differences in structural characteristics between edges and the other forest habitats. We did not detect differences in resource availability (fruits and invertebrates) among the three forest habitats, either. However, rarefaction curves indicated specific edge effects for the sampled areas, generally with higher richness at the intermediate zone or else in the forest interior. The communities of the larger and better preserved areas were distinct from communities of more fragmented and disturbed areas. The distribution of the most common species did not seem to be influenced by edge effects. However, there were variations related to the disturbance level of each forest. *Juliomys* sp., for example, seemed to need more complex arboreal strata and *Delomys dorsalis* preferred less disturbed forest environments. The results indicated that regional factors (e.g. total size of the area, disturbance level of the surrounding habitats) seem to be more influential than local factors (i.e. edge effects)

79 EFFECT OF PATCH SHAPE, DISTANCE BETWEEN PATCHES AND PATCH SIZE ON ANIMAL SEED DISPERSAL: AN SPATIAL MODEL APPROXIMATION.

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Seed dispersal influences many key aspects of plant ecology, including maintaining of genetic variability among vegetal populations, metapopulation dynamics and spread of some invasive species. This process can be affected by forest fragmentation and most exactly by several spatial conditions generated by fragmentation like different patch sizes and shapes, diverse distances between patches or changes in habitat heterogeneity. In this study we evaluate the effects of landscape spatial arrangement on animal seed dispersal. We have developed a model for a generalized two patch system including simultaneously three spatial variables (patch size, patch shape, distance between patches). With the model, it was possible to vary the magnitude that takes each of the variables to know what is the effect on interpatch seed dispersal by bats. The model shows that the distance is the variable with the greatest impact over seed dispersal and like the bibliography says this variable can produce an interruption on interpatch seed dispersal and possibly generated and alteration on plants genetic structure. Also we found that the patch size can affect seed dispersal process because the results through by the analysis of the model showed that in big patches are lower rates of interpatch seed dispersion the opposite happens in small patches. Finally we found that model can represent the reality because the result that generates the model numerical analysis shows coincidence with the results of empirical studies. And the meaning of those situation it's that the model is a first approximation to see the effect of the three spatial variables on seed dispersal.

80 EFFECTS OF SIMULATED MOOSE (*ALCES ALCES*) DENSITY AND PRODUCTIVITY ON THE FIELD LAYER VEGETATION

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Large mammalian herbivores can have a strong impact on the ecosystem including plant reproduction and productivity. The moose (*Alces alces*) is a large mammalian herbivore inhabiting northern boreal forests that can affect flowering, reproduction and productivity of vascular plants by their selective browsing, defecation, urination and trampling. The present study experimentally tested the impact of browsing, urination, and defecation corresponding to four different levels of moose population density on flowering, reproduction, aboveground biomass production, and growth rate of plants in the field layer. We also tested if the effect of moose density was modified along a habitat productivity gradient. The study was carried out in the middle boreal forest zone north and north-west of Umeå in Sweden (63°50' N, 20°18' E). The 8 study sites (exclosures) were chosen to cover the whole habitat productivity gradient in the northern boreal forest. In the experiment we simulated browsing, defecation and urination corresponding to the different moose densities by clipping of their food plants and adding dung and urine. During the summer seasons 2006 and 2007 we collected data on reproduction and growth in the field layer vegetation. For 12 of 29 flowering plant species we found significant effects of simulated moose densities on reproduction, growth rate or production of aboveground biomass, or a combination of the above. Both positive and negative effects of moose browsing increased with increasing moose density and varied among plant species. We also observed a shift in the field layer composition with increasing moose density from dominance of woody species such as *Vaccinium myrtillus* and herbs to dominance of grasses such as *Deschampsia flexuosa*. In general, the effect of moose density was also modified along the habitat productivity gradient and negative effects of moose decreased with increasing habitat productivity.

81 EFFECTS OF SUPPLEMENTARY FEEDING ON MOOSE (*ALCES ALCES*) BODY WEIGHT, REPRODUCTION & HABITAT SELECTION

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The effects of forage availability, winter supplementary feeding and habitat selection on moose body condition, reproductive rates and autumn slaughter weights are being studied in two locations in south-east Norway. GPS collared moose cows and their calves have been weighed and monitored in 2 years in the first study area and are currently being followed in the second study area. Preliminary results suggest that moose cows lose proportionally more weight over winter than calves and winter weight loss was lower in individuals using feeding stations but only in the study area with a longer history of feeding and more severe winters. In the less snowy study area, cows using feeding stations only spent 30% of the winter within 500m of feeding stations and showed little

difference in winter weight change or reproductive rate from individuals not using feeding stations. In the same study area, winter habitat selection differed slightly between users and non-users of feeding sites with users selecting less for spruce and deciduous stands. However, commercially important young pine stands were favoured by both groups of moose suggesting that supplementary feeding will not reduce forest damage. Moose using feeding sites concentrated space use around feeding stations, becoming central-place foragers. Data collection is on-going but we expect that the effects of supplementary feeding on habitat selection and ecological fitness will increase with the proportion of time spent at feeding stations, and hence be greater in severe winters and as the duration of the feeding programme increases.

82 ENERGY EXPENDITURE, BURROW STRUCTURE AND DIGGING ACTIVITY IN THE CAPE DUNE MOLE-RAT *BATHYERGUS SUILLUS*

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Mammals utilise the underground ecotope for a variety of reasons. These may include avoiding predators, utilising food resources and as a thermal refuge. However, living and foraging underground can present a challenging prospect - often with high levels of carbon dioxide, low levels of oxygen, high humidities and involve large amounts of energy expended on digging. Solitary subterranean mammals are faced with particularly challenging circumstances, necessitating energetically expensive burrowing to both search for mates and forage for food. As males are generally thought to invest more time and energy in searching and displaying for mates, this restriction presumably affects males more than females. Hence, males are thought to dig longer tunnels that cover greater distances to search for mates. We excavated burrow systems of male and female Cape dune mole-rats, *Bathyergus suillus*, the largest truly subterranean mammal, to investigate whether male burrows differed from those of females in ways we predicted would reflect mate-searching by males. We describe the burrow architecture (length and internal dimensions) of tunnel systems and consider these measurements in relation to possible mating strategy. Males had longer tunnels that had higher fractal dimensions and expended greater amounts of energy excavating burrow systems than females. Male burrow systems were also further from one another than females were from other females' burrow systems. However, there were no sex-differences in tunnel shape, number of mounds produced per unit burrow length or mass of soil excavated per burrow system. Hence, whilst males may utilise their habitat differently from females, they do not appear to differ in the dimensions of the tunnels they create. Results support the hypothesis that exploration and use of the habitat differs between the sexes, which is likely to be a consequence of sex-related differences in mating behaviour.

83 ESTIMATED DIVERGENCE TIMES OF SIGMODONTINAE TRIBES BASED ON CYTOCHROME B AND INTERPHOTORECEPTOR RETINOID-BINDING PROTEIN GENES

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The South American rodent subfamily Sigmodontinae was believed to have its origin on migrant Cricetidae from North America that crossed the Isthmus of Panama, but recent molecular studies showed a divergence time for the group far older than 3 million years ago (Mya), when the isthmus was formed. Besides, the discovery of a late Miocene (5.7 Mya) cricetid fossil in Argentina finally rejected the Isthmus of Panama hypothesis. However, no time scale of tribes within Sigmodontinae has been done until now. The dataset is composed by sequences of 63 individuals (from 35 genera) available on the GenBank for the genes Interphotoreceptor Retinoid-Binding Protein (IRBP) and Cytochrome b. Alignment was done with ClustalW and the matrices were submitted to Modeltest. Since the GTR+I model was chosen for both genes, a single concatenated dataset was used therefore. The time scale was estimated with BEAST v1.4.8 using the uncorrelated lognormal model of rate evolution. As calibration information, the age of the root of the Sigmodontinae clade was constrained to follow a Gamma distribution with shape parameter =1.0 and scale parameter =5.0. The minimum value allowed was the age of the oldest known Sigmodontinae fossil: 5.7 Mya. BEAST is a MCMC algorithm that samples trees using the Yule Process. The estimated divergence time for the tree root (Cricetidae) was inferred at 7.7 Mya, this is earlier than the estimates from previous studies. The Sigmodontinae node was dated at 6.2 Mya, which is very close to the estimate of Steppan et al. (2004). The estimates for the monophyletic nodes within the Sigmodontinae are approximately 4 Mya for Akodontini, 3 Mya for Phyllotini, 2.5 Mya for Oryzomini and 2.9 Mya for Abrothricini. Even though the Akodontini tribe is slightly older than the others, the estimated dates share a similar interval of confidence, suggesting a rapid radiation.

84 ESTIMATING COYOTE NUMBERS ACROSS WYOMING, USA: A GEOSPATIAL AND DEMOGRAPHIC APPROACH

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Coyotes are currently managed in the state of Wyoming as a predator species and as such are subject to unregulated harvest. Non-governmental organizations are frequently critical of this management because the size of the coyote population across the 253,325 km² of the state is unknown, and therefore removal has an unknown impact on the coyote population. To effectively manage coyote numbers across the state, a viable population estimate is needed to alleviate these concerns and allow for more informed management decisions. Traditional population estimation methods, such as mark-recapture or mark-resight, are difficult, costly, and time consuming. Application across Wyoming would be impracticable and require an exorbitant amount of funding, personnel, and time. We examined population parameters (density, survival, etc.) obtained from literature to predict coyote densities for specific habitats and land uses across the state. To obtain observed densities for comparison to the literature, scat-deposition surveys were conducted along a total

of 475 1-km transects assigned throughout the state. Regression analysis of the predicted density from the literature versus the observed density from the scat surveys indicated that modeling coyote densities from literature did not accurately predict coyote densities ($r = 0.22$, $p = 0.45$). We present a large-scale sampling scheme stratified across habitats and levels of protection (land use) to estimate coyote numbers for the state.

85 FACTOR AFFECTING SEED HOARDING STRATEGY OF RODENTS: A REVIEW ON PROGRESS IN CHINA

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Many factors may affect seed hoarding strategy of rodents in forests. During past decade, we have investigated seed hoarding strategies of small rodents in several field stations covering tropical, subtropical, warm temperate, temperate zones in China. We found seed traits, especially seed hull, seed size, tannin contents, germination schedule affect seed removal, seed caching, seed consumption and seed fitness, significantly but depending on the region or sites. We also presence of seed abundance, rodent abundance, competitor, predator also affect hoarding behaviors of small rodents. These impacts may in turn significantly affect seeding regeneration and evolution of seed traits of forest trees.

86 FIRST DATA ON THE SOCIO-SPATIAL ORGANIZATION OF WOODLAND DORMICE (*GRAPHIURUS MURINUS*)

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The socio-spatial organisation of Woodland dormice, *Graphiurus murinus* (Rodentia, Gliridae) was investigated from February 2006 to June 2007 in a riverine forest of the Great Fish River Reserve, South Africa. Spatial locations for 13 adults (5 males, 8 females) were determined through a monthly live-trapping and nestbox-monitoring programme. On average 24 ± 14 locations were collected per individual, over study periods of 247 ± 81 days. Dormice home-range size averaged $2,514 \text{ m}^2$ (range: $319 - 4,863 \text{ m}^2$). Male dormice ($3,989 \pm 950 \text{ m}^2$) had home ranges almost twice as large as females ($2,091 \pm 785 \text{ m}^2$; $p = 0.019$). Intrasexual home-range overlap was significantly larger in males ($62 \pm 12\%$) than in females ($26 \pm 13\%$; $p = 0.002$). However, females overlapped with more neighbouring female home ranges (5.5 ± 0.9) than did males with neighbouring male home ranges (4.0 ± 0.0 ; $p = 0.006$), so that, as for males, only little parts of female home ranges were really exclusive. Males overlapped a larger proportion ($48 \pm 10\%$) of female home ranges than did females with neighbouring male home ranges ($27 \pm 15\%$), although the difference did not reach significance ($p = 0.0065$). In addition, males overlapped with significantly more female home ranges (7.8 ± 0.5) than did females with male home ranges (4.9 ± 0.4 ; $p = 0.002$). Overall, the dispersion pattern of females was rather clumped, even during the breeding period, suggesting that females are not territorial. As some females showed a dyadic intrasexual overlap of up to 90%, and population density was very high at the study site (up to 16 dormice/ha), this indicates that food was very abundant and/or renewed rapidly during the study period. Sexual receptivity in females was asynchronous. In such circumstances, the Female in Space and Time Hypothesis predicts that males will be non-territorial and promiscuous. Trapping, nestbox and home-range data indeed suggest that male Woodland dormice do not defend territories, but search for and aggregate around receptive females during the mating season.

87 FIRST INSIGHTS ON THE DIET OF *LONTRA LONGICAUDIS* IN AN ESTUARINE ENVIRONMENT IN SOUTHEASTERN BRAZIL.

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There is clearly a lack of information about the use of marine-driven environments by the neotropical otter, since most studies have been conducted in freshwater systems. In this study, we evaluated the importance of each major group of prey of *Lontra longicaudis* from the analysis and taxonomic identification of food fragments contained in 22 scat samples, collected on the banks of Itapanhaú river, municipality of Bertioga, São Paulo State ($23^{\circ}48'47''\text{S}$, $46^{\circ}07'10''\text{W}$), which is mangrove-covered and directly influenced by the tide. We used frequency of occurrence and score-bulk estimate as methods of analysis of samples to take into account not only the occurrence but also the volume of the prey group consumed. With the combination of parameters, two indices were determined to express the importance of different prey in the diet of the animals. The crustaceans, which are predominant in occurrence (FO = 91%) and volume (SBE = 85.5%), comprised largely the basis of the diet of otters in the study area and are therefore the largest group of most important prey, with a Rescaled Importance Index (RII) of 0.924, on a scale ranging from 0 to 1. Fish are secondary items because, although present in 50% of the samples, they show a RII of 0.075, due to the low volume found in the samples (SBE = 12.7%). The remaining value (0.001) of the scale of importance is distributed among birds, mammals and unidentified groups, uncommon in the samples analyzed. These results were different from most previous studies, in which the fish appear as the main item. With new data collections and accumulation of data, we expect to obtain fluctuations in the some of our results to account for a possible seasonal pattern in the diet of otters in this area.

88 GENE TO JAW: POPULATION GENETIC STRUCTURING IN EUROPEAN WOODMICE *APODEMUS SYLVATICUS*

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Woodmice occur in contiguous habitats in western Europe. Dispersal capabilities suggest that population structuring does not occur.

We test this hypothesis using microsatellite and mitochondrial genetic data, stable isotope analyses and lower jaw morphology at three replicate study sites. The genetic studies show that mice in forests comprise two groups based on peripheral and central locations while mice on field boundaries comprise a third group, within distances of less than 1km. Stable isotope analyses and jaw morphology indicate corresponding trophic isolation among these three groups indicating repeated ecological as well as genetic isolation in the absence of physical barriers to dispersal. These data suggest that small mammal populations are comprised of genetically discrete units associated with habitat blocks and that local adaptation occurs within these blocks. This population structuring is likely to be maintained by behavioural means e.g. philopatry. Hence, early stages in speciation are not dependent on geographical isolation.

89 GUANACO SOCIAL ORGANIZATION: VARIATION IN HAREM SIZE SUPPORTS JARMAN'S HYPOTHESES

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Since Jarman's (1974) seminal study on antelope social organization, predation risk and feeding habits have been accepted as major factors shaping ungulate grouping patterns. However, few studies have assessed the effects of these factors simultaneously on a single species. According to current theory, high predation risk and predominance of grasslands favor the formation of larger social groups in open-dwelling ungulates. Guanacos (*Lama guanicoe*) have a flexible behavior both in their feeding habits and social organization, allowing for comparative studies in contrasting ecological scenarios. We modeled guanaco harem size (i.e. n° of adults in family groups) across five populations in order to test Jarman's predictions. We fitted a nested random model to account for variation inherent to each site at different scales, where vegetation type at stratum (km²) and patch (m²) scales were the random factors selected. Afterward, we tested the effects of predation risk, vegetation structure at patch scale, and local density by fitting a fixed effects model. We found that guanaco groups were larger at sites where predation risk was high than at predator-free sites, and harem size was larger in grasslands than in shrublands. These results support the idea that antipredator benefits induce group formation whereas dispersion and availability of key resources place the upper limit on guanaco group size.

90 HABITAT REQUIREMENTS OF TWO AFRICAN MOLE-RATS WITH A DIFFERENT SOCIAL SYSTEM IN THE AREA OF SYMPATRY

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African mole-rats (Bathyerigidae, Rodentia) are known for a high diversity of their social systems represented by solitary, social and eusocial species. Evolution of sociality in this strictly subterranean family is still debated. According to the Aridity-Food Distribution Hypothesis (AFDH), sociality evolved in areas with low and unpredictable rainfall, extremely soft or hard soil types and clumpy distribution of food resources. We investigated the habitat requirements of two mole-rat species with contrasting social organisation in the area of sympatry in two sites in Nyika n. p. (Malawi) in 2008. Whereas the solitary silvery mole-rat (*Heliophobius argenteocinereus*) occurs in high-elevated alpine grasslands, the social Whyte's mole-rat (*Fukomys whytei*) is found in low-lying miombo woodlands (*Brachystegia* sp.). We analysed soil parameters (hardness, moisture, density and skeleton) and food characteristics (biomass, density and spatial distribution of geophytes) along the burrow systems of 12 silvery mole-rats and 10 families of *F. whytei*. In addition, we analysed the same parameters for 10 burrow systems of the silvery mole-rat in miombo mnt. (where social species does not occur naturally). Our results partially support the AFDH presuppositions. Social species was found in harder soils if both species occurred sympatrically. We also found higher biomass and larger tubers along systems of the silvery mole-rats in Nyika and in Mulanje. There was no difference in the spatial distribution of food between the habitats of both species. It seems that the solitary silvery mole-rat needs sites with higher food supply and softer soil, whereas its social counterpart could inhabit also sites with low food supply and hardly workable soil. Absence of social species in alpine grasslands, where there is higher food supply and more easily workable soil, could be caused by its less effective thermoregulation capabilities (soil temperature in the *Heliophobius* burrow systems in Nyika n. p. was remarkably lower compared to the system of social species). We suppose that the cooperative way of life could be a preadaptation for colonization of extreme habitats with low food supply and hardly workable soils. The study was funded by GAAV (KJB601410826).

91 HABITAT SELECTION OF TWO SYMPATRIC ARMADILLOS: IMPLICATIONS FOR THERMOREGULATION

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Thermoregulatory behaviours have an important function in the energetic economy, in the assignation of energy and, in conclusion, fitness. The selection of habitats with favourable microclimates has a great signification in the survival, particularly in arid lands, where the pronounced local cycles of temperature tend to soften under vegetable cover. The armadillos present thermal limit to their distribution, consequently their present and abundance should be determined for the habitat characteristic. Our aims were: 1) determine if the presence and abundance of the two armadillos differ between high and low complexity habitat; 2) identify which habitat variables are associated to mammal's changes; and 3) examine the different strategies develop by armadillos. Data surveys were done during dry seasons 2001–2002 and wet seasons 2003–2004 in the Chaco Arid. We measured fourteen variables to characterize the habitats in light and severe degraded sites. In each site the relative abundance of *Chaetophractus vellerosus* y *C. villosus* was estimated. The analysis showed that light and severe degraded habitat presented differences in their complexity. During dry season two armadillos were more frequent (*C. vellerosus* p=0.0533 and *C. villosus* p=0.0221) and more abundant in the sites with major structural complexity (*C. vellerosus* p<0.0001 and *C. villosus* p=0.0069). During wet season were no differences in the present and

abundance of *C. vellerosus*; only *C. villosus* increased their abundance in more complex sites ($p=0.002$). The sites selection with high vegetable cover associated at soil that permit the building burrows and higher food availability -aspects that optimize the energetic balance- may be the key for the two species in the dry season. The strategy for *C. vellerosus* would be to modify its daily activity pattern. Implications of Global Climate Change and Desertification on the armadillo's conservation are discussed.

92 HABITAT USE AND ACTIVITY OF UNGULATES USING CAMERA TRAPS IN EL REY NATIONAL PARK, ARGENTINA

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This study was conducted in El Rey National Park (44,162 ha), located in Salta's province, in northern Argentina. It protects mountain forests and the transition to Chaco Serrano forests environments. Most of it consists of mature forests, nevertheless, about 11% of it is regenerating, which once were pastures. The aim of this study was to assess the use of mature and regenerating forests and to establish activity patterns of the brocket deer (*Mazama guazoubira*), tapir (*Tapirus terrestris*) and peccaries (*Tayassu tajacu* and *T. pecari*). 28 stations of camera traps (2) were placed from February to April and from September to November 2008, in both forests. Cameras remained active between 10 and 15 days. The sampling effort was 225 trap-night in the regeneration forest and 190 trap-night in the mature. We found no difference in the use of both forest types in any of the studied species (tapir: $X^2=0.08$ $p=0.96$; brocket deer: $X^2=0.01$ $p=0.99$ and collared peccary: $X^2=0.01$ $p=0.99$), except white-lipped peccary that use more the mature forests ($X^2=7.90$ $p=0.02$). Tapir showed higher activity between 20 and 7 hours ($n=101$). Brocket deer was mainly diurnal and within this period it was variable in the activity records ($n=16$). The collared peccary presented two peaks, between 8 to 12 and 18 to 20 hours ($n=21$). While the white-lipped peccary was more active from 10 to 18 hours ($n=23$). Knowing how the species use different environments and their activity hours is essential to better understand how they relate to their habitat and with other species. This will also allow to be more accurate to define conservation and management strategies at local and regional scales.

93 HABITAT USE AND SPACE PARTITIONING AMONG THREE SYMPATRIC SMALL MAMMALS IN THE PANTANAL SUL-MATOGROSSENSE, BRAZIL

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Sympatric species coexist due to the segregation in at least one of the three main niche dimensions – diet, time and space, the latter being considered the most important dimension for small mammals. In the present study, we investigated the habitat use and the space partitioning among three sympatric small mammals (*Clyomys laticeps*, *Thrichomys pachyurus*, *Monodelphis domestica*) in landscape (habitat types) and microhabitat scale (vegetation structure). The study was conducted in Fazenda Nhumirim (4.390 ha; 18°59'S e 56°39'W), Pantanal, central Brazil. Eight sampling events were carried out between March and November 2008, with four consecutive nights of trapping in each event yielding a total trap effort of 10053 trap-nights. The animals were captured using Sherman and Tomahawk live-traps distributed in thirty-five sampling units, systematically. In the landscape scale the sampling units were classified in five habitats types and in the microhabitat scale the sampling units were described according seven variables of vegetation structure. *Clyomys laticeps* and *M. domestica* were found in all habitats, while *T. pachyurus* occurred in higher abundance in closed vegetation habitats. In the microhabitat scale, the occupancy probability of *C. laticeps* was related with the abundance of *Attalea phalerata* palm and the occupancy of *M. domestica* and *T. pachyurus* were related with the cover of *Bromelia balansae* bromeliad. Despite of the high abundance of all species in closed vegetation habitats, in these areas, the rodents which presented similar ecological traits (diet, body size and activity), showed segregation in the microhabitat selection, while *M. domestica* and *T. pachyurus*, which occupied similar microhabitat, presented low overlap in diet and activity. Our results suggest that the spatial overlap in the landscape scale may be compensated by segregation in the microhabitat scale or in other niche dimensions.

94 HISTORICAL POPULATION GENETICS OF AN ENDANGERED RODENT IN THE FLORIDA KEYS.

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The Key Largo Woodrat (*Neotoma floridana smalli*) is an endemic rodent with a geographic distribution that is disjunct from all other conspecifics and limited to tropical hardwood hammock habitat on Key Largo in Florida. Forty-seven percent of the hardwood habitat suitable for woodrats has been lost since 1973. Two captive breeding programs have been established to maintain current genetic diversity and hopefully reintroduce woodrats back into suitable habitat. Current estimates of woodrat abundance are between 26 and 106 individuals. Estimates of effective population size (the actual number of breeding individuals) are underway. In addition, estimates are being made of the current genetic diversity found in this small, and dwindling, population. A small sample of 19 woodrats were collected in the 1950s and exist as prepared vouchers (skins plus skulls) at the Florida Museum of Natural History. We have sampled the prepared specimens by removing a small piece of skin from the ventral suture line for genetic analysis. We have successfully amplified and genotyped 15 variable microsatellite loci within the population. Estimates of genetic diversity from the 1950's samples was compared to modern samples from the same 15 microsatellite loci. This study will help to assess the amount of genetic variability that was present in the 1950s but has since been lost, as populations have dwindled.

95 HOW DOES PREVAILING WEATHER PREDICT RED DEER MOVEMENT RESPONSES AT DIFFERENT TEMPORAL SCALES?

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The home range concept has long been used to increase knowledge about ecological and evolutionary aspects of animal space use, but its conceptual usefulness remains controversial. A range of factors are known to influence home range size, but how these factors operate may differ depending on which spatial and temporal scale the home range is estimated. On the temporal scale, home range sizes are expected to vary as a response to changing environments and animal needs. On the spatial scale, home range size may be determined by the distribution of habitat types within the area and their associated costs and benefits, i.e. how limiting resources are distributed relative to each other. Here, we investigate the factors determining home range size at different temporal and spatial scales using GPS telemetry data from 48 female red deer in Norway. Climatic variables had a large influence on home range size on the longest time scales (months-every two weeks). The effect of temperature varied depending on season, with home range size increasing when temperature was higher than expected during winter and the inverse relationship during summer. Home range size generally decreased as snow depth exceeded expected levels, and there was a positive relationship with precipitation during all seasons and all temporal scales. Day length, which may be used as a crude estimate of plant productivity, was negatively correlated to home range size, but only on the daily time scale. Home ranges dominated by habitats low in forage were generally larger than home ranges dominated by forage-rich habitat types. Our study shows that scale should be carefully considered when analysing home range size, as different biological processes may operate on a particular temporal and spatial scale.

96 INSIGHTS INTO THE EVOLUTIONARY HISTORY OF SINGING MICE, GENUS *SCOTINOMYS*

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Insights into the evolutionary history of singing mice, genus *Scotinomys* Jorge Pino*; Polly Campbell; Bret Pasch; David Reed; Steven Phelps *Department of Biology, University of Florida; Gainesville, FL 32611-8525. *E-mail: jlpino@ufl.edu The genus *Scotinomys* is restricted to the Mesoamerican mountains at elevations above 1000m. Two species, *Scotinomys teguina* and *S. xerampelinus*, are formally recognized based on the last revision of the genus published more than 35 years ago (Hooper 1972). According to the literature, *S. teguina* is distributed from south-western Mexico to western Panama with a major population disjunction due to the Nicaraguan Lake depression lowlands, and *S. xerampelinus* occurs only south of the Nicaraguan Lake, both species end their distribution in western Panama. In the southern part of their range they segregate elevationally with *S. xerampelinus* found at higher elevations (above 2100m) with a few documented zones of sympatry at the lower distributional range of *S. xerampelinus*. This research examined the relationships of populations of both species throughout their distributional range by analyzing mitochondrial DNA sequences. Samples were provided by museum and field collections. Our analyses confirm haplotypes of what was thought to be *S. teguina* in populations to the north and south of the Nicaraguan Lake, showing geographic structure among populations. Results suggest an interesting demographic history with evidence of a bottleneck in the southernmost populations of *S. teguina* and a recent expansion in northern populations. Haplotypes of former *S. xerampelinus* (Costa Rica-Panama) were present in populations to the north of Lake Nicaragua, suggesting the possible presence of disjunct populations that would greatly expand the previously suggested distributional range. The mtDNA tree generated suggests other species level relationships, but nuclear data must be added to the existing dataset to test this prediction thoroughly.

97 ISOTOPIC ECOLOGY OF TWO SYMPATRIC SOUTH AMERICAN CAMELIDS: PRELIMINARY RESULTS

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We explored the isotopic signature ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$, and δD) of sympatric vicuñas *Vicuña vicugna* and guanacos *Lama guanicoe* inhabiting the high Andes of San Juan province in northwestern Argentina. We obtained bone collagen from the posterior section of the mandible from guanaco and vicuñas carcasses that spanned a wide-range of age classes (from ? 1 week- to ?11 years-old). We explored differences in $\delta^{13}\text{C}$, $\delta^{15}\text{N}$, and δD values between both species. We generated bootstrapped estimates of means and 95% confidence intervals for $\delta^{13}\text{C}$, $\delta^{15}\text{N}$, and δD . Values of $\delta^{13}\text{C}$ were similar for both species (vicuñas: $-20.2 [-20.5 - -19.8]$, $n = 18$; guanacos: $-19.8 [-20.2 - -19.4]$, $n = 19$), while values of $\delta^{15}\text{N}$ were slightly different, with vicuñas ($8.1 [7.3; 8.8]$, $n = 18$) being enriched compared to guanacos ($6.9 [6.3 - 7.3]$, $n = 19$). Likewise, vicuñas ($-54.4 [-65.6 - -43.8]$, $n = 15$) were enriched in δD relative to guanacos ($-59.9 [-79.7 - -50.7]$, $n = 20$). The similarity of $\delta^{13}\text{C}$ signatures suggests substantive dietary overlap between these closely-related species. This observation corroborates previous findings obtained from stomach and pellet analyses. Because vicuñas were enriched in $\delta^{15}\text{N}$ and δD , our results suggest that they (1) could be more tolerant to xeric conditions compared to guanacos and; (2) may obtain water primarily from consuming plants rather than drinking open sources of water. This is in contrast to previous work, which has described vicuñas as obligate water drinkers.

98 LEVELS OF FLUCTUATING ASYMMETRY IN *GRAOMYS GRISEOFILAVUS* (2N=34-38) AND *GRAOMYS CENTRALIS* (2N=42) (RODENTIA: SIGMODONTINAE)

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Developmental instability is related with stressful conditions and with high levels of fluctuating asymmetries (FA). FA comprises small

and random departures from perfect symmetry and its levels may increase when chromosomal rearrangements occur. Robertsonian chromosomal polymorphism has been described in the South American Sigmodontinae rodent *Graomys griseoflavus*, from animals with $2n=34$ to $2n=38$. In order to determine levels of FA in *Graomys griseoflavus*, a preliminary analysis was performed on the basis of geometric morphometrics approach. For the analyses, I used twenty specimens of *G. griseoflavus* previously karyotyped, with $2n=36-38$. Additionally, seventeen specimens of *G. centralis*, with $2n=42$, were used for a comparative analysis of FA levels between species. Eighteen landmarks were digitized in ventral view of skull, 16 of them were paired landmarks and the other two, unpaired. The landmarks were digitized three times in different occasions and in each specimen in order to estimate measurement error. For each species, I tested whether directional asymmetries (DA) were different from zero and whether FA were significantly higher than measurement error by means of Procrustes ANOVA. Difference in FA levels between species was evaluated by mean of F-test using the mean squares of the individual x side interaction and the degrees of freedom of the corresponding Procrustes ANOVA, thus avoiding the presence of DA. In both species, the Procrustes ANOVA revealed significant DA and FA. The comparison between species showed that the degree of FA in skull shape in *G. griseoflavus* was significantly higher than in *G. centralis* ($F_{304, 256}=1.42$; $P<0.01$). These results suggest that chromosomal rearrangements may have disrupted coadapted gene complexes, impairing developmental homeostasis and increasing FA levels. Additional studies are necessary to properly assess FA differences between those species and to compare FA levels in heterozygous and homozygous individuals of *G. griseoflavus*.

99 MAMMALS AND THEIR LANDSCAPE HABITAT ALONG A GRADIENT OF MATRIX DEVELOPMENT INTENSITY

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Human development of the landscape matrix threatens mammal species survival and mammal community integrity globally. The importance of the matrix is increasingly recognised, through its pervasive impact on habitat and functional landscape connectivity. The matrix is not uniform in its impacts, however, but development type and intensity shape its impacts. Furthermore, habitat loss and fragmentation can often confound the effects of the matrix and this has limited previous studies. To isolate matrix effects, I identified 19, 500m radius landscapes in southeast Queensland, Australia with similar remnant forest patch attributes, habitat loss, and fragmentation, but exhibiting a marked gradient from rural through high-density suburban development of the matrix, quantified by a novel weighted road-length metric, based on the ecological influence of roads, also highly correlated with housing density. In each landscape I surveyed three different landscape elements; patch 'core', patch 'edge' and 'matrix', for mammals, habitat attributes and disturbance. I asked two questions: (1) how does matrix development intensity impact mammal community structure, and individual mammal abundance and distribution throughout landscapes, and; (2) how do mammals respond to similarity of patch and matrix elements in habitat structure and floristics, despite matrix development intensity? Mammal response to matrix development intensity was highly species specific. Species response appeared to be related to their abundance in edge or matrix sites. Native species richness peaked at moderate levels of matrix intensity. Exotic species richness, feral mammal predators and disturbance increased with matrix intensity. Landscape elements were most similar in habitat structure and floristics at low to moderate levels of matrix intensity; however, there was no significant relationship between native mammal species richness and similarity of elements. Results suggest that even when both patch and matrix is of high habitat quality, disturbance factors emanating from the matrix may prevent mammals from persisting in modified landscapes.

100 MORPHOLOGIC AND PHYLOGENETIC DIVERSIFICATION IN SIGMODONTINE RODENTS OF CENTRAL ANDES AND COASTAL DESERT OF PERU AND CHILE

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Adaptive radiation is one of the bigger taxa generation mechanisms and is defined as the evolution of ecological and phenotypic diversity within a rapidly multiplying lineage, in close ecological times-. When it occurs, adaptive radiation typically follows the colonization of a new environment or the establishment of a key innovation, which opens new ecological niches and or new paths for evolution. Andean Sigmodontine rodents conforming groups highly diverse, which is why, they are candidates to be outcome of adaptive radiation. Among these there are three tribes: Abrotrichini, Akodontini and Phyllotini, which have been in the Central Andes for a similar time, for it that they would have been subject to the same environmental pressures, causing a high diversity for adaptive radiation and following synchronic path in their evolution. We developed a phylogenetic analysis to establish diversification patterns, based in cytochrome b sequences of 70 forms of Andean Sigmodontines and employers's quest of morphologic evolution on the basis of corporal and cranial measures with ecological and dietary found. Our results suggest than Phyllotini have evolved by adaptive radiation, characterizing for a bigger number of species and the development of adaptative morphologies in relation to the diet. In Abrotrichini and Akodontini evolution has been gradual. Synchronic processes in the three groups become evident, wich it's induced through Andean uplift and pleistocene events. In this case the first and successfully occupation of the Central Andes and desert by Phyllotines possibility a major diversification and niche occupation.

101 MULTIDIMENSIONAL NICHE ANALYSIS IN TWO SYMPATRIC BAT SPECIES OF THE GENUS *HISTIOTUS*.

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The lack of information concerning essential ecological factors of bats, like those related with the coexistence of species is generalized. Since niche differentiation is not always clear, ecologists focus their attention in measuring some important variables, using the hutchinsonian niche work frame. Being *Histiotus macrotus* and *Histiotus laeophotis* sibling species, their morphological and ecological similarities, makes us think that there might be a partitioning of resources. With this on mind, diet composition, trophic niche overlap was analyzed, and ecomorphological parameters, as well as activity peaks were compared, in the Potrero de Yala National Park (Jujuy, Argentina) where both coexist. A similarity of ingested insect orders as well as a big trophic niche overlap was detected. This could be explained by an abundance of prey items in the rainy season, which could in turn relax possible effects of interspecific competition. Ecomorphologically, both species are similar, indicating comparable foraging behaviors. Supporting this idea, both species were detected active in the same temporal periods and environments. The data suggests a lack of resource partition in the analyzed dimensions, which does not overrule the possibility of the existence of resource partitioning in dimensions not studied. The limited sample size makes us propose a more temporally extended analysis, increasing the sampling size to validate our predictions. All in all, the possibility of the complementarity of the niche theory with other points of view such as the neutralist or the self-organizing approach is considered. Estos datos preliminares son importantes ya que proporcionan un punto de partida interesante para futuros estudios en estas especies de las que poco se sabe. This preliminary data is important, since it gives an interesting start point for the future studies of these little known species.

102 MULTI-SCALE ANALYSES OF SPATIAL GENETIC STRUCTURE OF THE GRAY-SIDED VOLE: INTER-LANDMASS, REGIONAL AND LOCAL SCALES

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Spatial genetic structure of the gray-sided vole *Myodes rufocanus* Sundevall, 1846 was investigated at three spatial scales from inter-landmass to local scale based on the control region of mtDNA (425 bp). At the inter-landmass scale, samples from Primorsky region, Sakhalin, Hokkaido and related islands (Kunashiri, Rishiri, Rebun, Teuri, Yagishiri and Daikoku) were analyzed. Analyses of 39 populations in the Hokkaido mainland (77,982 km²) was regarded as the regional scale analysis. Local scale analyses (< 30 km) were done in 34 populations within Obihiro area (central Hokkaido). Populations from Primorsky region, Sakhalin, and Hokkaido significantly diverged but the phylogenetic relationship indicates that the Hokkaido populations originated from Primorsky region. Populations on the related islands of Hokkaido were also genetically differentiated from each other and showed derivative features of mtDNA in comparison with samples from the Hokkaido mainland. They were, therefore, considered as descendants of immigrants from the Hokkaido mainland. Although compact spatial genetic structures were expected within the Hokkaido mainland because of the low dispersal ability of this species, data suggested that of a complex one. Some remote populations shared common haplotypes, while some neighboring populations were genetically differentiated. The relationship between genetic and geographic distance, Isolation by Distance (IBD), was not detected at the regional scale. These results indicate that those populations were genetically isolated at this spatial scale (> 30 km). Although high gene flow was expected among populations at the local scale (< 30 km), the spatial genetic structures were also complex; IBD was not detected and they were genetically isolated even in this spatial scale. In conclusion, effects of dispersal were found to be very small on the spatial genetic structure of the gray-sided vole and other ecological processes (e.g., population dynamics) should be taken into consideration to understand the relationship between genetic and geographic distances.

103 PELLET MORPHOMETRY AS A TOOL TO DISTINGUISH AGE AND SEX IN MEXICAN WHITE-TAILED DEER IN MEXICO

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From an ecological or management perspective, it is important to know the sex ratio and structure age of wildlife populations. The importance of hunting Mexican white-tailed deer (*Odocoileus virginianus mexicanus*) has recently grown in central Mexico, highlighting the need for estimation methods that can be used in places where it is not possible to see directly to the animals. It has been shown that the shape and size of the pellets are useful to distinguish sex and age in ungulates such as moose, mule deer and northern subspecies of white-tailed deer. In this study, we evaluate pellet morphometry as a tool to categorizing age and sex classes in *O. virginianus mexicanus*. We collected fecal groups of captive individuals of age and sex known, in three time periods in 2006. The samples were dried at room temperature; it was a photographic record of all the pellets and analyzed using software Image J. We obtained the average of the pellets dimensions: area, width (W), length (L), ratio L/W and volume of each pellet and performed the following comparisons: 1) between fecal groups of an individual within and between time periods, and 2) fecal groups of individuals of different age and sex classes. We found significant differences in the average of all variables when comparing faecal groups of the same individual within and between periods. Fecal groups of males of 5 and 6 years had significantly higher averages than the rest of the individuals in the population. We conclude that pellet morphometry of pellets is an unreliable method for determining the age and sex of a population of *O. virginianus mexicanus*, because the high variation in the morphometric measures of the pellets from the same individual and displayed low variation between pellets of different classes of individuals.

104 PHYLOGEOGRAPHY AND CONSERVATION GENETICS OF GUIGNAS (*LEOPARDUS GUIGNA*, MAMMALIA, FELIDAE)

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The guigna (*Leopardus guigna*) is the smallest felid in the American continent, and also one of the smallest in the world. It has the most restricted geographic range of all the New World cat species, inhabiting only around 160,000 km². It is currently threatened by habitat loss, fragmentation and human persecution. We investigated the genetic diversity and demographic history of this small felid across its geographical range by analysing mitochondrial DNA (mtDNA) and microsatellite loci. Our results contribute to define the situation of the guigna in Chile and Argentina, facilitating research and conservation efforts on this largely unknown cat.

105 PHYLOGEOGRAPHY OF HUEMUL DEER, *HIPPOCAMELUS BISULCUS*: HISTORICAL AND CONTEMPORARY PROCESSES DETERMINED RECENT DISTRIBUTION OF THEIR POPULATION GENETIC VARIATION

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Huemul is one of three Cervids that inhabits Chile. Considered to be the most southern species of large deer, today it is classified as endangered species due to the loss of habitat and the consequent fragmentation and isolation of its populations. This condition has led to a contraction of its historic distribution range over the last 200 years, extending from 34° to 54° south latitude. At present, with the exception of a small isolated population in Nevados de Chillán (36°-37° S, Chile central), the remaining 1000 - 2000 huemul live mainly in the far southern part of Chile and Argentina. To examine the evolutionary and recent demographic history of huemul across its current range at the molecular level, and to assess its genetic variation, we sequenced mitochondrial DNA from the control region (CR) for 120 individuals from 13 populations across Argentina and Chile. All evidence are consistent with a great lineage with low genetic diversity that shows a widely distributed ancestral haplotype in southern populations. Despite that, the northernmost populations (e.g. Nevados de Chillán) showed some degree of genetic differentiation with respect to southern. Our results suggest that the current population distribution appears to be the result of a recent strong signal of past low population size and a recent population expansion during the Quaternary. The fragmentation and reduction of these populations, as we know them now, is likely to be a very recent process linked directly to human activities. Our results has direct implications for the conservation of the huemul, as it can provide basic information that can be taken into account in the design of applied conservation and management strategies of the species. Thanks to FONDECYT 11080098.

106 PHYLOGEOGRAPHY OF THE ARMADILLO *CHAETOPHRACTUS VILLOSUS* (DASYPODIDAE XENARTHRA): POST-GLACIAL RANGE EXPANSION FROM PAMPAS TO PATAGONIA (ARGENTINA).

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Armadillos (Cingulata, Dasypodidae) are the most diverse xenarthran lineage. They split after the isolation of South America from other continental masses at the end of the Cretaceous. Previous studies have provided a view of the intra-ordinal relationships and phylogeny of Xenarthra. In accordance with a relaxed molecular clock the genus *Chaetophractus* may have split from other related genera about 6 Myr ago. However, the first paleontological record of this genus is represented by plates assignable to the living species *Chaetophractus villosus* from the Chapadmalalense mammal age (4 – 3,2 Ma). It is endemic to southern South America, where it is one of the most widely distributed species of the order. Its range extends from Bolivia and Paraguay to Argentina and Bio Bio and Magallanes in Chile. *Ch villosus* was also introduced in Isla Grande of Tierra del Fuego, the southernmost insular region of Argentina, about 25 years ago. We report a phylogeographic study of *Chaetophractus villosus* in Argentina. Control Region sequences were obtained for 76 *Chaetophractus villosus* from 20 locations across its argentine whole range. Seventeen new haplotypes were identified. The highest genetic variation were found in the Pampean region, thus appearing as the most probable area of the species origin. A general pattern of contiguous range expansion was revealed by Nested Clade Analysis (NCA) while population expansion was suggested by the mismatch distribution analyses. The Pampean region would have been the preexpansion area, while from its center to the east and west and to Patagonia, would have been the main dispersal routes of contiguous expansion, possibly very recently in the case of the last mentioned region. Besides, we propose the existence of a ghost lineage of *Chaetophractus vellerosus*, a sister species of *Chaetophractus villosus*. The accurate identification of the fossils in the collections is essential for more realistic phylogeographic studies.

107 POPULATION DYNAMICS OF *AKODON CURSOR*: FEEDBACK STRUCTURE AND CLIMATE VARIATION.

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A population feedback structure study was done on a time series data of *Akodon cursor*. The series had nineteen observations taken each three months. We carried out the observations in a restinga, a type of coastal scrub vegetation, in Rio de Janeiro. We used PAS software to detect the feedback structure. We calculated Pearson's correlation of rainfall and SOI with abundance and population growth rate. Being the time series non-stationary we divided it in two segments. Then the first became stationary with first-order

dynamics (mean: 4.36; MRT = 0.43; VRT = 0.119; ACF: balanced r oscillation, period 2; narrow phase portrait at lag 1; PRCF: lag 1; linear R -function at lag 1: $R_{\max} = 1.54$; $C = -0.35$; $K = 4.35$; $R^2 = 0.729$). Even detrended, the second segment was non-stationary (mean: 12.49; MRT = 3.72; VRT = 7.79; ACF unbalanced r oscillation; spread phase portraits at lags 1 and 2). This latter results are due to an exogenous dynamics since there a correlation between abundance and SOI ($r = 0.511$; $p = 0.02$; whole series), with a weak second-order effect (linear R -function at lag 1: $R_{\max} = 0.53$; $C = -0.04$; $K = 12.55$; $R^2 = 0.187$; lag 2: $R_{\max} = 0.78$; $C = -0.06$; $K = 12.68$; $R^2 = 0.378$). The first-order dynamics is due to intraspecific competition, since *Akodon* cursor females are territorialists and rodents are strongly resources dependent. Because La Niña intensifies convection activities at SACZ, it may act as a non-linear disturbance, generating a low-frequency oscillation probably owing to resources overexploitation (second-order effect). Large-scale climate variation explained better the population fluctuations than rainfall.

108 POSITIVE SELECTION ON MTDNA GENES ASSOCIATED TO THE INVASION OF SUBTERRANEAN NICHE IN CAVIOMORPH RODENTS

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Rodents have invaded the subterranean niche independently at least six times. Adaptation to energetically demanding lifestyles, particularly when associated to limited oxygen availability in subterranean environments, may involve adaptive change in proteins linked to the respiratory chain, including those encoded by the mitochondrial genome. Preliminary evaluation of cytochrome *b* sequences in several pairs of subterranean and non-subterranean groups of rodents supported this idea. To test this hypothesis, we have sequenced the complete mitochondrial genome of representatives of two related, but independent, subterranean lineages of caviomorph rodents (three species of the genus *Ctenomys* and *Spalacopus cyanus*), two non-subterranean allies (*Octodon degus* and *Tympanoctomys barrerae*), and an outgroup (*Proechimys longicaudatus*). We estimated the ratio of nonsynonymous to synonymous substitution rates (dN/dS) of 13 coding genes in a phylogenetic framework using the software PAML4, and considered its increase as evidence of positive selection. We found larger dN/dS values in all genes (up to almost sixfold in COXII) except ATPase8, in agreement with our prediction of rate acceleration in subterranean lineages. We also found complete synteny between these genomes and that of *Cavia porcellus* and an agreement with previous phylogenetic hypotheses proposed for these species.

109 POTENTIAL FOR INTRAGUILD COMPETITION AND PREDATION WITHIN THE CARNIVORA FOUND IN BRAZIL

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Intraguild competition and predation of mammalian carnivores has become a topic of great interest for both ecological and conservation reasons. In the present analysis the potential for both intraguild competition and predation are evaluated for the 26 species found in Brazil (except the Amazon weasel). To assess potential predation we compared the mean body mass of carnivore species (Order Carnivora) whose distribution range overlapped more than 20%. Species were considered as potential predators if they had $\geq 50\%$ of the focal species weight. To evaluate their potential for interspecific competition we compared their geographic range, diet and habitat. Data on diet and predation came from published and unpublished sources. Food habits were grouped into 12 categories and habitat used in nine. Brazilian carnivores could potential prey upon 5.08 ± 3.96 species, and only jaguars and giant river otters are not subject to potential predation pressure from other species. On the other hand, lesser grisons, olingos, little spotted cats and kinkajous showed the highest number of potential predators. Actual predation was recorded for nine pairs of species. These either represented food ingestion (e.g., jaguars on coatis) or competitive exclusion (jaguars on pumas). Coatis were frequently preyed upon and the only carnivore species considered as important food item. Felids showed the most specialized diet, whereas canids and mustelids were the most generalists. Habitat and range overlap was high for most species. Crab-eating foxes and raccoons were found in the largest variety of habitat categories, while olingos, kinkajous, giant and Neotropical river otters were almost restricted to only one. The high/moderate levels of habitat and food niche overlap suggests potential competition for nine pairs of species. The de facto carnivore intraguild predation in Brazil was considered as incidental, but could, nevertheless, considerably impact members of the guild.

110 RATES OF SPECIATION, SEQUENCE EVOLUTION AND PHENOTYPIC EVOLUTION IN BIRDS AND MAMMALS

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Birds and mammals are similar in many ways: both groups of species dominate the higher trophic levels of biotas across the earth. Both originated somewhere during the late Jurassic, while most of the extant diversity originated during the early Tertiary. Also physiologically the two groups have many properties in common, most notably homeothermy, which, in turn, resulted in comparable ecology and life history. Given the many similarities of these large groups of species, it is interesting that their rates of evolution appear substantially different. A recent study has shown that rates of neutral (i.e. third codon position cytochrome) sequence evolution is about two-fold higher in mammals than it is in birds. We find that the rate of body size evolution is similarly twice as high in mammals as in birds. We use phylogenetic methods to analyze whether rates of cytochrome and body size evolution are related among subclades within birds and mammals, and whether differences in species number and in particular speciation rate can explain apparent differences in rates of neutral molecular and phenotypic evolution.

111 REPRODUCTIVE ECOLOGY OF THE SWAMP ANTECHINUS (*ANTECHINUS MINIMUS*)

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The reproductive ecology of the swamp antechinus *Antechinus minimus*, a small dasyurid (Dasyuridae) marsupial with obligate male semelparity, was investigated in populations inhabiting the mainland coast and on a nearby offshore island in south-eastern Australia. The size and sex ratios of litters, individual body mass and size, timing of births, female longevity and paternity of litters were determined from live-trapped animals. In contrast with other antechinus species, biased sex ratios were not evident. In addition, large variations of the timing of births were estimated at both sites and these appear to be related to seasonal conditions such as autumn rainfall and female body mass before mating. Like other antechinus species multiple mating by females occurs during a single oestrus period, as evidenced by multiple paternity of litters. The island population had significantly smaller litter sizes and greater adult body mass in comparison with the mainland population. This is consistent with features of the 'island syndrome', which predicts directional selection for these traits in high-density populations with reduced extrinsic mortality. However, inter-annual variability in litter sizes in the island population suggests that litter size is more responsive to fluctuating local conditions, such as population density, which is likely to affect food availability, rather than directional genetic changes.

112 REVIEW OF THE MAMMALS OF MONGOLIA

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Mongolia occupies a biologically critical zone in Asia: it is located at the transition of four ecosystems: taiga forest, steppes, mountains, and Gobi desert. These distinct ecosystems support at least 134 species known species of mammals. Many of these species are globally or regionally endangered; three species (2.2%) are critically endangered: *Camelus ferus* (Cetartiodactyla: Camelidae), *Saiga tatarica* (Cetartiodactyla: Bovidae), and *Equus ferus* (Perissodactyla: Camelidae). Another five species (3.7%) are endangered: *Cuon alpinus* (Carnivora: Canidae), *Panthera uncia* (Carnivora: Felidae), *Equus hemionus*, *Marmota sibirica* (Rodentia: Sciuridae), and *Ochotona hoffmanni* (Lagomorpha: Ochotonidae). Three species are near threatened, and six (4.4%) are vulnerable. The remainder are classified as "data deficient" (2 species, or 1.5%) or "least concern" (118 species, or 88%). Despite this potentially optimistic conservation scenario, it is quite likely that many of those taxa of least concern actually refer to cryptic species that currently are taxonomically masked, or are otherwise of conservation concern. The social and economic changes brought about by the shift from socialism to a free market economy has had marked repercussions in conservation of mammalian species in Mongolia.

113 RODENT EXPERIMENTAL EXCLUSION FROM BREEDING SHEDS IN POULTRY FARMS OF EXALTACIÓN DE LA CRUZ, ARGENTINA

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In order to evaluate the effect of exclusion by physical barriers on rodent reinfestation in poultry sheds, two sheds of 60 m x 12 m (one in each of two different farms) were enclosed to rodents with sheets of zinc of 80 cm above ground and which were buried 40 cm. The remaining sheds in each farm were used as experimental controls. After building the enclosure and during the five following weeks we conducted an intensive removal of rodents by trapping and poisoning in all sheds of both farms. The cost of the enclosures were 496 man/hours, US\$ 3,115 of materials and US\$ 1,200 of fuel. A total of 264 rodents were removed in both farms with an effort of 992 cage trap-nights, 2063 Sherman trap-nights and 2118 snap trap-nights. *Mus musculus* was the dominant species followed by *Rattus norvegicus* and *Akodon azarae*. Relative abundances of mice and rats were estimated in all sheds in five opportunities along eight months using a tunnel track index calibrated with rodent capture data. The variation in rodent relative abundance was similar in enclosed and not enclosed sheds. Relative abundance of mice and rats decreased from the beginning of the experiment towards the end of the rodent removal period, when it reached values of zero or close to zero. After this period, mice relative abundances increased to the initial values, while rat abundance remained low in both enclosed and not enclosed sheds. According to our results, this type of enclosure was not effective to prevent rodent reinfestation of the breeding poultry sheds, but this result may have been the consequence of the failure in maintaining the doors closed by the farmers. We consider that the design of the enclosures must be modified in order to facilitate the maintenance of the exclusion during the typical labors of the farm.

114 SOCIALITY AND THE COSTS OF PARASITISM

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Parasites reduce a host's fitness by depleting their energy resources and increasing energy expenditure by triggering immune responses. Due to the density-dependent nature of parasite transmission, parasites are considered a cost of sociality. Such costs could be particularly severe for social groups that are comprised of closely related individuals, as is the case in many cooperatively breeding species, due to their reduced genetic variability. However, for social grouping to persist the costs imposed by parasites must be outweighed by the benefits of sociality. Although costs and benefits of sociality are well documented in cooperatively breeding vertebrates, parasites have received little attention in these species. The aim of the current study was to measure the energetic costs of infection by a cestode parasite as well as the energetic benefits associated with group living that could explain the persistence of group-living in a free ranging cooperatively breeding rodent, the Natal mole-rat (*Cryptomys natalensis hottentotus*). Surprisingly,

both resting metabolic rate (RMR) and daily energy expenditure (DEE) were reduced in parasitized compared to unparasitized individuals and parasitized animals tended to have larger fat deposits. At the same time RMR decreased with increasing group size, while both DEE and fat deposits increased with group size. Our results suggest clear energetic benefits of group living while the observed effects of the cestode parasite on the energy balance may be explained by physiological and behavioural adaptations (e.g. reductions in body temperature and activity) that may further be facilitated by living in a group (e.g. huddling).

115 **SPACING BEHAVIOUR AND ACTIVITY PATTERNS OF *APODEMUS PENINSULAE* IN A TEMPERATE FOREST, KOREA**

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The Korean field mouse *Apodemus peninsulae* occurs in Northeast Asia. Although *A. peninsulae* is one of the commonest forest-floor small mammals in Korea, ecological information is very limited. In this paper, spacing behaviour and activity patterns of Korean field mice *Apodemus peninsulae* was studied at a temperate forest, Korea in two seasons, fall and winter, using radio-telemetry. Fourteen Korean field mice were located by telemetry average 41.1 ± 4.1 times over a period of 6 to 24 days with home-in technique in fall 2006. There was no difference in home range between sexes. The fall home range was $1,998 \pm 480$ m² (559-7,798, n = 14). Korean field mice were mainly nocturnal, showing bimodal activity pattern: 18-23 hours (peak at 22 hour) and 1-4 hours (peak at 1 and 2 hours). They usually began to move after sunset and came back to nests before sun-rise and rarely returned to their nests between their exits at dusk and returns at dawn. Activity patterns of male and female in fall was not different. Only three Korean field mice were radio-tracked successfully for 6 to 11 days in winter. Home ranges could not be estimated with MCP method due to rare outside movements of nests. A female mouse never moved after transmitter-tagged (53 location fixes); trapping point was 40m far from nest. Two other mice also showed very few movements during radio-tracking. All three mice used only one nest during winter radio-tracking sessions. Winter activity was much less and active period was shorter than in fall. We did not observe or locate mice on standing trees; all field mice were active on forest floor or fallen trees. We found a transmitter taken off on a tree in fall season only one time.

116 **SPACING BEHAVIOUR IN *AKODON AZARAE* (CRICETIDAE: SIGMODONTINAE)**

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Akodon azarae is one of the most abundant small rodent species in the agro-ecosystems of southern Córdoba, Argentina. We provide information about size and intra and inter-sexual home-range overlap, and suggest a social system. The study was carried out between December 2008 and February 2009 through three trapping sessions, in four 0.25ha enclosures (4 independent populations) at the beginning of the breeding period using CMR method in a 6x10 grid. To estimate the home-range area and overlap degree we used the minimum convex polygon and Batzli and Henttonen methods respectively. To analyse home-range size in relation to sex and trapping session a two factor ANCOVA was used. Population abundance was used as covariate. Intra and inter-sexual home-range overlap (males/males; females/females; males/females) was examined using the Friedman non-parametric test. 69 and 75 home-ranges of reproductively active males and females respectively were estimated. Significant differences in home-range size were observed in relation to sex and trapping session ($P < 0.05$). Home range size of males was always larger than that of females (65% higher), and this was more evident in the third trapping session (when almost 100% of females were sucking or pregnant). Significant differences in intra and inter-sexual overlap degree were observed ($P < 0.05$). Intra-male and intra-female overlap was lower than 10%. Males overlap their home-ranges over 3 or 4 females, and registered an inter-sexual overlap mean value of 23%. Home-range overlap suggests that both males and females are territorial, thus we suggest a polygynous social system.

117 **SPATIAL BEHAVIOR AND HABITAT USE OF OTTER (*LONTRA PROVOCAX*) AND MINK (*NEOVISON VISON*) IN CHILE**

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The introduction of alien species is considered the second most important cause of species extinction. In Chile, alien mink (*Neovison vison*) is considered a pest due to predation on wildlife. Mink and Northern river otter (*L. canadensis*) have sympatric distributions without competition. Instead, in Europe it appears that the Eurasian otter (*Lutra lutra*) is controlling minks. Competition can be observed on aspects like diet and spatial use. Thus, these study objectives are: i) to assess territoriality and avoidance between *N. vison* and *L. provocax* in marine habitats and ii) to assess spatial and habitat use, and daily activity of mink and otter in marine habitat of southern Chile. Between 2009 and 2010 this study is recording habitat use and spatial patterns using radiotracking. Preliminary results recorded data from one adult male otter and two adult males minks. Data show that the otter has a home range of 5 km following seashore contour, with a core area of 2.5 km. Activity was concentrated during the sunset and night. Instead minks have home ranges of no more than 2 km of seashore, partially overlapped with the otter's home range and concentrated its activity during daylight. Both species share the same seashore but differences in daily activity patterns and highly use of the terrestrial habitat by minks and water by the otter are suggesting niche partitioning. This observation is supported by studies of feeding behavior in the same study area, which recorded differences in diet and site use between the species depending on presence/absence of both species.

118 SPATIAL DISTRIBUTION OF MARA (*DOLICHOTIS PATAGONUM*) WARRENS TESTED BY REFINED NEAREST NEIGHBOUR ANALYSIS

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The mara (*Dolichotis patagonum*) is a large cavid rodent endemic of Argentina; it is monogamous but breeds communally in settlements which can congregate dozens of individuals. Although previous studies have described the settlements as clusters of warrens, such a pattern has not been tested so far by means of any specific quantitative methodology. With the objective of characterizing the spatial distribution of mara warrens, we interrogated a data base of warrens' GPS positions collected at four 2000-ha areas within Península Valdés (Argentinean Patagonia). The study sites represent two contrasting landscapes (shrub-grass mosaic and grassland) which could influence the distribution of warrens. The warrens were localized scanning the areas walking along 20 transects separated 200m. The data base included 88 records (14, 17, 18 and 39 data points for the 4 different areas). We tested for departures from a complete spatial randomness (CSR) hypothesis by applying a refined nearest neighbour analysis using the R software. We compared the average distance from a warren to its nearest neighbour with the expected distribution of this distance calculated from 10000 realizations of CSR using the same plot size and shape. The observed average distance was 390 and 387.82m in the shrub-grass areas and 385.16 and 248.22m in the grassland areas. We found that the distance between warrens was significantly shorter ($P < 0.01$) than expected under a CSR hypothesis for all areas, which is indicative of underdispersion thus supporting previous descriptions of the warrens' spatial pattern. This result suggests that social processes may have a stronger influence than habitat selection in defining the spatial distribution of mara warrens. Further studies will be needed in order to identify 1) the specific nature of the departure from a CSR pattern, and 2) the processes associated with the non-random patterns and their possible relationships with habitat variables.

119 SPATIO-TEMPORAL AGGREGATION AND HABITAT USE IN VOLES

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Although the habitat preferences of a species are considered to be constant, the realized habitat use can vary with a number of abiotic and biotic factors. Often the distribution of individuals is aggregated in space and time so that more dense populations are found in the core habitats, while marginal habitats are occupied only at times of low density. In a community of interacting species, the habitat use of the species may change as increased density of a stronger competitor forces a weaker one to marginal habitats. We studied the habitat use and spatio-temporal aggregation of two vole species, the bank vole, *Myodes glareolus*, and field vole, *Microtus agrestis*, in a 4-yr trapping study carried out in a large area of three main habitat types (forest, field and clear-cut). We found that both species were concentrated on their core habitats (bank voles to forests and field voles to fields) at times of low population density. Relative habitat use of both species increased in clear-cuts and that of bank voles also in fields with population increase. Both species showed aggregated pattern in all habitats and the level of aggregation increased in marginal habitats with increase of density. Results also suggest that aggregations of bank voles can be found in same sites continuously while field vole aggregations tend to be short-lived. The studied vole species are specialised to use different habitats but are flexible in their habitat use and can extend their distribution to the other habitats as density increases. They will contact each other in marginal habitats and may have negative effects on each others. Different habitat requirements, flexibility in habitat use and temporally and spatially fluctuating densities are likely factors allowing the coexistence of these potential competitors in the mosaic landscapes of boreal forests and open habitats.

120 SPATIO-TEMPORAL PATTERNS IN LANDSCAPE STRUCTURE CAUSE LIMITING THRESHOLDS FOR THE ABUNDANCE OF DECLINING GREY-SIDED VOLES

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The grey-sided vole (*Myodes rufocanus*) is one of the keystone vole species for ecosystem functioning in boreal forests. In 1970-2008 there has been a long-term decline in the numbers of grey-sided voles within a 100×100 km² study area in northern Sweden. Habitat destruction is regarded as a contributing factor to the decline. However, we have so far lacked knowledge on any spatio-temporal thresholds in landscape structure related to the decline. Here, we studied such thresholds in 16 5×5 km landscapes, systematically distributed within the study area. Local declines were most pronounced in the western (inland) part of the study area in 1980-85. At that time, the species already had gone extinct in the eastern (coastal) area. We related changes in landscape structure to the timing of the grey-sided vole declines. Landcover types (>0.25 ha) were digitized from aerial photographs within the 5×5 km landscapes with 5-yr intervals. The most pronounced changes in landscape structure were related to changes in forest age structure due to clear-cutting. Within the study area, there were significant geographical differences in the size distribution of clear-cuts and forest patches. In 1970, the coastal in contrast to the inland study area, was characterized by more clear-cuts (766 versus 182) that were smaller (mean 5 ± 18 ha versus 13 ± 34 ha) but covered larger areas (sum 4077 ha versus 2325 ha). Spatio-temporal comparisons showed that the coastal landscape in 1970, when the vole was rarely found there, resembled the inland landscape in 1985. The main decrease in focal forest patch size in the inland occurred in 1980-85, coinciding with the major drop in vole numbers there. Our results suggest that spatio-temporal changes in landscape structure are important and contributing to declines in grey-sided vole abundance.

121 STRUCTURE AND DIVERSITY OF SMALL MAMMAL SPECIES IN MOUNTAIN FOREST CLEARINGS

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In last ten years strong intention to replace forest monocultures of coniferous species to mixed coniferous – broadleaved stands which are close to nature composition is promoted. Mountains forests under study are of different character. In Beskydy Mts. (B) forests of beech-spruce mixture prevail but in Jeseníky (J) spruce monocultures prevail. In both, reforestation activities are complicated by impact of rodents and influence of chemical emission. Small mammal species were monitored during two successive years on clearings with artificial plantations. In both total abundance of species was similar but with different dominance of the species. Under influence of beech mast year *Apodemus flavicollis* was dominant in B. but *Myodes glareolus* in J. Higher dominance of *Soricidae* was in J (19%) against B (6%). The diversity and equitability was in both similar (J - 1.63, B - 1.49; 0.84 resp. 0.72). Notable was the high dominance of *Microtus agrestis* (23 resp. 27%) in both. Abundance of the dominant species was synchronized. Canonic correspondence analyses (CCA) of clearing characteristics show the significant preferences of *M. agrestis* for higher elevation, more grassy and grassy wastage (higher humidity) environment. This was above all problem of emission clearings. As to *M. glareolus* forest weeds preferably of *Rubus* sp. was responsible for its dominance. These results can contribute to understand rodent habitat preferences and help in prevention against their impact by the way of herb layer management. The paper was supported by financial means of the NAZV QH72075 and MSM 6215648902

122 *TAPIRUS TERRESTRIS* IN NORTHEASTERN BRAZILIAN PANTANAL WETLAND: DISTRIBUTION MODELS, HABITAT SELECTION AND ABUNDANCE

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The way an animal uses its habitat, as well as its abundance, are crucial knowledge for the development of appropriate management and conservation strategies. Ungulate mammals forage across a variety of spatial scales, but the most important environmental parameters for these spatial scales have not been fully established. The characterization of the agents that influence the spatial distribution of species is an efficient tool for conservation decision-making and for the better understanding of ecological processes. The population density and abundance, habitat selection and potential distribution of *T. terrestris* were analyzed by: Distance sampling methodology, standardized Manly Selection Index (SI), Logistic Regression and ENFA (Ecological Niche Factor Analysis), respectively. Estimated density for *Tapirus terrestris* in forest physiognomies inside the SESC Pantanal Private Natural Heritage Reserve (RPPN), Mato Grosso, Brazil, was 0.71 ind/ km², 92% higher than the estimated density in grassland physiognomies (0.37 ind./km²). This value was greater than mean global density without stratification (0.55 ind./km²). According to these data, population size of tapir inside the Conservation Unit (CU) is estimated as 581 individuals. Forest containing palm trees, represented in this CU by Forest with Acuri (*Attalea phalerata*), offer significantly higher selection indices (SI) when compared to other available habitats. According to the distribution models constructed in congruity to the results obtained through Selection Index and the density estimates, one may infer on the high quality of Forest with Acuri habitat type for this species

123 THE GIANT WHITE-TAILED RAT *UROMYS CAUDIMACULATUS*: A RAINFOREST SPECIALIST IN THE SAVANNA

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The Giant White-tailed Rat *Uromys caudimaculatus* is one of Australia's largest rodents, weighing up to 900 g and equipped with formidable jaws capable of opening coconut shells. It is a generalist feeder and, due to its size, is likely to play a vital role in driving ecological processes (e.g., seed dispersal, nest predation) in the rainforests and adjacent closed sclerophyll forests that it inhabits in north-eastern Queensland (Watts & Aslin 1981). Although normally thought to be a rainforest specialist (Williams & Marsh 1998), in the Lamb Range it has also been found to inhabit savanna woodlands, thus raising questions about the factors that limit its distribution and abundance. To begin with, comparative population studies are being carried out in both types of habitat through capture-mark-recapture techniques, yielding differences in abundance and sex and age composition. Preliminary results from radio-tracking, coupled with the location of the captures, suggest that space use by the white-tailed rats differs depending on the type of habitat in which they live. Further experiments will be set up to explore the relevant factors that might be triggering the aforementioned differences.

124 THE STATUS OF DHOLES (*CUON ALPINUS*) IN THAILAND: A PRELIMINARY REPORT

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The status of the dhole in Southeast Asia is poorly understood. In Thailand, dholes are found in protected areas that support large ungulate populations. Although the population size is unknown, and the species has been listed as endangered, opportunistic encounters by park rangers, villagers and tourists with dholes in protected areas have created public perception that dholes are overabundant. Our objective was to generate baseline information on dhole populations in Thailand, knowledge that will help decision

makers develop effective management plans for the species. The study was conducted at Khao Ang Rue Nai Wildlife Sanctuary, Thailand. We conducted 200 interview surveys in villages surrounding the eastern boundary of the sanctuary. Respondent age ranged from 18 to 81 years (mean = 50.2 y). The majority (54%) of the respondents were able to correctly identify dhole from photographs. Only 27 (13.5%) of the interviewees reported dhole sightings within the last 12 months. However, 81% of respondents were of the opinion that dhole populations in the area are stable. Camera traps (70 locations; 1,999 total trap nights) captured 497 wildlife photos, with 13 carnivore species, including one pack of dholes (6 members). Camera traps also documented the presence of domestic dogs ($n = 4$) in the protected area. Our findings suggest that dholes occur at low density in the sanctuary. The presence of domestic dogs inside the sanctuary suggests a disease transmission threat to dhole and carnivore populations in this region. The study is supported by the National Science Foundation, Friends of the National Zoo, Walcott Endowment Fund and AZA's Conservation Endowment Fund.

125 TOP DOWN CASCADE EFFECTS ON SOIL ECOSYSTEM BY THE LONG-CLAWED SHREW (*SOREX UNGUICULATUS*)

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Soricine shrews are supposed to have top-down effects on invertebrate community and functions of soil ecosystem, because of their high requirement for soil invertebrates as foods. To examine ecological role of shrews in soil ecosystem, field experiments were conducted in a cool-temperate forest in Hokkaido, Japan. Experimental design comprised 15 m x 15 m enclosures (exclosures) of the long-clawed shrew and open control. The number and biomass of earthworms (Haplotaxida) and the numbers of soil macro- and meso-invertebrates were recorded in each of experimental treatments and control quadrat. To estimate indirect effects of shrews on leaf-litter decomposition, seasonal change in litter biomass was measured and litter-bag survey was carried out. Furthermore, to estimate the effects on nutrient cycling and plant growth, amount of inorganic N and P, and growth rate of green plants of forest floor (*Sasa nipponica*, *Trillium smallii*, and *Smilacina japonica*) were measured. In three years after the experiments started, significant negative effects of shrews were detected on density of soil macro-invertebrates (mainly earthworms, spiders and isopods). The presence of shrews significantly affected on densities of some soil meso-invertebrates (positive effect on larger springtails, but no effects on mites and smaller springtails), and brought a significant negative effect on litter decomposition rate. The present study suggests two possible indirect effects of shrews in soil food web. One operates negatively on litter decomposition, decreasing population biomass and/or density of earthworms and isopods, both of which are litter eaters. The other indirectly operates on lower trophic group, decreasing population density of predatory invertebrates such as spiders, which releases their prey (large springtails) from strong predation pressure.

126 TROPHIC ECOLOGY OF MANED WOLF (*CHRYSOCYON BRACHYURUS*, ILLIGER, 1815) IN DISTINCT SITES

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Trophic Ecology of maned wolf (*Chrysocyon brachyurus*, Illiger, 1815) in distinct sites. RODRIGUES, F.H.G*; ROCHA, A.C.C.L. Universidade Federal de Minas Gerais and Instituto Pró-Carnívoros, rodrigues@icb.ufmg.br The maned wolf inhabits a broad area along the open vegetations of South America. It is an opportunistic species, feeding mainly on fruits and small vertebrates. We compiled data of 23 studies on feeding habits of maned wolf, and analyzed the relationship of diet and home range size, conservation degree of the area and size of the study size. The studies shown an omnivorous diet, with high seasonal variation on the food items consumed, according with food availability. The niche breadth ranged from 0.271 to 0.530 (average 0.389 \pm 0.074). There were a negative correlation (not significant) between size of the study area and niche breadth ($r = -0.387$; $p = 0.0751$). There were a strong correlation between home range size and niche breadth ($r = -0.9656$; $p = 0.0076$, $n = 5$ sites). This could be associated with food availability, with larger areas being used in poor habitats (the individuals need to travel larger distances to find food) and few different food items being consumed in these habitats (because low availability). The niche breadth was not correlated with conservation of the area or habitat type. The results reinforce the opportunistic nature of maned wolf, as related in other studies.

127 USING ECOLOGICAL NICHE MODELING TO EXPLORE NICHE EVOLUTION ON WEST INDIAN BATS

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Evolutionary processes, such as speciation, can be greatly influenced by spatio-temporal environmental variation. Ecological niche modeling allows for species' niches to be assessed over geographic areas using environmental information and point localities for a given species. Therefore, detailed inspection of niche evolution across large geographic areas can be performed by characterizing the environmental niches used by a single or multiple species. In this study, I apply an ecological niche modeling approach to test the hypothesis that niche specialization (i.e. niche evolution) plays a role on allopatric speciation in sister bat species across the West Indies. I use a MaxEnt modeling approach with data from 19 environmental variables (WorldClim) that summarize temperature and precipitation for the Caribbean region. Presence-only georeferenced data for multiple West Indian bats was obtained from museum collections via MaNIS and verified in a GIS. Niche occupancy and climatic tolerance were compared across species to make inferences of niche evolution in West Indian bats. Species distributions appear to be restricted primarily by temperature on the Greater Antilles and by precipitation on the Lesser Antilles. These patterns are consistent with island geographic position, size, and topography.

128 VARIATION IN MAMMALIAN SPECIES DISTRIBUTIONS ACROSS THE NATURAL ZONES OF MONGOLIA

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The topographical and ecological variety of Mongolia, located at the transition of four ecosystems, results in a remarkable variety of mammal species: at least 134 species known species of mammals. A preliminary broad perspective analysis of patterns of mammalian diversity suggests that mammalian species richness is highest in Mongolia's northern regions, with recorded numbers of species exceeding 60 in Hövsgöl and Hentii mountain ranges, and northern parts of Hangai Mountain Range. Species richness shows a decreasing trend from north to south, with lowest species richness in southern and south-eastern Mongolia, particularly Govi Altai Mountain Range, Alashan' Gobi Desert, Eastern Gobi, and southern parts of Eastern Mongolia. However, fine scale analyses suggest that there exist departures from the general pattern that bear further investigation. The Great Lakes Depression and Valley of the Lakes, an ecologically diverse region, contains an unusual transition zone that includes such disparate genera as *Tamias* and *Dipus*. Other pockets of high species diversity include the Nömrög Nature Reserve in extreme eastern Mongolia, as well as portions of the southwestern Gobi such as the Dzungarian Gobi Nature Reserve. We examine whether these patterns are real or a historical artifact of collecting patterns. These preliminary assessments point to where future research efforts may best be focused.

GENETICS

129 AN ASSESSMENT OF THE MTDNA ND5 GENE AS A MARKER FOR PHYLOGEOGRAPHIC STUDIES OF *PUMA CONCOLOR* (CARNIVORA, FELIDAE)

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The puma (*Puma concolor*) is one of the most extensively distributed species among terrestrial mammals, ranging from Canada to Patagonia. Its oldest known appearance in the fossil record is in Pleistocene, but molecular data indicate that it has diverged from its sister species (the jaguarundi) ca. 4 million years ago (Ma), possibly in North America. During the Great American Interchange, this species (or its immediate ancestor) likely invaded South America from the north, leading to a great expansion in its range and the adaptation to various habitat types. Molecular data have suggested that the species underwent a subsequent demographic reduction in North and Central America, where they have recolonized from founders originating in South America. Details of the phylogeographic patterns and underlying demographic history of this species are still incompletely known, especially with regard to the regional genetic structure of South American populations. This study aims to investigate the phylogeography of the puma with emphasis in South America, and including the development of new markers suitable for refining the available knowledge. Here we present an assessment of a 703-bp segment of the ND5 gene as a prospective marker for this species, conducted by analyzing 82 individuals sampled across the species range. Nineteen parsimony-informative sites were identified, leading to the identification of 21 different haplotypes. Samples from North America and some from Central America shared one haplotype, corroborating their distinction from South American sequences. The observed nucleotide diversity was 0.005, indicating low to moderate levels of coding mtDNA variability, and little evidence of genetic structure. Although the power of this segment by itself is limited (but higher than that observed with a shorter ND5 segment employed previously), our results indicate that it can be added to the mtDNA repertoire employed for phylogeographic studies targeting the puma.

130 A NEW KARYOMORPHOTYPE OF *WIEDOMYS PYRRHORHINUS* (RODENTIA: SIGMODONTINAE) WITH MOLECULAR COMPARISONS WITHIN THE GENUS.

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A new karyotype of *Wiedomys pyrrhorhinus* from the municipality of Morro do Chapéu, northern region of the Chapada Diamantina, State of Bahia, Brazil is described, including G and C-banding, Ag-NOR sites location and molecular analysis of Cytochrome b. Previous karyological studies of *W. pyrrhorhinus* have shown a constant diploid number (2n) of 62 with two different autosomal fundamental numbers (FNa): 86 (Pernambuco) and 90 (Bahia). *W. cerradensis* described from Jaborandi, BA has 2n= 60, FNa=88. The new karyotype described here shows a 2n=62 and FNa=110, having the highest autosomal arm number observed so far. The sex X chromosome is essentially a large acrocentric, intermediate in size between pairs 5 and 6. The Y is a small acrocentric chromosome. The C-banding showed conspicuous pericentromeric heterochromatic blocks in 21 pairs of autosomes and in the sex X chromosome. Silver staining showed that there are up to four pairs of chromosomes bearing NORs. The NOR sites were telomeric located on the short arms of some small submetacentric, subtelocentric and acrocentric chromosomes. Integrated analysis of karyological and molecular data suggests that specimens with the new karyotype from Morro do Chapéu (BA) are more closely related to the samples from State of Bahia with the karyotype 2n=62 and FNa=90. In both karyotypes the largest chromosome pair of the diploid complement is submetacentric, and in the karyotypes from Pernambuco, with 2n=62 and FNa=86 the largest chromosome pair is acrocentric. Analysis of neighbor-joining grouped specimens from Jaborandi and Caetité, BA (2n=62, NFa=90) and from Morro do Chapéu, BA (2n=62, FNa=110). These results confirm that both samples belong to *Wiedomys pyrrhorhinus*, a species with karyotypic polymorphism.

131 CODING VARIATION AT MELANOCORTIN-1 RECEPTOR GENE AND ITS RELATIONSHIP WITH COAT COLOR DETERMINATION IN CTENOMYIDAE

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The melanocortin-1 receptor (MC1R) forms a critical switch in the production of pheomelanin and eumelanin pigments during hair development in mammals. The association of MC1R variants with coat color in a variety of species, such as fox, jaguar, black bear and beach mice, has been strongly suggested. Ctenomids are Neotropical subterranean rodents (called tuco-tucos) that exhibit a wide diversity of coat colors in addition to a typical agouti; including melanistic, dark brown, paler coloration, and agouti with extensive white areas. Some of these pelages are similar to the soil coloration, therefore, considered as adaptive phenotypes. In this study, we explore the relationship between coat-color polymorphism in tuco-tucos and allelic variation at MC1R, considering that adaptative phenotypes may be derived from changes in amino-acid sequence. Twelve tuco-tuco species coming from different phylogenetic lineages, including all the above phenotypes, were analysed. Six primers were designed in conserved regions of MC1R across rodents lineages, using the software Primer3. A total of 760-bp of the exon was amplified and directly sequenced in both directions. Sequences were aligned using the software CodonCode Aligner. Patterns of substitution (synonymous vs. non-synonymous) were estimated within DnaSP 5.0. A polymorphic species, *C. torquatus*, retrieved identical MC1R sequences from agouti, dark brown, and agouti with white spots individuals. Since these color differences are continuous variation of a typical agouti such result could be expected at gene structure level. However, individuals with discrete coloration (e.g. melanistic) also showed amino-acid patterns identical to agouti. In addition, species from the 'mendocinus' group, which include paler coloration, agouti and melanic, had different MC1R sequences, but their pattern of amino-acid variation could not be associated with coat color. Thus, contrary to many other mammal species, our results suggest that coding variation at MC1R is not the major determinant of coat color phenotypes in Ctenomids.

132 CONTRASTING PATTERNS OF GENETIC INTROGRESSION AMONG THREE HYBRIDIZING NEOTROPICAL CATS

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Hybridization among three small Neotropical cats (*Leopardus tigrinus*, *L. geoffroyi* and *L. colocolo*) has been recently documented through the analysis of mitochondrial DNA (mtDNA) and microsatellite markers. In this study we extend these analyses by combining the use of mtDNA sequences and microsatellite loci with Y and X chromosome intron sequences to genetically characterize the processes of hybridization and introgression among these cats. We collected biological material from the three cat species, totaling 119 *L. tigrinus*, 78 *L. geoffroyi* and 10 *L. colocolo* individuals, and evaluated all the samples collected for two mitochondrial segments, 11 microsatellite loci, two intronic segments of Y-linked genes and one segment located on the X chromosome. Sequence-based analyses comprised mainly the assessment of haplotype networks, which were compared to the Bayesian genomic partitioning estimated with the microsatellite data using the program STRUCTURE. All molecular markers supported the inference of hybridization and introgression between *L. tigrinus* and *L. geoffroyi*, which is essentially restricted to Rio Grande do Sul, the southernmost Brazilian state, where the ranges of these two species meet. Several genetic combinations of the different markers were found in this region, suggesting the existence of extensive ongoing or recent hybridization, which results in bidirectional genetic introgression. In contrast, we could only identify clear evidence of introgression between *L. tigrinus* and *L. colocolo* with the mtDNA sequences, which revealed a very high rate of unidirectional introgression from *L. colocolo* into *L. tigrinus* individuals, almost all of which were sampled in the central and northeastern regions of Brazil. These results imply a strongly asymmetric introgression process affecting these two species, which seems to have produced a substantial cytonuclear dissociation in the *L. tigrinus* populations of central and northeastern Brazil, probably due to rather ancient events of hybridization that left a signature only in the non-recombinant mtDNA.

133 CYTOGENETICS ANALYSIS IN *CTENOMYS MINUTUS* (RODENTIA-CTENOMYIDAE) IN A CONTACT ZONE BETWEEN CHROMOSOMAL DIVERGENT POPULATIONS

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The subterranean rodent *Ctenomys minutus* (Nehring, 1887) occurs in a narrow stretch of the Brazilian coastal plain in the states of Santa Catarina and Rio Grande do Sul. Eleven different karyotypes were described for this species ($2n = 42, 46a, 46b, 47a, 47b, 48a, 48b, 49a, 49b, 50a$ and $50b$), and four intra-specific hybrid zones: a) $2n = 46a \times 2n = 48a$; b) $2n = 46b \times 2n = 48b$; c) $2n = 42 \times 2n = 48a$; d) $2n = 50b \times 2n = 48b$. In all the "a" karyotype system and in $2n = 42$, the chromosome pair 2 is entire, whereas in all of the "b" karyotypic system the same chromosome pair is fissioned, and the 2p arm underwent a pericentric inversion. This pericentric inversion, perhaps, can act as a postzygotic isolation mechanism between different karyotype systems. In this work were analyzed 8 specimens collected between the cities of Mortadas and Tavares in the Rio Grande do Sul state that belong to an intermediary population between the 42 and 46b karyotypes, parapatrically distributed. Three karyotype numbers were found: a) $2n = 42$ (2 specimens), with autosomal arm number (AN) = 74; b) $2n = 43$ (3 specimens), AN = 70, 72 and 74; and c) $2n = 44$ (3 specimens), AN = 74. The finding of a new hybrid zone, between $2n = 42$ and $2n = 46b$, demonstrates that in spite of the pericentric inversion found in the "b" karyotype system with respect to the "a", the reproduction among the specimens of the two systems is possible. The detection of a new hybrid zone and new karyotypes in *C. minutus* reinforce the high chromosome variability and the hypothesis that different karyotypes do not seem to represent effective barriers to the reproduction within this species.

134 CYTOGENETICS AND MOLECULAR PHYLOGENY OF THE GENUS *OLIGORYZOMYS* (SIGMODONTINAE, RODENTIA) FROM NEW BRAZILIAN LOCALITIES

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Pygmy rice rats of *Oligoryzomys* are widespread from Mexico to Tierra del Fuego in a variety of habitats and climates. Recently, 18 species were recognized for the genus, being 10 recorded in Brazil, inhabiting Atlantic and Amazonian rainforests, Cerrado, Caatinga, and Pampa. In our study we used samples of *Oligoryzomys* from 46 localities of 11 Brazilian states: Piauí, Ceará, Bahia, Minas Gerais, Espírito Santo, São Paulo, Paraná, Rio Grande do Sul, Mato Grosso, Goiás, and Tocantins. Cytogenetic data were obtained from bone marrow, spleen and fibroblast culture, and DNA sequences from liver and muscle. Conventional and differential staining and fluorescence in situ hybridization (FISH) for cytogenetic study evinced *Oligoryzomys nigripes* with $2n=62$, $FN=80$, 81, 82; *O. flavescens* with $2n=64$, 65, 66, $FN=66$, 67, 68; *Oligoryzomys microtis* with $2n=64$, $FN=64$; and *Oligoryzomys fornesi* with $2n=62$, $FN=64$. FISH with telomeric probes showed exclusively telomeric signals even in rearranged pairs and supernumerary chromosomes. Sequences of 750bp of the mitochondrial cytochrome-b gene were used for phylogenetic reconstruction. Parsimony and Bayesian analyses recovered the genus as monophyletic and the clades were related to the biomes where animals were trapped: Amazonian, Atlantic forest, Cerrado areas, and a clade composed of samples with $2n=62$ from Ceará - from a transitional area between Atlantic and Amazonian rainforests called "Brejos" - and Bahia. The Amazonian clade is related to *Oligoryzomys microtis*; the clade of Atlantic forest comprises several localities of Southeast and South Brazil and is composed for representatives of *Oligoryzomys nigripes*. Distinct clades were recovered from different areas of Cerrado. We emphasize karyotype as an important marker for this genus and that the recovered clades are related to biomes which animals inhabit. Financial Support: FAPESP, CNPq

135 CYTOGENETICS OF HUNTING RODENTS OF VENEZUELA

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Adequate conservation and management plans for game mammals require information on their cytogenetics. Techniques using cytogenetics allow comparing species, inferring evolutionary relationships based on chromosomal rearrangements, and planning crosses between populations. The purpose of this study was to describe chromosomal features in four species of game rodents in Venezuela: *Hydrochoerus hydrochaeris*, *H. isthmus*, *Cuniculus paca*, and *Dasyprocta leporine*, traditionally hunted by rural and indigenous communities. Fortunately, in Venezuela these species are not yet endangered. We analyzed 23 individuals of *Hydrochoerus*, 19 of *H. hydrochaeris* and four of *H. isthmus*; 9 of *C. paca* and 6 of *D. leporine*, from national zoos and wildlife. Karyotypes were obtained from bone marrow and lymphocyte cultures. We found that, the capybaras, *H. hydrochaeris*, have chromosomal complements of $2n=66$ and fundamental number (FN) of 102, and *H. isthmus* have $2n=64$ and $FN=104$. The first species has 19 pairs of two-armed (metacentric or submetacentric) chromosomes and 13 pairs of acrocentric chromosomes, and the second species has 20 pairs of two-armed chromosomes and 13 pairs of acrocentric. In both chromosomal complements, X is the largest metacentric chromosome and the chromosome Y is acrocentric. The paca, *Cuniculus paca*, have chromosomal complements of $2n=74$ ($FN=86$) composed of 7 pairs of two-armed chromosomes and 29 pairs of acrocentric. Both sexual chromosomes are metacentric. The karyotype of aguti, *Dasyprocta leporine*, have diploid number $2n=64$ and $FN=122$, with 30 pairs of metacentric and one pair of acrocentric chromosomes. The X chromosome is submetacentric and the Y is metacentric.

136 EFFECT OF FRAGMENTATION ON PRAIRIE DOG (*CYNOMYS LUDOVICIANUS*) GENETIC VARIATION IN CHIHUAHUA, MEXICO

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Prairie dogs (*Cynomys ludovicianus*) are distributed in northwestern Mexico, a site that represents the southernmost part of their distribution and one of the largest remaining prairie dog colony complexes. Habitat loss due to fragmentation and habitat transformation for agriculture and cattle rising represents a problem for prairie dog permanence in this area. Fragmentation causes the degradation of genetic variation by reducing population size and interrupting gene flow, this enhances the effects of inbreeding and genetic drift. It is important to assess the effect of habitat fragmentation on population genetic variability of threatened and key species such as prairie dogs. DNA extraction and PCR amplification of 10 prairie dog nuclear microsatellite loci were performed on 160 blood samples obtained from 13 colonies of the Chihuahua complex. All loci are polymorphic (2-4 alleles per locus) and mean expected heterozygosity is 0.525 ± 0.11 . Eight of thirteen colonies present heterozygote deficiency. There is no isolation by distance nor correlation between colony size and genetic variation. The AMOVA determines that genetic structure is moderate ($F_{ST} = 0.103$), with larger variation within individuals (73.6%) than between individuals within populations (16.5%) and between populations (10.3%). Values of F_{IS} and F_{IT} suggest moderate effect of inbreeding and genetic drift (0.180 and 0.264, respectively). Our results suggest that even though there has been a reduction on genetic variation, fragmentation is so recent that its effects are not clear yet. It is necessary to conduct management action to prevent further habitat fragmentation and preserve the genetic variation that remains and allows prairie dog response to environmental change.

137 EFFECTS OF POPULATION REDUCTION ON THE GENETIC DIVERSITY OF THE AMERICAN BEAVER IN ARIZONA, U.S.

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Effects of population reduction on the genetic diversity of the American beaver in Arizona, U.S. Pelz-Serrano Karla*1, Culver Melanie1, Piaggio Antoinette J.2 and Bergman David3 1 School of Natural Resources rm 325, University of Arizona. Tucson AZ 85721 US. 2 USDA/National Wildlife Research Center 4101 LaPorte Ave. Fort Collins, CO 80521 3 USDA/APHIS/Wildlife Services 8836 North 23rd Avenue?Suite 2?Phoenix, AZ 85021 During the 1800's and early 1900's the American beaver (*Castor canadensis*) was almost extirpated from most of the eastern and southern United States due to the marketing of their pelts. In Arizona a lot of the populations were extirpated and were not managed properly until the late 1990's. Thus, only few populations remain and little is known about the ecological and genetic status of these populations. Using eight microsatellite DNA markers and two mitochondrial DNA markers, we compared the genetic diversity of different populations in Arizona to other populations from Colorado, Alabama, Wisconsin, Texas and Maine. The populations in Arizona showed lower genetic diversity for both, the microsatellite and mitochondrial DNA markers compared to the other populations. This study provides important information of the current genetic diversity of populations of beavers in Arizona which can be used to generate management plans for the American beaver in this region.

138 EVOLUTION OF A HYBRID ZONE IN ISRAELI *SPALAX* (SPALACIDAE, RODENTIA)

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The aim of the present research was to disclose the chromosomal characteristics in a hybrid zone between two cytotypes of *Spalax ehrenbergi* ($2n=58$ and $2n=52$) to understand evolutionary processes determining the structure of this hybrid zone. Data on spatial distribution of various karyotypes across the hybrid zone, the level of chromosomal abnormalities in heterozygous individuals were used to achieve this goal. A total of 149 specimens of mole rats were karyotyped from the area covered approximately 2 km² in the region of Upper Galilee. This site ($33^{\circ} 01' 24''$ - $33^{\circ} 02' 09''$ latitude North and $35^{\circ} 14' 03''$ - $35^{\circ} 14' 58''$ longitude East) is located near the village of Miilya and was called the "Miilya" hybrid zone. Cytogenetic analysis of hybrids and parental species in the "Miilya" hybrid zone showed: 1. Very high frequency of back-crosses and apparently hybrids of F₂, give evidence of fertility in F₁ hybrids. 2. We found significant selection against heterozygote only for one Robertsonian rearrangement. 3. Prevalence of heterozygote hybrids in the "Miilya" hybrid zone did not support our preliminary hypothesis on advantage of homozygote karyotype in a hybrid zone. 4. Clines for four Rb metacentrics specific for cytotype of $2n=52$ were coincident and staggered from the cline for Rb metacentric specific for cytotype of $2n=58$. 5. The width of the "Miilya" hybrid zone is maintained by dispersal and geographically mediated barriers to parental gene flow. 6. Comparison of our results with data published by Nevo and Bar-El (1976) showed that period for 30 years did not change essentially the position and borders of the "Miilya" hybrid zone but shifted tendency for the distribution of chromosome frequency towards the high chromosome numbers.

139 GENETIC CHANGES IN THE WOOLLY-MOUSE OPOSSUM *MICOUREUS PARAGUAYANUS* AS A RESULT OF ATLANTIC FOREST FRAGMENTATION

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Habitat fragmentation is predicted to have considerable effects on the genetic and demographic viability of populations due to the combined effects of reduced population size and increased isolation. To evaluate the consequences of recent habitat fragmentation on diversity and genetic structure of animal populations, ten microsatellite loci were scored in 95 individuals of the arboreal marsupial *Micoureus paraguayanus*. Samples were obtained from six Atlantic forest remnants located in the west of São Paulo state, Brazil, comprising the Morro do Diabo State Park, with about 37,000 ha, and smaller fragments (30 to 2,000 ha) around it. The number of alleles per loci varied between 4 and 10 (6.1 overall) while the observed heterozygosity ranged from 0.382 to 0.588 across the examined populations (0.488 overall). This overall heterozygosity is lower than values described in the literature for non-inbred populations, and for some loci there were also a lower number of alleles than that observed for other population of the same species. So, on average, diversity was considered to be slightly lower than that observed elsewhere. A high number of migrants per generation was calculated, which we suppose to reflect the historic gene flow between the analyzed populations. In spite of that, a significant genetic differentiation (based on *F_{st}* and *R_{st}* values) was detected between three of them, fairly the smallest and most disturbed ones. Bayesian analysis reinforced this finding indicating three population clusters associated with the three most differentiated populations previously mentioned. A genetic bottleneck was also evident for the population present in the smallest fragment. These findings indicate that although recent – about 60 years – fragmentation can be promoting changes in the genetic structure of the studied population. Monitoring and management strategies to maintain the viability of this and other species inhabiting these forest fragments should thus be considered.

140 GENETIC CHARACTERIZATION OF CAPYBARA WILD POPULATIONS IN THE COLOMBIAN ORINOQUIA

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The capybara, *Hydrochoerus hydrochaeris*, the largest rodent in the world is semi-aquatic and lives in grassy wetland areas but also close to rivers. Capybara populations have been threatened by extensive hunting for their meat and skins, and also killed by humans

when grazing is seen as a competition for livestock. Their survival is also possibly affected by loss of habitat in the Colombian Llanos. We have investigated the genetic diversity and the population structure of these diurnal social rodent in Casanare, Colombia, by using the mt DNA Control Region (mtADN). We obtained D-loop sequences for 53 specimens from 5 localities of the Department of Casanare, and included data obtained elsewhere for populations of Venezuela. The Capybara shows moderate to low levels of diversity, given partially by the scarce extension of land surveyed. Evolutionary relationships between populations based on parsimony, maximum likelihood and bayesian inference do not show well supported clades based on geographic origin, suggesting lack of geographic structure. Nevertheless a very low differentiation exists between populations separated by the Meta river and it seems there are not large differences among Colombia and Venezuela populations separated by a large geographic range. Based on nested clade analysis, fifteen control region haplotypes suggest relatively low levels of gene flow although populations are significantly isolated from each other. Additionally, we did not find evidence of recent bottlenecks for the populations of Capybara in this region of Colombia. As a consequence, we propose that although translocations are genetically viable, the conservation strategies of capybara should be based mainly in the maintaining of genetic flow in all Department of Casanare and also include an adequate ecosystem management as well as habitat integrity.

141 GENETIC CHARACTERIZATION OF TWO OCELOT POPULATIONS FROM THE BRAZILIAN ATLANTIC FOREST

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The ocelot (*Leopardus pardalis*) is a highly mobile felid that occurs across several types of habitat from Texas to southern Brazil and Argentina. We investigated the genetic diversity of two ocelot populations from the Brazilian Atlantic Forest: one from Iguaçu National Park, in Paraná state, and another from Morro do Diabo State Park, in São Paulo state. Both protected areas are located in the Upper Parana Atlantic Forest (UPAF) ecoregion, and were isolated from each other by human-induced fragmentation ca. 30-40 years ago. In addition to surveying their current diversity, we tested whether the two populations presented any evidence of genetic differentiation from each other, which would imply lack of demographic connectivity. We used nine microsatellite loci that revealed an observed heterozygosity ranging from 0.60 to 0.71. The population at Morro do Diabo State Park showed higher heterozygosity despite occupying a smaller area. Estimates of genetic structure ($F_{ST} = 0.027$) revealed no meaningful subdivision between these populations. We performed different analyses to identify genetic signature of population decline using heterozygosity excess and low ratios of allelic number to allelic size range (M-ratios). Despite the habitat fragmentation that Iguaçu region has already suffered, we found no genetic evidence of a bottleneck in this population. In contrast, the Morro do Diabo population showed observed heterozygosity excess under two mutation models, TPM (95% SMM) and IAM. This area probably has suffered a stronger effect of hunting, habitat loss and fragmentation, with only 2.7% of the original area still remaining. Our data indicated that these ocelot populations still represent a genetic continuum, whose connectivity across this fragmented landscape should be maintained to ensure long-term viability of this species in the region. Financial Support: FAPESP, CNPq.

142 GENETIC DIFFERENTIATION AMONG GEOGRAPHICALLY AND ECOLOGICALLY DIVERGENT POPULATIONS OF THE SMALL CAVY, *MICROCAVIA AUSTRALIS*

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The small cavy *Microcavia australis*, a colonial and fossorial rodent, inhabits over a large distribution range in South American arid zones, which are typically heterogeneous and unpredictable environments. The species is versatile in coping with seasonal and spatial variability through changes in morphology (digestive organs size), physiology (energy extraction efficiency) and behaviour (dietary selection). Furthermore, habitat and ecological variables explain differences in social behavior and in life history traits of this species. In order to complement previous studies on ecology and physiology, we analyzed the levels of genetic variability and differentiation among four populations of the small cavy that differ in habitat characteristics (altitude, vegetation and precipitation). We sequenced the mitochondrial control region (D-loop) and used the Inter Simple Sequence Repeats (ISSR) technique to study the variability in the non-coding nuclear genome. Analyses were performed with the program Arlequin. ISSR variability levels were high in all populations (M from 0.305 to 0.345). Nucleotide diversity in populations from high altitudes was one order of magnitude smaller than in lowlands populations (? 0.001 versus 0.01/0.028); haplotype diversity was also smaller in highland populations (h 0.700 versus 0.844/0.944). Both kinds of markers revealed similar levels and geographic patterns of polymorphism. Pairwise genetic differentiation varied greatly (F_{ST} from 0.039 to 0.439 for ISSR and from 9.000×10^{-5} to 0.933 for mtD-loop), all comparisons being statistically significant except for the two highland populations. Only one out of 17 haplotypes found was shared among populations; the remaining haplotypes were exclusive for one population. Our results show that the variability in morphological, physiological and behavioral traits found among *M. australis* populations is also reflected in the degree of genetic differentiation.

143 GENETIC DIVERSITY AND CONSERVATION OF THE GIANT ANTEATER (*MYRMECOPHAGA TRIDACTYLA*) IN BRAZIL.

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This work presents new genetic variability data in the giant anteater (*Myrmecophaga tridactyla*, Pilosa, Mammalia) populations of Brazil. The species is threatened by such factors as habitat degradation and fragmentation, human encroachment, and numerous

stochastic factors. A re-evaluation of its conservation status is necessary. Lack of studies on this species' genetic diversity add to the difficulty of evaluating the true degree of the risk to which they are subjected. Seventy seven anteater samples were analyzed in this study. Samples originated from nine Brazilian states, from biomes in the Cerrado, Pantanal and the Amazon Forest. Two mitochondrial markers were sequenced (HVI and CytB), along with an autosomic gene (RAG2), and an X-linked intron (iAMELY), to provide broader information on the genetic situation of the species. The results show that a common haplotype, likely related to the ancestral origin, is shared by all Cerrado populations and some Pantanal individuals. This suggests the Cerrado is where the species first diversified, according to the samples used in this study. The populations from Cerrado Parks (Serra da Canastra National Park and Emas National Park) deserve special attention, as they might work as diversification spots, which are important for recolonization events. The Pantanal biome represents a zone of high diversity for the species. Exclusive haplotypes, as well as haplotypes derived from Cerrado, occur in Pantanal. Results are consistent with the diversity that characterizes the Pantanal. Fixation indexes revealed a probable structure between Cerrado and Amazon Forest individuals, stressing the requirement of caution when planning species management. These outcomes clarify some of the phylogeographic history of the giant anteater. Broader sampling within and outside Brazil would allow for a better evaluation of its conservation status.

144 GENETIC STRUCTURE AND DISPERSAL IN BROWN RATS (*RATTUS NORVEGICUS*) IN AN URBAN ECOSYSTEM.

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To investigate genetic variation we used 10 microsatellite markers in 91 *R. norvegicus* trapped in 9 sites throughout Buenos Aires city, Argentina. Fifty six alleles were registered (mean per locus: 5.6). One population located closed to the harbor showed the highest number of exclusive alleles (5), followed by two populations located in the Southwest, with 3 and 1 alleles respectively. Allele frequency was calculated only for 5 populations with at least 15 analyzed individuals. Two populations were from shantytowns (one near the port and the other from the west of the city) and the three remains from parklands (located in the north, in the south and in the southwest of the city). The *Fst* index showed low differentiation levels among populations located closed to the rivers (De la Plata and Riachuelo), although they were geographically distant (Correlation *Fst* vs. geographic distance: Mantel's test $P > 0.1$; Correlation *Fst* vs. differences in the distance to the river: Mantel's test $P = 0.03$). Genetic variability of the populations decreased with the increase of the distance to the port. This relationship was registered for the mean expected heterozygosity *He* ($R^2 = 0.656$), for the mean number of alleles per locus *A* ($R^2 = 0.673$), and for the allelic richness *R* ($R^2 = 0.662$). The population located closed to the harbor showed the biggest values in *Fis*. We detected a significant heterozygote deficit only in this population. This results could suggest that near the harbor several populations of *R. norvegicus* from different origins coexist, generating a mix of populations where the allelic frequencies has not been homogenized yet. We conclude that a) the rats coming from different parts of the world enter to Buenos Aires city through the port, and b) the habitats associated to the rivers could act as corridors allowing dispersal of this specie in the city.

145 GENETIC VARIABILITY OF *MAZAMA GOUAZOUBIRA* (MAMMALIA: ARTIODACTYLA: CERVIDAE). PRELIMINARY STUDY.

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The Gray brocket deer (*Mazama gouazoubira* Fischer, 1814) is a widely distributed species in the Neotropical region, ranging from Colombia to northern Argentina. These deer inhabit a wide range of ecosystems including different kinds of closed canopy forests, clearcut forests and savannah woodlands, and they are thought to be abundant and common throughout their range of distribution. However, populations are poorly managed and little is known regarding their patterns of genetic diversity and levels of gene flow between them. Therefore we conducted a study to elucidate the phylogeography and genetic variability patterns in this species by using sequences from the cytochrome b gene of the mitochondrial DNA from 40 samples collected throughout their range including Argentina, Bolivia, Brazil, Paraguay and Uruguay. First, we screened for levels of genetic diversity by analyzing a 985 bp fragment of the cytochrome b gene in 26 individuals from all sample localities. Our results showed high levels of genetic diversity for this species with 12 unique haplotypes. These haplotypes varied from 3 to 22 base pair substitutions within sampled localities and only 1 haplotype was shared between the sampled localities. In addition, when we analyzed a larger sample (40 individuals) comparing a shorter fragment (260 bp) we recovered up to 17 unique haplotypes. The results of an Analysis of Molecular Variance suggest that there are moderate levels of population genetic structure among geographic localities with 22% of the variation attributed to among groups and 76% to within population genetic variation. The high levels of genetic diversity coupled with the moderate levels of population structure imply larger population sizes and high levels of gene flow among them. These preliminary data suggest that gray brockets should be managed as a metapopulation.

146 GENETIC VARIATION IN POPULATIONS OF HOWLER MONKEYS (*ALOUATTA CARAYA* AND *A. GUARIBA*) IN ARGENTINA AND BRAZIL.

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Black and gold howler monkeys (*Alouatta caraya*), and brown howlers (*A. guariba*) are the primates southernmost distributed in the Neotropical region. The loss and fragmentation of the forests is widely regarded as the process that most threatens primate species. Nowadays, populations of these two species have been seriously threatened by the virus of yellow fever, with reported deaths of both species in Argentina and Brazil. With the aim to characterize the level of genetic variability, and the processes that determine the actual genetic structure, we analyzed a 290 nucleotides length fragment of the mitochondrial control region. We studied 5 populations of *A. caraya* inhabiting in different provinces of northern Argentina. (1C) Isla Brasilera, Chaco (2C) Estación Biológica Corrientes, Corrientes (3C) Parque Provincial Piñalito, Misiones and 2 states in Brazil (4C) Paraná, (5C) Minas Gerais. We also analyzed 6 populations of *A. guariba*; one inhabiting in (1G) Parque Provincial Piñalito, Misiones, Argentina, and the other 5 inhabiting different states in Brazil: (2G) Rio Grande do Sul, (3G) Santa Catarina, (4G) San Pablo, (5G) Rio Janeiro, (6G) Minas Gerais. Our results show moderate to high levels of genetic diversity for both species. For the 31 sequences of *A. caraya* we obtained a total of 15 haplotypes, 58 polymorphic sites, haplotype diversity, $H_d = 0,910$ and nucleotide diversity, $\pi = 0,053$ and for the 28 sequences of *A. guariba* 20 different haplotypes, 59 polymorphic sites, $H_d = 0,968$ and $\pi = 0,048$. All the tests applied to investigate population size changes (Mismatch Distribution, Fu's F_s and Tajima's D) shown no recent population expansion for each set of sequences. One interesting result to *A. guariba* set of sequences was the highest genetic divergence observed between the ones from the north vs. south of distribution suggesting the requirement of a revision of the taxonomic status for this clade.

147 KARYOTYPES SUGGEST THAT *ALOUATTA GUARIBA CLAMITANS* MAY BE REPRESENTATIVE OF TWO SUBSPECIES OR SEPARATE SPECIES

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Several studies indicate a great degree of chromosomal variability within *Alouatta guariba clamitans* due to pericentric inversions, chromosome fusions, translocations between chromosomes and other complex rearrangements. We studied the karyotypes of twelve males and twelve females of brown howler monkeys, *A. g. clamitans* (Platyrrhini, Atelidae), from populations of the south and southeast of Brazil. Among males we found a diploid number of $2n = 45$ and 49 and Y-autosome translocations and females we found a diploid number of 46 and 50 chromosomes. The X chromosomes were submetacentrics. The characteristic chromosome pair of *A. g. clamitans*, pair 1, was identified in all specimens studied. Heteromorphic chromosome pairs were observed within the two different populations. The major chromosomal differences between populations of the south (with 25, 27 to 28 banded chromosomes and 18 to 20 acrocentrics) and southeast (with 17 to 21 banded chromosomes and 27 to 32 acrocentrics) of Brazil suggest that *A. g. clamitans* may be representative of two subspecies or even two separate species, highlighting the need for a taxonomic review. Furthermore, *A. g. clamitans* chromosome analyses are important for subspecies identification and such information can in turn be useful for a variety of conservation purposes including repatriation of animals in an appropriate geographical region and for captive breeding programs, increasing the chances of ex-situ breeding. It is also an important tool for identifying the geographical origins of specimens with uncertain origin. Financial Support: FAPESP, CEPID/FAPESP, CNPq.

148 MITOCHONDRIAL DNA DIFFERENTIATION WITHIN THE EASTERN KALAHARI BUSHVELD LINEAGE OF *MICAELAMYS NAMAQUENSIS* (RODENTIA: MURIDAE)

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Here we demonstrate that the understanding of population dynamics critically depends on exploring species history at different temporal and spatial scales. The Namaqua rock mouse *Micaelamys namaquensis* Smith, 1834, is widely distributed in southern Africa and although catholic in its habitat requirements, prefers rocky outcrops or boulder-strewn hillsides. Phylogenetic analyses uncovered 14 divergent lineages in what is currently recognised as a single species. Preliminary analyses further show contrasting phylogeographic structuring within the independent lineages suggestive of different underlying microevolutionary processes. For example, although several lineages are present in the western, semi-arid parts of southern Africa (the Nama-Karoo, Succulent Karoo and Namib Desert biomes), variation in each appears to be fairly homogeneous even over large geographical distances. We conducted a more detailed phylogeographic analysis among 10 localities of the Eastern Kalahari Bushveld lineage based on mitochondrial cytochrome b sequences. A genetic pattern of phylogenetic continuity with a lack of spatial separation was observed. Despite the restricted number of samples (for some localities), the mismatch distribution analysis suggests that the lineage has expanded its population size, and the geographical expansion may have followed environmental changes associated with habitat modification in the recent past. Dispersal is greatly influenced by landscape heterogeneity, resource distribution and population densities and in turn determines the genetic structure of populations. A value above one migrant per generation is considered to be sufficient to overcome genetic divergence among populations caused by drift. Therefore, the estimates of female gene flow resulting from the present study suggest some level of connectivity among localities (some localities might act as sinks and others as sources). The description of the genetic structure within this lineage is fundamental in understanding the history and evolutionary potential of the species and also with regards to its conservation.

149 MOLECULAR CHARACTERIZATION OF *SIGMODON HIRSUTUS* (MAMMALIA:RODENTIA) POPULATIONS IN VENEZUELA BASED ON CITOCROME B

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Sigmodon hispidus (Rodentia) is comprised by three species of paraphyletic origin: *S. hispidus* (North América), *S. toltecus* (México) and *S. hirsutus* (México, Central and South America) based on cito b. Only two specimens from north of South America have been analyzed previously (Sarare, Lara State, Andean-Coriano System, Venezuela) named *S. hirsutus hirsutus* based on molecular characters. Our aim was to perform the molecular characterization and its evolutionary relationships of Venezuelan biogeographical populations from two areas: Valle Sartenejas (Miranda State, Coast Cordillera) and Sierra de San Luis (Falcón State, Coriano Systems) using 12 cito b sequences (810bp), plus 42 sequences of *Sigmodon* species available from GenBank, by mean of cladistic analyses (heuristic search, TBR, 100 random addition, 1000 bootstrap replicate, by CI reweight, *Peromyscus leucopus* outgroup). The genetic distance showed two haplotypes groups from Venezuela (K2P interpoplational = 0.5-0.6%, zero nucleotide divergence sites, and 0.14-0.1 MA divergence time). The populations' genetic distance among the three Venezuelan haplotypes group is related with geographic distance. The parsimony analyses (1 tree, CI:0.61, 784 step) shown that, our two populations from Venezuela plus the reference sequence of *S. hirsutus hirsutus* (Sarare) from GenBank, group as a well supported monophyletic clade (bootstrap 99%) with no nucleotide divergence and phylogeographic pattern. However, this Venezuelan monophyletic clade (99%), built an independent and ancient lineage to *S. hirsutus* from Central America and Mexico (bootstrap 100%), suggesting that the South America (Venezuela) populations represent a separate taxonomic lineage-group (subspecies probably). There will be necessary, to include Colombian populations and re-describe the *S. hirsutus hirsutus* sensu strict holotype using Venezuelan samples.

150 **MOLECULAR PHYLOGENETICS AND GENETIC DIVERSITY OF ASIATIC BLACK BEAR (*URSUS THIBETANUS*) POPULATIONS IN RUSSIAN PRIMORSKY AND NORTH KOREA : FOR RESTORATION OF KOREAN BLACK BEARS**

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Asiatic black bears (*Ursus thibetanus*) in Jirisan, South Korea are critically endangered. It is difficult for such small populations to avoid extinction because of inbreeding, lack of genetic diversity and unstable population size. Supplementation of individuals from other populations would be necessary to conserve genetic diversity for small populations and this requires establishment of accurate phylogenetic status and conservation unit to select suitable individuals to be used for the reintroduction. Thus, we compared mitochondrial DNA sequences of complete control region, tRNA^{thr}, tRNA^{pro}, and part of cytochrome b in 32 Asiatic black bears from various regions of East Asia. Sequence comparisons and the reconstructed molecular phylogenetic trees indicate that the Asiatic black bear populations in the Korean peninsula, Russian Primorsky region, and northeastern China form a distinct group and may be considered as a single evolutionary significant unit (ESU). Based on results, an ambitious reintroduction project is underway in order to restore the black bear population in Jirisan National Park. Twenty Asiatic black bear cubs from North Korea and Russian Primorsky region were imported and released into Jirisan. We evaluated the genetic diversity and population structure of the source populations of the reintroduced black bears utilizing 16 nuclear microsatellite markers. Mean expected heterozygosity (HE) across 16 loci for each population was 0.648 for Russian and 0.676 for North Korean populations with the total mean HE of 0.687. The level of genetic diversity in the two populations is comparable to that of other bear populations. However, FST value (0.063) indicated that there is a slight genetic differentiation between the two groups of black. Despite the slight genetic differentiation, they could be regarded as a single ESU.

151 **MOLECULAR PHYLOGENY OF *BLARINOMYS* THOMAS 1896 (SIGMODONTINAE, AKODONTINI) AND EXTRAORDINARY CHROMOSOMAL DIVERSITY OF THE GENUS**

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We present molecular phylogenetics and cytogenetics data on the monotypic fossorial rodent genus *Blarinomys*. Maximum parsimony, maximum likelihood, and Bayesian analyses based on cytochrome b gene sequences were performed for a sample of 11 individuals from nine localities of four states of Eastern Brazil. All topologies recovered two main lineages: a northeastern (A) and a southeastern clade. The southeastern grouped two sister-clades, B and C. A haplotype network showed three clusters, I, II and III involving the haplotypes from the localities represented in clades A, B and C respectively. Sequence divergence between individuals from clades, northeastern and southeastern ranged from 4.7% to 8.0%, B and C from 4.3% to 5.7%, northeastern and B from 6.1% to 8.0% and northeastern and C from 4.7% to 6.4%. Within the clades, divergence varied from 0% to 4.2% in the northeastern clade, was 0.7% in the clade B, and varied from 0.1% to 1.3% in clade C. Variation among specimens from same geographic regions ranged from 0% to 1.3%. Cytogenetic studies of five individuals revealed high karyotypic diversity with five distinct diploid numbers: 2n=52 (48A+2Bs, XY) from state of Bahia, 2n=43 (37A+4Bs, XX), 2n=37 (34A+1B, XY), 2n=34 (32A, XX), and 2n=31 (27A+2Bs, XX) from state of São Paulo, and same number of autosomic arms (FN=50) excluding sex chromosomes and supernumeraries. Polymorphisms are due to Robertsonian rearrangements, in addition to the variation from none to four B chromosomes, which are heterogeneous regarding morphology, heterochromatin constitution and presence of interstitial telomeric signals (ITS). ITSs were also observed in the pericentromeric regions of some biallelic autosomic pairs of three specimens. Results of molecular phylogeny and cytogenetics revealed a high diversity for this genus, showing an extraordinary chromosomal polymorphism and at least three lineages that coupled with genetic distances among their representatives may represent different species.

152 MONOPHYLY OF MONDELPHIS (DIDELPHIMORPHIA: DIDELPHIDAE) AND PHYLOGEOGRAPHIC ANALYSIS OF *MONDELPHIS DOMESTICA* (WAGNER, 1842) BASED ON CYT-B MITOCHONDRIAL DNA.

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The genus *Monodelphis* Burnett, 1830 is the most diverse of the family Didelphidae with at least 18 recognized species; *Monodelphis domestica* being the most widespread species. We carried out a phylogenetic analysis of six *Monodelphis* species and a phylogeographic analysis of *M. domestica* based on 900 base pairs of Cytochrome b DNA. We analyzed sequence data from 15 specimens of *M. domestica* from nine localities of the Brazilian Cerrado and Caatinga morphoclimatic domains, one *M. umbistriata*, one *M. gr. americana* and two *M. dimidiata*, together with GenBank data from two *M. domestica*, three other *Monodelphis* species, and *Didelphis virginiana* as outgroup. Genetic distance estimates, calculated with MEGA 4.0, using the p distance model and the "pairwise deletion" option, showed 0.4 to 7.7% of variation within *M. domestica* haplotypes, and 13.7 to 17.5% between *Monodelphis* species. Maximum parsimony (MP) and maximum likelihood (ML) analyses carried out with PAUP* 4.0b, showed similar topologies. These topologies confirmed the monophyly of this genus and of *M. domestica* from different localities. The most basal clade comprised *M. adusta* and *M. handleyi*, followed by *M. dimidiata*. The most derived clade showed two main lineages, one leading to *M. umbistriata* and *M. gr. americana* and the other to *M. domestica*. *M. domestica* split in two clades with high bootstrap support: one comprising specimens from central Brazil and another from northeastern Brazil. These results indicated an incipient structuration of *M. domestica* population, although the possibility that this taxon might represent a species complex can not be ruled out.

153 NEW MARKERS, SAME RESULT – LOW GENETIC DIVERSITY ON THE ATLANTIC FOREST COMMON-SLOTH NUCLEAR GENE GENEALOGIES

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Neotropical biota is still poorly known, although it is so threatened and biodiverse. Here, several species of well studied groups, such as mammals, are lacking basic information about biology, taxonomy and ecology. An example is the common-sloth (*Bradypus variegatus*): its vast distribution must be confirmed, its taxonomy should be revised and most of its evolutionary history is unknown. This species appears to be divided in six management units (MUs), revealed by mitochondrial DNA. However more data are necessary to better support these and other units. In order to clarify these questions, nuclear DNA molecular markers were successfully tested in 29 common-sloth samples, focusing mostly the two Atlantic Forest MUs. Gene genealogies of the following fragments were analyzed: β -fibrinogen (FGB) intron 7, β -globin (HBB) partial gene, k-casein (CSN3) partial gene and hypoxanthine-guanosine phosphoribosyl transferase (HPRT) intron 2. Analysis showed that all markers are evolving neutrally and two recombination events were detected in HBB. The genetic variability found was low in Atlantic Forest group, with nucleotide diversity varying between $0.88 \times 10^{-3} \pm 0.1 \times 10^{-3}$ (FGB) and $3.65 \times 10^{-3} \pm 0.73 \times 10^{-3}$ (HBB) and haplotypic diversity varying between 0.312 ± 0.092 (HPRT) and 0.584 ± 0.089 (HBB). The average number of polymorphic sites was 16 in all sampling analysis but decreased to eight when only Atlantic Forest was analyzed. Currently, more samples from all common-sloth distribution area and also samples from other sloths species (both *Bradypus* and *Choloepus*) are being analyzed. So far, data shows some differentiation concordant with the two Atlantic Forest MUs. These populations cluster in a well supported monophyletic clade, differentiating this forest from others. The low diversity seems to be characteristic of the Atlantic Forest common-sloth, since other markers (microsatellites and mitochondrial DNA) had similar values and, neither other common-sloth populations nor other sloth species seems to have such low values, reinforcing bottleneck-event hypothesis instead of an historic low genetic diversity.

154 PERFORMANCE ANALYSIS OF MIXTURE MODELS AND TAXON SAMPLING IN THE MAMMAL PHYLOGENY

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Phylogenetic inference can involve stochastic and systematic errors. The first one is due to insufficient taxon sampling, leading to the construction of phylogenetic trees that have low statistical support. The second one is related to the incapacity of the evolutionary models to incorporate all complexity of the substitution process, even when the amount of analyzed characters is high. This frequently leads to biased topological inferences. A classic example of this phenomenon is the long branch attraction (LBA), that occurs when one or more phylogenetically distant taxa have substitution rates significantly higher than the other taxa in the tree. Therefore, because of convergent evolution, they tend to cluster next to each other. An alternative to diminish systematic errors is the use of mixture models that qualifies and groups the characters according to their similar evolutionary parameters. Consequently, these mixture models estimate the branch length more accurately, avoiding saturation sequence problems. Recent phylogenetic analyses indicate the existence of four superorders of placental mammals: Afrotheria, Xenarthra, Laurasiatheria and Euarchontoglires, but the relationship between them is yet to be elucidated. Reduced taxon sampling often results in the dissolution of Euarchontoglires (Primates + Rodentia). In this issue we analyze the performance of mixture models (e.g., CAT model) in the recovery of phylogenetic relationships of placental mammal orders using an increasing taxon sampling. Aminoacid sequences were taken from online databases, and the topologies were generated by PhymL, MrBayes and Phylobayes. Our results show that even complex evolution models are incapable to surpass the effect of taxon sampling and the stability of the four mammal superorders is directly influenced by the number of the analyzed sequences.

155 PHYLOGENETIC RELATIONSHIP AND GENETIC VARIATION OF SIBERIAN ROE DEER (*CAPREOLUS PYGARGUS*) USING MITOCHONDRIAL CYTOCHROME B AND CONTROL REGION SEQUENCES.

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The Siberian roe deer (*Capreolus pygargus*) is widely distributed in northeastern Asia including Russia, Kazakhstan, eastern Tibet, Korean peninsula, Mongol and central China. There have been few studies on taxonomic status of the Siberian roe deer from Korea and genetic structure of the Siberian roe deer from northeastern Asia using molecular genetic tools. It was reported that Jeju Island population has some morphological differences from the Korean mainland population. In this study, mitochondrial cytochrome b (1140 bp) and control region (682 bp) sequences were determined to figure out phylogenetic relationships between the Siberian roe deer populations from northeastern Asia and Korea including Jeju Island where the morphological difference of the Siberian roe deer was found. The phylogenetic analysis of control region and cytochrome b was concordant. All Siberian roe deer samples were mixed and not resolved by geographic affinities, implying historical gene flow among the populations. However, Jeju Island roe deer consisted of a subclade. The results of mtDNA cytochrome b and control region showed no clear geographic structure of the Siberian roe deer and the Jeju Island population was regarded as enlarged clade, which is not concordant to the fact three groups of the Siberian roe deer (West Siberian, East Siberian and Jeju Island) were defined by the previous studies (Koh and Randi., 2001.) Nucleotide and haplotype diversities of the Jeju Island population (π : 0.0005; h : 0.295) were much lower than the population from mainland Korea (π : 0.011; h : 0.906). To get a better understanding on clear population structure of the Siberian roe deer, analysis with faster evolving genetic markers, such as microsatellites and nuclear DNA sequences would be needed.

156 PRELIMINAR PHYLOGEOGRAPHIC ANALYSIS OF THE ARGENTINEAN PAMPAS DEER (*OZOTOCEROS BEZOARTICUS*) POPULATIONS

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The pampas deer is one of the eight species of native cervids of Argentina, and it is considered the most endangered mammal. Although, it was abundant in the past in Argentina, its distribution has withdrawn more than 90% of the original area mainly due to human alteration of their habitat. Currently, only four populations remain, located in Corrientes, Buenos Aires, San Luis and Santa Fe. These populations are small and highly isolated from each other. Traditionally, the taxonomy of the species in Argentina has been based primarily on morphological data resulting in the differentiation of two subspecies: *O. b. celer* y *O. b. leucogaster*. Later on, other studies including molecular markers were performed on some populations from Brazil, Argentina and Uruguay, but the localities of Santa Fe and Corrientes were not included. At this respect, it is very important to analyze genetic differences among the four populations of Argentina, as well as to evaluate the intrapopulation variability in order to propose conservation strategies in the country. The main objective of this study is to carry out a phylogenetic analysis including the two proposed subspecies: *O. b. celer* y *O. b. leucogaster*. Also, to determine levels of genetic differentiation among these isolated populations and to analyze the role of the Paraná river as a geographical barrier between populations in Santa Fé and Corrientes. The results would be used to delimitate conservation and/or management units. We analyzed a 600 bp fragment of the mitochondrial control region of individuals from Santa Fe, Corrientes and Bahía de Sanborombón. Our preliminary results show unique haplotypes of pampas deer in each locality, as well as a clear pattern of segregation among them. The distribution of the genetic variability agrees with the morphological characterization of both subspecies.

157 *RHYNOPHYLLA PUMILIO* PHYLOGEOGRAPHY REVEAL PLEISTOCENE DIVERGENCE BETWEEN ATLANTIC FOREST AND THE AMAZON

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The *Rhinophylla* genus comprises the smallest members of the *Carollinae* subfamily. These are highly specialized forest fruit-eating bats. Currently the genus possess three species endemic to South America. *Rhinophylla pumilio* is the more abundant species and is distributed from the Amazon basin to the Brazilian southeast coast. Wright et al. (1999) used *cyt b* sequences to study the subfamily and described the genus *Rhinophylla* as monophyletic, with deeper divergence between the species than its sister group, *Carollia*. This work aims at describing the phylogeographic pattern of the species *R. pumilio* using a molecular marker. The mitochondrial gene *cyt b* was sequenced in 68 samples of *R. pumilio* and *R. fischerae*, and the sequences of six species from the genus *Carollia* as well as a sequence from *Noctilio albiventris* were used as outgroup. Phylogenetic analyses show that the species *R. pumilio* is formed by two distinct geographical lineages with 3% sequence divergence: one representing the Atlantic Rainforest and the other representing the Amazon Forest. This intraspecific pattern has a parallel in other bat species like *Desmodus rotundus* and like the common vampire bat the divergence time estimates is associated to Pleistocene vicariance. Coalescent and population genetics analyses show that the Amazon clade is older and has higher levels of genetic diversity. *R. pumilio* is a subcanopy specialist and is likely to be sensible to historical Forest fragmentation, originating the observed phylogeographic pattern.

158 SEQUENCE VARIABILITY OF CYTOCHROME C OXIDASE SUBUNIT I IN SIGMODONTINE RODENTS: BARCODING WORKS

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Sequence diversity in the cytochrome c oxidase subunit 1 (COX-1) gene has been considered as a helpful tool for species identification in various animal lineages, but has not been extensively tested in mammals, especially rodents. This study presents a preliminary analysis of intra- and interspecific variation of COX-I in the rodent subfamily Sigmodontinae, including 20 representative taxa of Oryzomyini, Akodontini, Phyllotini, Thomasomyini and genera often classified as incertae sedis. We tested reciprocal monophyly of species and the presence of a "barcoding gap". A total of 88 karyotyped and/or taxidermized specimens coming from different populations of southern Brazil were amplified (primers LCO1420 and HCO2198) and sequenced. The set of 658-bp sequences were visually checked and aligned and K2P distance matrices among and within tribes, genus and species were calculated. Neighbour-Joining and Bayesian trees were constructed. COX-I sequences divergence averaged 5.3% (ranging from 0 to 0.21) within species, 18.4% (0.04 - 0.25) between species, 7.25% (0.02 - 0.12) within genus, 19.2% (0.13 - 0.26) between genus, 9.6% (0.09 - 0.10) within tribes and 18% (0.16 - 0.19) between tribes. Distance results evidenced a "barcoding gap" at different taxonomic levels. NJ and Bayesian trees exhibited monophyletic species, expected tribes were recovered and their relationships were supported. Resolution inside tribes remains unclear, especially in Oryzomyini. Some (6.8%) sequences clustered with unexpected taxa, revealing probable misidentifications. Incertae sedis species *Rhagomys rufescens*, *Juliomys pictipes*, *Delomys dorsalis* and *D. sublineatus* showed no close distance with other genus (mean=15%) and did not cluster with any tribe in trees. Our data allow us to conclude that the barcoding approach is a promising tool to identify sigmodontine species and that COX-I revealed an unexpected phylogenetic signal at deeper levels.

159 STANDARDIZATION OF A COMPLETE MOLECULAR MARKER SET FOR EVOLUTIONARY AND DEMOGRAPHIC STUDIES OF *LONTRA LONGICAUDIS*

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Lontra longicaudis is one of the least known otter species worldwide, and molecular studies focusing on it are rare. This is mostly due to the difficulty in obtaining biological samples and the lack of informative molecular markers for this species. Since the availability of effective assays would facilitate the investigation of its genetics, ecology, behavior and evolution, this study aims to establish a complete set of molecular markers for this species, including multiple sequence-based markers targeting different genomic segments, along with fast-evolving loci suitable for ecological and behavioral studies. We have tested three mtDNA segments (control region, ATP8 and ND5 genes), twelve microsatellite loci developed for *Lontra canadensis* and *Lutra lutra*, and eight nuclear introns currently in use for phylogenetic studies targeting other carnivores. Our data indicated that the mtDNA control region has a limited potential for evolutionary studies of *L. longicaudis*, since this segment exhibited considerable saturation at variable positions, often obliterating the underlying phylogeographic patterns which were more clearly revealed by the ATP8 and ND5 genes. All the assessed microsatellite loci were quite variable in this species; however, two of them (Lut818 and RIO17) presented low amplification success and five others (RIO06-07, RIO18-20) produced a genotypic pattern suggestive of null alleles. We are currently addressing this latter issue by redesigning the primers for these loci, so as to test the presence of null alleles and produce a working set that is free of this bias. Finally, our tests of nuclear introns include segments located on autosomes as well as on the X and Y chromosomes, which can be applied for sexing assays and/or as sequence-based phylogeographic markers, with the ultimate goal of optimizing a set that includes maternal, paternal and biparentally-inherited loci. Financial support: CNPq

160 WILDLIFE DNA BANK IN CHILE: A SOURCE FOR CONSERVATION

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The conservation of biodiversity is an international concern, due to the fact that all around the world there is a large amount of species becoming extinct at a very fast rate. Genetic studies are becoming the basis for conservation; therefore, maintaining a DNA Bank helps in the process of sample collection reducing the impact on natural populations. Preserving a high number of samples from different localities can facilitate and improve population genetics and phylogeographic studies. Furthermore, spatial and temporal records of the samples preserved can make it possible to compare present and past genetic diversity at a geographic scale. On the other hand, the large variety of species collected, including rare and endangered species can contribute to higher evolutionary studies such as phylogenetic systematics. Since October of 2006 the gene bank at Universidad Andrés Bello was started by preserving DNA obtained from tissue samples of vertebrate species found dead during fieldwork, or blood samples from live animals. By now we have collected a total of 459 individuals, from 102 different species. Forty percent of the individuals collected correspond to mammals, with 29 different native, endemic and exotic species. In the exotic category some of the species collected are invasive species such as mink (*Neovison vison*). Forty one percent of the mammals collected are endangered species, and thus hard to acquire for genetic studies. Furthermore, the two most highly represented mammal species in the DNA Bank, are Chungungo (*Lontra felina*) and Pudu (*Pudu puda*), both categorized as endangered and vulnerable by the IUCN (2009). The DNA Bank should be a helpful tool for science, since most of the samples obtained come from animals found dead during fieldwork, and thus would have become lost. Studies generated from those samples can become management actions and species conservation policies.

PARASITOLOGY

161 BIODIVERSITY OF HELMINTHS IN WILD MAMMALS OF MONGOLIA

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Mongolia, a large landlocked country in Central Asia, occupies the transition zone where four ecosystems meet: taiga forest, steppes, mountains, and Gobi desert. These different ecosystems support a wide variety of plant and animal species, including 68 species of fish, 8 species of amphibians, 20 species of reptiles, 410 species of birds, and 134 species of mammals; many of these taxa are globally or regionally endangered. The biodiversity of helminthes in Mongolia should theoretically follow that of the hosts in that the evolutionary history of the parasites is linked to that of the host species. However, the biodiversity of the helminth parasites in Mongolia is relatively poorly known. Very few reports published on the parasitic helminths of wildlife and humans in Mongolia. At present, about 600 species of helminths have been recorded from Mongolia; of these, 272 species are known from wild and domestic mammals. Most of the results have been obtained during 1960-80's, but the volume of research in the field has sharply declined. It is speculated that the helminth fauna of the Mongolia is heterogeneous and ancient. The parasitological situation in wildlife and livestock in Mongolia has drastically changed after the country abandoned socialism and shifted to the free market system. Some of these changes include: lack of funds, insufficient numbers of parasitologists, outdated facilities at medical and veterinary institutions, high growth of the privatized livestock and inadequate veterinary service. In addition to these human infrastructural issues, natural factors as such global climate change have coupled with infrastructural changes to result in added problems, such as increases in emerging and re-emerging diseases.

162 FRAGMENTATION BY INTENSIVE FORESTRY POSES NO BARRIER FOR HANTAVIRUS TRANSMISSION — EXPLAINING HFRS EPIDEMIOLOGY IN EUROPE

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Nephropathia epidemica (NE), a mild form of hemorrhagic fever with renal syndrome (HFRS), is the most common hantaviral disease in Europe and is caused by Puumala hantavirus (PUUV). Both the virus and its host, the bank vole *Myodes glareolus* are found in most of Europe, but the incidence of NE is clearly highest in the boreal zone in northern and north-eastern Europe. This epidemiological pattern is partly a result of pronounced, multiannual vole cycles in boreal Europe. Also the landscapes are different: in temperate Europe, forests are mostly isolated patches, but cover ~70% of land in the boreal zone. However, during the past five decades, intensified forest management has led to forest mosaics with successional stands of all ages: nowadays, only 19% of Finnish forests are older than 100 years. We investigated the impact of intensive forestry on the abundance of bank voles and the prevalence of PUUV infection in northern Finland. In a hierarchical replicated study design, we trapped bank voles on four forest succession phases: 4–5, 10–12, 25–27 and >100 years old, both in spring and fall of the vole density peak year 2007. Our results show that fragmentation due to forest management has no impact on the spread of PUUV in bank voles. Although bank voles were most abundant in the oldest forests (>100 years), PUUV infected bank voles were equally abundant over all succession phases during the vole density peak in fall. Therefore, during the vole peak year, the risk of human infection is equally high from recent clear-cuts to old forests. These results further explain, why NE is so common in northern Europe: besides their capability to reach high reproduction rates, boreal bank vole populations can spread without barriers, facilitating continuous existence of PUUV in large areas over long periods of time.

163 HANTAVIRUS GENOME QUANTIFICATION IN EXPERIMENTALLY INFECTED LABORATORY RATS AND NATURALLY INFECTED WILD RATS (*RATTUS NORVEGICUS*)

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Seoul virus (SEOV), a species in the viral genus Hantavirus, is a causative agent of hemorrhagic fever with renal syndrome (HFRS). The natural reservoir of SEOV is the Norway rat (*Rattus norvegicus*) and it is transmitted horizontally from persistently infected rats to uninfected ones. However, the details of this in nature are still unclear. To study the ecology of SEOV in rodent colonies in more detail, we first examined laboratory rats (WKAH strain, female, six weeks) that were experimentally infected with SEOV strain SR-11 (6.0×10^4 ffu/rat, intra-peritoneal route). The fluctuations in the IgM and IgG antibody titers to SEOV were measured using enzyme-linked immunosorbent assays (ELISA) and the virus genome in the lungs was examined using a real-time PCR method. The amount of the genome was expressed relative to the amount of GAPDH mRNA. IgM antibody appeared 6 days post infection (dpi) and IgG antibody appeared 9 dpi. The IgM antibody titers began to decrease 13 dpi, whereas the IgG antibody titer increased until 16 dpi. The virus genome peaked at 6 dpi. Wild rats were captured in Saigon Harbor and Ho Chi Minh City, Vietnam. Forty-five rats that were SEOV antibody positive in a preliminary examination were re-examined using several diagnosis methods. Ultimately, 21 were determined seropositive (10 rats, anti-SEOV IgM and IgG positive; 11 rats, IgG positive). The relative virus genomes in the lungs of some of the rats examined were 100–1000 times higher than in experimentally infected rats. The amount of virus genome tended to be correlated to the IgM antibody titer. These results confirm the persistence of Hantavirus in rodents in nature. Further studies examining the relationship between age and infection are needed to understand the mode of transmission in rodent colonies.

164 HELMINTHS OF THE MOUND BUILDING MOUSE *MUS SPICILEGUS* (RODENTIA) IN SLOVAKIA

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The mound-building mouse, *Mus spicilegus*, is distributed mainly in forest-steppe zones of Eastern Europe and some parts of Central Europe. The population of the mound-building mouse is marginal in Slovakia, occurs only in its southern parts. *M. spicilegus* demonstrates a unique behaviour amongst other mice species. It constructs large earthen mounds and associated nesting chambers which serve to store food for individuals during the nesting period. The members of the same families spend several months from the late autumn to March – April in these mounds. Helminths of *Mus spicilegus* have been previously studied in Roumania with 14 identified species. The helminth community of wild rodents has been studied by several authors in Slovakia whereas relatively little is known about *M. spicilegus* endoparasites. Some informations about the presence of antibodies against *Toxocara* sp. in blood serum as well as occurrence of cestode eggs of *Hymenolepis* sp. and oxyurid eggs of *Syphacia* sp. in faeces of *M. spicilegus* were reported recently. With the aim to firstly explore gastrointestinal helminths of the mound-building mouse in Southern Slovakia, the helminthfauna of 134 individuals of *Mus spicilegus* trapped between winter 2002 and winter 2008 was analysed. Hosts were captured in four geographical areas : Košická kotlina basin (n=113), Východoslovenská rovina plain (n=10), Ipeľská pahorkatina downs (n= 9) and Hronská pahorkatina downs (n=2). A low species richness was found with three helminth species: two nematodes *Heligmosomoides polygyrus* (Dujardin, 1845), *Syphacia obvelata* (Rudolphi, 1802) and one cestode *Hymenolepis diminuta* (Rudolphi, 1819) with general prevalence of 7.4%, 23.7% and 1.5%, respectively. The homogeneous habitat (fields) and recent colonization of this mouse in Slovakia could contribute to explain the low detected species richness. This study was supported by projects – APVV-0108-06 and by VEGA 2/0043/09. The Attendance of first author to the ECM10 was partially supported by SECEM (Sociedad Española para la Conservación y Estudio de los Mamíferos). The National Scholarship Program of the Slovak Republic payed stay of first author in Slovakia.

165 HELMINTHS OF TWO GERBILS IN THE NEGEV DESERT, ISRAEL

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Studies on helminths of gerbils (Order: Rodentia, Family: Muridae) are limited to same localities and species despite is more than 40 species. Previous studies are reported in Egypt: *G. dasyurus*, *G. gerbillus* and *G. pyramidum*; Tunisia: *G. campestris*, *G. gerbillus*, *G. pyramidum*, *G. pyramidum hirtipes*; Iraq: *G. gerbillus*; India: *G. gleadowi*; and *G. tatera* and *G. gleadowi* in Mozambique. In Israel, where our study was performed previous studies where in *G. andersoni*, *G. dasyurus*, *G. gerbillus*, *G. pyramidum* and *G. tristrami*. All previous studies doesn't include ecological data on helminths being limited to the citation of species. In the present study, two desert rats were analyzed for helminths: the Anderson's gerbil (n=30) *Gerbillus andersoni* (de Winton, 1902) found in coastal zones in Tunisia and Israel; and the Greater Egyptian Gerbil (n=13) *Gerbillus pyramidum* (Geoffroy, 1825) that has a wider distribution from Mauritania to Israel. Analyzed hosts were collected in the Negev desert, Israel during April-May 2003. Samples of faeces were preserved in SAF solution until they were analyzed, in order to search for eggs of intestinal parasites. Egg density (eggs/ml) was estimated for each host individual and egg length was recorded for further taxonomic identification. A total of four species of helminths were identified belonging to Class Nematoda and Cestoda. General prevalence was 26,67%. The most prevalent and abundant species, *Mastophorus muris* (Gmelin, 1790), was found in both host species. Parasitization by a single species was 66,67%, 25% for 2 species and 8,33% for 3 helminths. *G. andersoni* presented a higher diversity (4) than *G. pyramidum* (2). Attendance of second author to the ECM10 was partially supported by SECEM (Sociedad Española para la Conservación y Estudio de los Mamíferos)

166 ZOOGEOGRAPHICAL OVERVIEW OF HOST-PARASITE RELATIONSHIPS BETWEEN FREE-RANGING/ CAPTIVE MURID AND HELIGMOSOMID NEMATODES

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The gastro-intestinal nematode family Heligmosomidae, especially *Heligmosomoides* and *Heligmosomum*, is an not only an interesting zoogeographical/co-evolutional biomarker of the host-parasite relationships between rodents including the families sciurids, cricetins, murins, microtins etc and the nematode group, but also an experimental model in captive condition. Hence, the nematode group is a well-studied parasite of the host group in both wild and laboratory. Among the nematode species, *Heligmosomoides polygyrus* shifted from *Mus musculus* is regarded as a highly pathogen in captive endangered rodent species [1]. First of all, this presentation will give an overview of the zoogeographical host-parasite relationships in Europe, Asia, Far Eastern Russia, Japan, Taiwan, North America and North Africa, mainly with data derived from recent our survey performed in Central Asia including Siberia, Xing-Jiang, Nepal, Tibet and Inner Mongolia. Principally, the relationships have evolved as a result of adaptive radiation or co-speciation between the native rodents and parasitic nematodes, but secondary phenomena including host-shifts and extinction. Now, aberrant host-parasite relationships due to the presence of alien (exotic) rodent hosts and/or nematodes (e.g. *H. polygyrus*) have been found in free-ranging and captive condition [2]. These relationships should be discriminated from the native relationships, and be regarded as risk factor for natural ecosystem. Some potential strategies including monitoring with consideration of the nematodes' life cycle will be presented briefly. The present survey was supported in part by a Grant-in-Aid (No. 18510205) of the Ministry of the Education, Science and Culture, Japan. References [1] Asakawa M, Sainsbury AW, Sayers G. 2006. Nematode infestation with *Heligmosomoides polygyrus* in captive common dormice (*Muscardinus avellanarius*). *Vet Rec.* 158 (19): 667-668. [2] Asakawa M. 2005. Perspectives of host-parasite relationships between rodents and nematodes in Japan. *Mammal Study.* 30: S95-S99.

SYSTEMATICS

167 MOLECULAR DIFFERENTIATION OF *HETEROMYS ANOMALUS* AND *HETEROMYS AUSTRALIS* (HETEROMYIDAE) FROM COLOMBIA USING MTDNA VARIATION

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We evaluated the genetic variability of two mtDNA genes: Cytochrome B (CytB) and Cytochrome Oxidase I (COI) in populations of two rodent species of the genus *Heteromys* in Colombia: *H. anomalus* and *H. australis*. For CytB, intraspecific genetic variation ranged between 0 to 14,1% in *H. anomalus* whereas for *H. australis* we observed a range between 0,3 and 14%. COI showed slightly lower values: 0 and 12,8% for *H. anomalus* and 0 to 13,8% for *H. australis*. Interspecific genetic variation varied from 11.1 to 15,4% for CytB and 9,9 to 15,1% for COI. Phylogenetic reconstruction with maximum parsimony, maximum likelihood and bayesian inference showed very congruent topologies, where populations of each species cluster as a monophyletic group. For CytB trees, individuals of *H. anomalus* showed well-supported clusters for the populations from north of Colombia and the Upper Magdalena Valley, whereas for *H. australis* the observed clusters do not show correspondence with their geographic origin. For COI, the monophyly of each species is recovered, however individuals of the same geographic zone do not form well-defined clusters. Evidenced by both, posterior probabilities and bootstrap supports, individuals from Amalfi (Department of Antioquia) cluster apart from both species of this study, suggesting the existence of a new species. Four substitutions in CytB, one non-synonymous differentiate the presumptive new species from *H. anomalus* and *H. australis*. Molecular clock calibration using *Mus/Rattus* split and bayesian inference estimation suggests that *H. anomalus* and *H. australis* diverged around 2,28 millions years (MA) and the new species could have diverged about 2,5 MA.

168 MOLECULAR IDENTIFICATION OF SMALL MAMMALS FROM BOTSWANA'S KOANAKA HILLS

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Molecular techniques provide one of the most efficient methods for identification of cryptic species known to differ in aspects other than morphology (i.e. karyology). In the Southern African Subregion, several karyotypically distinct rodents are known to exist in sympatry. Thus, utilization of molecular identification techniques is critical for appropriately assessing the mammalian diversity of an area in this region. In order to determine the species-level genetic diversity of small mammals from the Koanaka (Nqumtsa) Hills, Botswana, we sequenced the first 400 base pairs of the cytochrome-b gene from 225 small mammals collected in June 2008. Although genetic data for the Southern Subregion of Africa is underrepresented for many small mammals, we were able to combine our Cyt-b sequences with published sequences of Cyt-b for a subset of taxa known to contain cryptic species (e.g. *Aethomys*, *Crocidura*, *Micaelamys*, *Mastomys*) or morphologically similar species (e.g. *Gerbilliscus*, *Mus*, *Neoromicia*). Although some taxa were genetically similar to South African specimens (e.g. *Elephantulus*, *Lemniscomys*, *Mus*, *Mastomys*, *Neoromicia*, *Xerus*), others were highly divergent (e.g. *Gerbilliscus* and *Micaelamys*) with sequence divergence values from 5.5 – 10.6%. In addition, several species were more phylogenetically similar to species whose current distributional ranges lie outside Botswana (e.g. *Aethomys* and *Mus*). Our results indicate the importance of using genetic data in biological inventories and the need for increased sampling of specific rodents in Africa's Southern Subregion.

169 PHYLOGENETIC RELATIONSHIPS OF NEOTOMINE-PEROMYSCINE RODENTS: SEPARATE AND COMBINED ANALYSES OF MORPHOLOGICAL AND MOLECULAR DATA SETS

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The neotomine-peromyscine rodents (Muridae: Sigmodontinae) consist of a complex of some of the most common North American mammals. Their taxonomic arrangements have long been a focus of discussion, and yet some phylogenetic relationships within this group remain unclear. Controversial affairs include the position of *Onychomys* and *Ochrotomys*, whether or not *Nyctomys* should be placed in the *Tylomyini*, and relationships among tribes. We examined the phylogenetic relationships of neotomine-peromyscine rodents using separate and combined analyses of morphological and molecular data. The morphological characters scored by Carleton (1980) were used and DNA sequence data were obtained from mitochondrial (cytochrome b) and nuclear (beta fibrinogen, intron 7) genes, with a significant increase in taxon sampling. The *Baiomyini* and *Neotomini* tribes were recovered as being monophyletic, however their relative position and the closest placement of *Ochrotomys* with either one or the other tribe remained unclear. Our results corroborate previous evidences that *Peromyscus* (sensu stricto) does not conform a monophyletic genus, but rather a paraphyletic association of five other genera (*Habromys*, *Megadontomys*, *Neotomodon*, *Osgoodomys* and *Podomys*). Moreover, a clade containing the *Peromyscini* was recovered with the exclusion of the genus *Ochrotomys*, which might in fact represent a separate tribe, the *Ochrotomyini*. *Isthmonys* was not closely related to either *Reithrodontomys* or *Megadontomys*, as earlier suggested by allozyme or morphological studies, respectively. We also discuss species group relationships within *Peromyscus* (sensu lato) and whether *Nyctomys* should be considered as a member of the *Tylomini* tribe or as a basal sister to a clade containing all other neotomine-peromyscine rodents. The ultimate goal of this study was to provide additional evidence towards understanding the phylogeny of the neotomine-peromyscine complex.

170 PHYLOGENETICS OF *OLIGORYZOMYS* (RODENTIA: CRICETIDAE): CRYPTIC DIVERSITY OF HANTAVIRUS RESERVOIRS IN BRAZIL

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Species of the genus *Oligoryzomys* (Sigmodontinae: Oryzomyini) are commonly found throughout Latin America. Several forms of the genus have important roles as natural reservoirs of hantavirus pulmonary syndrome. Given its central position in the transmission chain, it is important to have a clear picture of the taxonomy, distribution, evolutionary history, and ecology of species of *Oligoryzomys*. In particular, the expansion of the agricultural frontier in Central and Northern Brazil brings human populations in contact with new forms of hantaviruses and its carriers. In order to assess the systematics of *Oligoryzomys* from these regions, where specimens were found to have positive serology for hantavirus, we inferred the phylogenetics of the genus. We sequenced the Cytochrome b of ca. 20 *Oligoryzomys* specimens from the states of Mato Grosso (MT), Pará (PA), Rondônia (RO), and Tocantins (TO), and analyzed it in a matrix composed of ca. 130 sequences from 12 other *Oligoryzomys* species and 12 outgroups. *Oligoryzomys* is recovered as monophyletic in Maximum Likelihood and Parsimony analyses, and most interspecific nodes received strong or moderate support. Five clades are recovered with strong nodal support in all analyses: *O. vegetus* + *O. fulvescens*, *O. stramineus* + *O. nigripes*, *O. chacoensis* + *O. flavescens* + *O. longicaudatus* + *O. magellanicus*, *O. moojeni* + new karyotypic form ($2n=72/FN=76$) from MT and PA, and *O. fornesi* + *O. microtis* + new karyotypic ($2n=64/FN=64$) form from RO and TO. The new *Oligoryzomys* forms differ from described Brazilian species in some morphological traits, such as pelage coloration and size, but are very similar in cranial and dental morphology. Our results indicate that the diversity of *Oligoryzomys* is likely much higher than currently known. As hantaviruses present a host-specific association with rodents, the identification of the new forms of *Oligoryzomys* is fundamental for epidemiological studies.

171 SYSTEMATICS AND EVOLUTION OF *ELIGMODONTIA* (RODENTIA, CRICETIDAE, SIGMODONTINAE)

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Species delimitation is a topic of continuous revision and debate. The objective of this thesis was to examine the taxonomy, systematics and evolution of *Eligmodontia* using chromosome, morphological and molecular analyses. Four well-differentiated species were identified: *E. morgani*, *E. typus*, *E. puerulus* and *E. hirtipes*, whereas *E. moreni* and *E. bolsonensis* exhibited little differences in some of the analyses. Single chromosome complements were recorded in *E. moreni*, *E. typus*, *E. bolsonensis*, and variable karyotypes in *E. morgani* and *E. puerulus*. Four species, excepting *E. typus* and *E. bolsonensis*, are separated morphologically. At molecular level (cytochrome-b), species presented intra-specific and inter-specific distances similar to those of other rodents, although *E. puerulus* has high variability and some individuals are non-distinguishable from *E. moreni*. The *Eligmodontia* species showed a strong correlation between the chromosomal differences (from conventional karyotype) and morphology. There was also positive correlation between morphological and molecular divergence, but this correlation was lost when *E. moreni* is compared with specimens of *E. puerulus* from Catamarca. In the latter case is observed a lack of differentiation at molecular level but high morphological differentiation. In this genus, three clades were identified (cytochrome-b), one composed of *E. hirtipes* + *E. puerulus* - *E. moreni*. These species have a north-central distribution and karyotypes with high FN. One of the other two clades is composed of *E. typus* and *E. bolsonensis* and the other one of *E. morgani* exclusively. These species have a south-central distribution and low FN. Diversification in *Eligmodontia* is linked to Andean orogeny and the most recent cladogenesis are associated with later mountain uplifts. (Partially supported by CONICET, PIP 5944, and Agencia, PICT 25778)



Tuesday, August 11th

ANATOMY, MORPHOLOGY AND PHYSIOLOGY

1 ACTIVITY PATTERNS AND HOME RANGE OF AN ANDEAN CAT AND PAMPAS CAT IN SOUTHERN BOLIVIA

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We report the tracking results of the first radio-collared Andean cat and of a pampas cat in the south western high Andes of Bolivia and that of their activity patterns. Both female cats were tracked in subsequent years during 8 (2004) and 10 (2005) months respectively. The home range estimated with Minimum Convex Polygon was of 66.5 Km² for the Andean cat and 55.3 Km² for the pampas cat. Both cats used three main rocky sites and remained particularly in one of them, where the pampas cat was captured. The three rocky places surround or are near to lagoons and bofedales. Main activity for the Andean cat was recorded at dusk or at night (between 18:00 and 23:00 hours) and the pampas cat showed regular activity during all day, but the most intensive was between 22:00 and 8:00 hours.

2 BITING FORCES IN THE SUBTERRANEAN RODENT *CTENOMYS TALARUM* (CAVIOMORPHA: OCTODONTOIDEA)

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Ctenomys talarum is a Southamerican, subterranean and territorial rodent that digs using both forelimbs and incisors, the later being used when animals should confront hard soils, fibrous roots, or rocks. In this poligynous rodent the incisors are also used during inter male aggressive encounter for territory defense and access to females. On 20 wild females and 17 wild males (both adult and young individuals) caught at Mar de Cobo, Buenos Aires, Argentina, biting forces were measured using a Necco force transducer. Biting force was significantly greater in adult males than females (32 N vs. 28 N respectively; $F=5.06$; $P<0.03$). The greater value was registered in an adult male weighting 175 g and was of 41 N, nearly 24 times its body weight. A multiple regression analysis using as predictor variables several exosomatic measurements (body mass; body length; head length; skull height; mandibular width) showed that mandibular width –an indicator of masseteric muscles development– has a significant influence on biting force. In regressions against body mass, biting force scaled with an allometric coefficient of 0.88 [± 0.13] in females and 0.97 [± 0.12] in males. Non-significant differences were observed neither in the slope nor y-intercept of both sexes equations; therefore intersexual differences in biting forces observed in adults should mainly due to size dimorphism, since muscle force is proportional to muscle mass, and muscle mass is more or less isometric to body mass. Taken into account that soil hardness of the habitats occupied by *C. talarum* averages 100 N/cm², and that incisor's cross section in this tuco-tuco is about 0.1 cm², it can be observed that the forces exerted by jaw adductor muscles at the level of the incisors is three times greater than that required for soil penetration.

3 ENERGETICS OF THE SOUTHAMERICAN SUBTERRANEAN *CTENOMYS* RODENTS: INTEGRATING DIFFERENT LEVELS OF UNDERSTANDING

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Maintenance of life requires a continuous flow of energy. Internal restrictions (i.e. digestive capacity), as external (i.e. environmental temperature) might determine the physiological responses of the individuals. The convergent evolution of subterranean forms of life among mammals is a fascinating evolutionary phenomenon. Subterranean mammals often exhibit convergent morphological and physiological features that can be seen as adaptation to the subterranean environment. In this broad context, species belonging to the genus *Ctenomys* are a valuable model to explore and understand several hypotheses related to energy acquisition and expenditure at different hierarchical levels (individuals or populations), since have a broad geographical distribution, occurring from 10° S to 55° S, in the southern cone of South America, can be found between 0 and 5000 masl, are all herbivores and inhabits a variety of habitats

and climates, and contrary to other subterranean mammals, have an extensive use of surface food items. Even *Ctenomys* includes more than 60 extant species, these are relatively morpho-physiologically homogeneous, but differing markedly in body mass, ranging from 100 g (*C. pundti*) to more than 1000 g (*C. conoveri*). In this study we attempt to show the state of the art in the knowledge of *Ctenomys* energetics. Also we will relate different ecological patterns, such as distribution and abundance, to physiological and molecular mechanisms underlying them, hence to understand the physiological strategies of *Ctenomys* species to cope with subterranean conditions. Finally, by comparing the observed patterns with recent information of different mammals groups, we could give insights into the factors that influence the broad scale pattern of subterranean mammals energetics.

4 EVOLUTION OF THE AXIAL SKELETON IN ARMADILLOS (MAMMALIA, DASYPODIDAE)

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Intraspecific and interspecific variation in cervical, thoracic, and lumbar region of the vertebral column of Dasypodidae were examined in a phylogenetic framework. The number of vertebrae for each region were recorded for 86 specimens and metric data for each vertebra (centrum length, high, and width) were recorded for 72 specimens, including eight of the nine living genera. The number of vertebrae and degree of fusion between them were used to define four characters which were plotted on two alternative phylogenies of Dasypodidae. The ratio between centrum height and width is similar across all taxa analyzed except for *Chlamyphorus*, which exhibits a deviation in the last two lumbar. *Tolypeutes matacus* is unique among the taxa examined in having a postcervical bone, which is a fusion of the seventh cervical and first thoracic vertebrae. The thoraco-lumbar numbers of dasypodids are reduced when compared with other xenarthrans and are more diverse than those of some other mammalian clades of similar geological age and higher ecomorphological diversity. This evolutionary plasticity in vertebral number is a feature shared by "southern" placentals (Afrotheria and Xenarthra) in contrast with the conservatism "northern" placentals (Boreoeutheria). Changes in size are somewhat coupled with changes in the number of body segments. Independent of the phylogenetic framework taken, changes in size are accompanied with small changes in numbers of thoracolumbar vertebrae within each genus. There are functional and phylogenetic correlates for changes in number of thoraco-lumbar vertebrae in dasypodids.

5 FECAL BILE ACID PATTERNS IN SOME XENARTHRA SPECIES FROM ARGENTINA AS DETERMINED BY HPLC

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Determination of fecal bile acid patterns is a useful tool to identify the presence of certain species in an area. In this work, a method for HPLC determination of bile acids in *Xenarthra* feces is described. Feces from individuals of *Zaedyus pichiy*, *ChaetophRACTUS vellerosus*, *C. villosus*, *Tamandua tetradactyla* and *Myrmecophaga tridactyla* were analyzed. Bile acids were extracted from feces with benzene:methanol. A Thermo-Finnigan HPLC equipped with an UV-visible detector set at 200 and 210 nm was used. The separation was achieved using a C-18 reverse phase column. Mobile phase consisted of ammonium carbonate 0.3%:acetonitrile (73:27) 10 min; (68:32) 10 min; (50:50) 10 min, at a constant flow of 0.8 ml/min. Bile acids were identified by comparison with 16 standard retention times (Rt), and quantified by the area under peaks. All the species were differentiated by their bile acid patterns, having lithocholic acid (Rt 29,6 min), glycochenodeoxycholic acid (Rt 23,3 min), cholic acid (Rt 9,5 min) and 1 unidentified peak (Rt 5,3 min). *C. villosus*, *C. vellerosus* and *Z. pichiy* have taurodeoxycholic acid (Rt 26,8 min) and dehydrocholic acid (Rt 4,7 min), while *M. tridactyla* and *T. tetradactyla* lack these compounds. *C. villosus* glycochenodeoxycholic acid's peak is smaller than taurodeoxycholic acid, being this relation opposite in *Z. pichiy* and *C. vellerosus*. In *C. vellerosus* there is an unidentified peak at Rt 14,2 min, absent in *C. villosus* and *Z. pichiy*; the relation between ursodeoxycholic acid and cholic acid is smaller in *C. vellerosus* than in *Z. pichiy*; in *M. tridactyla* cholic acid's peak is bigger than in *T. tetradactyla*. We were able to differentiate the feces of all the studied *Xenarthra* species; thus, demonstrating that HPLC is a useful tool to identify feces from unknown origin in ecological studies.

6 MANDIBULAR COMPARATIVE MORPHOMETRY OF TWO ARMADILLOS FROM THE SOUTH WESTERN BUENOS AIRES PROVINCE, ARGENTINA

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The morphometry of the mandible of two South American dasipodids, *ChaetophRACTUS vellerosus* and *Zaedyus pichiy*, was studied using traditional and landmark-based geometric morphometric methods. Adult specimens (*C. vellerosus*: 13 males, 16 females; *Z. pichiy*: 13 males; 10 females), coming from the surroundings of Bahía Blanca, Argentina, were used. Eight linear mandibular characters were measured by means of a digital calliper (0.01 mm) and traditional multivariate analysis were applied. For geometric morphometric analysis (Thin-plate spline), 16 homologous landmarks were digitalized on photographs of the labial side of the left hemimandible. With the Principal Component analysis a tendency to segregation of the species was observed, with mandibles taller and shorter in *C. vellerosus* than in *Z. pichiy*. The body length of the mandible and the height at the level of the last tooth were the main variables that discriminate both species and sexes, with percentages of correct classification higher than 75 % in all cases. The geometric analysis showed clear differences in shape between species. The superimposition of the consensus configuration indicated mandibles with wider body and ramus, and a more acute angle between both structures in *C. vellerosus* than in *Z. pichiy*. The intra-specific

comparison between males and females showed differences in the mandible shape only in *Z. pichiy*. Particularly, the relative position of the mandibular body with respect to the ramus, tends to be more open in males than in females. Future studies may allow to elucidate if differences in the shape of the mandible are related with the masticatory mechanical efficiency in both species. Funded by SGCyT (UNS), PGI 24/B122; ANPCyT 074/02

7 **MORPHOMETRIC VARIATIONS ON *ZAEDYUS PICHYI* (XENARTHRA, DASYPODIDAE) PELVIS**

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Despite the fact that armadillos are among the most characteristic mammals of the Neotropical Area, very little work has been performed on their natural history, ontogeny, morphometry, and ecology. Thirty individuals of *Zaedyus pichiy*, a small armadillo endemic to central and southern Argentina and Chile, were provided by the Dirección de Recursos Naturales Renovables of Mendoza Province to studies ontogenetic and allometric relationships. General morphometric measures, as well as cranial, mandible, limbs, and pelvic osteologic measures, were taken. Age groups were defined based on the degree of sutural synostosis. To compare differences among age groups and genders, eighteen pelvis measures were recorded, obtaining significative differences only for a few of the osteologic measurement. Relationships between total body length and cranial or pelvic length are unclear. Several features, such as sacral length, suggest important ontogenetic postnatal plasticity in the morphology of t species, and probably among different populations along its range of distribution. The present study constitutes an advance on postnatal ontogenetic changes and morphometric variations on *Z. pichiy* skeletons.

8 **PANTHERA FELIDAE 1: VIS-À-VIS, VIDEO AND INJURIES STUDIES OF COW CARCASSES AND THE TAXONOMIC DYNAMICS OF FEEDING**

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The discovery of animal/human remains involves the necessary study of indirect information as injuries, taphonomic traits, footprints, faeces and hairs to identify the predator. In the family Felidae, the genus Panthera has been specially studied because of its size and behaviour of hunting and feeding. The direct observation and the use of video have been successfully to determine a profile of the animal behaviour, but the available reports are insufficient to demonstrate the dynamics between bite, tongue and claws injured actions. This paper shows the preliminary results of a vis-à-vis (16 hs) and video (40 min.) studies of 7 large cats (1 *Panthera leo*, 4 *Panthera tigris*, 2 *Panthera onca*), fed with cow meat at Zoo Cordoba's Feline Complex and the study of injuries (direct examination, photography and data recovering) of the carcasses: 10 Cingulum membri superioris, 3 Brachium and 2 Antebrachium. The vis-à-vis study and the video analysis allowed the stage division according to the dynamics of feeding and predominance of posterior bite, anterior bite (deep or superficial) and tongue action. Injuries were been identified and interpreted as 20 bitemarks (16 tears wound by incisive-canine action, 1 contused wound by canine-exclusive action and 4 crushed wounds by molar action), 9 tongue marks (3 by rubbed action and 6 by dragged action) and 5 cutted wounds by claw action. All injuries were been specific characterized. Hairs were founded and recovered in 100% of the cases. These preliminary results suggest patterns of feed behaviour applicable to the studied species and the relationship between injury patterns and taxa. This study has been performed by the Forensic Dentistry Team of the National University of Cordoba and the Zoo Cordoba (Argentina).

9 **PANTHERA FELIDAE 2: BONE CLEANING AND TAPHONOMIC STUDY OF COW CARCASSES. PRELIMINARY RESULTS AND CLASSIFICATION OF TRAITS**

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Taphonomic traits in carcasses of feeding have been used as a proof of carnivore involvement and have been categorised as different tooth marks. While these marks have been considered insufficient to taxa identification, many reports affirm large cats can create irregular, biggest and deepest patterns of damage when they gnaw bones. Because of actual categorises do not include specific taphonomic-useful traits, this paper introduce a new model of pattern classification to expand the variables of taxonomic analysis. 15 cow carcasses (10 Scapulas, 3 Humerus, 2 Radius-Cubitus) after 7 large cats feedings (1 *Panthera leo*, 4 *Panthera tigris*, 2 *Panthera onca*), at Zoo Cordoba's Feline Complex, were been cleaned to make the taphonomic study. Following Binford's categories modified by the authors, 133 traits were been identified: single (26) and opposed punctures (7), crenated (12), furrows (12), pitting (2), single (8) and multiple scoring (24), claw marks (22), transverse (3), longitudinal (8), diagonal (2) and spiral fractures (4) and exarticulation (1). Microdenticultates were not identified. Traits have been quantified in lenght, width and area (mm²) with the help of callipers and grids. These preliminary results suggest patterns of feed behaviour applicable to the studied species and the relationship between bone traits and taxa. This study has been performed by the Forensic Dentistry Team of the National University of Cordoba and the Zoo Cordoba (Argentina).

10 **PATTERNS OF MORPHOLOGICAL EVOLUTION IN CRANIAL SHAPE AND SIZE IN *CTENOMYS* GENUS (RODENTIA: CTENOMYIDAE)**

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The tuco-tucos (*Ctenomys*), are diverse (about 60 species) south american subterranean rodents and are an example of rapid evolution. To the exception of a few species, quantitative morphological variation among tuco-tucos is poorly known. Recently, studies using cytochrome b proposed phylogenetic relationships for *Ctenomys* and support eight great clades. Our goal is to investigate morphological variation in a phylogenetic context. The skulls in dorsal, ventral and lateral views and the mandible in lateral view of adults of 48 living tuco-tuco species were compared. We explored shape and size variation between sex, species, and among the eight clades. We used geometric morphometrics data analyzed by multivariate statistics. Our results show significant size and shape sexual dimorphism and skull shape and size differences among clades and species. The phenograms of mahalanobis distances show strong phylogenetic signal only for Torquatus and Chaco groups and morphological similarity between two Bolivian groups and between Mendocinus and Patagonico clades. Common ancestral relationship between Patagonico and Mendocinus groups based in skull shape is reinforced by the same asymmetry in sperm morphology found in both clades. In addition, *C. sociabilis* is very similar to Mendocinus and Patagonico species and should be a case of convergence or common ancestry. Fellowship and Support: CNPq, FAPERGS, CAPES, PPGBM, UFRGS and Projeto Tuco-tuco.

11 PHENOTYPICAL MORPHOLOGICAL INTEGRATION IN THE MANDIBLE OF *CALOMYS EXPULSUS*

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Morphological integration refers to the modular structuring of inter-trait correlations within a given organism. The distribution of these correlations is expected to reflect functional interactions and shared developmental pathways. Consequently, the underlying genetic architecture controlling ontogeny is also expected to be related to the observed patterns of integration. The rodent mandible has become a very important model in understanding the causes and consequences of morphological integration. Traditionally, two modules are recognized within the rodent mandible: the anterior alveolar process and the posterior ascending ramus. In the present work, we compare this hypothesis with the patterns of phenotypical integration observed in the mandible of *Calomys expulsus*, a sigmodontine rodent. We constructed theoretical matrices that relate to the model, computed their correlations to the observed phenotypical correlation matrix and used Mantel's test to evaluate significance. We also accessed the influence of size over integration, computing a residual correlation matrix where the size factor was removed. Only the ascending ramus is significantly evidenced as a module when raw integration patterns are considered, but when the size factor is removed, both modules are recognized. This contrast in the results for the two matrices leads to the observation that the effect of size over integration contributes in a greater extent to correlations within the anterior region, hiding integration patterns within the more posterior region. Size is an important factor leading to morphological integration, but local developmental processes within each module also contribute to the patterns observed in the mandible of *Calomys expulsus*.

12 PRELIMINARY ANALYSES OF CRANIAL AND MANDIBULAR SHAPE DIFFERENTIATION IN *ARTIBEUS* SPECIES FROM BRAZIL (CHIROPTERA, PHYLLOSTOMIDAE)

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From the 22 species that currently compose the genus *Artibeus*, nine occur in Brazil: four of the "small" *Artibeus*, subgenus *Dermanura* (*A. anderseni*, *A. cinereus*, *A. glaucus*, *A. gnomus*), four of the "big" *Artibeus*, subgenus *Artibeus* (*A. fimbriatus*, *A. lituratus*, *A. obscurus*, *A. planirostris*) and the "intermediary" (subgenus *Koopmania*) *A. concolor*. A proper identification and distinction of these species is sometimes laborious, due to the morphological similarities and overlap of characters in part of the species distribution. Here we compare cranial and mandibular shape of these nine species, using geometric morphometrics. We established 13 and 9 landmarks on digital images of the skull and mandible, respectively, which were submitted to a Generalized Procrustes Superimposition, and the shape variables obtained were compared using Canonical Variates Analyses. No significant dimorphism was found for most species, so sexes were pooled. Even though isometric size was removed, the CVAs mainly separated the "big" species from all the remainder. CV1 is correlated with size ($r=0.66$ and $r=-0.87$ for skull and mandible, respectively) and summarizes 70-78% of overall shape variation, indicating that shape retains an important allometric component. "Big" *Artibeus* present shorter and narrower braincases, more elongated rostra and narrower coronoid processes. Additionally, *A. anderseni* and *A. glaucus* show little overlap along CV1 (for the skull), as well as *A. concolor* and *A. cinereus* along CV2 (for both skull and mandible). *Artibeus gnomus* shows little overlap with the latter as well, for the mandible. "Big" *Artibeus* are more homogeneous in cranial and mandibular shape than the smaller taxa, that show less overlap among species. These results indicate that geometric morphometric tools can provide some additional information for discrimination among *Artibeus* species, but analyses of other cranial and mandibular views are needed to obtain conclusive results on the effectiveness of this approach.

13 SEXUAL SIZE DIMORPHISM IN THE SKULL OF *GALICTIS CUJA* (MOLINA, 1782) (CARNIVORA, MUSTELIDAE)

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The occurrence of sexual size dimorphism has been extensively studied in carnivores. Still, the presence and magnitude of this phenomenon remains unclear for many South American mustelids. This is the case for the lesser grison, *Galictis cuja*, a species that is often considered to be rare, and has been the subject of very few studies addressing its morphology, ecology and evolution. In this study, we present the first quantitative analysis of sexual size dimorphism in the skull of *G. cuja*, employing traditional and geometric

morphometrics methods. The study was based on the analysis of 51 adult skulls (21 females and 32 males) from Brazil, Argentina, Paraguay and Uruguay. For traditional morphometrics, 15 linear measurements were taken using a digital caliper. For geometric morphometrics, 102 images were analyzed, with 10 and 11 landmarks digitized on dorsal and ventral views, respectively. In order to verify the existence of size differences between males and females, the mean of the 15 linear measurements, as well as that of the geometric morphometrics centroid, were compared with Student's t-test. The results indicated sexual size dimorphism with both methods, with males being always significantly larger than females ($P < 0.05$). Although sexual size dimorphism in which males are larger than females is considered to be common in the Mustelidae, this seems to be the first study revealing such pattern across all the assessed linear measurements, and also with geometric morphometrics. Differences in skull size of *G. cuja* may be related to sexual selection, differences in feeding behavior and/or life histories between males and females. Future steps in this study will include an expansion of sample size and an analysis of skull shape variation, so as to shed more light onto the evolution of sexual dimorphism in the species.

14 **SKULLS MORPHOMETRIC DIFFERENCES ASSOCIATE TO DIET IN THE PATAGONIAN FOXES *LYCALOPEX CULPAEUS* AND *LYCALOPEX GRISEUS*.**

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Lycalopex (Burmeister, 1854) is an endemic genus of foxes in South America, and currently three species are recognized in Chile: *L. culpaeus*, *L. griseus* and the endemic *L. fulvipes*. The two species most widely distributed (*L. culpaeus*, *L. griseus*) are sympatric in Chilean-Argentinean Patagonia, but the first is distinguished by larger size; long and narrow facial region in the skull, and a continuous interparietal crest, meanwhile, the second is a small skull and lacking an interparietal crest. Around to 33°S, both species have similar body size and diets. However toward to south, determine smaller size to *L. griseus* and larger size to *L. culpaeus*. Additionally, both species show microhabitat segregation: the larger species use favorable habitat and eat larger prey and another, use poor habitats and eat beetles and plants. With morphometric geometric analysis, we evaluate the shape adults-skulls differences relate to microhabitat use in both species. If microhabitat use and differential foraging determine the skull shape in this species, we hypothesized differences in bones relate to prey manipulation (short snout in omnivorous species). We digitalized 15 landmarks in dorsal view in 15 adult individuals of both species. According to our results, significative differences in skulls shape relate to rostrum of both species ($P < 0.01$) were found, and two supported group are detachable in the Cartesian plane. These new results are discussing in order to understanding the local pressure in Chilean-Argentinean Patagonia for these foxes.

15 **SYNCHRONIZATION OF DAILY ACTIVITY RHYTHMS OF A SUBTERRANEAN RODENT (*CTENOMYS* SP.) BY LIGHT/DARK CYCLES.**

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Tuco-tucos (*Ctenomys* sp.) from the Argentine Province of La Rioja are solitary animals, active both during the day and night in their natural habitat. However, when exposed to a controlled photoperiod in laboratory, appear to be strictly nocturnal. The activity rhythm persisted under constant darkness in the controlled laboratory environment, showing that they are not a reaction to the external cycles but are rather controlled by an internal clock. In mammals, the circadian clock that controls these rhythms is located in the hypothalamus and is synchronized mainly by the day-night cycle of the Earth. If the underground environment is not exposed to these daily light transitions, how can subterranean animals synchronize their activity rhythms to the above ground environmental cycles? We are evaluating the synchronization mechanisms by analyzing the daily rhythm in sensitivity of the clock to light stimuli. This is measured indirectly by the temporal assay of the running-wheel activity rhythm of rodents exposed to controlled light stimuli. Fourteen animals in individual cages were kept in constant darkness, and received 15 minutes light pulses in different phases of their circadian activity/rest rhythm. Results, assembled as the Phase Response Curve (PRC), show temporal differences between onsets of activity before and after the pulse as a function of the phase when the light pulses were delivered. These data are the first step towards understanding whether, and how, subterranean rodents synchronize their activity to light/dark cycles in their natural habitat.

16 **THE EYES OF TWO SUBTERRANEAN TUCO-TUCO SPECIES (RODENTIA, *CTENOMYS*): HISTOLOGICAL CHARACTERISTICS AND RETINAL SPECTRAL SENSITIVITY**

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The Eyes of Two Subterranean Tuco-tuco Species (Rodentia, *Ctenomys*): Histological Characteristics and Retinal Spectral Sensitivity Cristian E. Schleich¹, Alex Vielma³, Martin Glösmann², Adrian G. Palacios³ and Leo Peichl² ¹ Laboratorio Ecofisiología, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Mar del Plata, Argentina. ² Conicet ³ Max Planck Institute for Brain Research, Deutschordenstrasse 46, D-60528 Frankfurt, Germany ³ Centro de Neurociencia de Valparaíso, Facultad de Ciencias, Universidad de Valparaíso, Chile. Although vision was thought to be useless for organisms living in dark underground habitats, recent studies have shown that some species of facultative subterranean rodents have retained their eyes and visual capabilities. Among these are the species of the genus *Ctenomys*, which present some surface activity. The objectives of this work were to determine the anatomy

and function of the retina in two species of *Ctenomys*. *C. talarum* and *C. magellanicus* presented normally developed eyes with transparent lenses and corneas. The retinas were characterized by a low density of photoreceptors (110,000-170,000 mm⁻²), of which 69-85% were rods. Although rod-dominated, the retina of these subterranean rodents also contained a high density of cones (14-31 % of total retinal photoreceptors). The majority of cones expressed an LWS-opsin (19,000-47,500 mm⁻²). The densities of cones expressing SWS1-opsin ranged from 1,800-7,300 mm⁻² (5.7-16.5% of all cones). No co-expression of LWS- and SWS1-opsin was observed in any cones. S-opsin gene sequencing revealed that these species possess key amino acids that have a crucial role in shifting the spectral sensitivity of the SWS1-pigment towards the UV range. Photopic spectral electroretinograms of these species showed two relative main sensitivity peaks, which suggests the contributions of two cone mechanisms. However, a visual template consisting of the linear summation of three visual pigments produced the best fit. While the 373 and 509 nm peaks would correspond to the UV-sensitive SWS1-cones and the LWS-cones, an unexpected (third) sensitive mechanism with a maximum of sensitivity close to 450 nm need to be clarify. These results show that the eyes of *Ctenomys* seem to be analogous to those of surface-dwelling rodents. Avoiding predators and selecting food items during brief above-ground excursions may have exerted strong selective pressures to retain normal visual capabilities in the subterranean rodent *Ctenomys*

17 USING GIVING-UP DENSITIES AND ADRENOCORTICAL ACTIVITY TO DETERMINE THE STATE OF SOUTHERN THREE-BANDED ARMADILLOS (*TOLYPEUTES MATACUS*) HOUSED IN NORTH AMERICA

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The Southern three-banded armadillo (armadillo; *Tolypeutes matacus*), a near threatened omnivore of the Family Dasypodidae, Order Cingulata, inhabits parts of Argentina, Bolivia, Brazil and Paraguay. Little is known about the state and adrenocortical activity of this zoo-housed species. The Population Management Plan for the *T. matacus* reports an infant mortality rate of 55% (68% of males, 53% of females) across all institutions. Our objectives were to 1) assess adrenocortical activity through measuring fecal glucocorticoid metabolites (FGM); 2) use foraging behavior assessments (as biological assays) to assess *T. matacus*'s state; and 3) ascertain the connection between physiological state and infant mortality in this armadillo at Lincoln Park Zoo. Foraging assays in the form of artificial food patches detect psychological state; while fecal glucocorticoid metabolite (FGM) values detect the physiological state of the animal. Giving up densities (GUDs) for were collected concurrently with fresh fecal samples from 12 (5 males, 7 females) individuals for 3 months while testing for individual variation, optimal foraging and space and bedding level preferences. Hormones were extracted and analyzed via enzyme immunoassay for FGMs. Preliminary FGM results measured over a 12 month period showed mean baseline FGM (n=7) was 789.1 ± 113.6 ng/g dry feces (range, 486.0 – 1874.7 ng/g dry feces). Mean elevated FGM was 1716.1 ± 222.0 ng/g dry feces (range, 1072.3 – 3696.6 ng/g dry feces). Preliminary results from GUDs show an average of 7.25 food items remaining, over all individuals. Combining hormonal data with foraging behavior illuminates how an animal perceives its environment while giving cause and effect to the physiological state of the animal. These data will help to improve management practices, the state of zoo-housed armadillos and identify factors influencing infant mortality. This connection provides a suite of metrics for monitoring the overall state of animals which is broadly applicable to zoo-housed species.

BEHAVIOUR

18 ACTIVITY RHYTHMS IN A FREE-LIVING SUBTERRANEAN RODENT

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In most mammals periods of activity and rest follow circadian periodicity, which is usually maintained by natural cycles of light. Even mammals living permanently belowground are able to entrain the circadian cycles under artificial light regimes. Under natural conditions subterranean mammals expose themselves to daylight probably too rarely to enable resetting circadian clocks. Monitoring their circadian rhythms in the field is, nevertheless, intriguing. Activity status is usually derived from their occurrence inside or outside the nest, which requires radio-tracking with handheld antenna. We used automatic radio-telemetry system to monitor activity in a free-living subterranean rodent, the silvery mole-rat (*Heliophobius argenteocinereus*) in Malawi during the end of dry season 2008 (covering the hottest period of the year). This system enabled us to obtain long term records of activity of marked animals without excessive disturbance and human effort in the field. Activity pattern of radio-tracked mole-rats was polyphasic, with the animals being active in any time of the day. Pooled across the all animals, the activity had a one daily peak close to noon. This pattern did not change across the 2-month study period. Adaptive significance of the observed activity pattern is unclear. We propose it may be a behavioural thermoregulation. Our thanks are due to Stephen and Tamsin Christie, Jitka Zelová, Stephan Koeppen, Wilbert Chitaukali, Chancellor College, Zomba and the National Research Council of Malawi. The study was funded by the Ministry of Education of the Czech Republic (MSMT 6007665801), and the Grant Agency of the Academy of Sciences (KJB601410826).

19 ARTIFICIAL FEEDING IN ORPHAN OF *DASYPUS NOVENCINCTUS*

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Dasypus novemcinctus are found from the Southern of the United States to the Southern of Uruguay, the Eastern and Western Paraguay and the South of Argentina in the provinces of Santiago del Estero, Sante Fe and Entre Ríos. In October 2008 Veterinarian

of La Plata Zoological Garden received eight babies of *Dasypus novemcinctus*, they were founded by a driver on the road. The babies were weak, low activity, weigh 200 gr on average and 26cm long. We brought them artificial heat, about 26 to 28 celsius degree of temperature, after an hour we began to feed them with a mixture of milk without lactose, eggs, cat food, bananas, beef, rice, yogurt, added of multiple vitamin-mineral concentrate and vitamin K. Veterinarians had to feed them every three hours, using an insuline syringe , with 100cc of mixture per day for all of them. These "armadillos" were feeding and looking after for a month by hand. Then they began to eat 250cc to 500 cc of mixture by themselves twice a day, free acces to water, some fruits such as bananas, apple, orange, melon, pear. they are growing up healthy under our control. We are keeping knowledge about diets, behavior, physiology and morfology, parasites, injection rutes, "our armadillos are teaching us. "

20 BEHAVIORAL REPERTOIRE AND MATERNAL CARE OF *TAMANDUA TETRADACTYLA* IN CAPTIVITY

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Behavioral Repertoire and Maternal Care of *Tamandua tetradactyla* in captivity Natália Santos Brilhante^{1*}, Cecília Pessutti² nataliasantosbio@gmail.com¹ c_pessutti@hotmail.com² The Southern Tamandua, *Tamandua tetradactyla* (Linnaeus, 1758) belongs to the Myrmecophagidae family, order Xenarthra. Its gestation period is close to 190 days. Female gives birth usually once a year and the baby stays in in the back of the mother for its first 8 months of life. Few researches have been conducted about its parental behavior. The objective of this study was to analyze the behavior patterns of a female and its baby in captivity, describing their ethograms. Scan sample method was used in a total of 565 hours watching, using 30 seconds intervals for the baby and 60 seconds intervals for the mother. It was possible to observe 27 displays to the mother, all in the following categories: not visible (n=2), exploratory (n=4), foraging (n=8), interaction (n=2), plays (n=2), maintenance (n=3), feeding (n=2) and resting (n=4) and 21 displays for the baby as follows: not visible (n=2), exploratory (n=4), foraging (n=3), interaction (n=2), plays (n=2), maintenance (n=2), feeding (n=1), resting (n=4) and nursing (n=1). The records describe the behaviors diversity displayed by *Tamandua tetradactyla* in captivity along a time period, demonstrating that the relationship between mother and baby is very close and essential to the baby achieve in a safety condition skills that allow it to survive, since is totally dependent from the mother for protection, hygiene, feeding, transport and to develop motion abilities.

21 CHEMICAL COMMUNICATION IN THE SUBTERRANEAN RODENT *CTENOMYS TALARUM*: RECOGNITION, AGGRESSION AND REPRODUCTIVE BEHAVIOR

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The subterranean habitat provides environmental stability and safety from predators but, at the same time, represents challenges to obtain information from conspecifics, especially for solitary species, even occupying neighboring burrows. Sensory adaptations for living underground comprise particular adaptations for visual, auditory and somatosensory systems. Subterranean rodents are candidates to employ the chemical channel of communication because they are mammals, but also due to severe constraints imposed in using other channels. Until recently, our knowledge about chemical communication in solitary subterranean rodents was almost restricted to one species, since only deeply studies were developed in blind mole-rats. Here we summarize our studies on chemical communication in *Ctenomys talarum*, a solitary subterranean rodent that concentrates most of their daily activities underground but venture away from their tunnels for collecting grasses, during dispersal or searching for mates. Olfactory chemosensory cues in urine, feces and soiled shavings provide individual and sex identity, but the discrimination of reproductive condition requires that animals have direct contact with the odor source. Information about sex identity and reproductive status obtained investigating scents at the entries of burrows may represent valuable information for dispersing individuals or while searching for mates. Familiarity by odor cues affects both territorial and reproductive behaviors. Familiar male tuco-tucos responded less aggressively during contests than stranger males or males familiarized with a different male odor than the one with which they interacted. Females distinguish stranger from familiar males, showing low latencies to recognition behaviors and low aggression levels towards familiar partners. Hence, familiarization could reduce energetic costs, time spent in courtship, and probably stress derived from aggressive encounters.

22 COURTSHIP IN TUCO-TUCO *CTENOMYS PEARSONI* (RODENTIA, CTENOMYIDAE)

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Tuco-tucos (*Ctenomys*) are endemic rodents of South America. They inhabit subterranean burrows, a relatively stable and safe environment. *Ctenomys pearsoni* is a solitary species from southern Uruguay. Sexual behavior occurs into the burrow, and it is composed by multiple copulatory (CP) and intercopulatory (IP) periods. We considered IPs as courtships. We used 15 males and 20 females from Montevideo. Trials (2 minutes of acclimation and 30 of interaction) were done in neutral terraria. Copulation was observed in 27.8 % (10/36) of interactions. Observed CPs varied between 1 and 6, and we observed more than one copulation in 70 % of the trials. Copulation mean duration was 53.2 ± 61.3 seconds. Mounting Latency (ML) was 433.2 ± 342.9 s and Intromission Latency (IL), considered as the first IP, was 439.9 ± 341.6 seconds. The total number of IPs observed was 30 and its duration varied between 10 and 1194 seconds. Last IPs mean duration was 249.9 ± 142.6 seconds. We characterized and analyzed them using categorized behavioral units. Significant differences were found in duration and frequency between interactive and individual activities, being more important at the beginning of the trial and decreasing to its end. Agonistic units were present only at the beginning of the trial and showed smaller frequencies and durations than the other units. Males showed a tendency to use more time doing tactile stimulation. During interactions with the male, receptive females could be active or passive while being receptors of male's behavior.

We considered the active resistance during receptivity as a form of female evaluation of the male. Both sexes showed mutual interactions in high frequencies, being central to the behavioral sequences. The variability in IL is similar to that found for *C. talarum* and *C. rionegrensis*, and smaller than that of *C. mendocinus*.

23 **DETERRING ALIEN PREDATORS TO PROTECT PREY: UNDERSTANDING THE MOTIVATION BEHIND PREDATOR SEARCH EFFORT**

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Several of the worst alien predators use olfaction to detect prey, for example the red fox *Vulpes vulpes*, Black Rat *Rattus rattus* and Stoat *Mustela ermine*. Despite the significance to conservation management, the mechanisms by which prey odours increase prey vulnerability are not well understood. Theory predicts that animals will learn and improve their foraging tactics when it is worthwhile to do so, and it follows that prey will become increasingly vulnerable when they are associated with a conspicuous olfactory cue. To test interactions between prey conspicuousness and reward value with olfactory learning, we recorded foraging activities of a model olfactory forager, the House Mouse *Mus musculus*, over consecutive nights in outdoor enclosures. We manipulated the conspicuousness of the prey cue, reward quality (high nutritional value compared to low nutritional value) and the reward abundance within foraging patches. We found that the conspicuousness of the cue and the nutritional value of the prey increased the rate of learning, although prey abundance had no effect. We discuss the findings with regard to threatened species conservation in areas where alien predators cannot be eradicated.

24 **FEMALE MICE PREFERENCE: DOES *TRYPANOSOMA CRUZI* AFFECT MALES' SCENT?**

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Several studies suggest that female mammals preferentially select parasite-free or disease-resistant males for mating, thus the parasitic infection may influence mate choice. It has been proposed that in parasite-mediated sexual selection, animals should examine urine and fecal material to detect sickness in potential mates. In rodents, urine and other odoriferous secretions are of paramount importance in mate attraction and selection, and females can distinguish between infected and uninfected males through their scent. In female mice, a lower preference for males infected with either endoparasites (*Eimeria vermiformis*; *Heligmosomoides polygyrus*) or ectoparasites (*Polyplax serrata*) has been observed. Researchers have proposed three possible explanations on the means by which infection alters urine and other body odours: (1) alteration of the intestinal flora, (2) changes in immune response genes (i.e. major histocompatibility complex, MHC), and (3) modified hormone levels. The main goal of this study was to examine the effect of a tropical endoparasite (*Trypanosoma cruzi*) on female mice odour preference. For the experiment we used 50 two-month old, healthy female mice (NMRI), weighing 25 – 30 g. Each female was placed in the base of a Y-maze, and allowed to choose between two different odours: urine from uninfected male and urine from infected male (*Trypanosoma cruzi*). As control we used both arms with urine from uninfected males. Time spent by females on each arm was recorded during five minutes, as well as the number of visits to each arm where urine samples were placed. Both parameters appear to indicate that female mice prefer odours from uninfected males. Our results would indicate that females are able to detect parasitic infection caused by the protozoan *T. cruzi*. We are currently improving our study by increasing the number of samples, and incorporating additional controls.

25 **FORAGING AND SPACE USE BY THE SUBTERRANEAN RODENT *CTENOMYS PEARSONI***

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Subterranean rodents are herbivores that exploit a special niche that provides them with protection from predators, control of environmental variables, and reduced competition. Tuco-tucos (genus *Ctenomys*) are endemic of South America, and unlike other subterraneans they forage mostly aboveground. During short trips outside their burrows they cut plants' aerial parts around the tunnel opening and consume them inside their galleries. *Ctenomys pearsoni* is a solitary species from southwestern Uruguay for which we have previously shown that, as they forage aboveground around tunnel openings, Central Place (CP) foraging model (the main model used for rodents) do not apply. Indeed, CP model probably do not apply to the genus *Ctenomys* in general. To characterize *C. pearsoni* foraging behavior and space use, we analyzed observational data from our first study year. This preliminary analysis is based on a total of 7 different individuals (males and females), and show that mean distance from the "nest" to the foraging openings was 3.20 ± 2.27 m (N= 56), and that the distance between foraging openings in successive months for the same individual varied between 2 and 7 m. The mean foraging area for all individuals and months was 4.86 ± 4.1 m² (N=18) and that represented the 26.01 % (± 20.18 ; N= 18) of the total Home Range area of the animals. Tuco-tucos re-utilize tunnels dug months before in a cyclic way, returning to the same foraging tunnels after some months. This strategy probably allow them to decrease their energy investment in excavation and, at the same time, increase their energy gain performing additional foraging sessions using the same foraging tunnel. This behavior seems to be more behaviorally and energetically flexible than the foraging strategies used by other subterranean rodents constrained to feed only underground, thus rendering more energy gain for a similar digging effort.

26 NEW INFORMATION ON NATURAL HISTORY OF TWO ARMADILLOS SPECIES (*CHAETOPHRACTUS VELLEROSUS* AND *DASYPUS HYBRIDUS*) IN THE NORTHEAST OF ARGENTINEAN PAMPAS.

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In this work I provide new information about dietary habits, population structure, behavior, spatial and activity patterns of two armadillo's species from the northeast of Argentinean pampas: the southern long-nosed armadillo (*Dasypus hybridus*) and the screaming hairy armadillo (*Chaetophractus vellerosus*). Since February 2006 to February 2007 I conducted a study involving capture-mark-recapture method in three sites covering 100 ha for each site. Seasonal diurnal samplings were conducted from 0800-0900 h to 1900-2000 h during four days each; two field workers walked 30-m-wide fringes until covering the whole sampling area. In total I obtained 61 captures from 42 different individuals of *D. hybridus* and 236 captures from 136 individuals of *C. vellerosus*. Most armadillos defecated at the moment they were captured and these faeces were used for diet analysis. The screaming hairy armadillo was generalists in their dietary habits, active all year round, and were associated to calcareous-sand soil. During cold season their activities concentrated between 1pm to 5pm, and during hot season they concentrated at night-time. Home range size, obtained by the minimum convex polygon method, was between 46 m² to 8968 m² (Average 2669.7 m²). The screaming behavior was observed only in 14 of the 236 captures (5.9%). It never was registered any interaction between individuals. The sex proportion ($P = N^{\circ} \text{males} / N^{\circ} \text{females}$) was 0.88 ($P = 64/72$). The southern long-nosed armadillo showed a strong tendency to myrmecophagy, reduced their activity in cold season, and used mainly vegetation with high cover and associated to humic soils. The daily activity was focuses during the day-time, principally between 9am to 5pm. In two occasions I capture couples during spring and summer. The sex proportion was 0.81 ($P = 13/16$). This information represents first steps to design conservation strategies for an important mammal group of South America.

27 SOCIAL SIGNIFICANCE OF PROXIMITY IN SOLITARY NINE-BANDED ARMADILLOS, *DASYPUS NOVEMCINCTUS*

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Solitary mammals spend a significant portion of their time foraging alone. Solitary animals exhibiting site fidelity may establish relationships with others through infrequent interactions. Such interactions were studied in nine-banded armadillos (*Dasypus novemcinctus*) at the Rob and Bessie Welder Wildlife Refuge in south Texas, U.S.A. Age, sex and reproductive class were noted in solitary armadillos (no conspecifics within 30 meters) as well as those observed in social interactions (other animals within 30 meters). Of the 3891 events recorded over a 4-year period, 89% involved solitary individuals and 11% were social interactions. Most of these interactions involved two individuals (87%). Of these, 32% were affiliative (sibships, male/female pairs or mother/offspring), 35% were aggressive (fights, chases, or one individual avoiding another) and 33% were neutral (animals within proximity but inter-individual distance not maintained or both animals moved away). Monthly totals of social interactions and solitary animals were divided by hours of observation in order to compare across months. There was a bimodal distribution of social interactions throughout the year with one peak in spring and the other during the summer. Distribution of solitary sightings was also bimodal but peaks lagged behind those of social interactions by about one month. This may suggest that increased rates of solitary feeding may compensate for time lost foraging due to social interactions. Neutral interactions were evenly distributed throughout the year. When the sex and age of participants were considered, female/female proximity events increased during the summer while breeding male/female events were prevalent in early spring. Fifty percent of these male/female dyads were observed paired during the next mating cycle, suggesting an incipient courtship function for this seemingly neutral behavior.

28 WHEN NOT LIMITED BY PREY, LEAST WEASELS ADJUST THEIR DAILY ACTIVITY ACCORDING TO THEIR PREDATORS

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Daily activity and movements of animals can be associated with many factors, like food abundance and predators. The least weasel (*Mustela nivalis nivalis*) is highly specialized predator hunting on small rodents, mainly voles. Due to their small size, least weasels are subjected to intraguild predation. It is not known, however, how different predators affect the behaviour of least weasels. Previous studies primarily based on snow-tracking data have indicated that movements of least weasels are closely related to vole densities. We studied movements and home range sizes of least weasels in the increase and decrease phases of vole cycle using radio-tracking data from the wild. We also radio-tracked least weasels in large outdoor enclosures to obtain data on movements and daily activity in the presence and absence of a kestrel (*Falco tinnunculus*) or a Tengmalm's owl (*Aegolius funereus*) and the density of prey (*Microtus voles*). In nature least weasels moved equally during day and night and, as expected, travelled more in years with decreasing vole abundance than in years when vole densities were high, due to increasing difficulties to find prey. In the enclosures, in contrast, movements of least weasels were not associated with vole densities, probably because of relatively high densities in all experiments. The activity was, however, highly affected by the treatment: in controls without predators and in the presence of diurnal kestrels least weasels were mainly active from sunrise to sunset, whereas in the presence of nocturnal owl least weasels were, unexpectedly, most active during the night. This could be due to predator facilitation, i.e. the hunting activity of one predator benefits the hunting of the other. These results suggest that movements and activity of least weasels are primarily determined by vole density but by other factors, such as predators, when food is abundant.

BIOGEOGRAPHY

29 DISTRIBUTION AND MORPHOLOGICAL COMPARISONS BETWEEN *AKODON FUMEUS*, *A. SYLVANUS*, AND OTHER SYMPATRIC NORTHWESTERN ARGENTINIAN *AKODON*

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Species contained in the genus *Akodon* comprise one of the largest, most complex, and taxonomically less understood groups of South American rodents. Northwestern Argentina (NWA) is inhabited by at least 10 species of this genus. However, most of the taxonomic revisions dealing with *Akodon* species emphasized their comparisons between specimens from Peru and Bolivia. Although many species present in NWA are shared with Peru and Bolivia, others, such as *A. aliquantulus*, *A. budini*, *A. spegazzinii*, and *A. sylvanus*, are not. Possibly because of this, the taxonomy of the *Akodon* species inhabiting NWA is not fully resolved and has been subject of much controversy. Two particularly controversial species are *Akodon fumeus* Thomas 1902 and *Akodon sylvanus* Thomas 1921. Recently a redescription of *A. sylvanus* differentiated this species from many others NW Argentinian *Akodon* species. However, *A. fumeus* was not considered in these comparisons. *A. fumeus* was included in Argentina for the first time in the province of Jujuy. After that, it was questioned the identifications of those specimens, arguing that do not belong to *A. fumeus*, and proposed the exclusion of *A. fumeus* of the Argentine mammal fauna. Later, it was confirmed the presence of the species in Argentina and it was recorded in the province of Salta. Many features of cranial morphology and morphometry of the NWA specimens are clearly matching which those of *A. fumeus* from Bolivia and Peru, and distinguish it from all the species that inhabit the same area. Our goal is to point out the major characteristics that allow the recognition of *A. fumeus* from others species of *Akodon* that coexist in the Yungas forest of NWA in the provinces of Jujuy and Salta (*A. budini*, *A. lutescens*, *A. simulator*, *A. sylvanus*) and to clarify the distributional ranges of each individual species in NW Argentina.

30 GEOGRAPHIC VARIATION OF THE CRANIAL QUANTITATIVE CHARACTERS ON *SOORETAMYS ANGOUYA* (FISCHER, 1814) (RODENTIA: CRICETIDAE)

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The genus *Sooretamys* currently comprehends only one species, *S. angouya*, but previous hypothesis based on morphological variation associated names to geographical samples, namely *Oryzomys ratticeps tropicius* (São Paulo, Brazil) and *O. r. paraganus* (Paraguay), aside from the nominal species (formerly *O. r. ratticeps*; Rio Grande do Sul, Brazil). Considering the wide geographic range of this species, which includes the southern and southeastern Brazil, the northern Argentina and the eastern and western Paraguay, the goal of this study was to evaluate the quantitative cranial variation linked with geography. In order to study this variation 21 skull and molar characters were measured from 309 specimens from museums. The collecting localities of *S. angouya* were mapped and nearby samples were grouped. An eastern-western geographic transect was established to link the larger samples. Normality, sexual and age variation tests were performed. The variables were log-transformed and were used to construct Dice-Leeras diagrams for each character for the samples with $n \geq 6$ (five samples from São Paulo state, Brazil and one from Misiones, Paraguay). Those variables were also employed to perform canonical discriminant analyses categorized by geographic samples. The samples showed normal distribution and no sexual dimorphism was noticed; only adults were included in subsequent analysis. Dice-Leeras diagrams showed that the sample of Misiones is significantly larger than the closest sample, Ribeira (São Paulo), regarding several variables from the rostral region. However, the wide sampling gap between these two samples may account for this pattern. In the multivariate dimension, Misiones was distinguished from other samples, as well as Riacho Grande. Therefore, available evidence suggests that there is a geographic component influencing the variation among *S. angouya* populations. Such geographic structure will be addressed in upcoming studies employing molecular markers, under a phylogeographic perspective, in order to evaluate if this geographic variation could be of taxonomic value.

31 SMALL MAMMALS IN AN ECOTONAL AREA BETWEEN AMAZONIA AND CERRADO

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Recent studies have referred that ecotones may constitute important regions of divergence and potential speciation. Within South America, the confluence area between the two major biomes, the Amazonian Rainforest and the Cerrado from Central Brazil, is an extensively understudied region with high rates of deforestation and consequent impoverishment of its biodiversity. Firstly, this study aims to present a species list of small mammal fauna from the Parque Estadual do Cantão (PEC) and its surroundings, in the western border of the state of Tocantins and from the left margin of Araguaia River, state of Pará. Secondly, it aims to assess patterns of genetic variation among small mammals and its geographic structure within Brazil. From June 2007 to November 2008 five areas, with five sample points each, were surveyed using conventional methods for small mammals capture: Sherman and Tomahawk traps placed in the ground and understory; and pitfalls of two different sizes (30L and 60L) with drift fences. Three sampling periods averaging seven nights were carried out for each area. Nineteen species – Didelphidae (8), Cricetidae (8) and Echimyidae (3) – were captured in the area, updating the only previous list, compiled for the management plan of PEC, which included only nine species. Five species of marsupials (*Didelphis marsupialis*, *Gracilinanus agilis*, *Marmosa murina*, *Micoureus demerarae* and *Philander opossum*),

with wide geographic distribution, were selected for comparisons among populations from the sampled ecotonal area and from forests of other major biomes in Brazil: Cerrado, Amazonian Rainforest and Atlantic Forest. Genetic analysis is being carried out during the present year.

32 **SMALL MAMMALS OF SANTA CRUZ PROVINCE, ARGENTINA**

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With an area of 243,843 km², Santa Cruz province is the most poorly known with respect to small mammal assemblages of Argentinean Patagonia. Patagonian phytogeographic province is the single major unit of vegetation represented in its non-Andean territory; three main rivers cross the vast territory covered by shrub steppes and composed by basaltic plateaus and hilly systems. With the goal of contributing to the understanding of the taxonomy and ecogeography of the small mammals that inhabit Santa Cruz, more than 50 owl pellet samples from 28 localities were collected and studied. Available samples cover almost all the provincial territory and were collected between 1995 and 2008. We analyzed 7,236 individuals of small mammals recording at least 16 species, 13 of which were sigmodontine rodents, 1 marmosine marsupial, and at least 2 caviomorph rodents. A preliminary biogeographic approach using cluster analyses retrieved two main groups of localities. One included the northeastern portion of Santa Cruz territory (3 localities), characterized by the occurrence of several sigmodontines (e.g., *Akodon iniscatus*, *Graomys griseoflavus*) typically associated with the arid semideserts of the Monte biome. The other grouped the remainder localities (25) distributed over most of the provincial territory sharing typically occidental species that characterize the Austral Patagonia. We also found remarkable low values of specific richness (range 4 to 7) in localities close to the Atlantic coast.

CONSERVATION

33 **ABUNDANCE OF MAMMAL AND THE SPATIAL HETEROGENEITY IN CERRADO FROM CENTRAL BRAZIL.**

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The present study analyzed the relationship between the abundance of large mammals (> 1kg) and the landscape structure in Cerrado Biome. The Cerrado (woodland savanna) is the second largest ecoregion in Brazil, occupying 21% of national territory and it is considered one of the richest of all tropical savanna regions, with high levels of endemism. The Cerrado's ecosystem is now disappearing at a faster rate than the Amazon rainforest. Over 65% of the Cerrado has been destroyed in the past 30 years – primarily for agriculture. The study area was Grande Sertão Veredas National Park (231,000 ha), located in Central Brazil where are founded one of the last great remains at this biome. The mammals were sampled by using cameras trapping triggered by a infra-red sensor. Twelve camera traps were distributed in the field maintaining a distance of 2 km between each sample point. The equipment remained in functioning during a period of 12 months and were inspected once a month to change films and batteries. Sampling effort was 4,019 camera-days and it was obtained 380 photo-records represented by 31 taxa, including 7 endangered species. We used CBERs images from 2005 in order to map the natural vegetation coverage. The images were processed in different stages including: geometric rectification, the collection of training samples, the classification of images using the Method of Maximum Verisimilitude by the SPRING software. Landscape structure was quantified in composition and disposition index using the Patch Analyst Stastistic Extension for Arcview 3.3. We found a positive correlation between abundance and metrics related with area, MPS ($R^2=0.45$; $p<0.02$). By the other hand, variables related to density and shape of fragments (Number of patches and Median Shape Index for instance) were not significantly correlated with biological data. The results suggest that the natural mosaic of different ecosystem in the Cerrado is important to maintain healthy communities of mammals and the regional environment on Grande Sertão Veredas National Park still retain their natural characteristics.

34 **ACTIVITY PATTERNS AND PHENOTYPICAL TRAITS OF *LEOPARDUS GUIGNA* IN THE ARAUCANÍA DISTRICT OF SOUTHERN CHILE**

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Leopardus guigna is one of the world's smallest felids and is endemic to the Southern Andes, where its IUCN conservation status is "Vulnerable with a declining population trend". There is a paucity of data about the natural history of *L. Guigna*. Current knowledge of its ecology and behaviour in Chile is based on just two radio-tracking surveys. Our study area in the Araucanía district of southern Chile, represents the northern limit of the temperate rainforest in Chile (39°15' S, 71°48' W). Pilot studies with camera traps began in 2006. A final design for *L. guigna* was established during 2008/2009, with 27 camera sites (>2km) located in continuous forest (n=18 sites), and forest fragments in the agricultural matrix (<20ha; n=9). This analysis is based on 57 *L. guigna* records of which 84% were taken during 2008/2009. The photographs provide information on the date and hour when the picture was taken, from which we obtained daily activity patterns. The photographs also allow us to make an estimate of the incidence of melanism in the population.

In this analysis, we considered photos of cats from different cameras to be independent records or at the same camera site when separated by at least 24 hours. Detection of *L. guigna* showed a strong peak during night hours (2:00-8:00 am). This clear nocturnal behaviour is in contrast to previous studies using other methods, which indicate arrhythmic diurnal activity patterns. From a total of 49 independent photo records, 29% were melanistic, indicating an intermediate level of melanism compared to other regions. Both spotted and melanistic individuals of *L. guigna* were recorded during the same season at the same site (3 sites). This observation suggests home range overlap by several individuals. These results contribute to improve biological knowledge about this endangered native wild cat.

35 BODY CONDITION VARIATION IN WILD CARNIVORES AT SOUTHERN BRAZIL

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Animal body condition and parasite infestation reflect directly their health status. Weakened or diseased animals tend to have massive infestations of ectoparasites. Seasonal field trips were made (from November 2006 to November 2008) to four areas in southern Brazil, located at Anita Garibaldi, SC (little cattle farms), Campo Belo do Sul, SC (Pinus spp. reforestation farm) and Bom Jesus, RS (big cattle farms). On each trip 20 Tomahawk traps were used, baited with live chicken, totaling an effort of 100 traps per five nights. The captured carnivores were sedated by Zoletil® to enable handling. The ectoparasites were removed and fixed at 70% alcohol for identification at the laboratory of Parasitology of the Universidade Federal do Rio Grande do Sul (ICBS/UFRGS). The animals' body condition were also measured and classified following the LAFLAMME (1997) body score method for dogs. We captured 17 *Cercyon thous* (crabeating fox), 29 *Lycalopex gymnocercus* (pampas fox), 8 *Leopardus pardalis* (oncelot), 2 *Leopardus wiedii* (margay), 4 *Leopardus tigrinus*, 2 *Puma yagouaroundi*, 1 *Nasua nasua*, 1 *Procyon cancrivorus* (raccoon), 2 *Conepatus chinga* (skunk), and 2 *Eira barbara*. We found a statistically significant seasonal variation in body condition of animals caught in all areas of study, especially for pampas fox. Animals with good body condition occurred predominantly in autumn and winter, which is probably related to the fact that the spring and summer are the reproduction season for these animals, so there is increased energy demand in this period. We also found a significant correlation between body condition and the presence of ectoparasites for pampas fox and crabeating fox; which can be explained by the frequently low immunity state and increase

36 CHANGES IN KIT FOX DEFECATION PATTERNS DURING THE REPRODUCTIVE SEASON CAN BIAS NON-INVASIVE SURVEYS

Ralls, Katherine; Sharma, Sandeep; Smith, Deborah Anne; Bremner-Harrison, Samantha; Cypher, Brian, & Maldonado, Jesus Eduardo

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Changes in kit fox defecation patterns during the reproductive season can bias non-invasive surveys Ralls Katherine¹, Sharma Sandeep¹, Smith Deborah², Bremner-Harrison Samantha³, Cypher, Brian³, Maldonado Jesus Eduardo^{1*} ¹ Center for Conservation & Evolutionary Genetics, National Zoological Park, Smithsonian Institution, Washington, D.C., USA ² Working Dogs for Conservation, Three Forks, MT, USA ³ California State University, Stanislaus, Endangered Species Recovery Program, Fresno, CA, USA Noninvasive survey methods based on analyzing DNA extracted from hairs or feces can be useful for carnivores that are difficult to study by other methods. Studies of the possible errors associated with these methods have concentrated on genotyping errors rather than possible differences in fecal deposition patterns among sex or age classes. We investigated possible changes in fecal deposition patterns associated with reproduction in San Joaquin kit foxes (*Vulpes macrotis mutica*), a seasonally breeding, socially monogamous species in which females give birth in mid-February to mid-March. We used trained dogs to collect fresh scats on a 2-km transect in the home range of each of 11 radio-collared female kit foxes in January, February and March 2008 and attempted to determine the sex of each scat we collected by amplifying zinc finger protein genes. We sexed 135 scats in January, 148 in February, and 154 in March. If the scats of both sexes were equally easy to find, we expected to find a 1:1 sex ratio in the scats collected each month. In January the sex ratio of the scats was not different from the expected 1:1. However, in February there were almost 2 male scats for every female scat and in March there were more than 8 male scats for every female scat, both of which were significantly different than expected. In March, we found more male scats on all 11 transects than in January and fewer female scats on 10 of the 11 transects. These results suggest that both sexes show changes in fecal deposition patterns around the time pups are born that make it easier to find male scats and harder to find female scats. The effect of these changes on the results of noninvasive surveys will depend on the purpose of the survey.

37 CONSERVATION AND KNOWLEDGE OF JAGUAR (*PANTHERA ONCA*) IN COLOMBIA: PRIORITY REGIONS FOR BIG CARNIVORE CONSERVATION.

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Jaguars are distributed across the American continent with exception of few countries where it's been extirpated. Colombia represents an important country for jaguar conservation due to its unique geographical position, relative good conservation status and extensive regions for viable and large populations' maintenance. In order to establish the real conservation status and as a tool for conservation planning, the first comprehensive information compilation, knowledge status and distribution analyses for the species in the country

was held. There is scarce information regarding population status, ecology and distribution in Colombia, however, the environmental authorities are establishing a national program for the species and information has been compiled and systematized. We developed geographical analyses based on records, sightings and reports across the country from multiple sources (± 84 records) adding several new reports nationwide. We also developed regional habitat suitability models in order to determine critical areas for jaguar conservation across the country. We determined the presence of Jaguars in more than 20 protected areas of the country and in several locations where jaguars seem to inhabit across the entire national territory –excluding the higher parts of the Andes. Five regions were identified as important and heterogeneous jaguar areas with differential conservation status and threats. We subdivided each region by conservation class and importance in three categories and defined actions and conservation measures for each sub-region according to local needs. The distribution of records, conflicts and information –and also research records and institutions, is highly clumped and fragmented and this heavily influences the information and data availability and distribution of real conservation efforts and actions. Colombia still retains important areas for jaguar conservation, that we also inferred for other countries' carnivores and their conservation, however, habitat fragmentation, hunting and mainly human conflicts are increasingly threatening the viability of wild jaguar and carnivore populations.

38 **CURRENT DISTRIBUTION AND CONSERVATION OF *XENOMYS NELSONI* (RODENTIA: MURIDAE) ENDEMIC SPECIES OF THE MEXICAN DRY FORESTS**

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The Magdalena rat (*Xenomys nelsoni*), arboreal nocturnal rodent, is one of the eleven endemic genus of mammals to Mexico. This rodent has the smallest geographic distribution known for any mammal on Earth, exclusive to the Pacific Tropical dry forests. Due to its restricted distribution and specialized habitat requirements, this species has been classified as endangered by the Mexican government. In the present study, we used collection and current records of the species, several environmental variables, land cover maps, and two different Geographic Information Systems (GIS) to estimate the historical and potential distribution of *X. nelsoni*. The analysis of these distributions allowed us to estimate a better approach of the current distribution of this species taking in account the actual remnant patches of vegetation of tropical dry forests where it is distributed. Also, knowing the areas where *X. nelsoni* might be distributed allow us to implement conservation assessments for the species.

39 **ECOLOGY AND CONSERVATION OF *PANTHERA ONCA* AND *PUMA CONCOLOR* IN THE SEMIARID ARGENTINE CHACO.**

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Research on jaguars and pumas in the Argentine Chaco is extremely limited and this information vacuum is an important obstacle to conservation efforts. The Argentine semi-arid Chaco is unique for its environmental characteristics and was identified by WCS as one of the highest priority areas for jaguar conservation. The region has suffered severe environmental deterioration and the populations of jaguars and pumas are declining and threatened. However, the factors behind this decline are still unknown. Our general objective was to estimate the density of jaguars and pumas and explore potential threats (lack of prey, carnivore-human conflict, etc.) for these felids in one site of the semi-arid Chaco, the Reserva Aborigen. We conducted a two month-long camera-trap survey (30 stations, 1680 camera-trap days), line transect surveys (268 km) and interviews with local people (N=10). We confirmed the presence of jaguars through records of their tracks (0.37 tracks/100 km) and reliable reports from local people, but we obtained no photographic records of this species during the camera-trap survey, which indicates an extremely low density. Intensity of habitat use by pumas was much higher than by jaguars (14.5 tracks/100 km). We estimated a density of pumas between 0.7 ± 0.2 and 1.1 ± 0.2 pumas/100 km². Our density of pumas is much lower than estimates for similar regions, like the Bolivian Chaco, where density estimates range from 12.4 ± 4.9 to 19.4 ± 6.2 pumas/100 km². Local people reported no predation by jaguars within the last ten years (which further indicates that the density of this cat is very low). Local people persecute both jaguars and pumas, though pumas less intensely, and hunt most of their prey. It is necessary to take management measures that include reduce hunting, implement and create reserves and corridors, and develop educational programs to prevent the local extinction of jaguars and pumas.

40 **EFFECTS OF LIVESTOCK MANAGEMENT ON THE SPATIAL ECOLOGY OF GEOFFROY'S CAT IN THE ARGENTINEAN MONTE**

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Despite the importance of carnivores for ecosystem dynamics, few studies have quantified the response of felids to environmental changes due to livestock management. I analyzed the effects of livestock management on the spatial dynamics, home range size, movements, emigration patterns, and abundance of Geoffroy's cat (*Leopardus geoffroyi*) in a scrubland area of the Monte desert, Argentina. Between 2002 and 2008, 23 (13 M – 10 F) and 12 (5 M – 7 F) Geoffroy's cats were radiocollared and monitored by radiotelemetry in a protected area (Lihué Calel National Park, LCNP) and adjacent cattle ranches (CR), respectively. Mean home range size (100% Kernel) and daily distance traveled were consistently greater for males (822 ± 96 ha and 3445 ± 801 m) and females (593 ± 387 ha and 1339 ± 417 m) in CR than in LCNP ($P < 0.032$). The average core area (50% AK) of males (94 ± 66 ha) and females (117 ± 120 ha) in CR were no different ($P = 0.838$) of those of males and females in LCNP. Density of Geoffroy's cats

(estimated by camera trapping) in LCNP ($164 \pm SE 41$ individuals/100 km²) was 1.8 times greater than in CR, and M:F sex ratio was no different between areas ($\chi^2 = 0.51$; $P = 0.476$). Proportion of transient cats did not differ between areas ($\chi^2 = 0.07$; $P = 1.000$). During the study period 21 cats emigrated from the study area, and all events occurred within the fall-winter period. Proportion of emigrants from both sites was the same (83%) and distance of emigration (range 9 – 128 km) did not depend on the source site. Livestock management is likely to cause spatial responses of Geoffroy's cats in the Monte desert, but no response have been detected in some demographic parameters at the current livestock density (<0.2 cows/ha).

41 **OVERPOPULATION OF *DIDELPHIS AURITA* AND THE SMALL MAMMAL IMPOVERISHMENT IN A TROPICAL ISLAND**

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Small mammals are a key component of the Neotropical rainforests, with high species richness. We sampled the small mammal community in an 828 ha offshore island (Anchieta Island) in the coast of São Paulo, Brazil and found only one marsupial (*Didelphis aurita*) and two rodent species (*Oligoryzomys nigripes* e *Trinomys iheringi*) during 12 months of live trapping and 9,360 trap/nights. Not only the small mammal community is highly impoverished, but also highly unbalanced. We estimated a population of 81 (70-106, CV=8,83%) *D. aurita* and 65 (40-125, CV=20,40%) *O. nigripes*. For *T. iheringi* we cannot estimate their population size due to the small sample size. The abundance of *Didelphis aurita* is on average 12 fold higher than any other tropical area. The abundance of small rodents was extremely low (0.55 and 0.18 individuals/100 trap night, *Oligoryzomys* and *Trinomys*, respectively). *Didelphis aurita* at Anchieta also present smaller body mass and lower fertility when compared to other areas. We found a negative relationship between *Didelphis* and rodent abundance, suggesting that this opossum may be regulating rodent population in this community. Anchieta Island has a long historic of mesopredator introduction and the density of coatis, tegu lizards, and also *Didelphis* are probably the major constraints for the populations of rodents or other small marsupial species in this island. Keywords: Defaunation, land-bridge Island, mark and recapture method, mesopredators, predation.

42 **POACHING PROMOTES THE ECOLOGICAL EXTINCTION OF LARGE FELIDS AND UNGULATES IN THE ATLANTIC FOREST**

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Hunting of wildlife is a widespread activity in neotropical forests. Intense hunting can even cause local extinctions of isolated mammal populations. To evaluate the effect of hunting on the big felids (jaguar, puma, ocelot) and ungulates (tapir, collared and white-lipped peccaries, red and dwarf brocket deer), we conducted five camera-trap surveys (216 camera-trap stations, 13,929 trap/days) in three areas with different level of protection in the Green Corridor of Misiones, Argentina, the biggest remnant of the Upper Paraná Atlantic Forest. We estimated the density of the felids using capture-mark-recapture models. We evaluated the effect of the distance to the access routes used by poachers and the level of protection of the area on the probability of recording the five ungulates using logistic regression models that included sampling effort as a covariate. The density of the three felids was inversely correlated with the level of protection of the area, being 2-8 times higher in the better-protected areas. The probability of recording tapirs and red brocket deer was higher in the better-protected areas and at greater distances to the access routes of poachers. Collared peccaries were more abundant in better-protected areas. The dwarf brocket was the only species that showed the opposite pattern. White-lipped peccaries were only recorded in Yabotí Biosphere Reserve, an area with high poaching intensity. However, within this area, the probability of recording this species was higher in the better-protected sites and increased with the distance to the main access routes used by poachers. Poaching is affecting the populations of large felids and most ungulates. Considering the importance of these species in diverse ecological processes, their extinction may affect the structure and functions in this community. Activities aimed at reducing poaching are essential to conserve large mammals and their habitat in the Atlantic Forest.

43 **PREDICTING RESOURCE SELECTION BY A SEMI-AQUATIC RODENT AT MULTIPLE SPATIAL SCALES**

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Increasingly in conservation ecology, resource selection functions (RSFs) are being used to make predictions about species distributions. RSFs are useful for identifying species' requirements related to food availability and predation risk, enabling predictions to be made about the types of habitats that are important for conservation. Spatial characteristics of the landscape are likely to influence foraging decisions of animals; however many species distribution studies of habitat selection are restricted to a single scale. This may be problematic as crucial information about animals' habitat use and perception about habitat heterogeneity may be overlooked if the scale is not suitable to capture that effect. We investigated how the semi-aquatic rodent, the Australian water rat (*Hydromys chrysogaster*), uses the riparian zone in an agricultural landscape to make predictions about their distribution based on a suite of habitat characteristics. Water rats occur in freshwater rivers around much of Australia, however limited research exists concerning the species' ecology. Presence/absence data was collected over a 3 year period using baited track plates with habitat variables measured at three different spatial scales. Differences in the importance of each habitat characteristic were determined

using mixed effects models and the area under the curve (AUC) was calculated for model validation. Water rats exhibited scale dependent responses to their environment with the importance of vegetation structures varying hierarchically across scales. These results likely reflect the species' response to predation pressure from the two key predators in the area, the red fox (*Vulpes vulpes*) and the barn owl (*Tyto alba*). Our results demonstrate the complexity of habitat selection by water rats as a function of spatial scale. Such understanding can help in anticipating the impact of various riparian management strategies on this species and potentially other semi-aquatic mammals.

44 **PREDICTIVE MODELING OF POTENTIAL NEST PREDATORS ON A LAND-BRIDGE ISLAND IN SOUTHEASTERN BRAZIL**

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Introduced alien species are esteemed a major risk for local population and forest dynamics, especially in island ecosystems. This study aimed to predict the potential distribution of mammal species (*Nasua nasua*, *Callithrix penicillata*, and *Didelphis aurita*) considered potential nest predators that represent a threat for bird population in Anchieta Island State Park, southern Brazil. *N. nasua* and *C. penicillata* are exotic species introduced in 1983 and *D. aurita* is one of the species to be known as native on the island. All of them are regarded as overabundant population in the island. Data of the species occurrence were collected by sightings totalizing 110 occurrences for *C. penicillata*, 39 for *N. nasua*, and 20 for *D. aurita*. Environmental variables included in the modeling were land cover, slope, elevation, aspect, river distance gradient, Normalized Difference Vegetation Index (NDVI), and human accessibility. Ecological niche modeling was performed by environmental distance algorithm in the openModeller. All models were considered accurate due to low omission error and low average AUC (area under curve). Besides that, these models should be validated in the field. All models indicated great potential for widespread occupancy in the island by all three species in different successional stages and even in areas now occupied by exotic ferns. These nest predators may have their spatial distribution strongly related to resource availability and to proximity to touristic areas in the island. The results should be considered in the island management plan due to the potential impact of these species in the bird community structure and dynamic.

45 **PUMA (*PUMA CONCOLOR*) RELATIVE DENSITY AND DIET IN CENTRAL ARGENTINA**

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The creation of protected areas does not always satisfy the area requirements of large carnivores, and often do not even possess a complete assemblage of native preys, bringing large carnivores in conflict with humans due to livestock predation. In the mountains of Central Argentina, for over 4 centuries, the puma coexists with livestock ranching activities that deeply altered the landscape and caused the local extinction of large native prey, affecting the puma food habits. Our question is, if the Quebrada del Condorito National Park creation in 1997 and the consequent livestock reduction has augmented puma density and changed the diet incorporating more native species. From 2002 to 2008 we performed 64 transects (1-20 km) and collected 140 feces in sites with high and low livestock abundance inside the park. We analyze the information using Chi-squared, clusters and ANOVA tests. Our results show that the relative density of pumas, measured by the presence of signs, was higher in sites with less livestock ($p < 0.001$), and no differences were detected between years ($p = 0.06$). Native small preys dominated the diet according to the frequency of occurrence (2002: 58 %, 2004: 89 %, 2007: 80 %, 2008: 90 %). Also, as for the biomass consumed except for the year 2002, where the native consumption was lower (2002: 44 %, 2004: 74 %, 2007: 68 %, 2008: 84 %; $p = 0.05$). The clusters analysis mark a 40 % of similarity in the cavid and cricetine consumption, with regard to other preys. Our information suggests that the protected area creation positively influences puma density, and diet now contains less livestock than in the year 2002 when the park only had a few years of creation. We suppose the pumas adapt easily to a change in the prey base and use the park to avoid the contact with humans.

46 **PUMAS (*PUMA CONCOLOR*) SEXUAL DISPERSION PATTERNS IN A FRAGMENTED LANDSCAPE OF BRAZILIAN SOUTHEAST**

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Nowadays, only 8,5% of cerrado physiognomies – from open areas to forest formations – and 8,2% of semideciduous forest – one of Atlantic Forest phytogeography – of São Paulo state, Brazil, remain conserved. The human occupation of state central area resulted in sugarcane crops, pastures lands, and recently, in eucalyptus and pinus plantations composing the region main matrix. This highly disturbed landscape possesses few large patches (>1.000ha) and many small patches (<100ha), the minority protected by the government, and possibly suffering with fragmentation consequences as edge effects, populational isolation and loss or reduction of habitats. In this scenario, since 2006 we are monitoring a puma (*Puma concolor*) population inhabiting a protected area of São Paulo state, the Jataí Ecological Station, and its surrounding (<20.000ha) by means of a non invasive method, the fecal DNA analysis. We confirmed fecal samples species sequencing a cytochrome b gene fragment, differentiated individuals through 8 loci microsatellites analysis and amplified the amelogenin gene to investigate their sex distribution. Until this moment, we identified 16 animals (PI=2,40?10-13) active residents or not in the area, the majority females (81,25%). In this same period, we recorded eight male and only one female puma road killed in highways or smaller roads closer to the protected area. These informations suggest that in fragmented and disturbed areas, females tend to occupy natural vegetation patches, while males tend to disperse between

these patches throughout the landscape matrix, what makes them more susceptible to be road killed. The large number of females in the area also suggests that, concentrated in natural patches, females may tolerate higher home range overlap than males.

47 RANGE PREDICTION AND GENETIC INFORMATION SHED NEW LIGHT ON CONSERVATION PRIORITIES FOR *NASUELLA* (CARNIVORA: PROCYONIDAE).

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We investigate areas of conservation importance for *Nasuella* using bioclimatic range modeling, morphological variation and the first genetic sequences produced for this genus. *Nasuella* is currently recognized as a monotypic genus, containing only *N. olivacea* (Gray, 1865), found in montane habitats throughout the Andes. We utilized voucher specimens stored in museums across the world for this study: Locality and habitat data was obtained from specimen records and morphological variation was recorded from skins and skulls. We were able to generate sequence data for the mitochondrial cytochrome b gene from tissue samples from specimens kept frozen as well as from turbinal bone samples from skulls from voucher specimens using ancient DNA methods. Our analyses reveal a significant geographic, morphological, and genetic gap between *Nasuella* from the Andes of Venezuela and other *Nasuella* to the south. We consider the difference between the two groups of *Nasuella* sufficient to recognize the Venezuelan populations as a separate species, *N. meridensis* Thomas, 1901.

48 SEASONAL CHANGES IN THE DIET OF *LONTRA LONGICAUDIS* (CARNIVORA: MUSTELIDAE) IN LOTIC AND LENTIC ENVIRONMENTS

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The diet of *Lontra longicaudis* (Olfers, 1818) used to change along the year due to modifications in the environment's conditions or because of alterations on the prey's life cycle. The study, conducted in the "Sapé" river (lotic) and in the "Canoas I" dam (lentic), southeastern Brazil, between April 2008 and March 2009, aimed to compare the seasonal changes in the diet of the river otter between lotic and lentic environments, through fecal analysis. The river and dam banks were investigated once every 15 days searching for otter feces. The items contained in the collected materials were identified, totaling 146 samples of the river and 400 of the dam, and the data were separated according to different year's seasons. Fish was the most consumed group on the four seasons in the dam (94.56% spring, 100% summer, 66.13% autumn and 79.43% winter) and in the river (97.5% spring, 95.24% summer, 93.1% autumn and 98.21% winter). In "Canoas I", in the spring, otters ate mainly mollusks (23.91%), insects (19.56%) and crustaceans (13.04%); in the summer, mollusks (16.19%) and mammals (9.52%); in the autumn, leaves (25.81%), birds (8.06%) and crustaceans (8.06%); and, in the winter, mollusks (24.11%), leaves (18.44%), mammals (12.76%), insects (12.06%) and crustaceans (9.21%). In "Sapé", during the spring, besides fish, only crustaceans (32.5%) and insects (10%) appeared. In the summer, the most frequent were crustaceans (23.81%), insects (19.05%), birds (9.52%) and mammals (4.76%). Crustaceans and insects also occurred in larger percentage in the autumn (17.24% and 10.34%, respectively) and winter (33.94% and 25%, respectively). There has been difference on the consumption of the prey's groups along the year in each place, what could be related to the life cycle of the preys. However, differences in items frequency between two places can be related to the distinct physical conditions.

49 SMALL MAMMALS AS INDICATORS OF HABITAT INTEGRITY: SAMPLING COMMUNITY STRUCTURE EFFECTIVELY

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Small mammals, which comprise a large percentage (> 60%) of all mammal species in the South African grasslands, are found in comparatively large numbers (e.g. some species up to 200 individuals/ha). As primary and secondary consumers they have an important direct and indirect influence on ecosystem functioning, often constituting the first link in the food chains of many predators. They have evolved with fire as a natural disturbance factor in this grassland biome, and a number of short- and long-term studies have shown that small mammal (= rodent & shrew) community structure and species composition change with time after disturbance. This has led to the hypothesis stating that small mammal species richness, diversity, evenness and the presence of specific indicator species change with an ecological value and/or succession. This hypothesis has now been supported by a number of studies in pre- and post-climax grassland habitats in the Free State Province, South Africa. A number of characteristics also make them convenient to use as indicators of habitat integrity (see Avenant et al. 2008). Sampling small mammals is therefore an effective, practical and relatively inexpensive tool for wildlife managers and environmental practitioners to study, describe and monitor ecosystems. After 10 years of small mammal sampling at nine localities and in a variety of Free State habitats we have good indications that removal trapping by snap trap is more successful than mark-release studies or trapping by live box traps; especially at higher ecological values. We advise sampling of a large area, with traps spaced 5m. For removal trapping, trap periods should last for at least three days, but not more than five. Best results (= highest diversity and trap success) can be expected in the period mid-autumn to early-winter. For comparative purposes a standardized method is, therefore, essential.

50 SMALL-MAMMALS COMMUNITY CHANGES BY CLEARCUTTING OF MONTERREY PINE PLANTATIONS IN CHILE: PATTERNS AND POSSIBLE MECHANISMS

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There is increasing evidence that Monterey pine plantations in central Chile host a significant number of animal species. Nevertheless, little is known about the effects of management practices on these organisms. All pine plantations in Chile are harvested through clearcutting, a technique that has been regarded as detrimental for forest wildlife habitat. The result of this method is an heterogeneous landscape with difference age paths of plantations. During the breeding seasons of 2006-07 we studied the small-mammals community in a landscape dominated by pine plantations in Quirihue (36° 15'S, 72° 31'W), central Chile. We live-trapped mice in spring and summer at three sites with "open areas" cover (1-2 years old) and three sites with "forest cover" (over 20 years old). We describe the small mammals community by PCoA based in correlation matrix, finding that small-mammals communities are different between compared sites. Shrub species *Phyllotys darwini* and *Abrothrix olivaceus* was more abundant in "open areas". Specialist forest species *A. longipilis* was more abundant in "forest cover". We propose that mechanism by which large clearcut areas negatively affect forest animal species is through the process of relocation of animals from the disturbed area into other mature forest patches. Each time plantations are cut, a large proportion of the local population of many forest animal species is displaced (or killed) during the tree felling operations. Finally, we will test the prediction that animals expelled from large clearcut areas will experience a higher mortality rate, by a radiotracking study on *A. longipilis*. We will attach radiotags to individuals present in areas to differences distance to mature forest before they area harvested. Then, we will follow the location of these animals during one month from the beginning of the tree felling operations in order to compare the natural relocation and mortality rate of individuals displaced.

51 STATUS OF THE XENARTHAS IN URUGUAY

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A total of five species of *Xenarthra* inhabits in Uruguay: the southern lesser long-nosed armadillo (*Dasypus hybridus*), the nine-banded armadillo (*Dasypus novemcinctus*), the greater naked-tailed armadillo (*Cabassous tatouay*), the six banded armadillo (*Euphractus sexcinctus*) and the southern tamandua (*Tamandua tetradactyla*). Most of these species are considered common in Uruguay since they are distributed throughout the country. However, the greater naked-tailed armadillo and the southern tamandua are rare species whose southernmost distribution limit is in Uruguay. There are some records of these species in the north-east of the country (Rivera, Tacuarembó, Cerro Largo, Treinta y Tres and Lavalleja) limiting with Brazil. There is a lack of knowledge about the current status of the *Xenarthras* in Uruguay. However some potential threatens had been identified in our work. One of the most important threaten that we identified is the habitat loss as a result of thousand of grasslands hectares that had been converted into exotic tree plantations. In addition, illegal hunting and road kills are other important threatens that could be affecting *Xenarthras* populations in Uruguay. Finally, the lack of control from governmental agencies contributes negatively to their conservation. It is of paramount importance the development of long-term researches to determine aspects of their biology, ecology, population dynamics and distribution that contributes to elucidate the actual conservation status of these species in the country. The scientific research should be developed together with education programs in rural and urban areas and in education centers of all levels. Education programs would enhance the concern of the native fauna by the general public, improving the conservation of *Xenarthras* in Uruguay.

52 SYNOPSIS OF A FIFTEEN-YEAR INVESTIGATION OF COUGAR (*PUMA CONCOLOR*) EXPLOITATION IN UTAH, USA.

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Contemporary human activities impact cougar populations in western North America in two principal ways: (1) direct exploitation; and (2) habitat loss and fragmentation. In 1995 the Utah Division of Wildlife Resources and Utah State University, with other collaborators, commenced an investigation of cougar ecology and management with two primary objectives, namely: (1) comparison of enumeration procedures; and (2) examination the impacts of hunting and other mortality factors on cougars. This represents the longest continuous study of the species, in which we have instrumented >180 animals with conventional VHF and (since 2005) GPS radio collars. Employing a Before-After-Control-Intervention (BACI) design, we followed the demographics of an exploited population through a complete cycle of intense exploitation and recovery. The "exploited" population sustained a level of human-induced mortality reaching as high as 87% of available adult animals. This resulted in a >60% decline in survival, a sharply attenuated age structure and ultimately a complete failure of reproduction. During the same interval, survival in the control population, in which human-caused mortality averaged 36%, remained relatively constant. Following a 60% reduction in hunting pressure, the exploited population reached pre-experimental levels within 5 years, growing at an average annual rate of 10%. Recovery occurred in two overlapping phases with initial growth facilitated by male-biased immigration. Recruitment during subsequent years was achieved primarily through philopatry of local progeny. The treatment and control populations behaved as sink and source populations, respectively, but following recovery the former resumed the attributes of a source population. Given the demographic resiliency and lack of robust census techniques for this species, we suggest cougar management on a meta-populations or ecoregional scale. Future research will focus on adaptive management strategies and cougar habitat use and movements in landscapes along the urban-wildland interface.

53 THE ABUNDANCE OF GRAY FOX (*UROCYON CINEROARGENTEUS* SCHEBER) IN THREE DIFFERENT COVER TYPES IN VERACRUZ, MÉXICO

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The cloud forest occupies a small portion of Mexican territory, between 0.5% and 1% of the total surface; this is due to the few zones in which we can find the humidity and the appropriated temperature, because the cloud forest is defined by its high atmospheric humidity and the presence of fog. Nearby Xalapa, Veracruz, the transformation of this vegetation type has been increased in the last decades, the 90% of the forest has been destroyed already and the rest is in danger of being lost. Nowadays there are 19 fragments of non disturbed forest, the surrounding environment of these fragments is mainly pastures, urban zones, secondary vegetation and shaded coffee plantations. We estimated and compared the relative abundance of gray fox in three different cover types (cloud forest fragments, shaded coffee and cane plantations) by searching for tracks (footprints and scats) in three transects of 500 meters by cover vegetation during six months between October 2008 and April 2009; the activities of exploration and the presence of gray fox were registered in all sites. The coffee plantations were the vegetation cover type that shown the major abundance. It is important to consider that the relative abundance values for all types of vegetations could be affected by the matrix of the landscape in which they are immerse and the human activities in each one.

54 THE CHARACTERIZATION OF SMALL MAMMAL FAUNA IN THE OURO BRANCO MOUNTAIN RANGE (MINAS GERAIS, BRAZIL).

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The Ouro Branco Mountain Range is located in the city of Ouro Branco, which lies in the southern region of Quadrilátero Ferrífero and the Espinhaço Mountain Range of Minas Gerais state, southeastern Brazil. It is considered an ecotone between the Cerrado and Atlantic Forest biomes, consisting of delimited rupestrian fields within a plateau. Intense anthropogenic activity from mining and subsistence farming has resulted in the area's forests being composed of only secondary species. This is the same story for a large part of Brazilian territory: knowledge of local fauna is incipient and still lacks any information on the mammalian community. For this reason, an evaluation of the non-flying small mammal community was done over 15 months (December 2006 to March 2008), with monthly faunal samples performed using drift fences placed in linear transects, totaling a final capture force of 4800 trap-nights. During the sampling, a 5,73% capture success yielded the following results: 36 individuals from 4 marsupial species, and 239 individuals from 13 sigmodon rodent species. From the rodent species found, *Abrawayaomys ruschii*, *Blarinomys breviceps*, *Bibimys labiosus* and *Rhagomys rufescens* stand out by being considered rare in collections and classified as a species of "least concern" by the IUCN (2006). The marsupial species which stood out were *Gracilinanus microtarsus* and *Monodelphis americana*, which are also considered rare in collections. In this study, these were captured frequently during the rainy season. Between these, *G. microtarsus* is considered almost threatened according to the IUCN (2006). The presence of these small mammals—characterized by small, isolated, declining populations—in this study area indicates the necessity of not only immediate conservation actions, but also restoration of the whole environment. These are indispensable measures for a conservation project that successfully manages this fauna.

55 THE ROLE OF SMALL MAMMALS IN HABITAT INTEGRITY ASSESSMENTS IN SOUTH AFRICA

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In order to conserve and manage ecosystems we need to increase our understanding of ecosystem processes and establish efficient strategies for the monitoring of ecosystem integrity. In South Africa the Grassland Biome is currently one of the most extensively transformed. Where traditional methods of sampling vegetation (i.e. pioneer-climax species relationships; % ground cover; ecological values) are excellent indicators of grazing capacity, a monitoring strategy for grassland ecosystems is long overdue. Given that the components of ecological integrity in grassland ecosystems are so diverse and that it is time consuming and difficult to measure all the factors of these components, it is necessary to develop grassland indicators that are efficient and rapid in their assessment of grassland ecosystem integrity. Based on the success of the South African Scoring System and the River Health Programme in monitoring the ecological integrity of South African rivers, a Grassland Health Programme was initiated for the monitoring of grassland ecosystem integrity. So far two groups have been tested, sampling at different ecosystem levels: insects (using the South African Grassland Scoring System, SAGraSS) and small mammals. Both aim to be rapid and easy to perform methods. Where SAGraSS, however, still needs further refinement, a number of factors already indicate the importance of including small mammal community structure in integrity assessments. At high diversities and densities small mammals are not only a key prey species for a wide spectrum of predators, but are also important predators, dispersers of seed, soil fertilisers and ecosystem engineers. This contribution discusses the relatively quick, easy and inexpensive manner in which small mammals can be sampled, reports on ten years' results supporting our hypothesis, shows the important contribution this method makes to existing integrity sampling methods, and gives results from one study which clearly indicated the value of sampling ecosystem integrity at more than one level.

56 USE OF MICROSATELLITES FOR IDENTIFICATION OF WILD CATS IN THE PROVINCE OF MISIONES

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Entre las herramientas más comúnmente utilizadas en la biología molecular para la identificación de individuos y el análisis de su variabilidad, los marcadores moleculares proporcionan resultados reproducibles y sensibles para estos tipos de datos. Las estrategias para evaluar la diversidad son cada vez más exigentes a la hora de presentar diagnósticos valederos y fiables en cuanto a la biodiversidad en una población. Los marcadores moleculares proporcionan múltiples posibilidades de análisis, ya que pueden ser aplicadas no solo a una especie sino a especies emparentadas dentro de un género u orden, posibilitando a su vez, la selección de los miembros de una cadena trófica analizando el impacto ambiental sobre la reducción de la variabilidad estudiada. Además, posibilitan estrategias de conservación y manejo de ejemplares dentro y fuera de zonas protegidas. En el presente trabajo se seleccionaron marcadores moleculares microsatélites con secuencias tándem formadas por tetranucleótidos polimórficos y se evaluó su utilidad en seis especies de felinos de la región paranaense, Puma concolor, Panthera onca, Leopardus pardalis, Leopardus weidii, Leopardus tigrinus y Herpailurus yaguarundi, todos ellos encontrados en distintas localidades de la provincia de Misiones. Se analizó la calidad de ADN en cuanto a su amplificabilidad mediante espectrofotometría y corroborando la calidad mediante análisis estadístico, ya que las muestras se obtuvieron a partir de sangre periférica, pelos, materia fecal y otros tejidos. Las ampliificaciones por PCR mostraron una buena resolución de amplicones que fueron apropiados como herramientas de análisis de la biodiversidad observándose correlación con autores de referencia.

57 VEGETATION COMPOSITION AND THE ABUNDANCE OF SMALL MAMMALS IN PINE PLANTATIONS IN SOUTH-CENTRAL CHILE

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Pinus radiata plantations cover more than 1.5 million ha in Chile and are habitat to several species of wildlife. However, little is known about the specific attributes of plantations that favor their use by specific species. We assessed the relationship between the composition of the vegetation of pine plantations of different degrees of development and the abundance of small mammals in three study sites at the Biobio and Maule regions of South-Central Chile. Among these sites we distributed a total of 16 1-ha plots in which we live-captured small mammals using 100 Sherman traps for three nights during the breeding and non-breeding seasons, and we estimated the foliage volume (m³/ha) of all dominant plant species. All relationships were studied using GLM (Poisson). Out of eight detected species only four showed clear associations with vegetation variables. The abundances of *Akodon olivaceus* and *Phyllotis darwini* were negatively associated to the volume of pine in both seasons ($p < 0.002$), and *Oligoryzomys longicaudatus* only during the non-breeding season ($p < 0.001$). Only *Abrothrix longipilis* was positively associated to developed pine plantations ($p < 0.001$, both seasons). The latter relationship indicates a preference of this *A. longipilis* for forest-type habitats and agrees with the negative association of this species with scrub-type plants such as *Lithraea caustica*, *Escallonia pulverulenta* and *Quillaja saponaria* ($p < 0.001$, in presence of pine), and a positive relationship with more hygrophylous species, such as *Cryptocarya alba* and *Peumus boldus* ($p < 0.0001$, in presence of pine). However, for *A. olivaceus*, *P. darwini* and *O. longicaudatus*, the opposite was not true as they were also negatively correlated to scrub-type species ($p < 0.05 - 0.0001$, in presence of pine), indicating that these are mostly open area species.

ECOLOGY AND EVOLUTION

58 A COMPARATIVE STUDY OF SMALL MAMMALS AT THE N'WASHITSHUMBE ENCLOSURE SITE IN THE KRUGER PARK

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This paper describes the diversity of rodent species in the northern plains of the Kruger National Park and to investigate the possible role they may play as bio-indicators for different management practices. This paper gives results from small mammal trapping in, around and away from the N'washitshumbe enclosure, an area established in 1968 for the protection of endangered antelope species in the Kruger National Park. Plant associations, seasonal changes, management practices (e.g. presence or absence of fire and elephant impact) and community dynamics of rodents are described. The paper describes the number of rodent captures differed significantly ($p < 0.001$) between top slope grid B ($n = 814$), mid slope A ($n = 878$) and bottom slope C ($n = 634$). We found the number of rodent captures also differed significantly ($p < 0.001$) between the outside ($n = 970$), in the fire break surrounding the enclosure ($n = 631$), inside the enclosure site ($n = 589$) and in the sodic area ($n = 136$). This paper emphasizes that with the exclusion of other large herbivores such as buffalo, elephant, etc. an impact on the structure of the vegetation within the enclosure resulted, explaining that inside the enclosure, trees have increased in height and in percentage basal cover by over 50%, while those outside have remained short and have decreased in percentage aerial cover by 60%. The abundance and representation of different species of small mammals collected differed significantly ($p < 0.001$).

59 A DEMOGRAPHIC ANALYSIS OF MICE POPULATION RESPONSE TO MANIPULATION OF ADULT MALES

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Adults play an important role influencing the survival and/or reproduction of juvenile in many species of mammals. We provide a demographic analysis of the effect the experimental removal of adult males has on population growth rates of *Calomys venustus* enclosed populations. The study was carried out in four 0.25-ha enclosures (two controls and two experimentals), each situated on natural pastures. This study was conducted between September 1997 and May 1998. Adult males were removed after offspring from the first litter were born. Weekly trapping sessions were carried out from November (Spring) to May (Autumn). In order to estimate population growth rates (?), apparent survival (?) and recruitment rates (1-?) were estimated using capture-mark-recapture models. Several models were constructed with these two parameters and the recapture probability (p) constrained to vary as a function of time, enclosure and/or treatment. We derive estimates of population growth rates through the estimates of ? and ?. The best models did not show treatment effect. Variability between the four enclosures was greater than between both control and both experimental enclosures. Survival was constrained only by enclosures. Although recruitment varied by time and enclosures, an earlier peak (late spring) in recruitment rates was observed in control enclosures. In experimental enclosures recruitment rates were higher in summer. Enclosures had different growth rates at the beginning but were equalled at the end of the study. Temporal variation in population growth rates was a result of temporal variation of recruitment rates. The two control enclosures showed the highest growth rates earlier in time. The effect of the onset of reproductive activity of juvenile female on population growth patterns is discussed. A more controlled study should be conducted using greater sample sizes in order to reduce the variability among replicates.

60 A GEOMETRIC MORPHOMETRIC STUDY OF SIZE AND SHAPE VARIATION IN THE SKULL OF *MERIONES CRASSUS* (RODENTIA, GERBILLINAE): HOW DISTINCT IS THE POPULATION OCCURRING ON THE IRANIAN PLATEAU?

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Morphological variation in shape and size of the cranium in specimens of *Meriones crassus* (Sundevall, 1842) were investigated, in order to test whether the populations coming from the Iranian plateau form a natural group, being distinct from other populations. Ventral, dorsal and lateral craniums were analysed, using a two-dimensional (2D), landmark-based geometric morphometric approach. A total of 272 skull specimens from more than 40 different localities along their distribution range, from North Africa to the east of the Iranian plateau, were analysed. According to our results, the specimens from the Iranian plateaus have significantly smaller skull sizes and significantly different skull shape than those of other localities along the species distribution range. The observed intra-specific variation in skull shape and size may provide an important contribution to characterise taxonomic diversity and to better understand morphological evolution of these rodents. Key words: Iranian plateau, geometric morphometrics, skull shape, *Meriones*, Muridae

61 A STABLE METAPOPULATION SYSTEM IN ATLANTIC FOREST REMNANTS: MERGING ECOLOGICAL AND MOLECULAR DATA

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Natural populations persist in different stages of isolation and may form diverse types of metapopulation structures. Population genetics analyses were combined with ecological analyses to infer the spatial structure and local population dynamics of the marsupial *Didelphis aurita* (Wied-Neuwied, 1826). The population has been studied since 1997 using capture-mark-recapture in a preserved area of continuous Atlantic Forest in Rio de Janeiro State (locality of Garrafão). This long-term monitoring permitted analysis of a 9-year time series. The Mean Return Time, Autocorrelation and Partial Rate Correlation analyses were used to determine the order of the dynamic system. Blood or liver samples were collected for molecular analyses from Garrafão, another continuous forest area, and four local fragments, distant at most 18km from each other. The complete Cytochrome b sequence (1149pb) was analyzed for 81 individuals. We used AMOVA, Mismatch distribution, Median joining and Nested Clade Phylogeographic analyses. Population dynamics in Garrafão are governed by negative first-order feedback. Molecular analyses showed small, but significant genetic differences between haplotypes. Significant geographical correlation was found for two clades of haplotypes, with possible restricted gene flow and isolation by distance. Molecular and ecological analyses indicate an equilibrium population, not suffering from any severe demographic events and also regulated by density-dependent processes. The population presents some metapopulation persistence characteristics, where gene flow is limited between some sub-populations, isolation by distance occurs in others, and at least one local population is at equilibrium. The Garrafão population suits most characteristics of a source population since its local dynamics tend to be stable, the finite population growth rate sometimes exceeds 1, and its genetic diversity is high.

62 ANALYSING DIET OF SMALL HERBIVORES: THE EFFICIENCY OF DNA BARCODING

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In order to understand the role of herbivores in trophic webs, it is essential to know what they feed on. Diet analysis is, however, a challenge in many small herbivores with a secretive life style. We compare novel (high-throughput pyrosequencing) DNA barcoding

technology for plant mixture with traditional microhistological method. We analysed stomach contents of two ecologically important subarctic vole species, *Microtus oeconomus* and *Myodes rufocanus*, with the two methods. DNA barcoding was conducted using the P6-loop of the chloroplast trnL (UAA) intron. Although the identified plant taxa in the diets matched relatively well between the two methods, DNA barcoding gave by far taxonomically more detailed results. Quantitative comparison of results was difficult, mainly due to low taxonomic resolution of the microhistological method, which also in part explained discrepancies between the methods. Other discrepancies were likely due to biases mostly in the microhistological analysis. We conclude that DNA barcoding opens up for new possibilities in the study of plant-herbivore interactions, giving a detailed and relatively unbiased picture of food utilization of herbivores.

63 **ASSESSMENT OF PARENTAGE RELATIONSHIPS AMONG BURROW-SHARING INDIVIDUALS OF *CTENOMYS RIONEGRENSIS* USING MICROSATELLITES**

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With some exceptions, species of the genus *Ctenomys* are commonly regarded as solitary, so if more than one individual per burrow are found outside the mating season, they should be adult males and females, mothers with their pups, or siblings. However, multiple individuals have been removed from the same burrow in *C. rionegrensis*. With the aim of assessing the nature of burrow-sharing in this species, twelve microsatellites were genotyped in 24 individuals from multiple captures in 8 caves between October and November 1999 in Río Negro, Uruguay. Descriptive parameters and relatedness (*R*) between individuals were estimated using the softwares Cervus 3.0 and Kingroup v2. The number of alleles per locus and PICs (Polymorphic Information Contents) ranged between 1 and 5, and 0.154 to 0.71, respectively, and cumulative exclusion probability for the 9 polymorphic loci was greater than 99%. The analysis of exclusion, taking into account sex, age, and date of capture confirms that individuals from three of these 8 caves were not closely related and we can exclude the expected situation for solitary species. In particular, two adult females could be excluded as putative mothers of one or two juveniles caught in the same burrow in a single day. In the remaining 5 caves, expected relationships could not be excluded. We also found close kinship ties between pups and adults of distant caves suggesting considerable vagility within the study area. These results, together with demographic data, suggest that *C. rionegrensis* are able to share burrows beyond what would be expected for non-social tuco-tucos. It is also possible that increased mobility during certain periods makes them capable of sharing burrows.

64 **AUTOREGULATORY MECHANISM OF BREEDING CYCLICITY OF THE EDIBLE DORMOUSE ON THE PERIPHERY OF THE RANGE**

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At present in many European countries programs of rehabilitation of population of dormice species included in the IUCN Red List are implemented. For the devising of effective measures for protection of the rare species in Russia the research of intrapopulation mechanisms determining dynamics of population density of these animals seems the most perspective. One of the most important mechanisms regulating rates of population increase of the edible dormouse (*Glis glis* L., 1766) is autocyclicality of reproduction depending on population density. In the Western and Central Europe, the optimum of the species range, after 3-4 years of successful reproduction one year's pause ensues. European researchers ascertained that in years without mast crops of Fagaceae family trees reproductive activity of males is not observed, hereupon females don't bear young. On the eastern periphery of the dormice range (Zhiguli Mts., Russian plain) successful reproduction is observed even less often - once in 2-3 years. But it was revealed by 6-year observations that the majority of males (92-100%) are reproductively active every year irrespective of nut trees species productivity and climatic fluctuations. For the solution of this contradiction the regular examination of the females' reproductive condition by methods of analysis of vaginal smears and capture-mark-recapture was conducted over two field seasons 2007-2008. Results of the investigation have shown that estrus and insemination of the females are observed annually both in years of successful breeding (2007) and subsequent years of reproduction failure (2008). In 2007 after pairing at the majority of females (68,3%) pregnancy progressed normally. However in 2008 at 86,5% of females total resorption of embryos was registered. No significant correlation between food supply, hibernation conditions and breeding rates of the rodent was revealed. The phenomenon of mass resorption must be considered the key element of the ecophysiological mechanism of autoregulation of reproduction and population density of the edible dormouse in the pessimum of the species range.

65 **BIODIVERSITY PATTERNS, PROCESSES AND ASSEMBLY RULES OF SMALL MAMMAL ASSEMBLAGES IN MONTE DESERT, ARGENTINA.**

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Different biodiversity patterns can arise at different spatial scales. According to the heterogeneity hypothesis these patterns could be driven by structural habitat features, mostly at regional scale. Nevertheless, inter-specific interaction could also regulate community structure at local scale. These assemblage patterns could be potentiated in arid ecosystems with marked spatial heterogeneity and scarce resources. Particular questions are addressed across spatial scales: How is small mammal diversity additively partitioned into alpha, beta and gamma diversity? How do these patterns vary according to habitat heterogeneity and complexity? What functional traits are driving convergence and divergence in small mammal communities? and, What assembly rules drive our system? We

sampled 52 small mammal assemblages along the latitudinal extent of the central Monte Desert. Spatial scales considered were: habitat patch, locality and biome. Total sampling effort was 23,000 night/traps with a total of 411 captures of 12 species. By comparing beta and alpha diversity we found that alpha diversity was bigger than beta at most spatial scales (these varying depending on the index used). At patch scale we found no association of diversity with either heterogeneity or habitat complexity. Nevertheless, at regional scale we found a strong association between these variables (i.e. diversity vs. complexity $R^2=0.608$, $p<0.05$). According to functional traits, different divergent and convergent traits were mainly explained at all spatial scales [i.e. torpor and body/tail ratio are divergent traits ($R^2=0.90$; $p<0.034$), and body/tail ratio is also a convergent trait ($R^2=0.913$; $p<0.012$) at regional scale for the heterogeneity gradient]. We also found complementarity ($R^2=0.58$; $p<0.0001$) between small mammal species in assemblages of the Monte Desert at local scale, supporting Fox's assembly rule. Our results suggest that the structure of small mammal's assemblages of Monte desert is driven by a combination of several factors at different spatial scales. (Partially supported by CONICET, PIP 5944, Agencia, PICT 25778, Rufford and Idea Wild)

66 **CHANGING SEX-BIASED DISPERSAL IN *CALOMYS VENUSTUS* (RODENTIA: SIGMODONTINAE) ALONG LINEAR HABITATS DURING THE BREEDING SEASON**

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The landscape pattern of central Argentinean plains consists almost exclusively of agricultural land separated by "border habitats", which are narrow, linear and frequently uninterrupted for several kilometers. In order to study dispersal in those habitats, we performed spatial genetic autocorrelation (SGA) analyses by sex in *C. venustus*, one of the most abundant species, during the breeding season (spring, summer and autumn). Two transects with five lines of 30 georeferenced traps separated by 500m were set along opposite borders of a secondary road in an agroecosystem in central Argentina. We analyzed five microsatellite loci in 292 individuals; SGA analyses were performed using GenALEx 6.2. Both sexes showed a random pattern of genetic structure at long distances (maximum: 4000 m) during the entire breeding period, suggesting high dispersal rates along the border habitats. On the other hand, genetic structure varied seasonally at short distances. In autumn, males showed a random genetic structure, while females showed positive autocorrelation until 215 m. This result was similar to the pattern found in summer, but positive autocorrelation in females was observed at shorter distances (172 m). In spring, the pattern was the opposite: genetic structure of females was random while males showed positive autocorrelation until 190 m. In this species females are the territorial sex, their distribution is determined by habitat quality, and natal dispersal occurs early (<40 days). In spring, females settle bigger habitat patches (high dispersal rates) since habitat quality quickly improves and abundance is still low. When population abundance increases (summer and autumn), juveniles tend to establish near to their mothers (Social Fence). Seasonal variations in male dispersal rates are also related to the mating system of the species.

67 **CHARACTERIZATION OF THE CARNIVORE COMMUNITY FROM A FRAGMENTED LANDSCAPE IN THE SOUTHERN BRAZILIAN AMAZON USING FAECAL DNA**

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The use of molecular assays based on faecal DNA has allowed the investigation of several ecological and genetic issues in wild carnivores. A first step in such efforts is the species-level identification of faecal samples, yet no standardized method for global application to all carnivores is currently available, hampering comprehensive comparisons across studies and geographic areas. Moreover, many biomes of the world have not yet been explored in terms of their specific requirements for faecal DNA analyses, which may be more difficult in rainforest areas where the rate of DNA degradation is expected to be high. The present study aimed to test the efficacy of faecal DNA analyses in the Amazon region, by assessing the performance in that biome of a carnivore species-identification method we have developed. We employed our sequence-based assay targeting a 172 bp segment of the mtDNA ATP6 gene to identify the carnivore species present in a fragmented landscape in the Alta Floresta region, Mato Grosso state, Brazil. Ninety-four scat samples were collected from October/2007 to February/2008, and used for DNA extraction, PCR amplification and sequencing. So far 52 of these samples (55% of the total) have been reliably identified by stringent comparison to a reference carnivore data base, allowing the detection of the following species: *Cerdocyon thous* (n=19), *Leopardus pardalis* (n=14), *Panthera onca* (n=11), *Puma concolor* (n= 6), *Puma yagouaroundi* (n=1), and *Lontra longicaudis* (n=1). These results demonstrate that it is feasible to employ DNA-based assays to identify carnivore faecal samples from the Amazon region, and allow the development of in-depth genetic and ecological studies targeting these communities. In addition, the present data set provides insight into the spatial occurrence of carnivore species in this fragmented landscape, aiding in the process of understanding their dynamics in this endangered ecosystem.

68 **COMPARATIVE DIETARY ANALYSIS OF THREE NEOTROPICAL FELIDS IN A FRAGMENTED REGION OF THE BRAZILIAN AMAZON**

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Habitat loss and fragmentation may cause shifts in several ecological parameters of carnivore species, potentially leading to declines or local extinction. Few studies have focused on carnivores of the Amazon region, so that many aspects of their ecology in this biome

remain unknown. Filling this knowledge gap is particularly relevant at a time when large tracts of the Amazon forest are being fragmented, highlighting the need to characterize the baseline ecology of vulnerable species, and to compare areas under different degrees of threat. This study aims to investigate the feeding ecology of carnivores in the southern Amazon, and focuses on the Alta Floresta region of Mato Grosso state (Brazil), which currently faces severe levels of deforestation. From October/2007 to December/2008, we collected 108 carnivore scats in forest areas of varying size and connectivity, as well as human-altered habitats in the region. The identity of the predator species was determined using DNA sequences and/or hair microscopy, which were cross-compared whenever possible. Here we focus on the analysis of samples from jaguars (*Panthera onca*) (n=13), pumas (*Puma concolor*) (n=7) and ocelots (*Leopardus pardalis*) (n=15). Prey item identification is ongoing, but initial analyses are presented here employing broad categories of food contents. We measured the frequency of occurrence (FO) and relative frequency (RF) of each item, and then the niche breadth (B) of each species. All species showed narrow dietary niches, dominated by mammals (jaguar: 92.3% FO and 80% RF of mammals, respectively; puma: FO=71.4% and RF=85.7%; and ocelot: FO=80% and RF=55.2%). Birds represented the second most frequent item for jaguars and pumas, while fish was the second dominant item for ocelots. The estimated niche breadth was extremely narrow for jaguars (B=0.05) and pumas (B=0.08), while that of the ocelot (B=0.38) indicated a more generalist diet.

69 COMPARISON OF CORSAC FOX AND RED FOX DIETS BETWEEN STEPPE AND SEMI-DESERT ECOSYSTEMS IN MONGOLIA

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The corsac fox (*Vulpes corsac*) and red fox (*V. vulpes*) range sympatrically across northern and central Asia. Both species are generally regarded as opportunistic foragers as they consume a variety of food items. However, few detailed accounts of the food habits of either species exist in Asia. We quantified and compared corsac fox and red fox diets in two ecosystems in Mongolia, including 'grassland steppe' and 'semi-desert steppe', based on an analysis of scats collected during the early summer months of 2005, 2006, and 2007. We collected and analyzed 241 corsac fox and 33 red fox scats from a grassland site in the Eastern Steppe, and 395 corsac fox and 374 red fox scats from a semi-desert site in Ikh Nart Nature Reserve. Corsac and red fox diets in the Eastern Steppe were moderately broad, highly overlapping, and consisted mainly of small rodents, but also birds, reptiles, insects, and plant material. By comparison, corsac and red fox diets in Ikh Nart were moderately broad, highly overlapping, and consisted mainly of small rodents and insects, as well as birds, reptiles, plant material, and garbage. We detected intraspecific differences between sites and interspecific differences within and between sites in the frequency of food items consumed. Our results suggest that corsac and red foxes exhibit flexible diets and that potential competition between species may be reduced through dietary partitioning.

70 COMPOSITION AND HABITAT USE OF RODENTS IN DIFFERENT FLORISTIC SITES OF THE NATURAL RESERVE OTAMENDI, BUENOS AIRES, ARGENTINA.

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The Strict Natural Reserve Otamendi is a wetland of a great relevance for its fauna and flora composition. The aim of this study was described the abundance, composition and use of habitat of the rodent community in the reserve. Rodent trapping and vegetation survey were carried out in six floristic sites every three months (Septiembre-07/August -08) and in March-08, respectively. The association between the presence-absence and annual abundance of rodents with vegetation characteristics was evaluated by means of multiple regression. One hundred fifty three individuals were captured with an effort of 3636 traps-nights. The species captured were: *Oxymycterus rufus*, *Scapteromys aquaticus*, *Akodon azarae*, *Oligoryzomys flavescens*, *Deltamys kempi* and *Oligoryzomys nigripes*. At macrohabitat scale, *S. aquaticus* showed a greater use of habitat in sites with major creeper cover; *O. rufus*, presented a greater use in sites with low broad leaf herbs cover, higher trees and epiphytes cover and a major presence of *Metastelma diffusum*. For other side, *O. nigripes* was negative associated with *Carduus acanthoides*. For *A. azarae*, *O. flavescens* and *D. kempi* did not show association with any variables analyzed. At microhabitat scale, we study the use of rodent species only in riparian forest. *O. rufus* was captured in traps surrounding with low grasses cover and low presence of *Cissus aff Palmata* and *Ciperacea* specie. *Scapteromys aquaticus* was captured in trap station with low trees cover and greater cover of broad leaf herbs. *D. kempi*, *O. flavescens*, *A. azarae* and *O. nigripes* did not associated with any variables studied. The rodent species that inhabit the Natural Reserve Otamendi showed a differential uses of habitat, resulting in differential rodent composition and abundance among the six floristic sites.

71 DENSITY ESTIMATION OF SYMPATRIC GEOFFROY'S CATS AND PAMPAS CATS

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The study of carnivore population abundances is particularly difficult, but is necessary to develop management and conservation programs. Little is known about sympatric cats ecology in the Pampas grasslands, which, in Argentina, have been strongly altered and fragmented by human intervention. The aim of this study was to learn more about the effect of human disruption on the abundance and distribution of this species. We conducted a camera survey (58 days) in a bushland-rich area (a private farm with cattle in

southwestern Buenos Aires Province: 384200S-625700W). We placed 44 stations with 2 cameras positioned to photograph both flanks of the animals. The distance among cameras (800 m) was determined using data previously taken on radiotagged Geoffroy's cats (*Leopardus geoffroyi*). Sixty six photos of Geoffroy's cats and 13 of Pampas cats were taken; each photographed cat was identified by its unique spot pattern. We pooled daily data in blocks such that one encounter occasion consisted of a five-day time period. We used Capture software to estimate abundance. To calculate the effective survey area (39.5 km²) we created a convex polygon with camera locations and applied a buffer (using the MMDM) around it. The populations of both Pampas cat (*L. colocolo*, $Z=-0.707$, $p=0.24$) and Geoffroy's cat ($Z=1.155$, $p=0.88$) were closed. Geoffroy's cats (20 ± 7 individuals) were more abundant than Pampas cats (9 ± 4.2 individuals) considering the H(0) model. The estimated density was 50.6 animals/100 km² for Geoffroy's cat and 22.8 animals/100 km² for Pampas cat. Our abundance data suggest that the Geoffroy's cat is more flexible to human impact than the Pampas cat. At present, natural grasslands are fragmented and bushland patches probably represent a good habitat for cats that may guarantee the survival of relatively large populations within a less favourable matrix. Support: SGCyT 24/B 123, Earhwatch Institute and Panthera/Wildlife Conservation Society Kaplan Awards Program.

72 DIFFERENTIATION OF *TOLYPEUTES MATACUS* AND *EUPHRACTUS SEXCINCTUS* FECES BY THEIR BILE ACID PATTERN

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The analysis of feces is a useful tool for ecological studies. However, it is difficult to identify them by their external characteristics. Fecal bile acids and their relative concentration follow patterns that are species specific and can be characterized by different chromatographic techniques such as TLC and HPLC. Feces from wild and captive individuals of *T. matacus* and *E. sexcinctus* were analyzed. Bile acids were extracted with benzene:methanol. For TLC bile acids were spotted on silicagel plates, eluted with toluene:acetic acid:water and revealed with anisaldehyde:glacial acetic acid:sulphuric acid. An HPLC equipped with an UV-visible detector set at 200 and 210 nm was used. The separation was achieved using a C-18 column. Mobile phase consisted of ammonium carbonate 0.3%:acetonitrile in a gradient, at a flow of 0.8 ml/min. Bile acids were identified by comparison with standard retention factor and retention times in TLC and HPLC respectively. Both species were differentiated by their bile acid patterns, having taurocholic, glycocholic, chenodeoxycholic, dehydrocholic, deoxycholic and lithocholic acids, as well as cholesterol. In TLC, *T. matacus* showed deoxycholic and chenodeoxycholic acids as one spot (Rf:0.32) in the plates, while in *E. sexcinctus* they appeared as two separate spots (Rf:0.47, Rf:0.43). In HPLC, *T. matacus* showed a majority peak for chenodeoxycholic acid (Rt:20.6 min) which is not detected in *E. sexcinctus*; this species showed a majority peak for cholic acid (Rt:9.6 min) while this compound is minority for *T. matacus*. In HPLC, conjugated bile acids showed more absorbance at UV than no conjugated bile acids; and most compounds showed greater absorbance at 200 than 210 nm. Feces of *T. matacus* and *E. sexcinctus* were differentiated in this work; thus, demonstrating the usefulness of TLC and HPLC to identify wild-collected feces of those species by their bile acid pattern.

73 DIVERSITY AND DISTRIBUTION OF RODENTS IN THE MONTANE FOREST OF HUÁNUCO, CENTRAL PERU

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The montane forest region of the eastern slope of the Andes is one of the 18 ecoregions worldwide with the highest priority for conservation, nonetheless it is still a poorly known ecosystem. We present here the first analyses of diversity and distribution of cricetid rodents in a montane forest of central Peru, based on Rapid Assessments of twelve montane forests (2500-3900 m.a.s.l.) using Sherman and Victor traps. A total of 7200 night traps were gathered in puna, oconal, primary, secondary and Polylepis habits. We recorded 10 species: *Microryzomys altissimus*, *M. minutus*, *Oligoryzomys andinus*, *Phyllotis andium*, *Calomys sorellus*, *Akodon mollis*, *A. orophilus*, *Thomasomys cf. kalinowskii*, *T. incanus*, and *T. notatus*. The last four species are endemics to Peru. The ? diversity index was calculated using Simpson and Shannon-Wiener, ranged from (1-D=0.66, H'=1.69) in Campamento Regional to (1-D=0.17, H'=0.53) in Chaupiloma (N=2; N=3 species respectively); meanwhile the Pielou's evenness coefficient ranged from 92% in Campamento Ututo to 34% in Chaupiloma. However, the highest Rarefaction index obtained at Ucumaria (ES(10)=3.45) (N=5 species), suggests that this locality is the most diverse in part due to a greater variety of habitats. A measure of ? diversity was calculated using Bray Curtis index similarity between localities and between range altitudes of 100 m-intervals, and submitted to nMDS and Cluster analysis. Four groups were obtained by localities: at right, at left, and north of Río Marañón; and right of Río Huallaga; suggesting an effect of rivers as barriers. On the other hand, nMDS and Cluster analysis by elevation ranges obtained two groups: 2800-3300 m.a.s.l. and 3400-3900 m.a.s.l., similar to patterns previously reported for flora and cricetid rodents from the Peruvian eastern slope. These results suggest that rodent communities in montane forests of central Peru are a result of the interplay of geographic barriers and elevation.

74 DO MALLINES EXPLAIN SOCIALITY IN COLONIAL TUCO-TUCOS?

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Among mammals, sociality (defined as group living) typically arises due to natal philopatry. Current theory suggests that philopatry occurs when suitable habitat is sparse or patchily distributed, making it difficult for individuals to disperse from the natal area. Colonial tuco-tucos (*Ctenomys sociabilis*) are subterranean rodents that are endemic to a 700 sq km area of Parque Nacional

Nahuel Huapi in southwestern Argentina and that are listed by the IUCN as Critically Endangered. Unlike most other species of ctenomyids, colonial tuco-tucos are social, with each burrow system (colony) shared by multiple adult females. Previous studies of this species have suggested that *C. sociabilis* is restricted to mallines, which are mesic patches of Patagonian habitat characterized by a community of hydrophilic plant species that is distinct from the surrounding arid steppe grassland. The irregular spatial distribution of mallines coupled with their high level of productivity is thought to have favored natal philopatry and hence group living in *C. sociabilis*. To test the generality of this hypothesis, we quantified the structure and composition of vegetation associated with 57 colonies of *C. sociabilis* from 3 different populations (1 low and 2 high elevation sites) located at the extremes of the species' geographic range. These populations differed significantly with respect to both floral structure and composition, with animals at the 2 high elevation sites tending to occupy arid, shrub-like habitat while animals at the low elevation site occurred primarily in mallines. Anecdotal observations indicated that *C. sociabilis* lives in groups at all 3 sites, suggesting that an association with mallines is not a general explanation for sociality in this species. Analyses of the spatial occurrence of mallin and shrub habitats are needed to determine if the apparently patchy distribution of both vegetation types contributes to philopatry and group living by colonial tuco-tucos.

75 ECOLOGY OF LEPROSY INFECTION IN NINE-BANDED ARMADILLOS

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I report various aspects of leprosy infection in wild nine-banded armadillos (*Dasypus novemcinctus*) in the United States. Currently, the geographic distribution of infection is patchy, with high prevalence along the west side of the Mississippi River and western Gulf of Mexico coast, but prevalence drops rapidly to 0 as one moves farther east or west from this region. However, recent surveys have identified infected animals in western Alabama, in areas formerly considered leprosy-free. It remains unclear how leprosy has spread to these populations. Detailed study of a single leprosy-infected population in western Mississippi showed that only adults were infected, so there is apparently no vertical transmission of disease. Adult females were significantly more likely to be infected than were adult males, and infected females were more likely to be lactating than were non-infected females. No significant differences in behavior were found between infected and uninfected animals. Taken collectively, these latter data suggest that the seemingly substantial physiological costs of infection documented in laboratory studies are not manifested to the same degree in wild armadillos, or that they are manifested in ways which have not yet been measured. There were no obvious spatial patterns of infection within this population, underscoring the need to better understand transmission dynamics of leprosy if we are ever to fully describe the ecology of this disease in wild armadillos.

76 EVIDENCE OF TIME-LAGGED RESPONSES OF MEDIUM AND LARGE MAMMALS TO LANDSCAPE STRUCTURE IN BRAZILIAN CERRADO

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Due to the alarming increase of the destruction rates of the Brazilian Cerrado, it is crucial to understand the processes that cause species extinction, to prevent critical biodiversity loss. Although rates of land cover changes are high, there is often a time-lagged response of the biotic variables to these changes. Time-lagged responses has been observed in several taxonomic groups, but not in medium or large sized mammals. We aimed to evaluate the relative contribution of landscape structure change to explain community level response variables (overall richness, carnivore richness and number of records of carnivores) in a Brazilian Cerrado region. Camera-traps surveys were conducted in 24 stations distributed at eight, from June 2008 to January 2009. Landscape metrics (riparian forest cover, native habitat cover, edge density and heterogeneity) were obtained from Landsat images from 1989, 2001 and 2007. To explain biological responses, we defined a priori a set of ecologically relevant models using recent and preterit landscape structure as explanatory variables. Fifteen linear and non-linear (semi-log and power) models were fitted by maximum likelihood. Akaike Information Criterion allowed to evaluate the plausibility of models. Past landscape were the best predictors to recent biological data, suggesting a time-lagged response of the mammal community to land cover changes. Models selection indicated that overall richness was related mostly to riparian forest cover, whereas the carnivores richness was related only to past edge density and native cover (year 1989). The power model of edge density was highly plausible (wAIC=78%) to explain number of records of carnivores. These results support the commonly accepted hypothesis that riparian forests play a crucial role in the maintenance of mammal species diversity in the Cerrado biome, indicating also a high probability of losing carnivorous species due to habitat fragmentation on near future.

77 HABITAT USE AND ACTIVITY OF MEDIUM-LARGE MAMMALS IN FRAGMENTED LANDSCAPE IN CERRADO BIOME

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Cerrado biome has approximately 194 species of mammals, which 47 are medium-large species (≥ 1 kg). However, fragmentation process and landscape transformation (native vegetation to monoculture) have exercised a high pressure on species that have a large home range and size. This study was conducted in Jatobá farm (109,000ha) located in southwestern Bahia, Brazil in Cerrado-Caatinga ecotone. This area is a mosaic landscape that presents native formations (mainly cerrado), productive areas (*Pinus* spp.

and soybean plantations), and deforested areas. Fieldwork was done between January 2008 to January 2009 with a census (0600-1200h and 1400-2400h) along dirt roads during 15 days every two months to register medium-large mammal. We obtained 240 observations of 19 species and 6 represented 87% of registers. Three-banded armadillo (*Tolypeutes tricinctus*) was more frequent (28%), being active between 1801-2400h (74%) and occurring in cerrado (44%) and Pinus (24%) areas. Probably the feeding preference (termite) and strategy foraging in open areas this species contributed to this. *Tayassu tajacu* occurred in cerrado areas (46%) and foraging among cerrado and Pinus fragments (34%) principally between 0601-1200h. This species had hunting pressure in open areas. Brouck deer (*Mazama spp.*) and Pampas deer (*Ozotoceros bezoarticus*) occurs predominantly in Pinus areas (64% and 48.2% respectively) and *Mazama spp.* was mostly active between 0601-1200h (40%) and *O. bezoarticus* in 2001-2200h (37%). Canids were more registered between 2001-2400h with *Lycalopex vetulus* (100%) and *Chrysocyon brachyurus* (57%). *L. vetulus* is termite feeding specialist and your occurrence is restricted to open areas as deforested fragments (62%) where the termite is more abundant. Maned-wolf is diet and habitat generalist and was observed foraging in all habitats. Our data indicated that generalist species occurred in all habitats; preferentially open areas, and being benefited with a fragmented landscape.

78 EFFECT OF ECOSYSTEM ENGINEERING BY *CTENOMYS MENDOCINUS* ON ARTHROPOD FUNCTIONAL GROUPS

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By definition, ecosystem engineers are organisms that directly or indirectly modulate the availability of resources to other species, by causing physical state changes in biotic or abiotic materials. In so doing they modify, maintain and/or create habitats. The objective of this work was to assess how plant consumption and soil excavation by *Ctenomys mendocinus* affected arthropod functional groups present in the community. The study was conducted in the multiple-use private reserve "Don Carmelo" (30° 57' S, 69° 05' W), which is located in the Puna of San Juan Province, Argentina, at 3100 m a.s.l. We set up pitfall traps on five different sites, each with two distinct situations: engineered and unmodified patches. In engineered patches, pitfalls were set under *Artemisia mendozana* and on bare soil, and in unmodified patches they were under *Lycium chappar*, *Stipa sp.*, *Artemisia mendozana* and on bare soil. We grouped sixteen families, belonging to seven different orders, into five distinct functional groups: herbivores, phytophagous feeders, predators, detritivores and omnivores. For analyzing data we used a multi-response permutation procedure (MRPP) with PC-ORD program, with a Bray Curtis distance measure. As results we found that all the functional groups show significant differences between areas: herbivores ($d=0.31$; $p<0.0001$), phytophagous feeders ($d=0.33$; $p<0.0001$), predators ($d=0.31$; $p<0.0001$), detritivores ($d=0.4$; $p<0.01$) and omnivores ($d=0.27$; $p<0.0001$).

79 ESTIMATING AGE OF COATIS (*NASUA NASUA*) AND CRAB-EATING FOXES (*CERDOCYON THOUS*) FROM THE PANTANAL REGION, BRAZIL

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Conservation and management of animal species require knowledge of the age structure of populations. Here in we propose a method to estimate age of coatlis (Carnivora: Procyonidae: *Nasua nasua*) and crab-eating foxes (Carnivora: Canidae: *Cerdocyon thous*) through teeth condition and body size. From May/2006 to Feb/2009 we captured, weighted, measured, and photographed teeth of 74 foxes and 106 coatlis in the Nhimirim Ranch, Pantanal, MS/Brazil. Dental eruption and wear were quantified. Data on 8 body size measurements and 4 teeth condition categories of known-age individuals were used in a discriminant analyses (DA) to generate models for estimating age of animals of unknown age. Known-age individuals (30 coatlis and 39 foxes) were classified in one of five age categories. To reduce the number of variables and avoid redundancy, we ran a principal component analysis with body size variables and used the scores of the first 4 factors in a forward stepwise DA. Models were validated using a subset of individuals of known age. Teeth condition and PCA factors 1 to 3 were selected in the stepwise DA for generating the discriminant functions for both species. The first functions (explained mainly by teeth condition) accounted for over 70% of the discriminatory power and discriminated mostly between old (>3.6 years old) and younger animals. The second functions (represented by body size measurements) accounted for a smaller proportion of the total variances but were also significant ($P<0.001$). Following the combining of 2 age classes, around 80% of the validation data subsets were correctly classified. This method is as precise as others, but is less subjective. It is also less invasive than counting teeth cementum annuli, for example. It may be useful for age estimation of other populations, as long as the models are validated with a subset of animals from the region studied.

80 EVALUATION OF SPOTLIGHT COUNTS TO MONITOR POPULATION OF RED FOXES (*VULPES VULPES*)

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Spotlight counts have been widely used to monitor populations of nocturnal mammals, but the reliability of this method has rarely been tested. We conducted spotlight counts of red foxes in a 73 km² area in the Nemuro Peninsula, Hokkaido, Japan in the periods of 1987-1989 and 1998-2003. The surveys were conducted principally on five consecutive nights in November along routes of 22 km in total length. In the same area, we have also counted the number of fox families in May through the number of breeding dens since 1987 in a study of alveolar hydatidosis (a fatal parasitic disease to humans that is transmitted from red foxes). Based on these data, we examined the reliability of spotlight counts to monitor population trends. There was a strong positive correlation ($r = 0.966$) between the number of families in spring and the mean fox counts in autumn. Furthermore, to evaluate the effect of the number of survey nights on correlation, we resampled fox counts from the original data for 1 to 4 nights without replacement and calculated the

correlation coefficients between their means and the number of families in spring. Simulations with 100,000 replicates for each number of nights showed that as the number of survey nights decreases, the lower tail of the distribution of correlation coefficients becomes conspicuously longer: lower 5th percentile were 0.920 for 4 nights, 0.889 for 3 nights, 0.830 for 2 nights, and 0.660 for 1 night. The results indicated that spotlight counts are a valid population index of red foxes in the Nemuro Peninsula. However, the results also indicated that the variations in the counts among survey nights, which should be inherent to this method, require a certain number of survey nights to warrant a reliability of the index.

81 FENNOSCANDIAN VOLE CYCLES UNDER CLIMATE CHANGE - COLLAPSING OR NOT?

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Population fluctuations of small rodents appear in many localities of Northern Europe to have lost their multiannual cyclic behavior. This phenomena of collapsing population cycles has been attributed to changes in the abiotic environment of the populations, and more specifically to changes in climatic conditions. Climate is known to strongly influence the dynamics of cyclic populations by modifying processes acting in a density dependent manner. The effects of climate may manifest as geographic gradients in cycle period and amplitude. In particular, changes in the depth, duration and quality of snow cover are important determinants of population cycles. Both observations and theory suggest that a reduction in snow cover or its insulative capacity will stabilize vole population fluctuations. We tested this hypothesis by subjecting 26 vole trapping time series, collected between southern Finland and northernmost Norway for 10-40 years, to time series analyses with geographic location and climatological data as explanatory variables. Changes in vole population dynamics were found to have occurred in northern Finland, while the same could not be identified in Southern Finland. On the contrary, southern population cycles appear to have become both stronger and more regular during the most recent decade or two. This is unexpected, as the most obvious symptoms of climate change have occurred in the south, where winters have become warmer and snow cover much more transient. We discuss possible explanations for our counterintuitive findings.

82 FOOD HABITS OF A PUMA POPULATION ON MONUMENTO NATURAL BOSQUES PETRIFICADOS, SOUTHERN ARGENTINE PATAGONIA

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The wide range of the puma (*Puma concolor*) is generally associated with its opportunistic feeding behavior. We examined the diet of a puma population on a protected area, the Monumento Natural Bosques Petrificados (MNB), through the analysis of 413 scats collected in both, autumn and spring-summer, from 2003 to 2008. Scats were searched systematically in 4-km² square plot surveys, then were dried, washed and dissected, and the contents separated and identified. Diet was expressed as the percent frequency of prey in scats and as consumed biomass of main prey types. We did not find significant differences in the diet of puma neither among the same season in different years ($G = 3.96$, $p = 0.91$; $df = 9$ and $G = 3.08$, $p = 0.79$; $df = 6$; for spring-summer and autumn respectively) nor between both seasons ($\chi^2 = 2.62$, $p = 0.45$, $df = 3$). So data were combined to describe puma food habits. Mammals were present in 90% of scats (94% of consumed biomass). The rest of the scats contained birds. Among mammals we identified two species of armadillos, seven of small mammals, and two of small carnivores. However, only two species formed the bulk of the diet: the guanaco (*Lama guanicoe*) and the introduced European hare (*Lepus europaeus*) (31.8% and 35% of frequency respectively; 58.8% and 28.8% of biomass respectively). Our results agree with the diet of puma in the southernmost part of its distribution, where hares and guanacos are by far the most important prey, and are taken at the level expected. Nevertheless, in MNB, the smaller densities of hares and guanacos could force puma to diversify its diet and consume alternative prey like armadillos, small mammals and birds, confirming that pumas are generalist predators, able to feed on a wide range of prey.

83 GLOBAL MORPHOFUNCTIONAL PATTERNS DETERMINE REGIONAL ASSEMBLAGE STRUCTURE IN WILD CATS

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Forty one species of felids are distributed in all continents except Australia. While these species are remarkably uniform in shape and function, felids as a group cope with ecosystem variation as extreme as the contrast between the Arctic and the Amazon. Thus we set out to explore in depth the morphofunctional variation in felids at a global scale. We generated a morphospace based on metric variables measured on over 350 skulls of adult specimens covering all currently recognized species with representatives from most of the various regions they inhabit. As predicted, up to 98% of morphological variation can be explained by allometric scaling in a continuous gradient of size. However, many layers of interpretation were uncovered by detailed analysis. Residual variation primarily revealed differential bite performance and hence subtly different predatory capabilities for a given size. Species polygons drawn on the morphospace showed interesting patterns of non-overlap between sister species and within larger monophyletic groups based on body size discontinuity, and differences that emerged in association with dominant habits (arboreality, nocturnality) and biome occupation when morphofunctional overlap did occur. All sources of variation characteristically nested within major biogeographic regions of the World. Almost three quarters of the overall morphofunctional variation correlated with membership to six clades of

felids, particularly pantherine groups, the Puma lineage, the Leopardus lineage, and a major, primarily Old-World clade inclusive of the domestic cat. Thus, a strong historical component was found to influence the morphospace configuration based on body size and possibly also the coexistence of different species of felids at a global scale.

84 **HABITAT USE AND HOME RANGE OF RING-RAILED COATI (*NASUA NASUA*) IN CERRADO BIOME, TOCANTINS, BRAZIL**

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The Ring-railed coati (*Nasua nasua*) is a carnivorous species that is found in all the Brazilian biomes. However, very few studies report the use of habitat and the home range of this species. Thus, the aim of this work was to determine the habitat use, home range and core area of the *N. nasua*, in the Cerrado biome in the central region of the Tocantins state, Brazil. To carry out this study, three animals were followed and monitored by radio-tracking. The results of this study demonstrate that the three *N. nasua* used the formation of gallery forest, followed with greater frequency by woodland and wetlands. The home ranges varied from 2.20 to 7.55 km² for the Minimum Convex Polygon 100% (MCP 100 %) and from 4.38 to 13.32 km² for the Harmonic Mean 95% (HM 95%). The core area (area of greatest localization concentrations – HM 75%) made up 21.3% of the home range calculated for HM 95%. In this way, the present study provides basic information about the ecology of *N. nasua* in the Brazilian Cerrado.

85 **HOME RANGE AND MOVEMENT PATTERNS OF *CONEPATUS CHINGA* IN SOUTHERN BRAZIL**

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A study concerning home ranges and movement patterns of the hog nosed skunk (*Conepatus chinga*) was carried out in the southernmost region of Brazil, between April 2008 and April 2009. The study area is located in the Brazilian municipality of Arroio Grande, near the Brazil/Uruguay border. The local landscape is a mosaic composed of rice cultivate areas, grassland fields used by cattle and small patches of planted and native forests. To obtain home range estimates, 18 animals, 7 males and 11 females, were caught and radio tagged, and then monitored for 2 to 12 months. However, only 12 animals, 5 males and 7 females, had sufficient data for analyses. The mean home range for all individuals was 1.01 km² (range by 0.25 to 2.45 km²) when calculated by MCP analyses, and 1.65 km² (range by 0.74 to 4.30 km²) when calculated by Fixed Kernel 95%. Males presented home ranges 2 to 3 times larger than females. The core areas, calculated by Fixed Kernel 50%, represent ¼ of total home ranges and were located near the center of their area. The movement patterns presented by both sexes were congruent with the difference found in home range areas. The mean distance traveled in daily movements by males was twice than that observed for females (501 and 224 meters, respectively) considering three aspects: distance traveled between two locations in activity (consecutive nights), distance traveled between two resting sites (consecutive days) and distance traveled between locations in activity and resting sites (in a 24 hours interval).

86 **INFLUENCE OF AN INVASIVE PLANT SPECIES IN MAMMAL COMMUNITY AND IN DYNAMIC OF SEED DISPERSAL**

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Jackfruit, *Artocarpus heterophyllus*, is a tree species native to Southeastern India and Sri Lanka. *Artocarpus heterophyllus* fruit is the largest tree fruit, weighing up to 36 kg. One tree can produce up to 100 fruits per year. Jackfruit was introduced in Brazil during the XVIII century. In Rio de Janeiro state, it colonizes forests, edges and open areas associated with anthropic environments. The study was conducted in a secondary Atlantic Forest at Ilha Grande State Park, RJ. Mammals were captured during two years in 18 grids of 0.64ha, 10 with different abundances of jackfruit (between 5 and 128 individuals) and eight without jackfruits. In each grid, 11 traps baited with bananas were opened during three consecutive nights every two months. The feces of the animals captured were collected and the frequency of seed calculated. We captured 451 individuals of small mammals in 686 times. Fifteen species were captured: nine Rodentia - *Cuniculus paca*, *Dasyprocta aguti*, *Guerlinguetus ingrami*, *Nectomys squamipes*, *Euryoryzomys russatus*, *Oxymycterus dasytrichus*, *Phyllomys pattoni*, *Rhipidomys* sp. and *Trinomys dimidiatus*, four Didelphimorphia - *Didelphis aurita*, *Gracilinamus microtarsus*, *Marmosops incanus* and *Monodelphis americana*, one Primates - *Callithrix jacchus* and one Cingulata - *Dasyurus novemcinctus*. Multivariate analysis (MDS) followed by an analysis of variance showed that the communities differed among grids with and without jackfruit ($F=5.380$, $p=0.034$, $N=18$). The densities of *T. dimidiatus* and *G. ingrami* increased in the grids with higher densities of jackfruit ($F=10.761$, $P=0.005$ and $F=11.989$, $P=0.003$, respectively). *Oxymycterus dasytrichus*, occurred mainly in grids without jackfruit ($F=6.710$, $P=0.020$). Despite the higher densities of frugivores in grids with jackfruit, the amount of native seed in the feces decreased significantly at these sites ($r=0.605$, $p=0.008$, $N=18$). Our study showed that the presence of jackfruit changed the communities of small mammals and affected its role in the dispersal of native species.

87 **INFLUENCE OF LUNAR LUMINOSITY ON THE ACTIVITY OF SMALL NON-FLYING MAMMALS IN SOUTH**

BRASIL

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Moonlight is a factor that affects the nocturnal activity of many mammals, including small rodents, lagomorphs, marsupials and primates. Studies show that these animals, with exception of the primates, reduce their activity on full moon nights and seem to restrict their activity to dark nights. The activity of several mammals was monitored using camera traps from July/2005 to June/2007 in three Conservation Units in the state of Santa Catarina, South of Brazil. To check for difference among the activity distribution in the different moon phases it was used the Watson's U2 test. To check for difference of nocturnal activity between the initial period of 18:00 – 23:59 and the final period of 00:01 – 06:00 it was used the binomial test for proportions. 181 independent registers of small mammals were taken, including rodents (Family: CRICETIDAE) and marsupials (*Didelphis albiventris*, *D. aurita* and *Philander frenatus*). They exhibited significant difference on the activity among first quarter (intermediate-level moonlight) and full moon (bright moonlight) ($U_2=0,231$; $p<0,02$) and also among new moon (dark moonlight) and full moon ($U_2=0,262$; $p<0,02$). There was significant difference activity in the two different periods among new moon and first quarter ($Z=2,194$; $p<0,02$) and also among full moon and first quarter ($Z=2,354$; $p<0,018$). Both, new moon and full moon showed a more intense activity in the 18:00 – 23:59 period and the activity in the first quarter moon was more intense in the 00:01 – 06:00 period. On the nights with no alteration of luminosity within the two periods, small mammals presented a concentration of activity in the early hours of the night. On the other hand, when there was a variation of luminosity during the periods there was a concentration of activity in the dark period showing that this group tends to be more active when there is less brightness.

88 INTRA-SPECIFIC COMPETITION, LAND-USE AND CLIMATE EFFECTS IN THE DYNAMICS OF TWO RODENT SPECIES IN ARGENTINA

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Intra-specific competition, land-use and climate effects in the dynamics of two rodent species in Argentina Andreo Verónica¹, Lima Mauricio², Provensal Cecilia¹, Priotto José^{1,3} and Polop Jaime¹ ¹Departamento de Ciencias Naturales. Universidad Nacional de Río Cuarto. Agencia Postal N° 3. CP 5800. Río Cuarto, Córdoba. Argentina. ²Centro de Estudios Avanzados en Ecología y Biodiversidad (CASEB), Pontificia Universidad Católica de Chile. Santiago, Chile. ³CONICET. Consejo Nacional de Investigaciones Científicas y Técnicas The objective of this work was to explain the numerical fluctuations of two sympatric rodent species in agroecosystems of central Argentina. We used mark-recapture data from small-mammal live-trapping conducted monthly from January 1990 to June 2007 in a 6 x 10 grid (0.30 ha). Peak annual MNKA (minimum number of animals known to be alive) obtained after the reproductive season of each year was used as an estimate of population abundance. Data series of temperature and rainfall were provided by the National University of Río Cuarto (Argentina). Normalized difference vegetation index (NDVI) data series was obtained from the global inventory modeling and mapping studies (GIMMS) AVHRR 8km (1981–2006) data set. We estimated the order of the feedback structure for each species by means of the partial rate correlation function (PRCF). We fitted the non-linear logistic population model of discrete time proposed by Royama (including extra terms to account for exogenous effects) using non-linear regression analyses. Models with the lowest AICc (Akaike information criterion corrected for small-sample bias) values were selected to draw inferences and run deterministic predictions to simulate the dynamic behavior of the fitted models. We found that both rodent species show a first-order negative feedback structure suggesting that these populations are regulated by intra-specific competition (limited by food, space or enemy free space). In *Akodon azarae* endogenous structure seems to be strongly influenced by human land-use represented by annual minimum NDVI, with spring and summer rainfall having little influence upon carrying capacity. *Calomys venustus*' population dynamics, on the other hand, appears to be more affected by local climate, also with spring and summer rainfall influencing the carrying capacity of the environment, but combined with spring mean temperature.

89 JAGUAR (*PANTHERA ONCA*) FEEDING HABITS IN PORTO JOFRE REGION, PANTANAL, BRAZIL.

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As a non invasive method, scat analyses remain an important tool in studies with elusive carnivores. This study describes the results on jaguar (*Panthera onca*) feeding habits in Porto Jofre region, Pantanal, based on the analysis of scats collected between July and December 2008. Scats were gathered opportunistically, primarily along roads and trails. They were air dried in a screened cage, measured, gently broken apart and washed in individual nylon socks in 2-3 cycles of a washing machine. Prey remains were identified by the examination of hairs, teeth, claws, and scales detected in the samples. Prey items found in scats were expressed as percentage of occurrence. From a total of 68 scats collected, 42 were identified as being jaguar scats. The remaining scats were restored for future identification, possibly via mtDNA analyses. We identified five prey taxa present in jaguar scat samples: cattle (*Bos* spp.), caiman (*Caiman yacare*), capybara (*Hydrochaeris hydrochaeris*), peccary (*Tayassuidae*) and cottontail (*Sylvilagus brasiliensis*). White-lipped peccaries (*Tayassu pecari*) and collared peccaries (*Tayassu tajacu*) were combined in one taxa due to their similarity. Cattle comprised the primary prey documented in the samples (55.81%), followed by caiman (18.6%) and capybara (13.95%). Large prey (prey > 10kg) represented 98% of jaguar diet in the study area. In areas where jaguars coexist with livestock it is common to see cattle become part of their diet. Differences in jaguar diet may reflect prey availability and patterns of their distribution. Caiman and

cattle, both species which normally occur in high densities in the Pantanal, are frequent prey items in jaguars' diet, what may reflect an opportunistic behavior. To fully understand the feeding patterns of jaguars, it is important that we simultaneously collect data on the abundance of their prey. Only then we can make inferences about jaguar selectivity of prey and opportunistic behavior.

90 **MANDIBLE SHAPE IN MARSUPIAL AND PLACENTAL CARNIVOROUS MAMMALS: MORPHOLOGICAL COMPARATIVE STUDY USING GEOMETRIC MORPHOMETRY**

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Several authors had studied skull and mandible shape in carnivorous mammals showing the convergence between different marsupials and eutherians (i.e. Carnivora). In this work we analyzed the mandible shape using 2D geometric morphometry. Using this method we explored the relationship between shape, size and phylogeny. We analyzed almost 560 specimens, covering most of the genera of the terrestrial Carnivora and a wide sample of marsupials. We used 29 landmarks and semilandmarks to describe the mandible in a lateral view. The observed shape variation had ecological and phylogenetic components. For example, omnivorous species had low scores on the second PCA axis, with strong mandibles and large talonid in the carnassials, while hypercarnivores were concentrated with high scores on the PCA axes 1 and 2, having short mandibles and reduced talonids. On the other hand, most of the Carnivora families formed clusters indicating some kind of phylogenetic constraint. Marsupials overlapped with hypercarnivore and mesocarnivore placentals, especially of the Canidae and Felidae families, and presented less variation than Carnivora. There is a significant variation due to the allometry factor, however this factor explained less than 5% of total variation, where the largest species had shorter and stronger mandibles, with anteriorly displaced carnassials.

91 **MOONLIGHT AVOIDANCE BY BIPEDAL, BUT NOT QUADRUPEDAL, RODENTS IN SANDY AND OPEN HABITATS OF THE GREAT BASIN DESERT**

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Rodents make foraging decisions by balancing energetic and reproductive demands with predator avoidance. To identify variations in the risk of predation, nocturnal rodents may use moonlight as an indirect cue of risk from predators. Moonlight avoidance behaviors have been observed in many nocturnal rodent species and are widely generalized to small mammals. However, in no previous study has moonlight avoidance been evaluated in a systematic fashion in a naturally-occurring community over several seasons. Here, a study in natural habitats was performed where the effects of moonlight on the activity patterns of desert rodents were examined in 62 study sites across the Great Basin Desert of western North America from 1999 to 2006. Rodent activity is examined by live-trapping exclusively in sandy and open habitats throughout the Great Basin, using the presence of the sand-obligate kangaroo mouse (*Microdipodops*) as a habitat-indicator taxon. The activity patterns of this desert rodent community are assessed on 69 nights with clear skies (10,758 trapnights) and examined in relation to corresponding values of moon phase and moon brightness to assess the frequency of moonlight avoidance. No relationship is found overall between the activity levels of the rodent community and moonlight. Only bipedal rodents, but not quadrupedal rodents, display significant moonlight avoidance patterns overall and during waxing moon phases. Quantile regression analyses further indicate that the optimum activity of bipedal rodents occurs at significantly lower moon brightness values than that of quadrupedal rodents. Additionally, bipedal rodents are only found to avoid moonlight during the summer season, and not during spring or autumn. Thus, moonlight avoidance may be an over-generalized phenomenon that actually occurs only in certain species and under specific circumstances. These results are discussed in the context of moonlight as a cue of predation risk, as well as the hypothesized antipredator adaptations of bipedal rodents.

92 **MOVEMENTS AND HABITAT USE BY *ARTIBEUS LITURATUS* AND *CAROLLIA PERSPICILLATA* IN THE ATLANTIC FOREST, BRAZIL**

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Despite many evidences on the role of frugivorous phyllostomids in the maintenance and recovery of Neotropical ecosystems, very little is known on how these bats survive, interact and move in fragmented forests. Using mark/recapture and radiotelemetry techniques we investigated habitat use and movements of *Artibeus lituratus* (A.I.) and *Carollia perspicillata* (C.p.) in fragments isolated by agricultural fields in the Atlantic forest of south Brazil. The main hypothesis, based on the availability of food, is that C.p. has more restricted foraging areas and higher habitat fidelity, while A.I. has lower habitat fidelity, larger foraging areas and use different forest fragments. We also proposed that independently of the foraging pattern, the agropecuary matrix does not represent a barrier to the movements of these species. We banded 1302 A.I. and 501 C.p. between 2002 and 2008, and radio-monitored 16 individuals of each species in two sessions (Aug-Oct/2007 and Mar-Apr/2008). The results revealed high mobility of these species, both inside and between the forest remnants, with simultaneous use of different habitat attributes (e.g. fragments, matrix, and artificial structures). Radiotelemetry did not support the hypothesis that C.p. had restricted foraging areas; however the higher fidelity to some habitats, particularly riparian areas, was confirmed by several recaptures obtained in the same site of the first capture, with an increase in habitat use directly related to fruit density. On the other hand, the hypothesis that A.I. had low fidelity to the fragments and large foraging areas was largely corroborated. So, the use of fragmented ecosystems by these phyllostomids seems to be the result of an equation involving roosts and foraging opportunities. In spite of being a harsh environment, the agropecuary matrix does not seem to

inhibit the movement of these seed dispersing bat species what it is important for restoration strategies based on zoochorous dispersal.

93 NATURAL HISTORY OF TERRESTRIAL SMALL MAMMALS (DIDELPHIMORPHIA AND RODENTIA) FROM PARQUE NACIONAL LIHUE CALEL, LA PAMPA PROVINCE, ARGENTINA

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We studied the terrestrial small mammal (< 500 g) assemblages from Parque Nacional Lihué Calel (37°57'S, 65°33'W, La Pampa Province, Argentina) and surrounding areas using trapping data (11,720 traps/nights), field observations and analysis of owl pellet and felid and canid feces samples. The study area is included within the Pampean subdistrict of the Northern district of the Monte Desert. The landscape displays a mosaic of creosote bush of the genus *Larrea*, mixed shrub patches, grasslands and rocky outcrops. Field work was conducted during 2003-2008. Information about habitat, ecology, reproduction, and population structure is provided for the didelphid marsupials *Lestodelphys halli* and *Thylamys pallidior*, the cricetid rodents *Akodon azarae*, *Akodon molinae*, *Calomys musculus*, *Eligmodontia typus*, *Graomys griseoflavus*, *Oligoryzomys longicaudatus*, and *Reithrodon auritus*, and the caviomorph rodents *Ctenomys* cf. *C. azarae*, *Galea musteloides*, *Microcavia australis*, and *Tympanoctomys barrerae*. In addition, we compared the studied assemblage with others small mammal communities in arid and semi-arid areas of Argentina.

94 ON THE STABILITY OF A TWO PREDATORS ONE PREY SYSTEM: A NON-ADDITIVE APPROACH

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In nature, very few organisms are prey of exclusively one type of predator generating a multipredator effect on prey populations. Theoretical approximations that have studied this type of interactions have assumed predators functional responses as separate events (additive) neglecting the interaction among predators. A two predators-one prey model was developed. We propose a new theoretical approximation that represents these systems more realistically than those multi-species models based on the classical Lotka-Volterra equation. The model incorporates a non-additive combination of predators' functional responses on prey mortality and describes the dynamics of the three populations. The equilibrium and stability analysis showed the existence of eight equilibrium points from which only five have biological relevance. The equilibrium points that involved two populations presented a density-dependent Lotka-Volterra behavior (Leslie 1948). The three populations' coexistence point showed a stable behavior which is consistent to what is found in nature and opposite to what has been found with additive approximations. The non-additive combination of the predators' functional responses showed to be a stabilizing factor for the system. The model will be useful to complement empirical work done about the effects of multiple predation on a common prey and might be helpful for taking decisions on conservation issues.

95 PHYLOGEOGRAPHIC STRUCTURE OF THE SUBTERRANEAN TUCO-TUCO *CTENOMYS TALARUM* (RODENTIA: CTENOMYIDAE).

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We examined the phylogeography of the South American subterranean rodent *Ctenomys talarum* (Talas tuco-tuco) using mitochondrial DNA (mtDNA) control region (D-loop) sequences. We 1) assessed the genetic relationship among different populations of *C. talarum* in the Buenos Aires Province, Argentina, across the entire distributional range of the species and 2) analyzed how habitat history has affected the geographic genetic structure and demographic stability of these populations. The analysis comprised mitochondrial sequences (420 bp.) of 213 individuals distributed in 15 different populations along the coast from Magdalena to Pehuen C6 localities (more than 900 km apart), and in the "Sierra de la Ventana" system. The results of the minimum spanning tree and AMOVAs showed high genetic subdivision and a strong phylogeographic pattern among populations of *C. talarum*. A complex network of haplotypes (most of which have restricted distributions) was obtained, as well as a bimodal mismatch distribution and a high portion of genetic variation attributable to differences among regions. Furthermore, pairwise *F_{ST}* values showed significant population differentiation among all populations studied. Nevertheless, there were shared haplotypes in populations separated by distances greater than 300 km. The overall pattern is similar to that expected under the isolation-by-distance or the stepping-stone models. Major rivers in the area appear to be associated with strong genetic differentiation in this species. In sum, the current populations of *C. talarum* appear to be relicts of a more extended historical distribution along the Argentinean pampas, with possible local extinctions of some inland populations of this species (e.g. in the sierras of Tandilia). These historical extinctions, however, seem not to have erased the signature of long-term stability and geographic structure of this species along the coastal and inland distribution ranges.

96 PLASTICITY IN THE USE OF HABITAT BY *MICROCAVIA AUSTRALIS* IN THE MONTE DESERT (ARGENTINA)

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Microcavia is a rodent with wide distribution but restricted to arid and semiarid environments. The aim of this study is to describe the environment within the Monte where we located the species. This study was conducted in the Monte Desert of San Juan (Argentina) in four sites: -Matagusanos: mesquite woods (*Prosopis flexuosa*) and slimy clay soil; - El Leoncito: creosote bush scrub (*Larrea nitida*) and sandy silt soil; -La Cienaga: mesquite bush (*P. alpataco*) and clayey silt soil; -The Derivador: mesquite woods (*P. flexuosa*) and sandy silt soil. We quantified in active burrows (identified by fresh feces and footprints), the number of holes active and recorded: plant cover, stratum cover (tree, shrubs, herbs), percentage of bare soil and soil hardness. We used GLM in order to evaluate differences among sites and for to relate the microhabitat variables with holes active/burrow was used linear regression analyses. The plant cover was highest in Matagusanos (49.84 ± 2.74) and was lowest in La Cienaga (21.22 ± 4.76 ; $F = 16.24$; $df = 3$; $p = 0.0001$). The proportion of bare soil was highest in La Cienaga (63.50 ± 4.91 ; $F = 15.98$; $df = 3$; $p = 0.0001$) and the proportion of shrubs cover was highest in The Derivador (30 ± 4.42 ; $F = 3.28$; $df = 3$; $p = 0.02$). The holes active/burrow were positively related to soil hardness in El Leoncito ($R^2 = 0.57$; $p = 0.02$) and to bare soil in Matagusanos ($R^2 = 0.40$; $p = 0.04$). We found a negative relationship between cover plant and cave active/burrows in Matagusanos ($R^2 = -0.63$; $p = 0.03$). In La Cienaga and The Derivador we not found relationship between cave active/burrows and microhabitat variables. This study shows that *Microcavia* is not strongly associated with any environmental variable selected in the four sites of the Monte desert. In consequence this plasticity in the use of habitats may to explain the presence of this species in arid environments with different features.

97 POPULATION DYNAMICS OF COATIS (*NASUA NASUA*) IN THE PARQUE DAS MANGABEIRAS, BRAZIL

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The coatis (*Nasua nasua* Linnaeus, 1766), are medium-sized carnivores that have generalist habits, inhabit Park Mangabeiras ($19^{\circ}56'S$ and $43^{\circ}54'W$), located in Minas Gerais' capital city, Belo Horizonte, it is a place covered by vegetation in transition Cerrado-Atlantic Wood and surrounded by urban areas. They are gregarious representatives of the Procyonidae family. It is known that these animals are not predation targets in the Park, because their natural predators, the large mammals, are not present in this site. This may be contributing to achieve this carnivores population's growth in the park. Another factor that may contribute to the coatis' high densities existence in the area is related to the large food supply in rubbish dumps and animals feeding by visitors. This study aimed to estimate the coatis population's size in the place and assess its potential to growth. To lift coatis' stock, it was used the mark-recapture method, with multiple events of recapture. Captures and recaptures had been made since 2007 until april of 2009, using galvanized iron traps (70cm x 30cm x 20cm), with sampling effort of 2.550 traps a day. The sampled area was 59.74 hectares. The coatis were captured and chemically immobilized by an intramuscular injection of tiletamine and zolazepan (Zoletil 100® - Virbac do Brasil) at doses 0.1 mL / kg and marked with ear polypropylene and microchip. Data were analyzed using the MARK program, with estimated there were 108 coatis in the park in 2007 (32 ind./ km²), 117 individuals in 2008 (35 ind./ km²) and finally 123 until April of 2009 (37 ind./ km²). This results indicates that the population is tending to grow, and the management of the species may be required in the area, once it may cause it may causes drastic changes in the small vertebrates communities.

98 POPULATIONAL VARIATION IN THREE SPECIES OF SIGMODONTINAE RODENTS IN A CERRADO GRASSLAND OF CENTRAL BRAZIL

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The cerrado is a savanna-like vegetation ranging from open grasslands through sparse tree cover to gallery forests along the edges of watercourses, and to mesophytic forests. Climate is well marked with a dry cool and a warm and wet season, with rainfalls from 800 to 1,500 mm. Strong seasonality may influence the behavior, reproduction, diet and the phenology of organisms and hence, the populations and communities of animals and plants. Small mammals are diversified and abundant organisms, considered as good models for studies on population ecology. Literature suggests there are differences on abundance of rodents associated to seasonality in the cerrado region and the aim of this study is to test this hypothesis. One hundred Sherman traps were arranged in two 1.82ha grids in grassland vegetation at Águas Emendadas Ecological Station, Planaltina, DF, central Brazil. The traps were baited and inspected early in the morning, along six consecutive days per month, from 10/2004 to 09/2008. The individuals captured were identified and marked with ear tags. The sampling effort was 28,800 trap.nights that yielded 2,664 rodents (mean capture rate of 0.092). The most abundant species were *Necromys lasiurus* (50.5%), *Thalpomys lasiotis* (32%) and *Calomys tener* (15.9%). The number of individuals caught varied significantly between rainy and dry seasons for *N. lasiurus* ($\chi^2 = 95.835$, $df = 23$, $p < 0.0001$) and *T. lasiotis* ($\chi^2 = 60.304$, $df = 23$, $p < 0.0001$) but not for *C. tener* ($\chi^2 = 26.663$, $df = 23$, $p < 0.270$). Along the four years study, these three species were more abundant during the dry season. This results corroborate other studies that reported an increase in the density of rodents in the end of the rainy season until the middle of the dry season.

99 PREY SELECTION BY THREE SYMPATRIC NEOTROPICAL FELIDS IN SOUTHERN BRAZIL

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Felid species may exhibit either opportunistic or selective feeding strategies. Our goal was to compare the use of terrestrial small mammals by three sympatric felids (ocelot *Leopardus pardalis*, oncilla *L. tigrinus* and jaguarondi *Puma yagouaroundi*) with their availability in Araucaria Forest and Natural Grasslands of southern Brazil (25°28'18"S and 49°42'53"W). Scats were collected (12 mo) and assigned to felid species through microscopic analysis of hairs. Small mammals were live trapped monthly (12 mo) in 4800 trap nights. We compared small mammal abundance in 63 ocelot scats, 36 oncilla scats and 51 jaguarondi scats with their abundance in live traps. Chi-square tests and Bonferroni confidence interval were used to detect selection for prey taxa. The most abundant small mammal species in traps were *Akodon montensis* (38%), *Euryoryzomys russatus* (21.5%), *Didelphis aurita* (12%), *Oligoryzomys flavescens* (9%), *Philander frenatus* (7.5%) and *Sooretamys angouya* (5%) and others (7%). *Didelphis aurita* and *P. frenatus* were not found in scats. Felids consumed at least one prey taxa differently from expected (ocelot - $\chi^2=11.44$; d.f.=3; oncilla - $\chi^2=48.84$; d.f.=3; jaguarondi - $\chi^2=47.32$; d.f.=3). Ocelots consumed *Akodon* sp., *O. flavescens* and *S. angouya* opportunistically while *E. russatus* was selected negatively. Oncillas selected positively *S. angouya* and *O. flavescens* and negatively *Akodon* sp. and *E. russatus*. Jaguarondis selected positively *O. flavescens*, negatively *E. russatus* while *S. angouya* and *Akodon* sp. were consumed opportunistically. This data may reflect selection of different prey species by sympatric felids where ocelots consumed terrestrial small mammals opportunistically as it also eats bigger prey such as primates and other medium-sized mammals, oncillas may be favored by selecting less abundant prey such as *S. angouya* to escape exploitative or interference competition and jaguarondis may use small mammals opportunistically in a generalist feeding behavior.

100 PUMA DENSITY IN THE CAATINGA OF NORTHEASTERN BRAZIL

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With their high ecological demands - large areas and an abundant prey base -, top-chain carnivores as the puma (*Puma concolor*) play an important role in maintaining the equilibrium in the ecosystems where they occur. The Caatinga, a 800,000 km² semi-arid biome of northeastern Brazil where pumas are present, is characterized by a xeric vegetation and a severe dry season, with extremely high daytime temperatures. The Serra da Capivara National Park (SCNP), with its 130,000 ha, is one of the largest protected areas in this biome. The park is surrounded by rural communities relying on subsistence agriculture and where illegal hunting is common. The objective of this work was to evaluate the population status of pumas in the park. During August to October 2007, SCNP was sampled with camera-traps, and photographs were used to individualize and count pumas. Puma abundance and density in the study area was calculated using data from 1,706 camera trap nights and mark-recapture models. Puma abundance was estimated at 8 (± 0.801 SE) individuals in an effective sampled area of 730 km², which translates to a density of 1.095 (± 0.355 SE) pumas/100 km². Compared with previous studies in similar habitat, puma density in the Caatinga is lower than the Bolivian Chaco xeric biome (6.80 individuals/100 km² ± 1.50), the Brazilian Pantanal (3.01 ± 1.38) or the tropical forests in Belize (3.42 ± 1.3). The presence/absence of wildlife poaching is proposed to explain different puma densities in areas with similar environmental conditions. In contrast to the almost uninhabited study area in the Chaco, SCNP is not only smaller but under poaching pressure in its surroundings. This is the first puma density estimate for the Caatinga biome, and probably one of the few density estimates of large mammals for this region.

101 REASSESSMENT OF THE GENETIC POPULATION STRUCTURE IN *CTENOMYS RIONEGRENSIS*: RECONCILING SEEMINGLY CONFLICTING INTERPRETATIONS.

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How ecological and historical factors contribute to shape the population structure of natural populations is a crucial issue to understand their demographic history. *Ctenomys rionegrensis* represents an interesting study case because it is characterized by marked population structure within its restricted distribution area. Molecular and morphological analyses, suggest a scenario of recent colonization of the area, involving demographic expansion, followed by nearly complete isolation. A recent work suggests a different scenario, characterized by levels of differentiation in response to geographical distance and exposure to environmental disturbances linked to fluctuations in sea-level in the Quaternary. We reanalysed mitochondrial Cytb sequences and frequencies of eleven microsatellites loci employed in previous works, and found a clear signal of population expansion in several, but not all, populations of this tuco-tuco. Analyses performed with Bottleneck software show that populations at lower elevations, associated mainly to the Uruguay river, likely experienced a population bottleneck sometime in the past. Assessment of population growth parameter g with Lamarc software support this point of view in general, but produce different results depending on the genetic marker employed. Our results provide a possible reconciliation of seemingly conflicting interpretations. Specifically, a history of demographic expansion in a background of differential habitat stability can account for the broad patterns observed in the data.

102 RELATIONSHIP OF FLEA COMMUNITIES, COLONY SIZE, AND YERSINIA PESTIS IN BLACK-TAILED PRAIRIE DOGS FROM NORTHWESTERN MEXICO

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One of the largest areas of native grasslands in northwestern Mexico is in Janos-Casas Grandes, Chihuahua. The black-tailed prairie dog (*Cynomys ludovicianus*) is the keystone species of these native grasslands. Plague, caused by the bacterium *Yersinia pestis*, has decimated entire prairie dog populations in southern USA; however, we don't know if plague is present in Mexico. Similar environmental conditions exist in Janos and southern USA and fragmented prairie dog populations are factors that may enhance local transmission and perpetuation of disease outbreaks in prairie dogs in this area. The main objective of this study is to evaluate occurrence, distribution, and spatial dynamics of vectors of *Y. pestis* in black-tailed prairie dogs in the region of Janos-Casas Grandes, Chihuahua, Mexico. In 2007, we sampled 13 prairie dog colonies and we captured 272 individuals with Tomahawk traps. Captured animals were handled in canvas bags to collect blood samples and fleas. Fleas were identified at the "Universidad Nacional Autónoma de México" in Mexico City. We obtained 182 blood samples and 1847 fleas. A total of three flea species were identified including *Pulex simulans*, *Echidnophaga gallinacea*, and *Oropsylla* [*Opisocrostitis*] *hirsuta*. The most common and dominant flea in prairie dogs from Janos-Casas Grandes, Chihuahua was *P. simulans*. The higher relative density of fleas was found in size prairie dogs colonies among 100 to 1000 ha. The species *Echidnophaga gallinacea* is the first time that is reported for black-tailed prairie dogs in Mexico and alone been present in the colonies >1000 ha. Plague identification in blood samples at Centers for Disease Control and Prevention (CDC), USA, was negative for all samples. Final products of this research will help to develop conservation strategies that sustain wildlife populations and ecosystem integrity in one of the top priority areas for conservation of Mexican vertebrate diversity in the region of Chihuahua.

103 RESEARCH TRENDS IN THE ECOLOGY AND BEHAVIOR OF *EIRA BARBARA*.

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Eira barbara (Order: Carnivora) is a member of the family Mustelidae with large distribution from southern Mexico to northern Argentina. Populations are considered abundant and stable and are not under any conservation status. In spite of the large distribution of *Eira barbara* in Central and South America, there have been few studies of this species. The aim of this study is to assess the research trends of the ecology of this species. The methodology consisted of a web search using ISI Web of Knowledge and Jstor, searching for any articles published in all years containing the words "*Eira barbara*" or "*Tayra*" either in the title or in the abstract. Results showed that in the "Web of Knowledge" database only 29 articles have been published; from which only 10 contain the name of the species in the title. In the Jstor database 6 articles were found, from which 3 contain the name of the species in the title. The gap of knowledge of this carnivore represents a challenge for mammalogists in tropical areas. Due to this species' diet and its ability to use different landscapes, *Eira barbara* may represent an important element of tropical forest regeneration. This work is the first step in a research project on the ecology of *Eira barbara* and its role as a seed disperser.

104 RESOURCE PARTITIONING BETWEEN MESOCARNIVORES IN THE PANTANAL REGION, BRAZIL

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The diets, habitat use, and activity patterns of *Leopardus pardalis* (ocelot), *Cerdocyon thous* (crab-eating fox) and *Nasua nasua* (brown-nosed coati) were studied at Nhumirim Ranch, Pantanal, Brazil between 2005 and 2008 to investigate niche overlap. Food habits were assessed through scat analysis. Habitat use was examined by compositional analysis where the use was determined by radio-telemetry and habitat availability from a georeferenced vegetation map of the study area. The activity pattern was assessed using camera-trapping. We analyzed 296 scats (ocelot = 49, crab-eating fox = 164, coati = 83), monitored 21 animals (ocelot = 6, crab-eating fox = 7, coati = 8), and used data from 2238 cameras-trap days, which resulted in 1773 independent carnivore pictures (ocelot = 68, crab-eating fox = 1176, coati = 419). Major ecological differences between the three species occurred in feeding niches and activity patterns, but not in habitat use. Crab-eating foxes and coatis were more generalist, consuming fruits, arthropods, and vertebrates. Ocelot consumed exclusively vertebrates, mainly rodents, snakes, and lizards. Dietary overlap (Pianka's index) between crab-eating fox and coati was greater (0.85) than between crab-eating-fox and ocelot (0.45) or between coati and ocelot (0.24). Coatis showed more diurnal activity, while crab-eating-foxes and ocelots were more nocturnal. Compositional analysis (2nd and 3rd order selection) of the three species did not reveal habitat selection, indicating that the three species used the habitat types in proportion to their relative availability. Thus time of the activity was the main variable separating crab-eating fox from coati, while diet separated crab-eating fox from ocelot. There was strong segregation in food habits and activity patterns between coatis and ocelots. These data allows a better understanding of the ecological divergences that enables the coexistence of these three medium-sized carnivores.

105 TERRESTRIAL NON FLYING SMALL MAMMALS FROM NEUQUÉN CITY PERIURBAN

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La provincia del Neuquén manifiesta un fuerte componente asimétrico en el conocimiento de sus ensambles de micromamíferos

terrestres no-voladores. En los ambientes áridos y semi-áridos sólo existen contribuciones puntuales. No existen registros de trabajos preliminares referentes a la diversidad de micromamíferos en la ciudad de Neuquén. El presente trabajo tuvo por objetivo generar un cuerpo de datos básicos sobre diversidad de micromamíferos terrestres no-voladores de un área periurbana de esta ciudad, ubicada a los 38°57'06" S y 68°04'28" O. Para esto se llevó a cabo un muestreo aleatorio estratificado (chacra con plantaciones de manzanas y peras, barrio de la ciudad y vegetación de monte autóctono, todos colindantes entre si) por bloques con reemplazos. Se colocaron dos grillas en el estrato monte y una grilla en los restantes, todas con un área de 3600 m², con 25 trampas de captura viva funcionando durante 3 a 5 noches consecutivas en cada periodo. El estudio se desarrolló desde Abril de 2007 hasta Enero de 2008 (1300 noches/trampa). Como resultado del trabajo de muestreo se capturaron seis especies (87 individuos), dos móridos exóticos (*Mus domesticus* y *Rattus norvegicus*) y cuatro autóctonas: dos roedores sigmodontinos (*Akodon neocenus* y *Eligmodontia typus*), y dos cávidos (*Microcavia australis* y *Galea musteloides*). El área se comportó como una única unidad de paisaje en cuanto a la distribución espacial de las especies, hallando un grado de similaridad entre sitios mayor al 50% en todos los entrecruzamientos, siendo menor entre el barrio y la chacra, ambientes donde la densidad relativa de individuos fue mayor que en los naturales, observándose así mayor riqueza de especies en hábitats que tienden progresivamente hacia la simplificación. Por otro lado, se encontró una elevada asociación ($p < 0.001$) entre las especies y la estación del año, presentándose mayor abundancia de individuos en las estaciones de Otoño y Primavera.

106 RODENT INFESTATION IN THE CITY OF BUENOS AIRES: A TEMPORAL, SPATIAL AND ENVIRONMENTAL ANALYSIS.

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The aim of this work was to study rodent infestation levels in the city. We analysed complaints about rodent infestation received by the government authorities of the city of Buenos Aires between 2001 and 2002. We also performed a survey of the presence of rodents in 103 sites distributed as a grid, covering the whole city surface. Number of received complaints per month was related with monthly mean temperature, with a two months delay ($r = 0.812$, $p = 0.000$), being highest in late summer and lowest in winter and spring. Number of received complaints was highest in city areas with high density of industries (Multiple regression $R^2 = 0.925$, $p = 0.000$). A 98.02% of 4243 inhabitants surveyed in the 103 sites were georeferenced using their home or work address. We used as rodent infestation indexes the proportion of people surveyed who answered to have seen rodents in their home or work (PropHome/Work), and in their neighbourhood (PropNeig) during the last 90 days, in each city site. The PropHome/Work showed a mean value of 0.108 (s.e. = 0.090) and was positive associated to the PropNeig ($p < 0.001$). The PropHome/Work showed a spatial autocorrelation that reached 11686 meters defining big areas with different levels of rodent infestation. The highest PropHome/Work values were observed in city areas with the lowest department buildings densities, highest proportion of the surface occupied by shantytowns and highest food factories densities (GLM $RL2 = 0.242$, $p = 0.003$). In conclusion, city areas with the highest department buildings densities have the lowest values of rodent infestation, while shantytowns and industrial areas have the highest values of rodent infestation and, which, according to the information available for trapping, belong to *Rattus rattus* infestations in industrial areas and to *Rattus norvegicus* and *Mus musculus* in shantytowns. Shantytowns and industrial areas must be the priority areas to carry out rodent control and prevention actions.

107 SEASONAL ACTIVITY PATTERNS OF THE TUCO-TUCO MENDOCINO, *CTENOMYS MENDOCINUS*, IN THE MONTE DESERT, ARGENTINA

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Activity patterns in fossorial rodents result from the interplay of their biology (i.e. physiology), environment (e.g. temperature, humidity), topographic features (e.g. soil hardness), and availability of resources. We tested the association of these variables with the activity of the mendocino tucó-tucó, *Ctenomys mendocinus* in the Monte desert. The study was conducted at the MaB Ñacuñán Reserve located in the central Monte desert, Argentina. We sampled 3 habitats during 4 seasons, Larrea shrubland, mesquite forest and sand dunes. We quantified the number of active burrows, soil humidity and food availability, whereas temperature was compared only seasonally. Our results showed that the peak of activity (number the burrows) was in autumn and it varied seasonally in all habitats ($X = p < 0.0001$). The habitat with the highest activity was the sand dune, followed by mesquite forest and Larrea shrubland, however we found non significant differences. Temperature and humidity showed seasonal variations, with the highest values recorded in summer and the lowest in winter. Food availability (e.g. grasses, herbs and shrubs) was constant throughout the year. We found that the peak of activity was associated with intermediate levels of temperature and soil humidity. Our results are in accordance with the energetic hypothesis, where soil properties and intermediate values of temperature and soil humidity in autumn would provide the optimum energetic conditions for burrowing (Partially supported by CONICET PIP 5944 and AGENCIA PICT 25778)

108 SEASONAL VARIATION IN THE NEOTROPICAL OTTER *LONTRA LONGICAUDIS* DIET IN AN ATLANTIC FOREST RIVER, SOUTHEASTERN BRAZIL

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We studied the diet of the Neotropical otter *L. longicaudis* in the Águas Claras river basin, northern Rio de Janeiro state, southeastern

Brazil, and analyzed temporal variations in the diet, based on spraint analysis. We collected 59 spraints in three expeditions, one in the wet and two in the dry season. We compared the frequencies of the major prey items between seasons, using contingency tables. Considering the year as a whole, fish was the most frequent prey item for the species (91.5%), as shown in previous studies. Crustaceans were the second main prey occurring in the spraints (55.9%), followed by insects (47.4%), amphibians (20.3%), reptiles (3.4%), leaves (3.4%) and mammals (1.7%). The frequencies of prey items did not differ between the two dry season expeditions ($G=10.81$, 6 d.f., $p=10.81$). However, the dry seasons differed significantly from the wet season (dry season 1, $G=36.65$, 6 d.f., $p<0.0001$; dry season 2, $G=39.47$, 6 d.f., $p<0.0001$). Fish were significantly more frequent in the dry seasons than in the wet one ($\chi^2=7.659$ d.f.=2 $p=0.0217$). The importance of prey items in the whole analysis of the spraints confirmed other studies. However, this study was one of the few so far which found insects as a common prey. This is also the first study which found leaves on the Neotropical otter's spraints as an intentional food resource. Besides, the level of crustaceans and amphibians increased from the dry to the wet season. These results suggest that the otter adjusts its behavior in the wet season, when fish are harder to catch, by shifting preferences towards other prey groups.

109 **MICROHABITAT SELECTION BY TUCO TUCO (*CTENOMYS* SP) IN ECOSYSTEMS DISTURBED BY FIRE AND GRAZING**

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In southern Argentina, the subterranean rodents known as tucos, inhabit different ecosystems. Fire and sheep grazing increase the ecosystem spatial heterogeneity through the modification of the vegetation structure and consequently they influence the activity of tucos and its microhabitat selection. We studied the microhabitat selection by tucos in two ecosystems: one belongs to the Monte phytogeographical province and the other to the Patagonian province. Both are characterized by a microtopography of mounds associated with shrubs and mound interspaces areas. We determined the number of tumuli (T) and openings (O) on mounds and in the mound interspaces, using 150-m² plots, in 4 areas in the ecosystem located in the Patagonian province: unburned-ungrazed (UU), burned-ungrazed (BU), grazed-unburned (GU) and grazed and burned (GB) and a BU area in the ecosystem of the Monte province. The mean cover of mounds for the five studied areas was between 10 and 30%. In the Patagonian ecosystem the higher activity of tucos was in BU area (36 T and 101 O) and the lower was in GU (8 T y 5 O). The higher quantity of tumuli was found on mounds in the 4 studied areas (63% UU, 56% BU, 80% GU, 60% GB); as in the case of tumuli, the higher number of openings was on mounds, except in the BU area. A similar result was found in the Monte ecosystem, where 71% of tumuli were found on mounds. We conclude that although the activity of tucos was strongly influenced by fire and grazing, mounds represented the most selected microhabitat in the five areas.

110 **SELECTION OF FORAGING MICROSITES BY GRANIVOROUS RODENTS IN THE MONTE DESERT: A FIELD EXPERIMENT**

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Most desert granivorous rodents forage preferentially under shrub and trees. Though usually associated with perceived risk of predation, this preference is particularly likely if seed abundance peaks in those microsites, as in the open algarrobo woodlands of the central Monte desert, Argentina. To evaluate if rodents use of space is associated with the main structural features of the vegetation, we recorded, once per season, the nocturnal removal of a single *Setaria italica* seed from each of 300 stations arranged every 5 m in three 10x10 grids. Nocturnal consumers were confirmed as small mammals in two smaller, similar field experiments, by identifying their footprints over sieved fine soil around seed stations. We characterised every microsite (1m-diameter circle around each station) by measuring percent cover of each plant species with a point-interception technique, and then used PCA to summarise the correlation patterns of the multivariate matrix. We also measured distance to the nearest-neighbour tree. We assessed microsite selection graphically and statistically. As expected, seed removal was higher in autumn-winter than in spring-summer. In only one of the three grids there was some evidence of positive spatial autocorrelation of neighbouring stations. Although woody cover and seed abundance were strongly associated with the main PCA axes, there was no avoided microsite type, and the structural characteristics of used sites did not differ from availability. The use of particular microsites among seasons did not differ from random. In conclusion, in a field experiment in which seed addition was almost nil, rodents did not show a particular use of space at the microsite scale. In contrast, they did show a tendency at a bigger spatial scale, foraging farther from trees than expected by chance. We contrast these results with those found simultaneously for granivorous birds at the same place. [We acknowledge CASEB for financial support].

111 **SEX-BIASED DISPERSAL OF *CALOMYS MUSCULINUS* (RODENTIA: SIGMODONTINAE) IN LINEAR HABITATS**

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We performed multilocus spatial genetic autocorrelation (SGA) analyses at a fine geographic scale in central Argentina in order to study sex-biased dispersal in *Calomys musculinus*. We conducted the analyses in autumn (at the end of breeding period, highest population density) and winter (nonbreeding period; low density). Two transects with five and two with three lines of 30 traps, separated for 500m, were set along the weedy borders of secondary roads in an agroecosystem near the city of Río Cuarto (central

Argentina). All traps were georeferenced using a GPS. We analyzed eight specific microsatellite loci in 77 individuals captured in autumn and 54 individuals in winter. We used the program GenALEx 6.2 to estimate spatial genetic structure. In autumn, when population density peaked, and reproductive activity was still high, males showed the highest dispersal rate (autocorrelation was not significant). Females showed SGA at short distances (autocorrelation was positive and significant up to 66m). In winter, males showed a significant structuring up to 276m. Females did not show significant SGA. Male movements are strongly influenced by search for mates, whereas in females vegetation cover, quality, abundance and distribution of food are most important. In autumn, the habitat patch conditions are still suitable, there are a high number of reproductive active females, therefore a male-biased dispersal is observed. In winter, habitat conditions are poor and suitable habitat patches are sparse, this resulted in a high dispersal of females. Thus the sex-biased dispersal in *C. musculus* vary in relation to reproductive activity and habitat patch conditions.

112 SMALL MAMMAL COMMUNITIES ARE STRUCTURED RANDOMLY OR BY DETERMINISTIC FACTORS? A STUDY IN ATLANTIC FOREST

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In this study, we investigated the role of two assembly rules in the structure of some small mammal communities. We sampled nine communities in the Atlantic Forest of Rio de Janeiro State, recording the species richness and composition. We used presence-absence matrices to analyze the influence of Fox's rule and the effect of nested subsets, through the generation of null models. Our results indicated a ranking of communities in hierarchical subsets of species and functional groups, suggesting no strong influence of interspecific competition structuring this process. This is a pattern often found in nature and it can guide decisions involving conservation efforts. We believe that this pattern is produced by disturbances caused by humans in the landscape, affecting the probability of immigration and extinction of species and functional groups. According to our results, investments in the conservation of remaining more hospitable in the Atlantic Forest of Rio de Janeiro State, controlling the human activities, seems to be a good strategy to maintain biodiversity.

113 SMALL MAMMAL COMMUNITIES IN ATLANTIC FOREST: FACTORS THAT INFLUENCE RICHNESS AND SPECIES COMPOSITION

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Understanding the species richness and distribution is a key factor for ecology. Some environmental factors are important to explain several parameters of animal and plant communities in nature, such as species richness and species composition. We investigated the influence of environmental variables, altitude, area size and fitoecological region in the species composition and species richness of small mammal communities in the Atlantic Forest of Rio de Janeiro State. We sampled nine localities in the State of Rio de Janeiro inserted in different fitoecological regions. We captured the small mammal using live traps and pitfalls traps, and recorded altitude and some environmental variables. These variables, including altitude and area size, were reduced to two axes through the Principal Components Analysis (PCA) and only the first axis, interpreted as a gradient of slope, explained the species richness. The species composition was reduced through multidimensional scaling (NMDS) in order to compare the similarity among the localities. The first axis of NMDS seems to be explained by the species richness and the second axis by the fitoecological region. To investigate the relationship between beta diversity, geographic distances and altitudinal differences, Mantel test was performed. There was a positive and significant relationship only between the beta diversity and the altitudinal differences of localities. We believe that the species richness of small mammals is related to the slope, since preserved forest fragments in Rio de Janeiro State are located on the mountains, in areas with greater slopes, associated with greater species richness. The understanding of ecological differences which are responsible for the permanence of species in fragmented landscapes can be of great importance to the development of management plans and conservation of biodiversity.

114 SPATIAL AND TEMPORAL DISTRIBUTION OF *CTENOMYS* POPULATIONS IN A FRAGMENTED LANDSCAPE

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In fragmented habitats, landscape features strongly affect the genetic structure of populations. A good example of fragmented habitat is the Iberá wetland, in Corrientes, Argentina, is one of the largest wetlands in South America, located between three large rivers, covering more than 14,000 km² and consisting of a vast mosaic of marshes, swamps and lagoons, of which nearly 60% are permanently inundated. Altogether 90% of the Iberá marsh is dominated by permanent or temporary wetlands and in the dry areas there is a predominance of sandy soils, sometimes forming extensive hillocks where it is possible to find populations of the "perrensi" lineage of the subterranean rodent *Ctenomys*. The perrensi group is a complex of three species (*C. roigi*, *C. perrensi* and *C. dorbignyi*), and several forms of uncertain taxonomic status. Because of limited availability of suitable dry habitat, *Ctenomys* populations are distributed patchily around the wetland and become connected or isolated over time, depending particularly on the precipitation regime. Given that this system is not only dynamic in space but also in time, we propose to understand temporal patterns of genetic variability among populations using museum samples belonging to the same localities that are being sampled at present. The use of this material in phylogeography and population dynamics is now widespread and it can be applied to the analysis of population

declines and loss of genetic diversity, changes in connectivity following habitat fragmentation and detection of hybridization and introgression. We analyzed the temporal and spatial patterns of genetic variability together with the landscape structure in a group of populations from which we already had microsatellite variation suggesting hybridization between some of the “perrensi” forms. The results of the study will contribute to understand the relationships among populations connected by limited dispersal in a dynamic landscape that produces temporary barriers to gene flow.

115 SPATIAL ECOLOGY OF MANED WOLVES (*CHRYSOCYON BRACHYURUS*) AT SERRA DA CANASTRA NATIONAL PARK, BRAZIL

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Several aspects of spatial organization and social behavior in carnivores have been documented through the way animals use and share the space. We estimated the home range size and overlapping of maned wolves and incorporated this data to genetic analysis to verify the spatial ecology of this species at Serra da Canastra National Park. Thirty one maned wolves were captured and radiocollared from January 2004 to February 2007, using live-traps arranged in areas in and outside the park. The maned wolf's home range size was on average 50.97 ± 32.47 km². We didn't find significant difference in home range sizes during the dry and wet seasons. However, during the reproductive season home ranges were smaller for females, and such reduction may be associated to the late gestation period and to the offspring care. The overlapping zones of couples' home range, as well as their core areas, were more numerous than between individuals of the same sex. Between males, home range overlapping was almost inexistent. The individuals living exclusively inside the park presented larger home ranges and higher overlapping compared to animals living outside and in the border, being these outliving individuals possibly more subjected to behaviour alteration due to anthropic pressures. Furthermore, home range overlapping is higher between genetic related individuals. Due to genetic analysis we identified three distinct familiar cores in the study region. However, unrelated individuals were also registered, indicating the existence of a dispersion system outside-inside the park's wolf population. Our results support the hypothesis that the maned wolf spatial organization is based on monogamous pairs, presenting home ranges overlapping in different levels of complexity, having its core areas defended more intensively as a territory.

116 SPATIAL FORAGING RESPONSES OF A REFUGE-DEPENDENT HERBIVORE TO FOOD, PREDATION RISK AND COMPETITION

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Spatial foraging responses of a refuge-dependent herbivore to food, predation risk and competition Katherine Tuft, Mathew S. Crowther, Kristin Connell, Clare McArthur School of Biological Sciences, University of Sydney We examined the interaction of spatial foraging responses to food, predation risk and competition using the refuge-dependent brush-tailed rock-wallaby *Petrogale penicillata*. Brush-tailed rock-wallabies are medium-sized macropods (average weight 7kg) that live in refuges in complex rocky habitat. We expected rock-wallabies to forage where more food was available and predation risk lower. However, we predicted these patterns to change when interactions with potentially competing sympatric macropods were included. We measured rock-wallaby foraging under different scenarios of predation risk and competition by surveying 200 1m² plots at four sites in south-eastern Australia. At each plot we recorded the presence or absence of rock-wallaby or sympatric macropod droppings, percent cover of edible and inedible vegetation, canopy cover, distance from refuge and presence or absence of boulder piles. We modelled the probability of finding a dropping as a function of food and predation risk using logistic regression, then used information theory to rank and compare the fit of a range of models to our data. At all sites, rock-wallabies foraged more where predation risk was lower. There was some evidence that rock-wallabies traded off between edible vegetation and predation risk by foraging more in riskier areas if there was more edible vegetation. By themselves, rock-wallabies foraged more where there was more food but this pattern changed when sympatric macropods were present, indicating potential asymmetric competition between them.

117 SPATIAL GRADIENTS IN PREY CUES AND THE FORAGING SUCCESS OF A MODEL OLFACTORY PREDATOR

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Olfactory cues may linger in the environment long past the departure of prey, whilst visual cues are fleeting and often instantaneous. Thus foraging theory predicts that predators in olfactory systems must make decisions not only about which prey to hunt, but also which odour cue to follow. Optimal foraging theory also predicts that predators should be able to use information embedded in odour cues to constantly update their search strategies. To test these predictions, we attempted to influence the foraging success of an olfactory predator by manipulating spatial variation in odour cue strength, as well as the level of spatial association between cue and prey. House mice (*Mus musculus*) were used as a model olfactory predator, foraging in 10x10 grids of seed trays in large outdoor enclosures. Peanuts were used as the prey, which were buried in sand, with peanut oil as the odour cue. Mouse foraging success was reduced where odour cues became more uniform but the mice did not distinguish along a gradient of prey cue strength. Success also increased with the level of spatial association between cue and prey; a 1:1 association more than doubled foraging success compared to a random walk, where all other reductions in association (1:2, 1:4 and 1:9) did not improve success above random

detection. Together these results suggest that the deliberate addition of prey cues to the environment can reduce the success of foraging predators, which may help to reduce the impact of undesirable olfactory predators such as cats and foxes.

118 STUDIES ON SMALL MAMMALS HOSTS OF HANTAVIRUS IN PARANÁ STATE, SOUTHERN BRAZIL

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The close association between sigmodontinae rodents and hantavirus genotypes from South America requires studies on rodents ecology and systematics. Here in we investigated 3 small mammal communities of different vegetation types in the Paraná State, Southern Brazil and conducted serological/molecular tests to evaluate the presence of hantavirus on wild rodents. The study areas were at the municipalities of General Carneiro (GC-Mixed Ombrophilous Forest); Paranaguá (PN-Atlantic Ombrophilous Dense Forest) and Itamaracá (IB-Atlantic Semi-Deciduous Forest). With a total of 2500 trap-nights in each area, we captured 72 individuals in GC, 71 in PN and 71 in IB. Rodent communities were different in composition and structure. PN showed the higher diversity index ($H'=1.71$). Species richness was higher in GC and in PN, but equitability index was higher in IB ($E=0.94$). Despite this, we found only generalistic/opportunistic species in IB. In fact, IB is a highly fragmented area that contrasts with GC, which is one of most forested areas in the Paraná State. *Akodon montensis* and *Oligoryzomys nigripes* occurred in all three areas and showed high relative abundances, mainly on edge ecotopes (wild and peridomiciliary). Other captured species were: *Thaptomys nigrita* and *Sooretamys angouya* in GC and PN; *Nectomys squamipes*, *Euryoryzomys russatus* and *Didelphis aurita* in PN; *Akodon serrensis*, *A. paranaensis* and *Monodelphis sp.* in GC; and *Didelphis albiventris* in IB. The synantropic rodent *Mus musculus* was found in IB and had the higher relative abundance. Infection by hantavirus was detected in 2 *A. montensis* and 1 *Oxymycterus judex* from GC; in 3 *O. nigripes* and 1 *A. montensis* from PN; and in 1 *O. nigripes* from IB. The species *O. nigripes* is a recognized reservoir host of the JUQ virus in the Atlantic Forest while *A. montensis* seems to be a potential host in the southern Brazil.

119 THE ROLE OF SMALL RODENTS AND WILD CERVIDS IN THE TRANSMISSION OF TICK-BORNE PATHOGENS

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A total of 12.4% of immature *I. ricinus* ticks collected on rodents in Lithuania and 3.8% in Norway were found infected with *B. burgdorferi* s.l. *Microtus arvalis* and *Myodes glareolus* in Lithuania were significantly more infested with infected larvae than *Apodemus flavicollis* mice captured in Lithuania and Norway. About 22% of the infested rodents in Lithuania carried infected ticks, and 6.9% of all rodents were infested with infected ticks. The highest percentages of infested hosts carrying infected larval and infected nymphal ticks were *Mi. arvalis* (40%) and *My. glareolus* (67%) respectively. In Norway, 12.5% of the infested *A. flavicollis* carried infected ticks, and 9.9% of all captured *A. flavicollis* were infested with infected ticks, while 2.4% of the larvae and 12.1% of the nymphs feeding on *A. flavicollis* were infected. *B. burgdorferi* s.l. was not detected in any of the 234 *Laelaps sp.* mites collected on rodents in Lithuania and 73 mites collected on rodents in Norway. According to the calculated host-to-tick transmission coefficient (?H-T), *Mi. arvalis* and *My. glareolus* voles were found to be more efficient in transmitting *B. burgdorferi* s.l. to ticks than *A. flavicollis* mice, and the common vole *Mi. arvalis* was found to have the highest reservoir competence, higher than other captured rodent species. In contrast, roe deer (*Capreolus capreolus*) and red deer (*Cervus elaphus*) are incompetent reservoirs for *Borrelia burgdorferi* s.l. It has been suggested that adaptive immune responses may be involved in their regulation of the spirochete transmission. We compared the prevalence of *B. burgdorferi* s.l. and *A. phagocytophilum* in *I. ricinus* ticks on sites with high and low abundance of roe deer, red deer, and moose (*Alces alces*) to evaluate the infection routes and epidemiology. The highest prevalence of *A. phagocytophilum* in ticks was found on the sites Fjelløyvær and Strøm (with 15.6% and 19.4% in 2007, respectively), both with high abundance of roe deer and red deer compared to sites Tjore and Hinnebu with low abundance (0%). The opposite situation was found for *B. burgdorferi* s.l. with infection rates of 16.5% in Hinnebu and 7.5% in Tjore, but no infected ticks were detected in Fjelløyvær and Strøm. High levels of cervids raise the abundance of ticks and the prevalence of *A. phagocytophilum*, and may also raise the risk of infection in humans. However, high levels of cervids may also reduce levels of *B. burgdorferi* s.l. in ticks and therefore the risk of human infection by tick bites.

120 TITRATING THE COSTS OF POISONOUS PLANTS AGAINST PREDATORS: WHAT'S THE TIPPING POINT FOR FORAGING HERBIVORES?

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Herbivores often eat plants that vary in toxicity across landscapes and forage in patches that vary in predation risk. Toxins impose physiological constraints on herbivores that limit food intake because when detoxification pathways are saturated, animals must stop feeding until concentrations fall, or find something else to eat. Predation risk also influences how long an animal will spend at a patch searching for food and potential prey will quit patches when the marginal value of foraging returns fall below the perceived predation risks. In this paper we examine how toxins and predation risk interact to influence the foraging decisions of common brushtail possums, a generalist herbivore. Our aim was to titrate toxin concentration against perceived predation risk, to identify the tipping point at which animals move from safe but toxic food patches to unsafe food patches without toxins. Animals were offered a choice between non-toxic food at "risky" patches, paired against increasing concentration of toxic food at "safe" patches. At low toxin concentration, animals ate more from safe patches, but this shifted as toxin concentration increased until they ate primarily from risky

patches. This shift was associated with changes in vigilance and other behaviors. Our results demonstrate the importance of both plant toxins and predation risk in shaping herbivore foraging decisions and show that herbivores can quantify, compare and balance these two quite different proximate costs, altering their foraging patterns in the process.

121 VARIATIONS IN RODENTS COMMUNITIES ALONG THE LAST 24 YEARS IN A PAMPEAN AGROECOSYSTEM

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The aim of the present study was to analyze abundance variations in rodent communities along the last 24 years in a rural area, and to assess the effect of environmental variables and land use changes on these variations. In order to assess these changes we analyzed capture data of both croplands and their borders at two moments of the cycle of rodent abundance, high abundance in Autumn-Winter and low abundance in Spring-Summer. We analyzed the temporal trend in abundance by simple linear regressions between rodent abundance and years (1984 - 2008), and we conducted multiple linear regressions between rodent abundance and climatic variables (minimum and maximum temperature, cumulated precipitation in autumn-winter and spring-summer and number of days with frost). Although overall rodent abundance decreased over time in croplands and their borders, this variation was not significant in all seasons and species. While *Akodon azarae* (the most abundant species) did not show significative changes, *Calomys laucha* and *C. musculinus* abundance in autumn-winter decreased in both habitats and *Oligoryzomys flavescens* showed a decrease in the two seasons in croplands, but an increase in borders in spring-summer. Total abundance of rodents in autumn-winter was positively associated to the cumulated precipitation of the previous spring summer period and negatively with the cumulated precipitation of the same period. To analyze the effect of the increase in soybean culture and the no- tillage technology on rodent communities we compared rodent abundances between the periods 1979-1997 and 1998-2008. *C. laucha* abundance is lower in the period 1998-2008 in borders, while *C. musculinus* abundance is higher in autumn-winter of 1979-1997 than in autumn-winter of 1998-2008 and spring-summer of both periods. The observed trends in rodent abundances are better explained by changes in land use than by climatic variables, whose changes are not associated with those observed in rodents.

122 VOLE PREFERENCE OF *VACCINIUM MYRTILLUS* AND *DESCHAMPSIA FLEXUOSA* ALONG A GRADIENT OF SIMULATED MOOSE HERBIVORY

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Herbivory affects plants in different ways, either increasing, decreasing or not changing the palatability and nutritional value. Shoot browsing has a large consequence for woody plants as it is targeted at the parts containing the meristems from where new shoots grow. Grasses are adapted to herbivory in other ways than woody plants, as the meristems are located close to the ground and hence are harder to reach for herbivores. Logically, woody plants previously browsed should therefore contain high levels of secondary metabolites and be unpalatable while grasses should be less affected by herbivory. Resource availability may also affect plant responses to herbivory. Plants growing in nutrient poor soils have often a different response to herbivory compared to plants growing in nutrient rich soils. Intensity of herbivory is another factor that may affect plant responses to browsing or grazing. Using captive root voles (*Microtus oeconomus*) we investigated the effects of simulated moose (*Alces alces*) herbivory on vole feeding preference of a grass (wavy hair grass (*Deschampsia flexuosa*)), versus a dwarf shrub (bilberry (*Vaccinium myrtillus*)) along a productivity gradient. Simulated moose browsing was applied with four intensities corresponding to different moose densities (0, 1, 3 and 5 moose/km²) at eight sites with different productivity. For wavy hair grass we found that the voles did not show any particular preference between browsing levels, but for bilberry they did. We found an interaction between productivity and browsing level. The voles preferred unbrowsed bilberry at low productivity, while they preferred browsed bilberry at high productivity. Bilberry was also analysed for chemical composition, and the results of vole preference are discussed in the light of these findings.

GENETICS

123 ANALYSIS OF MICROSATELLITE LOCI IN *CTENOMYS PEARSONI* (RODENTIA: CTENOMYDAE)

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Most species of the genus *Ctenomys* are solitary and live in individual burrow systems; in 1985 Pearson and Christie found a species (*C. sociabilis*) which lives in colonial burrows. A continuum of sociality may exist between exclusively solitary and social mammal species. Behavior observations combined with analysis of high polymorphic genetic markers, like microsatellites, are a powerful tool to study social structure and other population's traits. In the present study we analyze the amplification pattern of 5 microsatellite loci, designed for *C. sociabilis* (Soc) and *C. haigi* (hai), in a *C. pearsoni* population; examine the degree of polymorphic content of that loci and principal components of genetic data. Our tuco-tuco population inhabits in "El Relincho" which is an establishment in San José,

Uruguay (34° 20' S 56° 58' W). DNA extractions were made from hair samples and PCR amplification products were ran in ABI 3100 microcapilar gel. Allele assignation per locus was made using GenMarker V1.71 ®. Other softwares were also used; Cervus 3.0 (to analyze the polymorphic content and heterozygosity), and Genetix (for main genetic components analysis observation). All loci examined were polymorphic, in which the mean polymorphic information content was 0.5909 and the mean expected heterozygosity 0.6654. Other results obtained were combined non-exclusion probability for the parent pair (0.01489817) and for the identity (0.00017728). Molecular data exhibited here allowed us to confirm or not some kinship hypothesis made from field observations in previous ethological studies. This set of primers proved to have a good level of polymorphism and heterozygosity to perform inferences related to group structure and mating strategies.

124 CHARACTERIZATION OF A HYBRID ZONE BETWEEN *LEOPARDUS TIGRINUS* AND *LEOPARDUS GEOFFROYI* EMPLOYING MULTIPLE MOLECULAR MARKERS

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The characterization of hybridization processes, including the identification of hybrid individuals, is an important issue in the context of designing and implementing adequate management and conservation strategies for the involved species. This can be challenging when the hybridizing species are closely related and do not possess clearly diagnostic molecular markers. Methods to infer admixture proportions mostly rely on mitochondrial DNA sequences and unlinked loci. However, Hardy-Weinberg and linkage disequilibrium among independent markers decline rapidly with admixture time, and the admixture signals could be lost in a few generations, underestimating the hybridization and introgression rates. *Leopardus tigrinus* and *L. geoffroyi*, two small Neotropical felids, present a narrow geographic contact zone in Rio Grande do Sul (RS) state, in southern Brazil, where we have previously identified the existence of a complex and extensive pattern of hybridization between these species. The goal of this study was to evaluate the feasibility and power of combining linked and unlinked sequence-based molecular markers to improve the detection of hybrid individuals, to characterize the admixture patterns, and to assess the magnitude and directionality of this process. Our final data set included DNA sequences from seven different segments (five of them located in a low recombination region of the X chromosome, and two on autosomes), which were analyzed in a sample of 68 individuals of both pure and hybrid origin. Six *L. colocolo* individuals were included for additional comparison. Through the use of haplotype networks and Bayesian admixture analyses, it was possible to identify 48 hybrids, most of them originating from RS state, presenting signals of interspecific genomic introgression. Our results corroborate the inference of ongoing hybridization between these species, and suggest a pattern of bidirectional and likely asymmetric genomic introgression.

125 CONTEMPORARY EFFECTIVE AND CENSUS POPULATION SIZE OF THE HUMPBACK WHALES (*MEGAPTERA NOVAEANGLIAE*) WINTERING OFF BRAZIL

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The estimates of the census (N_c) and effective (N_e) population size are essential for conservation of species. However, N_e is important because it determinates rates of loss of genetic variability. Whether the ratio N_c/N_e is known or can be estimated, a estimate of N_e can provide insights into population abundance as well. The worldwide humpback whale population was reduced to approximately 2% of the original size by commercial whaling during the 20th century. Humpback whale Breeding Stock A is distributed along the Brazilian coast (5° to 21° S). The present study aims to estimate contemporary N_e and N_c of this population based on the analysis of ten microsatellite loci. A total of 420 humpback whales were sampled at two geographic locations (Abrolhos Bank and Praia do Forte) off the Brazilian coast. Two methods were used to estimate contemporary N_e , requiring only a single sample. First, we used the program ONESAMP 1.1, which uses summary statistics and approximate Bayesian computation. The upper and lower bounds on the prior distribution for N_e were 100 and 800, respectively. Second, the program LDNE was used to estimate N_e from genotypic data based on the linkage disequilibrium method. We used random mating model, jackknife methods for obtaining confidence intervals to N_e and the following critical values (P_{crit}): 0.05; 0.02; 0.01. We calculated the N_c from N_e by multiplying by 3.2 and 4.0 ratios. The estimate of contemporary N_e reported by ONESAMP (510 individuals, 95% CL = 458-585) was lower than that more reliable ($P_{crit} = 0.02$) obtained by LDNE (1061 individuals, 95% CL = 688-2104). Our estimates of contemporary N_c (1632 and 2040 individuals, ONESAMP N_e ; 3392 and 4244 individuals, LDNE N_e) were lower than the most recent estimate of abundance of the Brazilian humpback whales, based on line transect methodology through aerial surveys.

126 DNA BARCODING AS A TOOL FOR DIETARY STUDIES IN MAMMALS.

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Dietary studies of carnivore species are relatively common, as they can be performed on the basis of faecal sampling or stomach content analysis. A problem that frequently emerges in these studies is the difficulty of identifying prey items at species level, due to the fragmentary or degraded nature of the materials recovered from these sources. In the last few years, the DNA barcoding approach has emerged as a large-scale initiative proposing the use of standardized molecular markers for the species-level identification of living organisms. The proposed DNA barcode for animals is a 658 bp fragment of the mitochondrial gene cytochrome c oxidase I

(COI), which has been reported to successfully differentiate closely related species using only a small amount of tissue or a drop of blood. The present study aims to assess the power of DNA barcoding to investigate carnivore food habits, by testing the performance of this approach in the identification of rodent specimens found in the stomach of wild felids. We initially built a reference data base containing 126 individuals representing multiple rodent species that occur in southern Brazil. This data base was used for comparisons with samples of 11 rodent individuals removed from the stomach of road-killed wild cats representing three different species (*Leopardus tigrinus*, *L. geoffroyi* and *Puma yagouaroundi*). All samples had their DNA extracted with a phenol-chloroform protocol, followed by COI amplification and sequencing. Species identification was performed on the basis of a neighbor-joining tree, whose nodal support was assessed with 1000 bootstrap pseudoreplicates. All samples could be assigned to a species-defining clade with high bootstrap values (>80), indicating that the standardized animal DNA barcode is capable of identifying felid stomach content items at species level. Future steps include an expansion of sample size, associated with tests of different analytical methods for reliable species identification.

127 DNA BARCODING AS A TOOL FOR MAMMALIAN IDENTIFICATION: A TEST OF POWER WITH RECENTLY DIVERSIFIED CARNIVORAN LINEAGES

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The use of DNA barcoding as a standardized tool for species identification is growing, and multiple groups of organisms have become the target of large scale efforts employing this approach. The worldwide initiative aiming to barcode mammals is gaining momentum, but so far few studies have been conducted with a focus on this taxon. One important issue is to assess whether the proposed standardized barcode segment, the mtDNA COI gene, is capable of fully distinguishing sets of multiple closely related species, a widespread consequence of recent mammalian radiations. The Neotropical region is an interesting testing ground for this problem, as its complex evolutionary history has produced multiple sets of recently diversified species, some of which would benefit from the use of DNA barcoding for field identification in ecological studies, or for the species-level assignment of confiscated or road-killed specimens. The purpose of this project is to evaluate the effectiveness of the DNA barcoding approach for species-level identification in Neotropical mammals, by investigating the power of COI and other sequence-based mtDNA markers to distinguish closely related species. We are initially focusing on two endemic genera of Neotropical carnivores, *Leopardus* (Felidae) and *Lycalopex* (Canidae), both of which have rapidly diversified in parallel after the closure of the Panamanian Isthmus ca. 3 million years ago. We are generating sequences of the barcode segment of the COI gene for both groups, and comparing its performance for species-level identification to that of the mtDNA control region and the ND5, ATP8 or cytochrome-b genes, which are often used in phylogenetic and phylogeographic studies targeting these taxa. Our results suggest that the COI segment performs quite well for distinguishing these species, even in the case of the genus *Lycalopex*, whose radiation into six different species seems to have occurred very rapidly in the last 1 million years.

128 INTEGRATION OF GENOMIC, CHROMOSOMAL AND PHYLOGENETIC LEVELS IN THE RODENT *CTENOMYS* FROM IBERÁ MARSH ARGENTINA.

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The rodents of the genus *Ctenomys* (tuco-tucos) conform an extreme case of chromosomal evolution in mammals. The species and forms of tuco-tucos from the Iberá marsh (Corrientes province, Argentina), involve 3 linnean species (*C. roigi*, *C. dorbignyi*, *C. perrensi*) with stable karyotypes, and *C. sp* group: a taxonomic undefined complex of populations which exhibit high chromosomal polymorphisms. In this work the relationship between nucleotide sequence and the expansion/contraction dynamics of the major satellite DNA of tuco-tucos (RPCS) was studied. Nucleotide variability distribution and RPCS copy number, was estimated. Nucleotide sequences were obtained by PCR strategy that yielded RPCS genomic consensus sequence (gcs). RPCS copy number was determined by dot blot hybridization. The phylogeny was obtained using a 400 bp fragment pertaining to the mitochondrial D-loop control region. RPCS nucleotide variability corroborated the ancestral library hypothesis, evidenced by the absence of total fixation in unique variants. RPCS copy number varies between 39-2,160 x10³ copies per haploid genome. The relationship between RPCS copy number, sequence variability and chromosomal evolution resulted not trivial, but is being elucidated in a phylogenetic context.

129 KARYOTYPIC EVOLUTION OF VAMPIRE BATS (DESMODONTINAE - CHIROPTERA)

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Phyllostomidae is the most diverse family of Neotropical bats. It is cytogenetically characterized by highly conserved karyotypes among closely related species, but by great intergeneric variability, which leads to difficulties in comparative analysis using classical chromosome banding methods. Great effort has been made concerning the elucidation of Phyllostomidae karyotypic evolution, mostly through comparisons of G-banding patterns between species. However, in some circumstances these data might not provide accurate evolutionary history of chromosome segments due to similarity of non-homologous bands. This seems to be the case of Desmodontinae bats. Despite several identified homologies, banding data have not yet provided an understanding of the chromosomal changes throughout their karyotypic evolution. Thus, in this study, emphasis is placed on the karyotypic differentiation of the three species within this subfamily (*Desmodus rotundus*, *Diphylla ecaudata*, and *Diaemus youngi*) by the use of whole chromosomal

probes from *Phyllostomus hastatus* (Phyllostominae) and *Carollia brevicauda* (Carollinae). Painting probes of *P. hastatus* have respectively detected 23, 22 and 21 conserved segments in *D. rotundus*, *D. ecaudata*, and *D. youngi* karyotypes, while 28, 27 and 27 were respectively detected with *C. brevicauda* paints. This reflects greater chromosomal homologies between Desmodontinae and *P. hastatus* compared to *C. brevicauda*. Desmodontinae have highly derived karyotypes and there is a high degree of conservation among the three vampire species, with *D. rotundus* representing the most rearranged karyotype. Based on the evolutionary relationships proposed by morphological and molecular data, we present the probable events that have occurred during chromosomal evolution of vampire bats. Additionally, karyotypic comparisons allowed us to relate a number of chromosomal arms among the five species here studied, providing background information for further establishment of the karyotypic evolution in the family as a whole.

130 KARYOTYPICAL CHARACTERIZATION OF THE COATI, *NASUA NASUA* (PROCYONIDAE, CARNIVORA) FROM MINAS GERAIS, BRAZIL.

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The coati *Nasua* sp. is a carnivore from the Procyonidae family, which also includes raccoons (*Procyon* sp.) and ringtails (*Bassariscus* sp.). The coati is distinguishable by its long, slender, non-prehensile tail, which is equal in length to the head and body and is often held vertically erect while foraging. The coati has an elongated rostrum terminating in a flexible rhinarium that protrudes beyond the end of the lower mandible. The claws are long and the feet are plantigrade with naked soles. It is diurnal, lives in forested habitats and spends the night sleeping in trees. It is omnivorous, eating predominantly invertebrates and fruits, and vertebrates and carrion when available. The genus *Nasua* includes two species: *Nasua narica* has white pelage on the muzzle whereas *N. nasua* has it brown or gray. *Nasua narica* is found in southern USA, Mexico and Central America. *Nasua nasua* is found from Colombia and Venezuela to Uruguay and northern Argentina. The taxonomy of the genus is complicated with an increasing number of species recognized due to classifications primarily based on pelage color variation, highly variable cranial characters and a lack of understanding of their social structure. In this work we analyzed the chromosomes of *Nasua nasua*. Our sample was composed of two males and one female kept by the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais (IBAMA) in Belo Horizonte, Minas Gerais, Brazil. Chromosome preparations were obtained from blood culture and the three animals presented a karyotype with 38 chromosomes and 66 autosomal arms ($2n=38$, $NF=66$). The G- and C-banding patterns and the silver-staining of the nucleolus organizer regions (Ag-NORs) were obtained and the karyotype of *Nasua nasua* was compared with that proposed to be the ancestral carnivore complement, which has the same diploid number of 38 chromosomes.

131 MICROSATELLITE LOCI ISOLATED FROM THE LOWLAND TAPIR, ONE OF THE LARGEST MAMMAL OF THE NEOTROPICS

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Mammal populations have been suffering reductions due to hunting and habitat fragmentation. The disruption of continuous environments, such as fragmentation, highways and agricultural areas, may interrupt the gene flow of the species. The lowland tapir (*Tapirus terrestris*), one of the last members of the Neotropical megafauna, have a cis-Andean distribution. However, it is considered vulnerable by IUCN since their distribution has shrunk in the last years. Lowland tapirs are rare or locally extinct in most of its former distribution in the Atlantic forest. There are few studies on population genetics of lowland tapirs and it is paramount to develop genetic markers to diagnosis the remaining populations. We isolated microsatellite loci from *T. terrestris*, in order to investigate populations through non-invasive genetic analysis of faecal samples in two corridors that probably contain the largest populations of this megaherbivore: Serra do Mar and Serra de Paranapiacaba (Southeast Brazil). We designed 18 pairs of primers from 169 sequenced clones and tested in 24 DNA samples: 10 blood samples from a natural population of Parque Nacional de Emas (Brazil) and 14 hair samples from five different zoos. Ten loci yielded reliable polymorphic banding patterns. Four to thirteen alleles per locus (7.4 alleles/locus) were detected with the analysis of all individuals. The expected heterozygosity of the natural population ranged from 0.30 to 0.88 (mean of 0.60). All but one (Tter13) conformed to the Hardy-Weinberg expectations with a heterozygosity deficit due to the presence of null alleles at a frequency of 0.26. No pairwise test of the loci for genotypic disequilibrium was significant. These microsatellite loci will be an important tool for studies on population genetic of the lowland tapir, providing data on population size and structure, genetic diversity, dispersal patterns of these vulnerable animals, contributing to the conservation of the species.

132 MOLECULAR ECOLOGY OF *LONTRA LONGICAUDIS* (CARNIVORA, MUSTELIDAE) IN THE MAQUINÉ VALLEY, RS, BRAZIL

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Data on ecological and behavioral parameters of the Neotropical otter (*Lontra longicaudis*) are still very scarce. Most of research performed so far has addressed its diet and habitat use, and aspects such as spatial organization and social structure remain unknown. This is in part due to the elusive behavior that renders *L. longicaudis* hard to observe and capture. The use of non-invasive samples (such as scats) in association with molecular tools can provide important information on the biology of this species. This work aims to employ a non-invasive sampling method and molecular assays to identify individuals and to estimate the minimum population size of *L. longicaudis* in the Maquiné Valley, located in the southern edge of the Atlantic Forest biome, in the Brazilian state of Rio Grande do Sul. Samples of fresh scats/mucus are collected in a study area that includes three rivers, with each river

being surveyed for approximately 10 km every two months. Samples are preserved in ethanol and the DNA is extracted using the QIAamp DNA Stool Mini Kit (Qiagen) in a room dedicated to the analysis of noninvasive samples to avoid contamination. The presence of otter DNA in samples is confirmed using a pair of primers designed to amplify a short segment (~250 bp) of the mtDNA control region of mustelids. A set of ten microsatellite loci were selected to perform the molecular analysis. Until now, 165 samples of fresh scats/mucus were collected, of which 121 had the total DNA extracted and the presence of otter DNA confirmed. Four loci have been successfully amplified, whose genotypes indicate the presence of at least 12 different individuals in the study area. Future steps include the typing of additional microsatellite loci along with sex-identification assays to further investigate the social structure of this species. Financial support: CNPq and PPGBM-UFRGS.

133 **PHYLOGEOGRAPHY OF *CTENOMYS LAMI* (RODENTIA, CTENOMYIDAE)**

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Ctenomys lami inhabit the coastal plain of southern Brazil, in a narrow line of 78 km x 12 km. This species has five diploid numbers ($2n = 54, 55, 56, 57$ and 58) with 26 different karyotypes. A total of 418bp of the control region (CR) and 622bp of the cytochrome c oxidase I (COI) were analyzed for 166 specimens deriving from the four populational blocks (A, B, C and D) suggested by Freitas, 2007. Fourteen haplotypes were found for the CR ($Hd = 0.87$), 9 for the COI ($Hd = 0.64$) and 18 for the concatenated data (CR+COI; $Hd = 0.70$). The haplotype networks of the 3 data sets showed a star-like topology, with a central haplotype including populations of the A, B and C blocks. However a pattern of recent population expansion was discarded according to the Fu's FS and Tajima's D neutrality tests and the mismatch distribution analysis. The D block showed 2 or 3 exclusive haplotypes, according to the data set, and only one was shared with 3 populations of the C block. Most of the 16 populations are strongly structured, having low levels or absence of gene flow, for all data sets (global F_{ST} : CR = 0.69; COI = 0.72; and CR+COI = 0.70). The analyses of genetic differentiation were consistent with an isolation by distance model ($CRr = 49.99\%$; $COIr = 53.60\%$; and $CR+COIr = 56.67\%$). For AMOVAs tests, the grouping that better explain the partition of genetic variation in geographical distribution was A+B+C vs. D. Different karyotypes do not represent effective barriers to gene flow, and the block D populations seem to be the most genetically divergent from the others, perhaps by effects of introgression caused by the geographical proximity to an interspecific hybrid zone between *C. lami* and *C. minutus*.

134 **POPULATION STRUCTURE AND DEMOGRAPHIC HISTORY OF THE MANED WOLF (*CHRYSOCYON BRACHYURUS*) (MAMMALIA, CARNIVORA)**

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The maned wolf is the largest Neotropical canid, and exhibits a geographic range that is closely associated to grassland formations, especially the Brazilian Cerrado. This savanna-like biome is a large and complex environment, presenting a highly heterogeneous vegetational composition, and currently also undergoing an intense process of habitat loss and fragmentation. These natural and human-induced factors can lead to different degrees of population structuring of the maned wolf. To study such aspects, molecular markers are a widely utilized tool, whose analytical power is becoming increasingly detailed. Thus, to investigate the population structure and history of the maned wolf, four local populations were sampled, in addition to widespread individual collection from a large portion of this species' distribution, resulting in a total of 144 tissue or blood samples. Individuals were genotyped for 14 microsatellite loci, and the resulting data were analyzed to assess genetic variability and population structure, along with demographic tests to detect bottlenecks or population expansion, and to estimate the effective number of individuals (N_e). The estimated diversity levels were quite high (mean $H_e = 0.75$) when compared to other canid species, and no clear-cut population subdivision was detected. Demographic analyses pointed to a population expansion event, and the estimated N_e was high. Jointly, these results suggest that maned wolves underwent a population growth in the last few thousand years, maintaining a large number of individuals without any geographic subdivision. The generalist diet and the great dispersal capability of the maned wolf may help explain this lack of population structure. Given the current rates of habitat loss and fragmentation seen in the maned wolf range, the data set generated here can serve as a baseline for future monitoring of possible human-induced differentiation among regional populations.

PARASITOLOGY

135 **ABUNDANCE, COMPOSITION AND HANTAVIRUS SEROPREVALENCE OF RODENTS IN TWO NATIONAL PARKS OF ENTRE RIOS, ARGENTINA**

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Hantavirus Pulmonary Syndrome in Argentina is caused by hantaviruses associated with wild rodents species of the genus *Oligoryzomys*. Due to the presence of wild rodents and the constant tourist visits, National Parks (NP) are areas where the human-rodent contact is probable. The aim of this research was to study the abundance, composition and hantavirus seroprevalence of the rodent community in El Palmar NP, Pre Delta NP and neighbouring islands. From April 2007 to March 2009 we carried 11 trapping sessions in different floristic environments, 8 of them in El Palmar NP and the other 3 in Pre Delta NP and neighbouring islands. All captured individuals were anaesthetised, sexed, measured, and a blood sample was collected to determine the presence of hantavirus

antibodies. In El Palmar NP we captured a total of 105 rodents: *Oligoryzomys nigripes* (43), *Calomys callidus* (34), *Akodon azarae* (19) and *Oxymycterus rufus* (9) with a trapping effort of 6195 traps-night. In Pre Delta NP we captured a total of 131 rodents: *Oligoryzomys flavescens* (82), *Calomys callidus* (23), *Holochilus brasiliensis* (7), *Oxymycterus rufus* (12) and *Akodon azarae* (7) with a trapping effort of 2361 traps-night. Species composition and abundance differed spatially and temporally in both National Parks. In El Palmar NP, 6 out of 43 *O. nigripes* present hantavirus antibodies in three of six floristic environments and the highest seroprevalence values were registered in October 2007 and March 2009. In Pre-Delta neighbour islands 8 of 82 *O. flavescens* tested positive and the highest prevalence was found in July 2008. Based on these results, an integrated rodent control was carried out in a restricted area and recommendations were to continue monitoring rodents through time.

136 ARTHROPODS PARASITIZING THE EXOTIC RED BELLIED SQUIRREL *CALLOSCIURUS ERYTHRAEUS* (PALLAS, 1776) IN ARGENTINA

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Parasitology of exotic species provides relevant data to understand the success of many invasive species and to inform management plans for those that carry pathogens and constitute a health risk. *Callosciurus erythraeus* is native to Southeast Asia and was introduced into Argentina for ornamental purposes in 1970. Since then, the first wild population of this arboreal rodent has grown in number and extension, and new foci of invasion have appeared within the country. Herein we present preliminary results describing ectoparasites associated with this squirrel in Argentina. Squirrels were live trapped in three sites: Luján (34°33'S, 59°07'W) and Open Door (34°30'S, 59°04'W) in Buenos Aires province, and Cañada de Gomez (32°48'S, 61°23'W) in Santa Fé province, between October 2008 and January 2009. Ectoparasites were obtained by brushing their furs, fixed in 96% ethanol and prepared following conventional techniques. We calculated total prevalence (P) and total mean abundance (MA) for each study area: Luján (n=31) P=22%, MA=0,3; Open Door (n=47) P=13%, MA=0,1; Cañada de Gomez (n=28) P=7%, MA=0,1. At present we have identified the mite *Androlaelaps fahrenheitsi* Berlese (Gamasida, Parasitiformes, Laelapidae), the flea *Polygenis (Polygenis) rimatus* Jordan (Siphonaptera, Rhopalopsyllidae), and fly larvae (Cuterebridae). This is the first record of parasites of exotic squirrels in Argentina. None of these parasites were found in the previous study conducted in Japan, where *C. erythraeus* was also introduced. Higher P (34%) and MA (0,8) found in Japan might be related to the time elapsed since introduction in each country and to the assemblage of species in the recipient communities resulting in new host-parasite associations. These results are important from an epidemiological point of view because of the possibility of pathogens dissemination given that the attractive pattern of these squirrels makes them valuable animals in the pet market.

137 COMPONENT COMMUNITY OF ECTOPARASITES ASSOCIATED WITH *ABROTHRIX OLIVACEUS* WATERHOUSE (CRICETIDAE: SIGMODONTINAE: ABROTRICHINI) IN PATAGONIA, ARGENTINA

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In Argentina, *Abrothrix olivaceus* is distributed from Mendoza to Tierra del Fuego. Fleas, lelapid mites and ticks were mentioned associated with this rodent, but no studies considering different higher taxa together were performed. In this contribution we study component community of ectoparasites of *A. olivaceus* in two extreme sectors of its eastern distribution. Rodents were captured in Chubut (Pico Salamanca 45°24'32"S; 67°24'58"W), and Santa Cruz (Puerto Santa Cruz 51°56'09"S; 69°34'26"W, and Pali Aike 50°06'30"S; 68°27'37"W; data were pooled). Ectoparasites were collected by brushing the furs of the hosts, fixed in 96% ethanol and mounted following conventional techniques. Ectoparasites were identified at higher taxa level. Frequency (F), mean abundance (MA) and Prevalence (P) for every taxa were calculated. In Chubut, *A. olivaceus* represented 32% of the trapped rodents (N=44); ectoparasites total: [MA=1.45; P=48%]; fleas (Insecta, Siphonaptera): [N=27; F=60%; MA=0.87; P=35%]; mites (Acari, Macronyssidae): [N=13; F=29%; MA=0.38; P=10%]; ticks (Acari: Ixodidae): [N=5; F=11%; MA=0.09; P=9%]. In Santa Cruz, *A. olivaceus* represented 95% (N=32); ectoparasites total: [MA=5.40; P=93%]; fleas: [N=139; F=58.5%; MA=3.13; P=77%]; mites: [N=72; F=30%; MA=1.54; P=50%]; ticks [N=28; F=11,5% MA=0.63; P=36%]. No lelapid mites were collected, while macronyssid mites are reported for the first time on *A. olivaceus*, and in Patagonia. Frequency of every higher taxa was similar in both areas, supporting that the structure of the component community was constant across latitudinal gradients. High P and MA in Santa Cruz are related with the dominance of *A. olivaceus*. High abundance of a host population, decreases its health status, as well as increases the frequency of contacts among rodents, which in both cases give ectoparasites better opportunities to colonize new hosts, and to increase their populations. Further studies including more localities, will allow to know if the structure of ectoparasite component community is constant along the geographical range of *A. olivaceus*.

138 DETERMINATION OF THE HELMINTHS ASSOCIATED TO THE DIGESTIVE TRACT OF THE OPOSSUMS AND RODENTS

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In this work was found nine species of helminths were found, which are associated with the digestive tract of three Species of Mammalian captured in Piendamó, Cauca (Southwest of Colombia). The nematodes were fixed and clarify in alcohol, glycerol, and were mounted in Glycerin Media; the plathyelminths were fixed with AFA, stained with Meyer Carmin and mounted in permount; the

acanthocephala was previously treated with distilled water for came out the proboscis completely. The acanthocephala was fixed with AFA and stained with Meyer Carmin. The helminthes fauna found in the digestive tract of the *Didelphis marsupialis* (Mammalia: Didelphidae), was represented by nematodes (*Trichuris* sp, *Rabditis* sp, *Parastrongyloides* sp, *Aspidodera* sp.), founding that this last genera is the more common in this taxonomic group. Furthermore, was identified an acantocephala of the *Hamaniella* genera. In *Melanomys caliginosus* (Cricetidae) was registered a nematode of the *Cruzia* sp. genera and a cestode of the *Hymenolepis* sp. genera, while in the *Oryzomys alfaroi* nematodes of the *Siphacia* sp. and *Longistriata* sp. were identified.

139 DOES THE DIVERSIFICATION OF SYPHACIINI NEMATODES ACCOMPANY TO THAT OF ORYZOMYINI RODENTS?

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Host specificity is one of the main features of parasitism. The discovery of highly specific parasite species can offer information on the evolution of their hosts. A recent study showed that the nematodes in the tribe Syphaciini (Syphaciinae-Oxyuridae) are highly specific and that their species diversify together with the genus of rodents in the tribe Akodontini (Sigmodontinae-Cricetidae). In this work we advance in the study of the taxonomy of the species of Syphaciini parasitic in rodents of the tribe Oryzomyini (Sigmodontinae-Cricetidae), and analyze their host distribution with the aim of observing the degree of correspondence between parasites and their hosts. Hundred thirty seven specimens belonging to nine species of Oryzomyini from Argentina were studied. These identified and revised Syphaciini species as well as those known from the literature were correlated with the phylogeny of the Oryzomyini proposed by Weksler et al. (2006). *Syphacia kinsellai* was found in *Oligorizomys nigripes*, *O. flavescens* y *O. fornesi*, and *S. venteli* was found in *Nectomys squamipes*, several of which are new host and geographic records. The re-examination of "*S. venteli*" specimens found in *Melanomys caliginosus* in 1969 showed that these should be reassigned to a new species. The seven species of *Syphacia* known from Oryzomyini rodents to date showed a similar host pattern to those observed in Akodontini rodents, in which each species of *Syphacia* is associated with one host genus. Future studies that enlarge the host range and include the results of host specificity in an ecological-phylogenetic context will allow us to distinguish and suggest possible co-evolutionary events between Syphaciini nematodes and Oryzomyini rodents. This could support the hypothesis that species of *Syphacia* are good taxonomic markers of the evolutionary history of rodents in the Sigmodontinae.

140 ECTOPARASITE DIVERSITY AND SPECIFICITY IN BAT ECTOPARASITE INSECTS FROM IQUITOS AND SURROUNDING AREAS (LORETO, PERU)

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Parasitological indexes and host-ectoparasite specificity are reported for 20 species of ectoparasite insects, 19 Diptera (Streblidae) and one Siphonaptera (Ischnopsyllidae) collected from 29 species of bats (one Molossidae: *Molossus rufus*; two Noctilionidae: *Noctilio albiventris* and *N. leporinus*; two Vespertilionidae: *Myotis albescens* and *M. simus*; and 24 Phyllostomidae: *Artibeus planirostris*, *A. lituratus*, *A. anderseni*, *A. gnomus*, *Artibeus* sp., *Carollia perspicillata*, *Desmodus rotundus*, *Lophostoma brasiliense*, *L. silvicolum*, *Mesophylla macconnelli*, *Phyllostomus discolor*, *P. hastatus*, *P. elongatus*, *Platyrrhinus brachycephalus*, *Rhinophylla fischerae*, *R. pumilio*, *Sturnira lilium*, *S. tildae*, *S. magna*, *Sturnira* sp., *Tonatia saurophila*, *Trinycteris nicefori*, *Uroderma bilobatum*, and *Vampyriscus bidens*). The bats were captured with mist nets set at different habitats, between December 2002 and December 2005. Each collected bat was placed individually in a fabric bag, and the ectoparasite material was collected from the fur and preserved in 70% ethyl alcohol. At the lab, the ectoparasites were processed and mounted in Canada balsam on microscope slides. The calculated indicators of parasite infection were: Prevalence (P), mean intensity (MI) and mean abundance (MA). The host-ectoparasite specificity was recorded considering the species as monoxenes (*Aspidoptera falcata*, *Mastoptera minuta*, *Neotrichobius ectophyllae*, *Noctiliostrebla aitkeni*, *Pseudostrebla ribeiroi*, *Strebla curvata*, *S. galindoi*, *S. obtusa*, *S. wiedemanni* -all Streblidae- and *Myodopsylla wolffsohni wolffsohni* -Ischnopsyllidae-; oligoxenes (*Megistopoda proxima*, *Metelasmus pseudopterus* and *Paradyschiria fusca*), pleioxenes (*Megistopoda aranea*, *Paratrachobius dunni*, *P. longicrus*, *Strebla consocia* and *S. hertigi*) or polioxenes (*Neotrichobius delicatus* and *Paradyschiria parvula*).

141 FACTORS DETERMINING ABUNDANCE OF A CHEWING LOUSE ON COATIS FROM PANTANAL/MS, BRAZIL

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Lice can potentially influence their host populations while affecting the individual hosts. However, because long-term studies of this group on wild hosts are scarce, little is known about variables that may influence their abundance. Here in we investigate the relative importance of host characteristics (age, sex, size) and abiotic factors (precipitation, daily minimum temperature, relative humidity) underlying the abundance of (Phthiraptera: Trichodectidae: *Neotrichodectes pallidus*), on coatlis (*Nasua nasua*) in the Nhimirim Ranch, Pantanal, MS/Brazil. From May/2006 to Feb/2009, 108 coatlis were captured/recaptured up to 4 times/yr. Lice were then collected via 10 strokes with a flea comb from the base of the neck to the tip of the tail on the dorsal region of coatlis, totalizing 670 specimens. We constructed a series of explicit hypothesis-based a priori models relating the host characteristics and abiotic factors

with lice abundance (+1) and ranked the fit of these models using Akaike's information criterion (AICc) and Akaike's weights (w). We used generalized linear models with negative binomial distributions for model selection. Abiotic variables were calculated as the average for the 30 days prior to the date of lice collection from the individual coatis. Age categories of coatis were estimated through teeth condition and body size. Around 58.1% (95% CI: 0.4988 to 0.6594) of the coatis were infested with a mean louse intensity of 7.44 (95%CI: 5.91 to 9.40). The best approximating model included only minimum temperature and relative humidity (w = 0.527). Other candidate models represented poor approximations of the data (w = 0.229 or less). Relative abundance of *N. pallidus* was best predicted by abiotic factors, increasing with temperature and humidity in the environment. While temperature tends to accelerate the life cycle of lice, a minimum humidity level at the host skin may be an important factor to prevent egg desiccation and lice mortality.

142 **FIRST RECORD OF *TRICHOLEIPERIA PROENÇAI* (NEMATODA: MOLINEIDAE), PARASITE OF *NOCTILIO LEPORINUS* (CHIROPTERA: NOCTILIONIDAE) IN ARGENTINA**

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First Record of *Tricholeiperia proençai* (Nematoda: Molineidae), parasite of *Noctilio leporinus* (Chiroptera: Noctilionidae) in Argentina Oviedo M. C. (*), Ramallo, G., Miotti, M. D. y Claps, L.E. Instituto de Invertebrados, Fundación Miguel Lillo. Miguel Lillo 251. (4000) San Miguel de Tucuman. CIUNT. mirnaoviedo@gmail.com In Argentina there are scant studies on nematode parasites of bats; nowadays, only specimens of *Trichostrongyloidea*, *Trichuroidea* and *Physalopteroidea* parasites of *Artibeus planirostris*, *Desmodus rotundus* and some insectivorous bats (*Molossidae* and *Vespertilionidae*) are registered in Chubut, Entre Ríos, Salta, Jujuy and Tucumán. The *Tricholeiperia proençai* Travassos, 1937 nematode was recorded in *Noctilio leporinus* (Linnaeus, 1758) (Chiroptera: Noctilionidae), whose capture localities are Colombia and Brazil. On the other hand, *Noctilio leporinus* is one of the two piscivorous bat species which live in nature in the North of Argentina, and there does not exist information about its biology. The aim of the present study is to register *Tricholeiperia poençai* as a parasite of *Noctilio leporinus* for the first time in the country. In August 2005, two adult females of *Noctilio leporinus* were caught in the banks of Rio Seco, General Jose de San Martin Department, in Salta Province. These specimens were examined in order to extract helminths. Firstly, the isolated nematodes were fixed in 10% formalin and conserved in 70% ethanol; then, they were made diaphanous and photographed. The nematodes isolated from one of the *Noctilio leporinus* specimens were identified as *Tricholeiperia proençai*. This is the first record of nematode parasites of piscivorous bats in the country. In addition, their geographical distribution extends over the South (22° 32' 16" S, 64° 0,03' 0,2" W). This study takes place within the project "Biología y sistemática de invertebrados terrestres (Insectos y Nematodos) dañinos, del norte de la Argentina" of the Universidad Nacional de Tucumán.

143 **FIRST REPORT OF ENDOPARASITES IN TUCO-TUCOS (*CTENOMYS* SPP.) FROM BRAZIL**

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Tuco-tucos are small, subterranean rodents that occur throughout much of sub-Amazonian South America. In Brazil, several studies addressing genetic and ecological features of tuco-tucos have been published so far, but none have evaluated their parasitic fauna. We analyzed the large intestine of 19 specimens of tuco-tucos representing three species: *Ctenomys minutus* (n=10), *Ctenomys torquatus* (n=5) and *Ctenomys lami* (n=4). The mucosae were examined in a stereomicroscope and the contents were washed in a sieve with mesh size of 150µm for helminth collection. The parasites were clarified in lactophenol and mounted on slides for later identification and counting. Seven individuals (38,6%) were parasitized by the nematode *Trichuris* sp. No parasites were recovered from *C. lami*. The prevalence of parasitism for *C. minutus* and *C. torquatus* were 40% and 60%, respectively. The number of parasites varied from 1 to 5 per animal. *Trichuris* sp. is a parasite of the large intestine of mammals. In South America, at least eleven species of this genus are known to parasitize rodents. The specimens found in this study possibly represent a new species for the genus. This is the first report of endoparasites in tuco-tucos in Brazil and the first record of *Trichuris* sp. parasitizing the hosts *C. minutus* and *C. torquatus*.

144 **FLEAS ASSOCIATED WITH SMALL MAMMALS FROM BOLIVIA**

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Adult fleas are common ectoparasites of mammals with most described species known from rodents. More than 2,500 species are known all over the world, but the fauna of many Neotropical areas is still understudied. Such is the case of Bolivia, where less than 25 species have been recorded. Herein we give preliminary information from a survey carried out between August 1984 and June 2000 from different localities of the country situated in the Departments of Chuquisaca, Cochabamba, La Paz, Santa Cruz and Tarija. Mammals were captured alive and fleas were collected by examining their pelage. Collected specimens were fixed in 70% ethanol and prepared following conventional techniques for their identification using microscopy. Hosts were identified as the marsupials (*Didelphidae*, *Marmosinae*) *Thylamys* sp. and (*Didelphinae*) *Micoureus cinereus*; and the rodents (*Cricetidae*, *Sigmodontinae*) *Euryoryzomys nitidus*, *Microryzomys minutus*, *Neacomys spinosus*, *Nephelomys levipes*, *Nephelomys keaysi*, *Andinomys edax*, *Phyllotis caprinus*, *Phyllotis xanthopygus*, *Akodon aerosus*, *Akodon boliviensis*, *Akodon fumeus*, *Akodon mimus*, *Akodon puer*, *Akodon simulator*, *Oxymycterus paramensis*, *Oxymycterus* sp., *Lenoxus apicalis*, *Thomasomys aureus*, *Thomasomys ladewi* and *Thomasomys* sp.. Fleas were identified as species of *Polygenis* (*Rhopalopsyllidae*, *Rhopalopsyllinae*); *Cleopsylla*, *Craneopsylla* and *Sphinctopsylla* (*Stephanocircidae*, *Craneopsyllinae*); *Neotyphloceras* (*Ctenophthalmidae*, *Ctenophthalminae*) and *Adoratopsylla* (*Doratopsyllinae*);

and Hectopsylla (Tungidae, Tunginae). Specimens of the subfamily Parapsyllinae (Rhopalopsyllidae) are still being studied and as yet are unidentified. Species in the genera Cleopsylla and Sphinctopsylla, as well as Neothophiloceras rosenbergi are recorded for the first time in Bolivia, having been previously known only from surrounding countries. Cleopsylla townsendi was recorded from O. paramensis and A. boliviensis; Sphinctopsylla inca on Oxymycterus sp., Thomasomys sp. and P. xanthopygus; and N. rosenbergi from Thomasomys sp., and A. fumeus. With the exception of N. rosenbergi -Thomasomys sp., the remainder parasite-host associations are new. The results obtained contribute to the knowledge of the biodiversity in Bolivia.

145 **HELMINTH COMMUNITIES IN TWO CRICETIDS RODENTS FROM A SECONDARY RAIN FOREST OF MISIONES, ARGENTINA**

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The reserve UNLP Valle del Arroyo Cuñá Piru (27°05'S; 54°09'W) is located in the central hills of Misiones, northeast Argentina, an area originally covered by Interior Atlantic Forest, currently largely represented by 'capueras' (secondary forest). Despite Akodon montensis and Oligoryzomys nigripes (Cricetidae) are the two most commonly trapped rodents in the area their parasite fauna has not been described. Here I provide the first description of their helminth communities. Rodents were trapped using 180 Sherman live traps arranged in 15 concentric circles 12 traps each, forming a 'trapping-web'. Mice were trapped, marked, and released on the first five consecutive nights, collected on both the sixth and seventh nights, and prospected for parasites. Eight species of helminthes were recovered from A. montensis (n=61). Nippostrongylina (2 genera included) (Prevalence [P] = 68.8%; Mean Intensity [MI] = 48.7) and Trichofreitasia sp. (P=6.2%; MI=5.7), Trichuris n. sp. (Trichuridae) (P= 52.4%; MI=2.5), Syphacia carlitosi (Oxyuridae) (P=27.8%; MI=10.4), and Litomosoides sp. (Onchocercidae) (P=1.6%; MI=1); a Cyclophyllidea cestod (P=70.4%; MI=2,9) and a Diplostomidae trematode (P=1.6; MI=8). In O. nigripes (n=22) six species of helminthes were recorded including the Nippostrongylina Guerrerostrongylus zetta and other undescribed species (P=90.9%; MI=48.7), S. kinsellai (P= 22.7%; MI= 30.6), Trichuris sp. (P=4.5; MI=1), L. odillae (P= 4.4, MI=4), and a Cyclophyllidea (P=13.6%; MI=1). Nippostrongylina helminthes and Syphacia spp. were the dominant parasite species on both host rodents. While the "core species" (those with high P and MI) were also represented by the Nippostrongylina. The "satellite species" in A. montensis were represented by Trichofreitasia, S. carlitosi, and Litomosoides sp., and in O. nigripes by the remaining parasite species. No "secondary species" was identified. The cestode and Trichuris from A. montensis could not be assigned to any category since they have medium to high P but low intensity. Litomosoides sp. and Trichuris sp. are accidental species since only one immature specimen was collected. Funded by PICT33019.

146 **HELMINTHS OF RATTUS SPP. IN CHILE: EFFECTS ON THE HELMINTHFAUNA OF ABROTHRIX OLIVACEUS**

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Several studies have shown that exotic host species lose their parasites in processes of colonization of new environments. However, some parasites arrive to the new ecosystem with their host and then they colonize new hosts species. Rattus rattus and R. norvegicus are introduced species in Chile. They have colonized several environments in which they live together with the native rodent Abrothrix olivaceus. In this work, the helminths of R. rattus and R. norvegicus from Chile central were studied with the aim of observing shared helminths taxa with A. olivaceus. Nine species of helminths were found in Rattus spp.: Aonchotoca sp., Aspiculuris tetraptera, Heterakis spumosa, Hymenolepis diminuta, Litomosoides sp., Nippostrongylus brasiliensis, Physaloptera sp., Pterygodermatites (Pauicipectines) sp. and Syphacia muris. Rattus rattus was parasitized by all these species, but in R. norvegicus, A. tetraptera, Pterygodermatites sp. and Litomosoides sp. were not observed. Heterakis spumosa was previously found in A. olivaceus. This is the first record of helminthfauna of Rattus spp. in central Chile, observing that these rodent species have been font of typical cosmopolitan helminths, as H. spumosa, for A. olivaceus. By the other hand, Physaloptera sp. and Pterygodermatites (Pauicipectines) sp. could colonize Rattus spp. from native rodents. Therefore, these advances are the bases for future studies whose aim will be to check which factors affect the processes that act in the parasitic colonization of host species (e. g. role of intermediate hosts species), suggesting the more probable route direction between exotic and native hosts.

147 **HELMINTHS/MAMMALS FROM THE CANARY ISLANDS (SPAIN): A MODEL OF INTEREST.**

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Several studies have shown that exotic host species lose their parasites in processes of colonization of new environments. However, some parasites arrive to the new ecosystem with their host and then they colonize new hosts species. Rattus rattus and R. norvegicus are introduced species in Chile. They have colonized several environments in which they live together with the native rodent Abrothrix olivaceus. In this work, the helminths of R. rattus and R. norvegicus from Chile central were studied with the aim of observing shared helminths taxa with A. olivaceus. Nine species of helminths were found in Rattus spp.: Aonchotoca sp., Aspiculuris tetraptera, Heterakis spumosa, Hymenolepis diminuta, Litomosoides sp., Nippostrongylus brasiliensis, Physaloptera sp., Pterygodermatites (Pauicipectines) sp. and Syphacia muris. Rattus rattus was parasitized by all these species, but in R. norvegicus, A. tetraptera, Pterygodermatites sp. and Litomosoides sp. were not observed. Heterakis spumosa was previously found in A. olivaceus. This is the first record of helminthfauna of Rattus spp. in central Chile, observing that these rodent species have been font of typical cosmopolitan helminths, as H. spumosa, for A. olivaceus. By the other hand, Physaloptera sp. and Pterygodermatites (Pauicipectines) sp. could

colonize *Rattus* spp. from native rodents. Therefore, these advances are the bases for future studies whose aim will be to check which factors affect the processes that act in the parasitic colonization of host species (e. g. role of intermediate hosts species), suggesting the more probable route direction between exotic and native hosts.

148 IS IT POSSIBLE TO ESTIMATE THE INTENSITY OF INTESTINAL NEMATODES THROUGH FECAL MATERIAL STUDIES ON WILD MAMMALS?

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The concentration of parasites, most notably the number of parasite eggs, is an important parameter in epidemiology and the diagnosis of infections. The objective of this work was finding a simple tool that allows estimating the parasite intensity to contribute to the health state knowledge of wild mammal's populations. Two armadillo species *Zaedyus pichiy* and *Chaetophractus vellerosus* (*Xenarthra*), from a net South American ancestry and a wide distribution in Argentina, were taken as study model. The gastrointestinal tract was examined ($n = 4$) and fecal samples were collected of the same individuals. These samples were analyzed with a flotation method of saturated sugar solution and the parasite load was estimated through a MacMaster chamber expressed as eggs per gram of feces (epg) for each morphological egg type. Nematodes found in the intestinal tract were identified as *Aspidodera scoleciformes* and *A. fasciata* (*Aspidoderidae*), and *Moennigia* sp. (*Molineidae*). The proportion of sexes was calculated and in all parasites species it was 1:1 average. The epg was multiplied by the fecal material amount that these animals eliminate per day (5 to 7 gr). The obtained value was divided by the number of mature females found in the alimentary canal of each host and thus the number of eggs/female/day number was estimated (biotic potential). An *Aspidodera* female oviposits among 14-22 eggs per day and a *Moennigia* sp. female does it around 20 eggs per day. The number of female nematodes can be inferred with this information starting from the epg and the number of males arises from the proportion that characterizes each species. These techniques are erected as quantitative tools not only for revealing the presence of parasite species but also for estimating their intensity. Advances in parasitological research on wild animals will allow referring areas, parasite and host associated species, and an evaluation of the antropic impact.

149 PRESENCE OF *FASCIOLA HEPATICA* INFECTION IN «NUTRIA» (*MYOCASTOR COYPUS*), IN URUGUAY

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Fascioliasis is an important parasitic and zoonotic disease, in evident expansion all over the world, which compromises an estimated population of 17 million people. This disease mainly affects domestic ruminants; but wild herbivorous mammals are also susceptible to *Fasciola hepatica* infection. The role of these species in the epidemiology is actually being discussed, as well as its potential conservation threat. Several rodents have been described as effective reservoirs of *F. hepatica*. Brown rats (*Rattus norvegicus*), mice (*Mus musculus*), and Guinea pigs (*Cavia porcellus*) are commonly used as experimental hosts, and sporadically found naturally infected. The black rat (*R. rattus*) was described as a fascioliasis reservoir in specific biotopes, such as Corsica; as well as introduced *Myocastor coypus* in France. Natural infections in South American rodents have been described in guinea pigs *Cavia aperea* and *C. porcellus* (Peru), capybara *Hydrochoerus hydrochaeris* and nutria *M. coypus* (Brazil), and chinchillón *Lagidium viscacia* (Argentina). The aim of the present work is to describe the detection of *F. hepatica* infection in *M. coypus* in Uruguay. The sampling site was located in Lavalleja department, Minas locality (S 34° 24.064' W 55° 21.213'), in a farm with a recognized domestic fascioliasis problem. Nutria's feces were recognized by its typical characteristics, and manually collected in a small pond, where the animals dwell. 5 feces were processed with a Fast Sedimentation Technique (3 minutes), especially used for trematodes eggs. *F. hepatica* eggs were detected in every sample, with a mean number of 7.86 eggs per gram (± 7.11 , min 1.5, max 15.6). It is the first time that *M. coypus* is described as affected with *F. hepatica* in Uruguay. Although further studies are required, the species should be taken into account as an effective wild reservoir and considered in the design of control programmes on domestic animals and human fascioliasis.

150 RECONSTRUCTING THE EVOLUTIONARY HISTORY OF MAMMALIAN SUCKING LICE

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Sucking lice (Phthiraptera: Anoplura) are obligate and permanent ectoparasites of eutherian mammals, parasitizing 11 of the 26 recognized mammalian orders and 18% of mammalian species. These host specific and blood-sucking insects are morphologically adapted for life on mammals; they are wingless, dorso-ventrally flattened, possess a single tarsal claw on each leg to cling to host hair, and have piercing mouthparts for feeding. Given their host specificity, morphological adaptations, and restricted host distribution, the close association between sucking lice and their hosts likely began as early as the end of the Cretaceous with the radiation of eutherian mammals. Thus, this host-parasite assemblage is an excellent candidate for formal studies of cospeciation. Cospeciation studies are not possible, however, until robust phylogenies are available for sucking lice. Although there are more than 530 described species assigned to 50 genera in 15 families of Anoplura worldwide, there have been only two attempts to reconstruct phylogenetic relationships among anopluran families and both of these studies were based on small morphological datasets. In this study, I reconstruct the evolutionary history of sucking lice using multiple molecular markers and use the resulting phylogeny to perform cophylogenetic analyses of these lice with their mammalian hosts. Preliminary findings indicate that multiple families and

genera of sucking lice are not monophyletic and that associations with eutherian mammals are likely the result of a complex history of cospeciation and historical events such as extinction and host switching.

151 SURVEY OF SEROLOGICAL ANTIBODIES TO *BRUCELLA ABORTUS* AND *LEPTOSPIRA INTERROGANS* IN A CAPTIVE POPULATION OF ANTEATERS

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Monitor zoonotic diseases in wild animals kept in captivity, not only important for public health issues, but is an indispensable tool for management of captive populations. Serological studies have shown that many wild species are involved in the epidemiology of these diseases. Research in wild animals showed the presence of brucellosis and leptospirosis in different species, which can act as a source of infection. The knowledge and assessment of the health status of wildlife, both in captivity and in quarantine, is extremely important since many species are part of the wild cycle of different diseases. The aim of this work was to serologically determine the rate of seropositivity to *Leptospira interrogans* serovars and in *Brucella abortus* in a captive population of *Myrmecophaga tridactyla*. A total of 30 samples were processed from clinically healthy animals kept in captivity at 6 institutions in Argentina. Sampling was performed by puncture of the saphenous vein extracting 5ml of blood without anticoagulant after chemical restraint Tiletamina-zolazepam at a dose of 4 mg/kg, of the animals. The technique used for the serological diagnosis of leptospirosis was MAT (micro-Test), recognized internationally as the technique of choice to determine the kinetics of antibody in this disease. All animals tested were negative confrontation of all serovars *Leptospira interrogans* from a dilution 1/50 of the sera. For the serodiagnosis of brucellosis using the technique of BPA (plate agglutination test antigen buffer), all sera tested were negative. The contribution to the knowledge of the prevalence and some variables related to the acquisition of infection in animals is of great importance for the design of prevention and control policies, both in humans and in animals.

152 TEMPORAL VARIATION IN *TRYPANOSOMA CRUZI* INFECTION IN NATIVE MAMMAL SPECIES FROM CENTRAL CHILE

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Fluctuations in environmental conditions can impose short and long-term directional changes in the dynamics of infectious diseases. In the present study, we compare infection rates with the protozoan *Trypanosoma cruzi* in four native mammal species from an hyperendemic area for Chagas disease in Chile during three periods (summer season of 1999-2000, 2005-2006 and 2008-2009). The parasite was detected in DNA extracted from blood by PCR assays targeting the minicircles hypervariable region of *T. cruzi*'s kinetoplast. We compare infection levels among years for all mammal species combined and for each host species separately (the rodents *Phyllotis darwini*, *Octodon degus* and *Abrothrix* sp., and the marsupial *Thylamys elegans*). Overall, results show statistically significant differences in the infection levels among the compared periods (1999-2000: 61%, 2005-2006: 16%, 2008-2009: 22%). Large-scale climate fluctuations, such as El Niño-Southern Oscillation (ENOS), would explain indirectly the differences in prevalence by means of irruptions of small mammal populations after increased rainfall and primary productivity. We suggest that the major El Niño event occurred in 1997-1998 could be indirectly explaining the extremely high *T. cruzi*-infection in 1999-2000, by means of a time-lag response of the wild transmission cycle of Chagas disease in semi-arid Chile after a sudden increase of small rodent populations. Supported by: CONICYT PBCT/PSD66, FONDECYT 1085154 & 1070960.

153 THE TAXONOMIC DIVERSITY OF THE HELMINTH COMMUNITY OF TWO *AKODON* CONGENERS SPECIES IN ARGENTINA

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Akodon azarae and *A. montensis* (Rodentia, Cricetidae) are allopatric species. The former is distributed in Central and North East of Argentina inhabiting open environments (grassland); the second is restricted to the primary and secondary forest of northeastern Argentina. The helminth community of *A. azarae* is well known, but that from *A. montensis* is poorly study. The aim of this work is to compare the richness (S) of helminthes present in these congener hosts along their geonemy in Argentina, determining if the presence of each taxa could be related to phylogenetic or ecological process. *A. azarae* (n=98), collected from 12 localities distributed from Buenos Aires to Misiones showed a richness of 13, while *A. montensis*, collected from 5 localities in Misiones (n=177) S was 9. The curves of accumulation of parasite species are close to reach the asymptote in both host species. This means that the observed richness is similar to the expected one. However, the curve from *A. azarae* indicates that fewer host specimens are necessary to reach the expected richness than in *A. montensis*. The Jaccard coefficient showed low specific similarity between the two parasite component communities (0.1) because of rodents does not share parasites species; however, they share four genera. As *Akodon* species are close related, the presence of these congener helminthes indicates possible co-speciation process due to an environmental barrier interrupting the gene flow between the hosts and their parasites. Those taxa presents in *A. azarae* but not in *A. montensis*, such as the Physalopteridae, Rictularidae, and trematodes are explained by ecological factors related to the host diet and behaviors, survivor of the free living stages of parasites in the environment and/or the presence of intermediate hosts.

154 VARIATION IN *CALOMYS MUSCULINUS* ABUNDANCE IN ENDEMIC AND NON-ENDEMIC ARGENTINE HEMORRHAGIC FEVER (AHF) ZONES.

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It is assumed that reservoir population density is influenced by environmental characteristics, and it is suggested that there is a correlation between population density and disease risk. Thus, our goal was to determine *C. musculus* abundance in zones with different epidemiological and environmental characteristics of AHF. The potential distribution of endemic (epidemic and historic) and non-endemic zones was modelled based on environmental data from localities with known AHF epidemiological situation. Satellite remote sensing techniques were then used to extrapolate biophysical features of potentially suitable places of each zone. Within these zones, one central and two peripheral areas (adjacent between zones) were selected to carry out two trapping sessions in autumns 2007 and 2008. Three sampling sites were selected within each area, and these were different in each trapping sessions. A nested ANOVA followed by the Student Newman Keuls procedure was used in order to compare rodent reservoir abundance by zones and areas. Regarding zones, population abundance of *C. musculus* was higher in the epidemic zone in both years. The non-endemic zone showed different values of abundance when considering years, being lower than historic zone in the sampling sites of 2007 and higher in 2008. Statistical analyses showed significant differences only in rodent reservoir abundance between epidemic and non-endemic zones and between historic and non-endemic zones in 2007. The rodent abundance also varied among areas. The lack of differences observed among zones in 2008 point out the need for additional analyses. It could be important to consider different environmental factors and anthropogenic process to understand the dynamic of *C. musculus*- AHF system.

SYSTEMATICS

155 *CTENOMYS BRASILIENSIS* BLAINVILLE, 1826: REDISCOVERING THE TYPE SPECIES OF THE GENUS *CTENOMYS* (RODENTIA : CTENOMYIDAE)

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The genus *Ctenomys* (Rodentia: Ctenomyidae) comprises more than 60 species of subterranean rodents. Despite the wide distribution in southern South America, the type locality of the type species of the genus - *Ctenomys brasiliensis* Blainville, 1826 - had been described from southeastern Brazil, at the state of Minas Gerais, outside the actual distribution area of the genus. Since it has never been collected again in that state, the type locality of this species is still a matter of investigation. In order to elucidate this taxonomic question and discover the real type locality of the type species of the genus *Ctenomys* we investigated the skull of the type species of *Ctenomys brasiliensis* at the Muséum National d'Histoire Naturelle (MNHN), in Paris, France. In morphometric geometric comparisons with other species of the genus and taking into account the label information the skull analysis lead us to a rediscovery of the type locality of this species. There is no doubt that the specimen was collected in Minas province at the Lavalleja department in Uruguay, where nowadays the city of Las Minas is located. After collection, this material was send to Paris where Blainville described the species *C. brasiliensis*. Thereby, the name "brasiliensis" was a reference to the country of origin. The specimen was collected between 1820 and 1822 when Uruguay was still dominated by the Portuguese monarch. After the Brazilian independence (1822) the Uruguayan territory was considered as part of the new country: Brazil. Later in 1825, Uruguay became independent again. Populations of *Ctenomys pearsoni* Lessa & Languth, 1983 were described in the southern coast of Uruguay at the same area of the type locality of *C. brasiliensis*. We propose that the name *C. pearsoni* must be considered as a junior synonym for the name *C. brasiliensis*, due to the fact that this name had been used to nominate individuals from these populations before the designation of the name *C. pearsoni*.

156 WHO ARE THESE TUCO-TUCOS? A QUESTION MADE SINCE 1848 AND A PROBABLE NEW SPECIES
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There is virtually nothing known about middle-west brazilian species of *Ctenomys* since brief descriptions made of 4 different species in the last 161 years. An expedition covering brazilian states MS, MT and RO registered four new localities in Mato Grosso inhabited by tuco-tucos: Pontes e Lacerda (PL), Cáceres (Ca), Nova Olímpia (NO) and Nova Ubiratã (NU). Ten adult individuals were collected from each site. A caryotypic and a cytochrome-b mitochondrial analysis was carried out to verify the evolutive relations between bolivian and brazilian species. Individuals from Ca and PL presented the same caryotype described for *Ctenomys boliviensis* individuals from Roboré (2N=36, FN=64). These individuals from Bolivia clustered with brazilian individuals from Ca in the phylogenetic analysis. The individuals from NO and NU presented a distinct caryotype (2N=34, FN=66) and were monophyletic in the phylogenetic analysis. The external morphology of the tucos from NO and NU are perfectly distinguishable, presenting a redish brown uniform pelage with a dark line over the head and torso, contrasting with of a more grayish pelage, brown dappled of the Ca and PL individuals. We propose the entity *Ctenomys nattereri* as a valid species, including individuals from Bolivia and Brazil. Based on this data, a new *Ctenomys* species can be considered present in part of Mato Grosso, inhabiting the lowlands between the Chapada dos Guimarães, Chapada dos Parecis and the Ronuro river. More individuals are been analyzed to add morphological and morphometrical support to this hypothesis and to unravel the evolutive history of these tuco-tucos, that increase at least 120000km² to the area occupied by this south american widespread genus.

OTHERS

157 DISEASE AND ECOLOGICAL ASPECTS IN ALIEN AMERICAN MINK (*NEOVISON VISON*) AT THE MAULLÍN RIVER, CHILE.

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The invasive American mink (*Neovison vison*) has become widespread in Chile since the 1970s. We suspect that the mink is imposing a disease transmission risk to endangered endemic carnivores. A study was undertaken to test the hypotheses: 1) mink carry diseases of potential risk for native carnivores; 2) pathogen exposure in the mink is greater in a peri-urban environment with higher abundance of domestic carnivores; and 3) mink ecology lends this species to present a particular disease risk to endemic carnivores. A total of 34 mink were trapped at rural and peri-urban sites of the Maullín river in southern Chile. Animals (n=17 each periurban and rural) were captured over 147(peri-urban) and 193 (rural) trap nights using 2 km and 3.8 km river transects respectively. After capture, sedation and serum collection, animals were euthanized and examined for ectoparasites, and gastrointestinal and cranial helminths. Fecal samples were collected from trapped animals and from mink latrines along the river (n = 61). Serology results (n=30) found positive titers for *Toxoplasma gondii* (22/30), *Leptospira interrogans* serovar pomona (3/30) and *L. biflexa* serovar patoc (1/30). No mink were seropositive for Aleutian parvovirus, Canine distemper virus and other *Leptospira* serovars. More mink (p<0.05) were seropositive for *T. gondii* in peri-urban versus rural habitats, and more (p<0.05) adults were seropositive compared to juveniles. Parasite exams found no mink with gastrointestinal and cranial parasites. The Rat flea (*Nosopsyllus fasciatus*) was present in 6/34 Minks. Dietary analysis of feces found crustaceans (100% of samples), insects (8%), rodents (4%), birds (3%) and fish (2%). Results indicate that 1) mink could serve as sentinel species for zoonotic diseases in peri-urban areas; and 2) mink are ubiquitous in Chile and share food preferences with endemic otters, which may pose a disease transmission risk to these endangered species.

158 EVALUATION OF FOOD INTAKE AND HORMONAL RESPONSES TO ANESTHESIA OF BROWN BROCKET DEER (*MAZAMA GOUAZOUBIRA*)

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Food intake (FI) and fecal glucocorticoids (FC) measures is a non-invasive tool to evaluate stress response. The objective was evaluated the FI and FC responses to anesthesia. Twelve captive adult *Mazama gouazoubira* were used. After 24h of fast, six animals (anesthetized group-AG), were randomly anesthetized during 1h using: P1– induction: isoflurane face mask (3%), anesthesia maintenance: isoflurane (2.6±0.1%; Mean±SE); P2– midazolam oral pre-medication (1mg/kg), after one hour induction: as P1 and anesthesia: isoflurane (2.3±0.1%); and P3- induction: ketamine/xylazine/atropine (5/1/0.05mg/kg) combination i.v. and anesthesia: isoflurane (0.9±0.1%). Serum cortisol (SC) was analyzed every 20 minutes of anesthesia. The other six animals were randomly fasted for 24h, simultaneous to anesthetized animals (control group-CG). The perennial soybean (PS) and horse pellets (HP) intake were measured five days prior to fast period and after anesthesia; and fecal samples were collected in the beginning and end of fast period, and at 12, 18, 24, 30, 36, 42 e 48 hours after anesthesia in both groups. The SC and FC were measured by Enzyme Immune Assay. Data were analyzed by Tukey test (P<0.05 significant). The P2 and P3 increased the HP intake in the five days after anesthesia when compared to P1. The P2 increased the HP intake on the first day after anesthesia when compared to P1 and P3. It was not observed differences in FC concentrations between AG and CG, neither between anesthetic protocols. The FC higher levels found for each protocol (P2>P3>P1) do not corresponded to the pattern observed in the SC (P1>P3>P2). The FI was less affected when anxiolytic (P2) and sedatives drugs (P3) are used and oral administration of midazolam should be preferred because increase and turn the FI faster. The FC measures should be caution interpreted, since the hepatic metabolism of drugs in P2 and P3 probably affected the FC metabolism.

159 TRAPPING, ANESTHESIA AND SURGICAL RADIOTRANSITTER IMPLANTATION IN SOUTHERN RIVER OTTER (*LONTRA PROVOCA*) AND AMERICAN MINK (*NEOVISON VISON*).

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The southern river otter (*Lontra provocax*) is an endangered species native from southern Chile and Argentina, whereas the American mink (*Neovison vison*) is an invasive mustelid present in the same area. This work is part of a study on the ecology and interactions between otters and minks in a marine environment of southern Chile. Between 28 January and 3 April 2009, an average of 30 soft-catch leghold traps and seven box traps were set in an area of 25 km of coast in Isla Magdalena, XI Region, Chile. Traps were activated in the rocky seashore above at least 0.5 m of the highest tide level, and were checked daily. For anesthesia we used a combination of ketamine-medetomidine in a dose of 5-0.05 mg/kg IM for otters, and 10-0.1 mg/kg IM for minks. Reversal was accomplished using atipamezole at 0.25 and 0.5 mg/kg in otters and minks, respectively. The surgery carried out in one otter and 10 minks, consisted in an intra-abdominal implantation of VHF radiotransmitters using a ventral midline approach. Transmitters were

cylindrical for the otter and rectangular and flat for minks, and measured 10x2.0 cm and 3.5x3.2x1.0 cm, respectively. The capture effort for leghold traps was 825 traps/day/otter, and for box traps 15 traps/day/mink. Anesthetic parameters monitored throughout captures and surgeries were within normal expected ranges for both species. However, six minks presented a moderate hypothermia ($<36^{\circ}\text{C}$) at the end of the anesthetic monitoring. Also, a mild hypoxemia ($<90\%$ SatO₂) did occur throughout the anesthetic procedure of the otter. The surgery developed without major difficulties and healing of the incision completed in 4 days. Post-surgically two minks showed evident pain with a prolapsed penis. One individual actively took its sutures off at day 2. In conclusion, we recommend the methods presented for capture, anesthesia and surgery for otters and minks, however, the development of smaller transmitters for minks should be considered for future studies.



Thursday, August 13th

ANATOMY, MORPHOLOGY AND PHYSIOLOGY

1 CLIMATE CHANGE AND SMALL RODENT WINTER SURVIVAL ON THE ROOT VOLE (*MICROTUS OECONOMUS*) EXAMPLE

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Climate change and small rodent winter survival on the root vole (*Microtus oeconomus*) example. Zbigniew Borowski Department of Forest Ecology and Wildlife Management, Forest Research Institute. Braci Le?nej 3, 05-090 Raszyn, Poland Climate warming is known to be able to change the community and demography of many high-latitude rodents, mainly by change of the winter conditions (temperature and humidity, length of winter period, snow cover). There is an empirical evidence, that climate's change drives mammal population dynamics between stable and cyclic phases. Differences in environmental conditions during the period with the lowest population growth rate may result in change of direction of natural selection. However, little is known about link between climate driven processes and natural selection. Still we do not know if global warming creates the higher impact than environment on winter population dynamics of small mammals. Therefore, between 1984 and 2009 I was investigating winter survival of the root vole (*Microtus oeconomus*) in relation to their body mass, sex and winter condition. I compared both warming and local environmental effects and I analysed vole survival on two trapping grids located in the same habitat 3 km from each other. In studied population warmer and colder winters had no effect on winter vole survival, contrary to local environmental effect. Winter selection pressure on phenotypes (body mass and sex) was stable and did not fix under different winter and local environmental conditions. This result suggests, that climate warming has weaker influence on the root vole population dynamics and micro-evolution, than local environmental conditions.

2 COEVOLUTION OF THE REPRODUCTIVE TRACT IN AUSTRALO-PAPUAN OLD ENDEMIC RODENTS- AND ITS ASSOCIATION WITH COPULATORY BEHAVIOUR.

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In mammals, male external genitalia show considerable interspecific diversity in form which may in part be due to either runaway sexual selection by cryptic female choice or sexual conflict. Coevolution of the female reproductive tract morphology appears to be rarely investigated. Here we describe the structure of the female reproductive tract of a species of Australo-Papuan Old Endemic murine rodent, the Spinifex Hopping mouse, *Notomys alexis*, that has a highly divergent male reproductive tract anatomy that includes very small testes, a glans penis with narrow shaft and large spines, minute seminal vesicles, and enlarged vas deferens that acts as a sperm store (Breed 1986, J. Zool. 209: 607-629; Peirce et al 2003 Reproduction 125: 233-240). We use the plains mouse, *Pseudomys australis*, that has a typical, ancestral, male reproductive tract, as a control. We compared the structure of the vagina and cervix and determined the lumen size by resin casting. Plains mice have a comparatively large vaginal lumen surrounded by thin muscle coat and large vaginal fornices. Resin casting showed a dramatic reduction in lumen size at the external os with two narrow cervical canals, surrounded by a highly fibrous cervix, being present. By contrast the hopping mouse has a much smaller vagina lumen surrounded by a thicker, much more muscular, vaginal wall, and minute fornices. The lumen gradually narrows to a single cervical canal and the cervix is far more muscular and less fibrous. Copulatory behaviour of the plains mouse shows multiple intromissions and pelvic thrusting, whereas hopping mice exhibit locking for several minutes but no marked pelvic thrusting. These observations show that, within this group of Australasian endemic rodents, *Notomys alexis* has a highly divergent distal region of the female reproductive tract which has coevolved with that of the male tract associated with which is highly divergent copulatory behaviour.

3 CRANIAL ONTOGENY IN CANIDS AND FELIDS: A COMPARISON WITH CARNIVOROUS MARSUPIALS

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The postnatal ontogenies of some carnivorous marsupials were recently studied in a bivariate and multivariate frame. In a comparative

context, we analyzed the ontogenetic trajectory (RMA and multivariate allometry) of the skull in three species of eutherian carnivorous: *Puma concolor* (n=71), *P. yagouaroundi* (n=41) (Felidae) and *Lycalopex culpaeus* (n=100) (Canidae). As in marsupials, we detect a close interaction between neurocranium and splachnocranium, which results in a modified adult skull, functionally adapted to a more carnivore feeding habits. The trends observed includes some common patterns as the negative allometry of the braincase, shared in all groups (can be interpreted as present in the theria ancestor), the negative allometry of the orbit is a common feature observed in almost all groups, although it is isometric in *P. yagouaroundi* (as in the australidelphian *Dromiciops gliroides*). The positive allometry of the zygomatic breadth detected in the larger placental carnivorous analyzed (*P. concolor* and *L. culpaeus*) combined with the breadth of the braincase determine the space for the temporal musculature. This pattern is shared with the highly carnivorous australasian marsupial *Dasyurus albopunctatus*. Seemingly, the height of the mandibular ascendent ramus in placental predators, implied in the insertion of masseteric muscle, is related with the mechanical resistance, as in the small sized *P. yagouaroundi* it is isometric, whereas in the larger *P. concolor* and *L. culpaeus* it is positively allometric. Indeed, in marsupials this variable is positively allometric only in the larger *D. albopunctatus* and *Didelphis albiventris*. The trends observed in this study suggest that some patterns are strongly influenced by functional demands more than by phylogenetic constraints.

4 DIFFERENCES IN THE LENGTH OF GESTATION IN *ARTIBEUS PLANIROSTRIS* (CHIROPTERA: PHYLLOSTOMIDAE) IN NORTHWESTERN ARGENTINA

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Most species of neotropical phyllostomids are classified as bimodal polyestry presenting reproductive activity throughout the year (aseasonal) or two peaks of birth in a breeding season followed by a period of inactivity, which coincides with months of lower productivity of the environment (seasonal). *Artibeus planirostris* is considered a seasonal bimodal polyestry for some regions of Peru and Brazil and poliestra aestacional for other regions. These studies classify females as reproductively active or inactive based on observable external features to the naked eye (vagina open or closed, or incipient pregnancy term, presence or absence of milk). The aim of this work was to study the annual reproductive cycle of *A. planirostris* histological techniques to understand what happened in those months of apparent sexual inactivity. We studied 21 females, subadults and adults, with optical microscope techniques, captured between 2003 and 2008 in the provinces of Salta and Jujuy. Early Pregnancy could be determined in the months when the females were considered sexually inactive. The females studied showed two reproductive periods, a long one (? 7 months) during the period of lower productivity of the environment, followed by a post-partum estrus and a shorter period (? 3.5) in the period of greatest productivity. This is the first record of variation in the length of pregnancy, where the longer period corresponds to a slower development of the embryo rather than a true diapause. Therefore, females show reproductive activity throughout the year, but with 2 peaks of births, one at the beginning of the wet season and one towards the end, manifesting a great synchronicity between the females of the same population.

5 DISTRIBUTION OF ANDROGEN RECEPTORS IN PROSTATE OF VISCACHA (*LAGOSTOMUS MAXIMUS MAXIMUS*)

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The prostate is an annex gland of the reproductive masculine system. The morphofunctional characteristics of this gland depend of the circulating testosterone levels. In viscacha, the gland has two lobes partially lateralized that not surround in its totality to the urethra. Two glandular zones are defined in relation to the distance with urethra: central (CZ) and peripheral (PZ). These zones have significant histological differences. The objective of the present work was to study the distribution of androgen receptors (AR) in the different glandular zones by means of immunohistochemical techniques. Prostates of adult male viscachas were surgically extracted and processed by conventional techniques of optical microscopy. The AR was immunohistochemically identified using the antibody AR (N-20): SC-816. The obtained results demonstrated that in the PZ, the prostatic adenomeres have a wide and regular lumen. Furthermore, numerous epithelial cells show nuclear immunostaining. In the CZ, the prostatic adenomeres have small lumen and scarce epithelial cells show immunostaining in the cytoplasm. These results reveal morphological differences and significant variations in the location of AR between both zones. It has been demonstrated in normally active cells that the AR localization may be continuously shuttled between the nucleus and the cytoplasm. This dynamic situation is an energy-dependent process. Under conditions that alter the normal levels of cellular energy would affect the nuclear localization and retention of AR in the cellular cytoplasm. Probably, the adenomeres in CZ of viscacha have minor cellular activity due to differences in the blood irrigation between ZP and ZC.

6 ECO-PHYSIOLOGY STUDIES ON THE POPULATION LEVEL IN RODENTS AND ITS RELEVANCE TO SPECIATION

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Studies on the population level of physiological adaptations are of great importance in understanding the animal-environmental relations. As individuals have a similar genetically compositions changes in their physiological and behavioral abilities to cope with various environments are considered as adaptations. In general, eco-physiological differences revealed on the population level can be attributed to selection and presumably should reflect changes in the genetically background. Rodents as small endotherms are

used as bio-indicators because all their necessary resources for existence should be found close to their dwelling place. We have been comparing eco-physiological characteristics in rodent populations from different ecosystems for many years. The Levant as a crossroad between biogeographically regions and its climatic and landscape heterogeneity is a cradle for such studies. The results of our studies, where in many of them we used chronobiological tools, show that indeed populations of the same species inhabiting different ecosystems or even from the same ecosystem but from different habitats, show different adaptations in relations to their thermoregulatory and osmoregulatory abilities. The paper reviews these changes using examples mainly from three species: the golden spiny mouse *Acomys russatus*, the common spiny mouse *Acomys cahirinus* and broad toothed wood mice *Apodemus mystacinus*. Such differences in physiological abilities are of great importance to our understanding of speciation trends. We can study differences between populations of control mechanisms mainly in the endocrine system. A further step is to find genetic differences between the populations in order to discover the genetic background of the physiological differences or the speciation properties of rodent populations in the Levant.

7 FEMALE BIASED POPULATION SEX RATIO IN THE BREEDING SEASON OF *MASTOMYS NATALENSIS*: WHERE DID THE MALES GO?

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In most mammals about the same number of males and females are born. Deviations from an equal sex ratio can be the result of either an adaptive or a non-adaptive mechanism. In a population of the multimammate mouse, *Mastomys natalensis*, each year a marked change in the sex ratio occurred during the second half of the breeding season: the number of males declined sharply. This result was based on 13 years of monthly capture-mark-recapture data collected in Morogoro, Tanzania. We hypothesized that an increased movement pattern of males in pursuit of females during the second half of the breeding season led to higher mortality. We observed that the mobility of males versus females changed markedly in the breeding season. To account for this movement pattern in the analysis of survival the capture-recapture was examined under Pollock's robust design, which allows estimation of emigration and immigration. Our results suggest that during the first 6 years of the study males have a lower probability of survival than females. This could be a result of habitat unfamiliarity, predation pressure or an increased parasitic contact rate. In the last 7 years of the study males' survival is still lower than females' survival, but in addition, temporary emigration from the study area occurs more often in males than females in the second half of the breeding season. We suggest that these observed differences could be sufficient to explain the seasonal skewness in the population sex ratio.

8 GEOGRAPHIC SIZE VARIATION OF PECCARIES (*TAYASSU PECARI* AND *PECARI TAJACU*) IN COLOMBIA

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Geographic size variation in peccaries has been shown along their whole range. In Colombia, however, information on such variation is lacking. In a recent study on peccary geographic distribution in Colombia, it was noted that museum specimens from different regions of the country seemed to differ among regions. To test the hypothesis that both species of peccaries (*Pecari tajacu* and *Tayassu pecari*) differ in size along several regions in Colombia, we conducted 29 mandibular and maxillary measurements in 28 adult specimens of *Pecari tajacu* and 26 adult specimens of *Tayassu pecari* from the north and central regions of the country. Specimens were held at the American Museum of Natural History. One-way analysis of variance was conducted to compare mean measurements among regions. Only non-correlated variables were used in the analysis. Preliminarily, specimens of *Pecari tajacu* from the northern region were marginally smaller than specimens from the central region of the country ($p=0.06$). Specimens of *Tayassu pecari* from the northern and western region were significantly smaller than specimens from the central region ($p=0.001$). Further measurements of specimens from other regions in the country, currently held at the mammal collection of Instituto de Ciencias Naturales and Instituto Humboldt in Colombia, are being performed, to include data from the southern region of Colombia, and to provide a more complete analysis of size variation of both species in the country.

9 GUT SIZE FLEXIBILITY IN RODENTS: WHAT WE KNOW, AND DON'T KNOW, FOR SOUTHERN HEMISPHERE SPECIES

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Phenotypic plasticity comprises a central concept for understanding how organisms interact with their environment, and thus, is a central topic in ecology and evolution. A particular case of phenotypic plasticity is phenotypic flexibility, which refers to reversible change in organism traits due to changes in internal or external environmental conditions. Flexibility of digestive features can be understood considering the benefits of digestion, which links animal foraging to metabolizable energy and nutrient gain, and its costs, which are partly indexed by digestive tract tissue mass, which is one of the most expensive to maintain in terms of energy and protein metabolism. Studies in rodents on gut size flexibility have been developed for more than a century, mainly from two different areas of the biological sciences, physiology and ecology. However, as for several other topics related with physiological ecology, both kinds of studies largely developed along separate paths. In this talk I will bring together all information available on gut size flexibility in rodents, in order to evaluate what is known (and don't know) for Southern Hemisphere species. In addition, future directions for the study of digestive flexibility in vertebrate animals will be presented. Funded by Caseb (Chile) and CSIC (Uruguay).

10 INTERSPECIFIC VARIATION OF THE INTESTINAL VILLI MORPHOLOGY IN COLOMBIAN BATS

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This paper describes the interspecific variation of the spatial organization and form of intestinal villi in 35 species of Colombian bats, representing Emballonuridae, Noctilionidae, Mormoopidae, Phyllostomidae y Molossidae, of the Chiroptera order. The aim of this descriptive exploration was to assess the extent of variation and to reveal some evolutionary signs in features of the alimentary tract. Was found six differential morphological patterns, four of whom have not been mentioned in previous studies of mammals. There was no significant morphological variation along the intestinal villi or between individuals. It is possible that these traits are not exposed to a strong selective pressure and that the nature of variation is given by its relationship with the genetic expression of other traits of the alimentary tract, exposed to intense selective pressures. However, are needed future comparative studies with explicit reference to a phylogenetic framework to reveal a more accurate cause of the variation.

11 MORPHOMETRIC ANALYSIS ON THE DIETS OF BATS ASSEMBLY IN TRINIDAD (CASANARE-COLOMBIA)

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The great diversification of bats in the tropics is due in part for the wide variation of habitat and food of that may use. The morphological differences, the echolocation and wing morphology, allow the species to use different types of habitats and food resources. The purpose of this work is to establish whether there is a relationship between the morphometric variation of the different species of bats captured in the study area, with the resources that they are consuming and the habitat that they are using. It were captured 307 individuals of whom 96 were collected in order to obtain a record minimum representative for each species found at the site of sampling. A total of 24 species were found in the study area. Analysis were based on traditional morphometric and geometric morphometric, the second for the wing. He was finally found significant differences that led partnerships in length and shape with respect to different diets. Key words. Morphometry, geometric morphometry, diet, group.

12 ORBIT ORIENTATION IN DIDELPHID MARSUPIALS: EFFECTS OF ECOLOGY, PHYLOGENY, MORPHOLOGY AND SIZE

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Considered a morphologically conservative group, didelphid marsupials present a considerable amount of variation in ecology and body size, some of which were shown to relate to morphological structures. To assess the effects of ecology, phylogeny and size, we calculated orbit orientation in 873 specimens of 16 didelphid genera using landmarks inserted in digital images of the skull, yielding estimates of orbits convergence (their position relative to midsagittal line) and frontation (their verticality degree). Similarities in these variables across taxa were compared to ecological, morphological and phylogenetic data using matrix correlations and Mantel tests, in order to evaluate the influencing factors on orbit orientation in didelphids. Results show an inverse relation between convergence and frontation. Didelphids orbits are – as a whole – highly convergent and with low frontation (pointing in the same direction but dorsally positioned). Nevertheless, Analyses of Variance showed a significant differentiation in orbit orientation between taxa. Among morphological data, only rostral variables correlated with orbit orientation. Increasing snout length yields more convergent orbits, while increase on snout breadth imply in more frontated orbits. Size and encephalization quotients are uncorrelated with orbit orientation. Among ecological data, diet showed significant correlation while locomotion is the factor that less affects the orbits position. Phylogeny is uncorrelated to any orbital parameters measured. Thus, it appears that ecological factors play a more important role on orbit orientation than previously expected, and differentiation on orbit orientation seems to be an adaptive rather than an inherited attribute. Effects of diet and rostral morphology suggest a possible combined role of feeding and mastication on orbit configuration through the action of masticatory muscles. Aggregation of new data on the masticatory apparatus and muscular action that influence bones which compose the eyes sockets will help to clarify the patterns of these morphological influencing factors on orbital construction.

13 PITUITARY PARS INTERMEDIA OF MALE VISCACHA: A MOPHOMETRIC STUDY OF SEASONAL AND AGE-RELATED CHANGES

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The *Lagostomus maximus maximus* (viscacha) is a rodent mammal with nocturnal habits that live in underground caves in semiarid zones in the center of Argentina. Their physiology and behaviour vary during the year according to modifications in environmental signals such as photoperiod length, temperature, rainfall pattern, food composition and social interactions. The aim of this work was to study the pituitary pars intermedia in seasonally captured adult male and immature viscachas by immunohistochemistry and image analysis. The pars intermedia exhibited a well-developed parenchyma with scarce connective tissue and vascularization. It

was formed by a close association of melanotrophs and folliculostellate cells. The folliculostellate cells were stellate in shape with cytoplasmic processes, and they originated follicles with PAS-positive colloid inside. The morphometric parameters of melanotrophs, follicular colloid and folliculostellate cells (S-100-ir and GFAP-ir) varied seasonally and in relation to age. These parameters showed minimal values in the adult males captured in winter and in immature animals, and they were maximal in summer. The percentage of vimentin-positive area of the folliculostellate cells was maximal in immature animals, decreased in relation to age and did not vary seasonally in the adult animals. The greatest development of pars intermedia in the adult animals in relation to the immature ones is probably related to the adults' adaptation to the semiarid environment. The expression of the tested proteins suggests a probable neuroectodermic origin for the folliculostellate cells of the viscacha pituitary pars intermedia. In addition, the cytoplasmic processes of folliculostellate cells might originate an intercellular communication network inside the pars intermedia. The decrease in the morphometric parameters melanotrophs, follicular colloid and folliculostellate cells in winter suggests a low endocrine activity of this zone. This fact might be due to the effect of the short photoperiod and high melatonin serum levels.

14 **POSTCARNIAL ANATOMY OF MICRONYCTERIS *MICROTIS* (CHIROPTERA: PHYLLOSTOMIDAE: PHYLLOSTOMINAE)**

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An anatomical description of the postcranial skeleton of *Micronycteris microtis* (Chiroptera: Phyllostomidae: Phyllostominae), is offered. This is a member of a family of neotropical bats, characterized by their wide range of feeding habits, and preferences for food items. Our study was based in a sample of specimens collected in two localities of northwestern Argentina, recently added to the list of bats of the country. The analysis was focused in comparing similarities and differences of three species of bats of the same family, but basically different with respect to their food preferences and habits. *Micronycteris microtis* is an insectivorous foliage-gleaning bat, that can also eat fruits. Its skeleton is described and compared with the skeleton of two other species already studied: *Chrotopterus auritus*, a carnivorous bat, and *Glossophaga soricina*, a nectarivorous bat. These two species were chosen in order to highlight morphological differences and similarities between species holding different feeding guilds. Although the three species belong to the same family they are fundamentally different in size and basic food habits and share similarities in the type of flight and high maneuverability, which allows them to maintain a flight suspended and a great ability to avoid obstacles, which is reflected in the wide and short shape of the wings. We here describe, in detail, some skeletal structures such as the atlas, axis, femur, humerus, metacarpals, pelvis, prosternon, and scapula, among others.

15 **PULLEY FUNCTION OF MASSETER INFRAORBITAL PART IN DESERT-DWELLING HETEROMYID RODENTS**

Kazuhiko Satoh, Yasutoku Kogaya, Kin-ya Kubo & Sadakazu Ejiri

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Pulley function of masseter infraorbital part in desert-dwelling heteromyid rodents Kazuhiko Satoh*, Yasutoku Kogaya, Kin-ya Kubo, Sadakazu Ejiri Department of Oral Anatomy, Asahi University School of Dentistry, Mizuho, Gifu, Japan Desert-dwelling forms of the heteromyid rodent have large eyeballs and auditory bullae as adaptations for nocturnal vision and predator avoidance. These sense organ modifications greatly reduce the volume of the temporalis. To examine compensation for reduction of the backward force by the other masticatory muscles, their anteroposterior forces were calculated based on the muscle mass, length, and origin-insertion site, and then compared between a moderately specialized form, *Chaetodipus formosus*, and a highly specialized form, *Dipodomys merriami*. The rudimentary temporalis of *Dipodomys* lacks the origin on the lateral side of the brain case found in *Chaetodipus*. Many units within the masseter act anteriorly in both species. The infraorbital part of the masseter, however, has a role similar to that of the temporalis muscle. The line of action for this part is posteriorly convex due to the zygomatic plate extending posterior to both the origin and insertion of the muscle. The masseter infraorbital part consequently produces a backward force on the mandible by pulley-like mechanism. The masseter infraorbital part is much more massive in *Dipodomys* than in *Chaetodipus*. This characteristic of *Dipodomys* compensates for the excessive reduction in size of the temporalis.

16 **SPERM ANALYSIS OF CAPTIVE GIANT ANTEATER (*MYRMECOPHAGA TRIDACTYLA* LINNAEUS, 1758): PRELIMINARY RESULTS**

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The present study shows the preliminary results of physical, chemical, morphological and functional characteristics of captive Giant Anteater (*Myrmecophaga tridactyla*) semen. These information are important for forthcoming studies aiming to apply assisted reproductive techniques as a conservational tool in this species. All animals of this study are kept in zoo facilities in São Paulo State, Brazil. Semen samples were collected by electroejaculation under general anesthesia. Routine sperm analyses were performed in order to study the characteristics of the ejaculate (i.e. volume, concentration, motility, vigor, pH and sperm morphological abnormalities). Some sperm functional tests were also performed in order to evaluate membrane (eosin nigrosin) and acrosome (simple staining method - Pope) integrity and mitochondrial activity (3,3'-diaminobenzidine). Preliminary results for volume, motility, vigor and pH were 811.6 ± µl (333 µl-1656 µl), 26.6% (15 - 40), (1-2 and 2-3) and 7, respectively. Major, minor and total sperm defects averaged

60%, 7.8% and 68%, respectively. The plasmatic and acrosomal membranes integrity tests showed 49.2% and 15.3% of injured cells, respectively. The results of sperm cell mitochondrial activity were: Class I = 68.5%; Class II = 21.5%; Class III = 5.3%; Class IV = 2% e Class V = 2.6% (Class I: Full mitochondrial activity; Class V: Absent mitochondrial activity). No spermatid cells were observed in three animals out of six. Two of them were about two years old which may indicate that animals were not mature. The other animal showed a body fat of 35%. There is limited information regarding the semen of this species. To our knowledge the data presented in this study are the first obtained from ejaculates of Giant Anteaters, denoting the lack of knowledge on basic reproductive aspects of this species. More representative results from an increased number of individuals are desirable and will be available in near future.

17 THE COLD INTOLERANCE CHARACTERISTICS AND BROWN ADIPOSE TISSUE IN THE HOUSE SHREW, *SUNCUS MURINUS*

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The house musk shrew (*Suncus murinus*, Insectivora: Soricidae), or *suncus* as laboratory name, distributed in tropical and subtropical areas in Asia, is thought to be cold intolerant. When maintained at low temperatures, it becomes hypothermic, immobile and eventually dies. However, no circumstantial reports on this phenomenon are currently available. We therefore exposed *suncus* to cold temperatures for 3 weeks to evaluate the effects of a cold environment. By cold exposure, about half of *suncus* became immobile or died in the early phase of the experiment. No marked changes were found in body weight, epididymal white adipose tissue (EWAT), or interscapular brown adipose tissue (IBAT) in *suncus* that became immobile or died during the early phase. Moreover, in this phase, immobile *suncus* easily recovered from deep hypothermia if warmed by hand. Some *suncus* also became immobile or died in the middle and late phases. In contrast to the early phase, these animals showed decreased body weights and atrophied lipid droplets in EWAT and IBAT. These results suggest that *suncus* are susceptible to cold, and that reasons for their cold intolerance are a malfunction of rewarming from daily torpor caused by low thermogenic activity and lipid depletion in BAT. As one of the mechanisms of the cold intolerance, we have considered the component of the food since *suncus* are fed by diet containing less fat. Since it has been reported that the oral administration of sucrose induces hypertrophy of mouse brown adipose tissue (BAT) and the hypertrophy helps the mice to adapt to cold environments, we hypothesized that sucrose may also improve the cold intolerance of *suncus* by inducing hypertrophy. Therefore, we studied morphological changes in BAT as well as other tissue that are involved in energy production by oral administration of sucrose in *suncus*.

18 USE OF SPACE BY *LONTRA LONGICAUDIS* IN AN ALTERED ENVIRONMENT IN THE SOUTH OF BRAZIL

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The neotropical otter is a semi-aquatic mammal widespread in the neotropical region and threatened with extinction in the state of Rio Grande do Sul, Brazil. Due to the habitats degradation, many of the environments used by the species have changed, and there is little information about how it came to use them. This study aimed at obtaining information about the space used by *Lontra longicaudis* in the inferior course of the Caí River. In the sampled stretch, the river is wide with small and big sized boats crossing. The river margins have different degrees of disturbance, being the right side less affected since part of this area belongs to a private conservation unit. About 1 km of the river was surveyed along a stretch of 10 m distance on both margins on foot and with the help of a boat from December 2005 to December 2007 (17 expeditions). The otter's signs such as spraints, tracks, footprints and scratches found had their date, place, geographical coordinates, deposition place and distance from the water line registered. The shelters were identified and monitored concerning their reuse. For the analyses, all the monitored stretch was sub-divided into 50 X 50 quadrants, totaling 96 quadrants. Considering the 226 signs registered, there were no differences in the number of quadrants used ($U=1138$; $p=0.96$; $n=96$) nor in the shelter use comparing both river edges, indicating that the use in this stretch is similar on both river edges despite the level of disturbance in the environment. A greater use of the quadrants where there were shelters in relation to the other ones was observed ($U=112$; $p=0.002$; $n=96$), suggesting that the scent marking is more intense in the areas next to their shelters which can be attributed to a territorial demarcation of these areas.

19 VARIATION IN PLASMA CORTISOL CONCENTRATIONS AND CAPTURE STRESS IN WILD AND CAPTIVE POPULATIONS OF DEGUS, *OCTODON DEGUS*

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In vertebrates, unpredictable and/or noxious stimuli can spark a stress response. Such responses can shift the phenotype to an evolved suite of physiological, hormonal and behavioral traits that promote survival. One important characteristic of the stress response is the release of glucocorticoids (GC) into circulation, which can mediate changes in blood glucose, body temperature, foraging activity, and fat storage. In the wild, many animals including mammals seasonally modulate GC secretion. However, compared to the number of studies that have examined stress-induced in other free-living animals, the GC data for mammals are sparse, and even fewer studies have determined baseline GC concentrations in the wild. In this study we examined the modulation of cortisol in a South American rodent endemic to Chile, *Octodon degus* (common name: degu). We found variation in the basal (unstressed) and stress-induced plasma (acute stress) cortisol levels associated with (i) wild individuals during the breeding season, (ii) degus under captive conditions from two contrasting populations (low altitude and high altitude populations), and (iii) degus born in captivity. We

catalog these data as a first step toward establishing an ecological cortisol profile in degus, also bearing in mind the perturbation of its natural habitats and population declines. In addition, this type of information may serve as a physiological and health indicator, given the increasing worldwide tendency to maintain degus under captive conditions. (FONDECYT 1090794, ICM-P05-002, PFB-23-CONICYT)

BEHAVIOUR

20 ARE ORCAS SILENT WHEN HUNTING? A FIRST INSIGHT ON INTENTIONAL STRANDING IN PATAGONIA

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In Punta Norte, Peninsula Valdes, orcas (*Orcinus orca*) hunt nearshore, stranding intentionally on the beach to capture sea lions (*Otaria flavescens*). Orcas may be hunting noisily, for example using echolocation to detect their prey, or quietly by using passive listening. It was suggested though that orcas feeding on marine mammals need to be silent because marine mammals have well developed acoustic organs, and can therefore easily detect potential predators. In this work we investigate whether killer whales at Punta Norte, Peninsula Valdes, vocalize when stranding intentionally on sea lion pups. We put a hydrophone on the most frequently used hunting site known in the area and recorded all acoustics made by orcas within a frequency range from 0- till 22- kHz during 8 intentional strandings. Vocalizations were identified and classified. We quantified the normalized vocalization frequency (NVF) in 30 sec intervals during the last 5 minutes before and 1 minute after each IS event. Within the 5 min interval preceding the IS, we found an increase in the NVF. We also found a comparable level of NVF 1 minute before and 1 minute after each IS event. These results suggest that killer whales do vocalize during this hunting behavior. This increase was due to a higher number of social (e.g. whistles and calls) instead of hunting (e.g. echolocation) vocalizations, suggesting echolocation is not playing a key role in prey detection. One possible explanation is that the advantage of increasing the accuracy of prey location information by social vocalizations and prey sounds might compensate for high cost echolocation due to topographic features (e.g. increase in echoes) and anti-predatory behavior.

21 AT-SEA MOVEMENTS AND ATTENDANCE PATTERNS OF LACTATING SUBANTARCTIC FUR SEALS FROM MARION ISLAND

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Sixteen lactating Subantarctic fur seals (*Arctocephalus tropicalis*) were satellite-tracked during the winter of 2006 (n = 6), summer 2006/07 (n = 6) and autumn/winter (n = 4) seasons of 2007, from Marion Island (46°54'S, 37°45'E) in the Southern Ocean. Despite varied individual movement patterns, a favoured area lay to the northeast of the island. In contrast to findings for populations at similar latitudes, female Subantarctic fur seals from Marion Island did not undertake short overnight foraging trips but trips consistently went beyond 300km from the island. This aligns with the at-sea duration of lactating seals from temperate Amsterdam Island. Time spent at sea, time on shore (telemetry data and maternal attendance observations), maximum distances travelled, total distance travelled and movement variation of tracks (telemetry data) from the island varied seasonally. Faecal analysis revealed a diet comprised primarily of myctophid fish with little variation between seasons. Well-defined areas of restricted movement of the fur seal females coincided with a cluster of significant bathymetric features to the west and northwest of the Crozet Plateau with the Del Caño Rise clearly being important. The results suggest that bathymetry encountered by seals during the transit phases of foraging trips, and other potential oceanographic correlates, explain the preferred long-distance eastward movements. Though probably not linked, the Subantarctic fur seal populations from distant Amsterdam – and Marion Island appear to be similarly influenced by bottom-up factors. Conversely, the Îles Crozet and Marion Island Subantarctic fur seals differ in their foraging ecology despite being neighbours.

22 AUTUMN FOOD CACHING BEHAVIOR OF THE NORTH AMERICAN BEAVER, *CASTOR CANADENSIS*

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The two beaver species (*Castor fiber*, Eurasian Beaver; *C. Canadensis*, North American Beaver) are semi-aquatic, primarily nocturnal and live in family groups exhibiting both genetic and social monogamy. They are described as choosy, generalist herbivores utilizing many species of herbaceous and woody plants found in their riparian habitats. Both beaver species cut and store branches of woody species during the autumn, which they use as food during the winter when the nutrient value of living vegetation is low and ponds may freeze limiting beaver movement. The food cache is generally constructed in front of the lodge (or burrow) where the beaver family resides during the winter months. Published reports indicate that beavers are less selective in species choice for the food cache as the autumn progresses and that there is a clear correlation between food caching activity and decreasing air temperature. In this paper we examine the weekly and seasonal food caching behavior by using motion activated and time-lapse photography. Beavers were less active around the food cache during the early stages of food cache construction (early to mid October), but increased their activity later in the caching season. Peak weekly activity occurred between week 5 and 6 (late October) and beavers were more active in caching branches later in the autumn. Total activity around the food cache increased after the last week in October and is strongly correlated with decreasing air temperature. These preliminary data support earlier published reports and allow further study of individual (specific family member) contribution to the construction of the winter food cache. These data are significant due to the evolutionary importance of the food cache in the life history of the beaver and will allow testing of theories into the evolution of monogamy in beavers.

23 BEHAVIOR OF *HISTIOTUS VELATUS* (CHIROPTERA, VESPERTILIONIDAE) IN THE «PARQUE ESTADUAL DE ITAPUÃ», RS, BRAZIL.

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Bats spend over half of their lives inside the day roost sites and little it is known about their diurnal behavior. *Histiotus velatus* is an insectivorous species that was found using the roof of a construction as a roosting place. We have intended to study its behavior including intraspecific and interespecific relationships, during roosting time. Observations were carried out in the "Parque Estadual de Itapuã", Viamão, Rio Grande do Sul, Brazil. We used a cine camera Sony NPF 570 Nightshot, as well as observations and photography. Every two weeks were the frequency of observations in the field, alternating activity in the morning and in the afternoon. The results were got from august/2007 to september/2008. The diurnal behavior was divided in states (sleeping, active, grooming) and events (wing stretching, wings flicking). Maternal care were studied too. From November to December occurred the parturitions. Up to 30 days of age the nestlings stayed close to their mothers, being loaded for them. Between 30 and 60 days of age the nestlings form a nursery group. The bats stayed in the shelter from October to May, disappearing in the wintertime and coming back in September (springtime). The colony was built up of near 80 individuals. This number was gradually decreasing between April and May. The sleeping behavior among adults prevailed in the morning as well as in the afternoon. The walking behavior was more frequent during the mornings of the spring. While during the summertime was more frequent in the afternoon. The other events were observed among the adults, showing no difference between the mornings and the afternoons. Prevalence of sleeping behavior, among the juveniles, was observed during the morning and the walking during the afternoon.

24 BEHAVIORAL SYNDROMES AND MAMMALIAN MOVEMENT: DOES PERSONALITY COUNT?

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In the last decade, the ecological and evolutionary implications of individual personalities have become a prominent field of research in behavioral ecology. Behaviors such as exploration, boldness, aggression, and dispersal may correlate across contexts, forming "behavioral syndromes". Numerous recent studies in wild bird or fish populations have suggested a "mover" - "non-mover" personality axis. Little work has been done on mammals, however, outside of common domestic and laboratory strains. Field observation in some mammals suggest that "long" and "short" distance dispersers may move in fundamentally different ways, with short-distance dispersers using exploratory movements to become familiar with a new space before settling. A connection should be made for mammals between the laboratory understanding of behavioral syndromes and field evaluation of individual movements. Here I present a theoretical framework for how dispersal tendencies in mammals may relate to behavioral syndromes, and potential population ramifications at the edge of a species range or in fragmented habitat. I also provide preliminary evidence on movement behavioral syndromes in captive dwarf hamsters (*Phodopus sungorus*) and wild muskrat (*Ondatra zibethicus*).

25 CAPYBARA SOCIAL STRUCTURE: A NEW INSIGHT

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Group size and social structure are key ecological aspects to understand evolutionary processes and to define wildlife management strategies in social animals. In this research we identified and compared Capybara (*Hydrochoerus hydrochaeris*) social structure of a focal group in two contrasting climatic seasons in de flooded savannas of Colombia. Social structure was characterized using Social Network Analysis measures: group cohesion and subgroup structure. In addition, we characterized Capybara groups' genetic structure. We used microsatellites markers to measure number of alleles, allele frequency, polymorphisms and heterozygosis. The group showed a characteristic social organization in each of the evaluated seasons. We identified key differences in subgroup structure, but group cohesion doesn't seem to be affected by seasonal conditions. Genetic analyses are still running, but preliminary results shows an interesting proportion of heterozygosis.

26 DAILY AND SEASONAL ACTIVITY PATTERNS OF THE CAPYBARA (*HYDROCHOERUS HYDROCHAERIS*) IN ESTEROS DEL IBERÁ, ARGENTINA

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Capybara (*Hydrochoerus hydrochaeris*) is the largest living rodent, widely distributed in South America. In Argentina it is an important economic resource: free-living populations are commercially harvested for their meat and leather. However, little is known about its ecology and behavior. For this reason, between spring 2006 and winter 2007, we studied daily and seasonal activity patterns of a capybara population in Esteros del Iberá, in relation to air temperature. Using scan samples we surveyed each of 15 groups from dawn to dusk every 15 min recording air temperature. Daily activity was different according to time of day ($X^2=335.04$; d.f.=45; $p<0.01$), with animals being more active at dawn. The numbers of "active" individuals varied according to season ($p<0.05$). In spring and summer we observed a bimodal pattern; in fall the autumn, it was unimodal, while in the winter we observed three activity peaks along the day during the winter. The numbers of active individuals varied was seasonally different varied seasonally ($X^2=8.029$; d.f.=3; $p<0.045$). We observed more active individuals during the winter, then with fall, summer and spring being the season with less activity during the day. Daily activity was not related to daily temperature but we found significative regressions between the number

of individuals (active and inactive) in habitats with water and daily temperature, with a better adjustment in the warmer seasons (spring-summer), while in the coldest days in fall and winter we did not find any relation between those variables. There was no relationship between capybaras' activity and air temperature during summer and spring. We observed fewer active capybaras during the warmer hours in those seasons and lower daily activity. During fall and winter we found more active capybaras during the day and during the warmer hours of the day.

27 **DAILY DISTANCES TRAVELED AND ACTIVITY PATTERN OF BOBCATS (*LYNX RUFUS*) FEMALES AND MALES AT CHIHUAHUA DESERT, DURANGO, MEXICO.**

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To know bobcats daily movements and activity pattern is important to understand how these predators distribute their time into daily activities. The objective was to investigate if males and females bobcats travel similar daily distances and how is their daily activity pattern related with number of traveled periods at Mapimi Biosphere Reserve (Chihuahuan desert), Durango, México. We captured seven adult bobcats (4 females and 3 males) with soft-catch traps, registered their size and weight, each cat was ear-tagged and equipped with GPS collars (Lotek GPS 3300s) on 2006 - 2008. Bobcat locations were registered daily every half an hour at night (19:00-8:00h) and every hour at day (8:00-19:00h) for a 9 week period. Daily movements were estimated by plotting straight-line distances between consecutive locations. Females travel daily longer distances than males ($F=165.7 \pm 8.48m$, $M=122.4 \pm 15.09m$), ($t=4.524$, d.f. = 71, $p<0.05$). Between females, one showed mean smallest distances moved ($115.7 \pm 12.80m$), other had the highest ($226.3 \pm 24.97m$) and two had similar and intermediate distances (153.2 ± 18.23 & $148.0 \pm 13.45m$), ($F=27.806$, d.f. = 3, $p < 0.05$). Between males, two individuals showed similar mean distances traveled ($M_1=127.2$, $M_2=142.8$) while the third one show smaller movements ($M_3=87.119$), ($F=12.992$, d.f. = 2, $p<0.05$). Females and males had similar activity patterns with two peaks of main activity, with longer distances traveled from 5:00 to 22:30 and shorter distances from 23:00 to 4:30. Females active peaks duration is longer (5:00 -15:00 and 16:00 - 24:00) than males (4:30 - 8:00 and 19:30 24:00). Differences found on daily traveled distances between sexes could be related to bobcats activities in a desert environment, because these were different to other studies made in United States, where males usually travel longer distances than females. Bimodal activity pattern is similar to other distribution areas where bobcats sincronized with lagomorphs, their main prey also in Mapimi.

28 **DIET OF *NASUA NASUA* AND *PROCYON CANCRIVOROUS* IN AN AREA WITH EXOTIC PLANTATION IN BRAZIL**

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This work describes the diets of coatis (*Nasua nasua*) and raccoons (*Procyon cancrivorous*) through analyzing stomach contents of road-killed specimens in Paraná State (24°12'42"S, 50°33'26"W), Brazil. The landscape includes native grasslands and forests, and silviculture. Food items were represented by frequency of occurrence (FO) and relative volume (RV). Stomach contents of 23 coatis were analyzed, from which 65 items were identified. FO analysis included all the stomachs while RV considered 16 of them. Both animal and plant items were frequent (100% and 91.3%, respectively). RV were mostly represented by plants (72.6%), followed by animals (16.1%) and soil (8.6%). Among plants, consumption of exotic species was higher (FO=69.6%; RV=64.6%) than native ones (FO=43.5%; RV=7.4%). Fruit represented the FO=87% and the RV=72.1%, mainly due to the consumption of *Eriobotrya japonica*, *Morus nigra*, *Persea americana* (exotics) and *Syagrus romanzoffiana* (native). Among animal prey, invertebrates (FO=95.7%; RV=10.3%) were more representative than vertebrates (FO=21.7%; RV=5.8%), mainly because of the frequency of Coleoptera (60.9%) and Annelida (52.2%) and the volume of saprophytic Diptera larvae (5%). Vertebrates were represented by rodents (FO=17.4%; RV=3.3%) and birds (FO=8.7%; RV=2.5%). Five specimens of raccoons were analyzed, from which 18 items were identified. Animals had higher FO (100%) and plants had higher RV (74.8%), given the high consumption of *S. romanzoffiana* (FO=80%; RV=74.5%). Both invertebrate and vertebrate prey had FO=60%, although vertebrates had higher RV (23%). Invertebrate prey FO was 60% for insects and 20% for crustaceans and chelicerates. Vertebrate prey FO was 20% for rodents, fish and amphibians. Rodent RV was 21.7%. Coatis had generalist diet evidenced by the consumption of exotic species while the usage of soil as food item may reflect lack of minerals in a disturbed area. Conclusions about the diet of raccoons were limited given the small sample.

29 **ENRICHMENT OF THE FORAGING BEHAVIOR OF *CEBUS APELLA* IN FAUNISTIC PARK, ARGENTINA**

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Is widely knowledge that is necessary conduct studies on identifying psychological needs of animals in captivity in order to working with animal managers to provide objective data for the improvement of animal management. The performance of abnormal behaviors, as stereotypies, is interpreted to reflect a lower level of well-being and an inadequate environment. Also, inactivity and high aggressiveness are currently considered indicative of lower level of well-being. In this study was assessed the environment enhancement of *Cebus apella* in order to promote their well-being in the Faunístico Park, San Juan. We registered, by focal and scan

sampling, the behavior of four specimens of *C. paella* during three phases: before carry out enrichment (first phase), another stage was performed immediately after enrichment (second phase), and the last stage was to two months to enrich the environment in order to know the effectiveness of an environment enhancement program (third phase). The individuals of *C. paella* spent more time foraging when the enrichment was sustained in the time i.e. in the third stage of enrichment while we found intermediate investment of time after enrichment (second phase) and the lesser time was found before enrichment (first phase, ($F(2,1415)=28.98$; $p=0.00001$). With respect to aggressiveness and anxiety, we found that the investment of time in both behaviors was significantly lowest at third phase compared to second and first phases ($F(2,1415)=5.22$; $p=0.00547$; $F(2,1415)=4.09$; $p=0.01684$, respectively). In the third stage we find a significantly less time spent in abnormal behaviors ($F(6,2826)=6.28$; $p=0.00001$). This study is in agreement with several studies that suggest that enrichment can promote an increase in activity and a reduction in abnormal behavior.

30 **EXPLORATORY AND SPATIAL LEARNING ABILITIES IN TWO AFRICAN MOLE-RATS WITH DIFFERENT SOCIAL SYSTEM**

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The goal of this study was to examine differences in the exploratory activity, spatial learning and memory between two strictly subterranean rodents with different social systems, solitary silvery mole-rat (*Heliophobius argenteocinereus*) and social giant mole-rat (*Fukomys mechowii*) in a complex artificial maze. Although the giant mole-rats showed better performance in most of tested parameters, this could not be simply explained by superior learning abilities of social species. Obtained differences could be more attributed to different exploratory activity in both species. Despite the same level of motivation, the solitary mole-rats were remarkably more careful in exploration, moved with lower velocity, spent more time in the maze, made more errors and traveled a longer path before reaching the reward box. We suggest that solitary subterranean way of life probably inevitably leads to more cautious behaviour and this could be the main factor favoring social species in spatial navigation tests. It is necessary to clearly distinguish between exploration and spatial navigation and take in account noticeable impact of social life on testing learning and memory tasks. Study was funded by Grant Agency of AS CR (GA AV 32-IAA601410802)

31 **FEEDING AND ANTI-PREDATOR ASSOCIATION AMONG PLUSH-CRESTED JAYS (*CYANOCORAX CHRYSOPS*) AND MARMOSETS (*CALLITHRIX* SPP.) IN BRAZIL**

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Cases of interaction among birds and primates have been previously described in literature only under the perspectives of feeding association and predation. This work reports the interactions among groups of Plush-Crested Jay (*Cyanocorax chrysops*) and mixed groups of two exotic species of marmosets (*Callithrix jacchus* and *C. penicillata*) and their hybrids. This study was conducted during seven months (from august 2008 to february 2009), in an urban fragment of 48 ha called Parque do Ingá ($51^{\circ}55'49''W$ and $23^{\circ}25'43''S$), in Paraná State, southern Brazil. We observed ad libitum two types of interactions among Plush-Crested Jays and marmosets: feeding association ($n=19$) and anti-predatory behavior ($n=5$). Feeding associations were observed the jays followed the marmosets to catch the arthropods that were flushed from the trees by the movement of the primates, and also when jays looked for prey in the same places that marmosets had sought. The number of jays that followed the marmosets ranged from one to seven individuals. The anti-predatory associations occurred in two ways: (1) in four events when the Plush-Crested Jays produce a alert vocalization, and immediately marmosets that were in the highest strata of trees also produce a warning call, and those in lower strata climb on trees and (2) in one inter-specific coalition event when three individuals of marmoset and one individual of jay concomitantly invested against and chased a Roadside Hawk (*Rupornis magnirostris*). The events of feeding association could be considered as commensalism. Already the events of anti-predatory interaction could be considered as proto-cooperation, where both are benefited with a greater perception of predators and possible reduction of predation. Moreover, the agonistic coalition observed is, to our knowledge, the first record of mobbing behavior formed by a combination of mixed neotropical species against same potential predator.

32 **FORAGING HABITAT OF *MYOTIS BECHSTEINII* (KUHL, 1818) IN A MEDITERRANEAN LANDSCAPE**

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Bechstein's bat (*Myotis bechsteinii*) is one of the less common bat species in Europe, where they have mostly been recorded in temperate regions, being considered scarce in the Mediterranean. In order to characterize their habitat use in Mediterranean landscapes, we investigated spatial use and habitat selection of 20 lactating females belonging to 13 maternity colonies in Southern Iberian Peninsula. Foraging areas averaged 7.69 ha, and the maximum distance flown from roost to foraging grounds was 908 m (mean 539 m; $SD=197.4$). The habitat selection pattern observed was similar to that reported in northerly European areas: deciduous forests (essentially *Quercus pyrenaica*) were positively selected, coniferous forests were opportunistically used, and no foraging was reported in evergreen broadleaved woodlands or in non-forested areas. Bats selected to forage inside the forest better than in edges or clearings, and higher canopy cover was also preferred. Nevertheless, they show some flexibility and used loose woodlands (deciduous dehesas) as well, despite their wing morphology and echolocation characteristics, which are better fitted to forage in the clutter. The

preference for deciduous over evergreen broadleaved woodlands seems to have more weight than the areas' structural characteristics, which suggests that other variables such as prey availability, rather than structural constraints, drive habitat selection. Our research indicates that *M. bechsteinii* might be abundant in well preserved deciduous forests within the Mediterranean range as well, where the species' distribution might be limited by habitat loss and degradation related to agricultural practices and deforestation.

33 FROM AUDIBLE TO ULTRASOUND IN STEREOTYPIC VOCAL SIGNALS: A PHYLOGENETIC EXPLORATION IN PEROMYSKINE MICE

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Among mammals, vocally mediated signals are common, and certain signal forms are used with strong conservation. True stereotypic signals (for instance whistles, trills and songs) however, are poorly described, particularly from a comparative perspective. One noteworthy acoustic phenomenon is the use of ultrasound. High frequencies, above our hearing, are endowed with a unique, yet problematic set of physical attributes. These attributes, related to potentials for propagation, distortion and attenuation, limit the circumstances vocal ultrasound can be successfully employed as a communication medium. In contrast, audible vocal signals, those roughly 15 kHz or less, possess more liberal utility, but may present greater risk. Peromyskine mice comprise the most common and speciose assemblage of the North and Central American rodents, and are composed of several distinctive clades (Baiomyini, Ochrotomyini, Reithrodontomyini) that together with Neotomini form a monophyletic Neotominae. Their ecological, behavioural, genetic, and taxonomic diversity, coupled with their ubiquitous distribution, make them ideal candidates for comparative studies. Among peromyskines, employment of frequency varies among genera, and within and among species. In 2008 Miller and Engstrom presented a new phylogenetic hypothesis for peromyskines, based on 3 independent and concatenated molecular loci (cytochrome b, interphotoreceptor retinoid-binding protein, growth hormone receptor). I use this construct as a template for phylogenetically controlled, behavioural contrasts. The occurrence and character of stereotypic signals correlate strongly with taxonomy, a pattern that includes examples of ultrasonic versus audible vocal communication. Ecological factors, such as substrate use (terrestrial, semi-arboreal, arboreal) and habitat openness, demonstrate weaker relationships.

34 GIANT ANTEATER'S (*MYRMECOPHAGA TRIDACTYLA*) ALERT BEHAVIOR

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The giant anteater (*Myrmecophaga tridactyla*) is a south-American mammalian predator of ants and termites. Their eyesight and hearing are poor, but their sense of smell is well developed and they use it to locate preys. Adult giant anteaters have jaguars and pumas as natural predators. However, humans are the animal that probably imposes higher hunting pressure. Alert behavior is a vigilance consequence for an animal exposed to hazards. Besides the anecdotic reports of giant anteater rising on its hind legs as a posture of alert and defense, we have observed that is a stage that precede this rare and extreme behavior. In this study, we describe this first stage of alert sequence displayed by free-ranging giant anteater in response to humans. Although we had seen this behavior many times before, we attempted to describe it in a field trip in Santa Teresa ranch – North region of Brazil (02°51' N, 60°45' W), when we had the opportunity to witness, photograph and describe with ad libitum sampling the alert sequence performed two times by a same female, in our presence. The alert behavior followed defined motors patterns. First, the female was foraging with the snout near the soil, moving around the savanna. When the female was aware of our presence, it paralyzed with the left forelimb slightly raised. Then it aligned the head with the body promoting nasal movements as if sniffing the air. The completion of this sequence showed two responses: (1) the animal interrupted alert and returned to forage ignoring our presence or (2) it become piloerected and run away. After running about 200 meters, the female stopped at a new place and resumed to forage. Besides some behaviors were reported to giant anteater, this alert sequence had never been described, although it is a very important behavior for an animal of solitary habits.

35 GROOMING RELATIONSHIPS IN THE COOPERATIVE BLACK-FACED-LION-TAMARINS

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Grooming is the most common social interaction among primates. Individuals can develop grooming relationships with multiple proposes like reinforcing affiliative bonds and tolerance. The aim of this study was to delineate the grooming relationships and its roles in the individual social strategies of the cooperative breeding black-faced-lion-tamarin, *Leontopithecus caissara* (Primates, Callitrichidae). We observed a free ranging monogamous group (1 breeding male (BM), 1 breeding female (BF), 1 adult male helper (H) and 2 juveniles) over 257 h in Superagüi National Park, Brazil. All occurrences of grooming, agonism and food sharing were recorded and scan sample was used to access proximity. We observed 257 grooming interactions. The BF had the greatest number of grooming interactions (BF n=228; BM n=149; H n=124; Juveniles n=89). Also, the BF initiated the majority of grooming interactions (BF n=100; BM n=34; H n=68). The BM and juveniles received more grooming than executed while the H executed more than received. The BF groomed the two males in same frequencies but more often than the juveniles. Both males groomed more frequently the BF than the juveniles. The BF executed and received equally from the males but the H groomed the BM more than received. The number of interactions differed among reproductive periods, decreasing during estrous and the false estrous. There was negative correlation between grooming and agonism and positive correlation between the grooming performed by the BF and food share. Also, grooming performed by the H and its distance to the closest individual correlated negatively. Possibly, grooming and sex could

be used strategically by the BF to keep longer relationships with the males, as their help is essential in the rearing of offspring. The grooming can also be used by the subordinate male (H) to achieve tolerance from the BM.

36 HISPID COTTON RATS AS A SOURCE OF MORTALITY TO PINE TREES INVADING AN OLDFIELD

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During the second year of a demographic study in an oldfield in eastern Virginia, USA, it became clear that rodents were killing pine trees by eating the bark (girdling). Only cotton rats (*Sigmodon hispidus*) were large enough to reach to 15-18 cm heights to which the bark was eaten. To determine the extent of mortality caused by girdling and the relationship to rodent abundance, the grid was enlarged to 1.266 ha, producing a square grid with 81 'cells', each 12.5 m on a side. After each cell was divided into four sub-cells, each tree was evaluated for condition (dead from girdling or natural causes, partially girdled, no damage). In all 2329 (15.1%) of 15,409 pines > 0.8 m tall had been killed by rodents, a further 53% were partially girdled, and 0.0016% were dead by natural causes. Three years later, when herbivorous rodents had nearly disappeared, only 137 pines (0.8%) were dead by girdling, compared to 3846 (23%) dead by natural causes. Analysis of fecal pellets and direct observation suggest that most eating of bark occurs in late winter or early spring, a time of sparse and poor-quality food. This is the first account of cotton rats killing pine trees by girdling.

37 INTERMALE AGGRESSIVE IN RELATION TO FEMALE AVAILABILITY IN THE PROMISCUOUS *CALOMYS MUSCULINUS* (CRICETIDAE: SIGMODONTINAE).

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C. musculus females are territorial and typically mate with more than one male during each estrous period. At low number of adult females, breeding males decrease their home range size and intra-sexual home range overlap, presumably as a consequence of intra-sexual competition for receptive females. We tested the hypothesis that at male-biased sex ratio *C. musculus* males exhibit more intrasexual aggression than when there is not male-bias. The study was carried out in four 0.25 ha enclosures (two control and two experimental) during breeding season in 2004. Using field dyadic arena test, we carried out 17 male-male trials in control and 18 in experimental enclosures. Mean sex ratio (male/female) values ranged from 1 to 1.1 in control (CE), and from 2 to 2.3 in experimental enclosures (EE). Dyadic encounters were conducted between non-familiar and sexually mature males of similar weight and age, which established home ranges in the same enclosure at the same trapping session. Encounter was performed in the home range of one of the opponents (owner), with the other opponent acting as an intruder. We estimated 34 and 36 male home ranges in CE and EE respectively. In CE males overlapped their home ranges with 3 or 4 males, but in EE the intermale overlap occurred only with 1 or 2 males and did not exceed the 10 % of overlapping. Aggressiveness, submissiveness and amicableness of owner and intruder varied in relation to treatment (one-tailed Mann-Whitney U tests, $P < 0.0031$). Males were more aggressive in EE than in CE. Intruder males were more submissive than owners in EE. Both owners and intruders never exhibited amicable behaviour in EE. Male behaviours varied in relation to sex ratio and home range ownership status. Our results support the hypothesis that in *C. musculus* intermale aggression is related to female availability.

38 LIMITED SEXUAL SEGREGATION IN DEPTH USE BY SOUTHERN ELEPHANT SEALS FROM MARION ISLAND

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Based on body size dimorphism, southern elephant seals from Marion Island were expected to display significant differences between sexes in depth use while at sea. We instrumented 53 adult and sub-adult animals of both sexes with satellite-relay data loggers (SMRU) between 2004 and 2008. These devices transmitted basic dive data, as well as location and temperature data while the instrumented animals were at sea. Using a simple calculation, we determined time spent by individual animals in various depth categories during a total of 182 882 dives. Animals of both sexes targeted depths between 300m and 600m more than other depth categories, and substantial overlap between sexes was recorded for time spent in depths between 500m and 600m. Male elephant seals however targeted and spent significantly more time in depths between 600m and 1250m ($p < 0.05$). Female elephant seals targeted and spent significantly more time in depths between 200m and 500m ($p < 0.05$). No significant differences were recorded for depth use between adult and sub-adult males. The overlap in mid-water depth use by both sexes suggests that the limited segregation observed in depth use by southern elephant seals from Marion Island is likely driven by different physiological capabilities, and not forage selection or predator avoidance.

39 MATE CHOICE AND INBREEDING AVOIDANCE IN *OCTODON DEGUS* FROM TWO CONTRASTING POPULATIONS

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Inbreeding is considered a determining factor in fitness and mate choice in wild animals. However, studies about mate choice and

inbreeding avoidance in wild mammals are scant. This study analyzes mate choice in females of the caviomorph rodent *Octodon degus*, from two populations of distinct geographic distribution. The aim of this study was to analyze if female mate preference shows inbreeding avoidance in two highly contrasting populations, one in northern (Huasco), and the other in central Chile (Rinconada de Maipú). Each female could select between the odorants of two males, one genetically related (sibling) and the other with no genetic relationship, but originated from the same population. The experiments were carried out in a Y-maze that allowed the female to receive odor signals from both males. Females did not show any preference for particular males within each population. However, we did find significant differences between populations. We discuss the probable causes of these differences between populations. (FONDECYT 1090794, ICM-P05-002, PFB-23-CONICYT)

40 **MINERAL CONSUMPTION BEHAVIOUR IN *CERVUS ELAPHUS HISPANICUS* IS AFFECTED BY CALF GROWTH AND LACTATION VARIABLES**

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Foraging theory predicts that animals should be able to assess nutrient content of food sources and adjust their diet according to needs. Thus, as many minerals are essential nutrients, animals should be able to discriminate and consume the amount needed for each mineral. Although this has been proved in ungulates for sodium and phosphorus, it is not clear if animals can discriminate among other essential minerals. Requirements depend on sex, age, and physiological status. Thus, if animals behave as optimal foragers of minerals, factors affecting physiological needs should also affect intake behaviour of each mineral. This prediction was tested at the Experimental Farm of Universidad de Castilla-La Mancha during two lactation periods. A series of containers with different mineral mixtures were offered to 59 adult hinds and their calves during the whole lactation period. Consumption behaviour was also recorded. Study animals were monitored weekly and milk production was assessed during the experiment. All the lactation variables studied (calf sex, age, total milk yield, hind calving weight and year in the case of hinds; sex, calf weight gains during lactation, calf birth weight and year in the case of calves) influenced mineral consumption, and the effect was different for each mineral. Lactation variables explained a greater amount of variability in mineral consumption behaviour for calves than models for hind mineral consumption. Thus, results show that deer can select mineral content in their diet and that selection is shaped by physiological effort as expected if consumption is driven by physiological needs.

41 **MULTIPLE BREEDING FEMALES AND INFANTICIDE IN THE BUFFY-HEADED MARMOSET, *CALLITHRIX FLAVICEPS* (PRIMATES: CALLITRICHIDAE)**

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A growing number of callitrichid field studies, especially of *Callithrix* marmosets, have reported breeding in subordinate females. In the present 17-month study in western Espírito Santo state, Brazil, reproductive patterns and associated behavior were monitored in a free-ranging group of *Callithrix flaviceps*. Whereas breeding in *Callithrix* groups is normally restricted to a dominant female and no more than one subordinate, all four fertile adult female members of the present study group reproduced simultaneously. As is typical of groups with multiple breeding females, all observed copulations of subordinate females involved extragroup males, although no sexual behavior was observed in the more dominant female (BT). All six recorded births occurred during the early wet season (October-December), including four during a ten-day period in November, 2008. On the day after one of these births, the new mother was attacked by an unidentified individual (probably BT), which resulted in the death of one of her twin infants due to a bite to the top of the head. Five days later, another female gave birth to twins, and on the day after the birth, BT was observed ingesting the head of one of the newborn infants. BT had more births and more surviving offspring, on average, than the subordinate females. The occurrence of infanticides appears to reflect competition for the services of infant caregivers, which was especially intense in this group. All four females carried their own infants for relatively long periods (more than a week) following the births, a pattern possibly related to the risks of infanticide. However, BT carried infants much less frequently than other females. In callitrichids, three or more breeding females have been observed only in *C. flaviceps* groups, which may indicate either a species-specific pattern, or the effects of specific local ecological factors.

42 **PLAYING WITH FOOD (AVAILABILITY): STATE GAMES BETWEEN OWLS AND GERBILS**

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Predator-prey interactions are often behaviorally sophisticated games in which the predator and prey are players, the value of prey behavior depends on the characteristics of the predator, and the value of predator behavior depends on the characteristics of the prey. Thus, changes in one player's behavior may strongly affect the behavior of the other players in the system. Past studies teach us that hungrier prey take higher risks when foraging and that hungrier predators increase their foraging activity and are willing to take higher risks of injury. Yet, what happens when predator and prey can respond to each other simultaneously? We investigated the state game between predators and their prey by simultaneously manipulating the state of barn owls, *Tyto alba*, and their prey, *Gerbillus andersoni allenbyi*, in a large outdoor vivarium containing seed trays as resource patches for the gerbils. The owls significantly increased their activity when hungry. However, contrary to our predictions, they did not respond to changes in the state of the gerbils.

The gerbils reacted strongly both to their own state, as well as to the owls' state. In the presence of a hungry owl, the gerbils left more food in the resource patches, were less efficient in searching for food, and spent less time husking seeds in the food patches. The gerbils also left more food in the resource patches when they were well fed, mostly dramatically when a hungry owl was present, i.e., when the risk was greater. Our study shows that predator-prey interactions give rise to a complex state game in which changes to the state of any of the players have important ecological consequences.

43 **POLAR OPPOSITES: SUBANTARCTIC RESIDENT KILLER WHALES EAT FISH, FEATHERS AND FUR**

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Killer whales display marked variation in their foraging and social organization through their cosmopolitan range. At subantarctic Marion Island we conducted opportunistic, land-based observations of killer whales between 2006 and 2009 as well as 738 cumulative hours of dedicated land-based observations between 2008 and 2009. Killer whales showed annual return and seasonal abundance coinciding with the presence of seals and penguins at the Island. We observed killer whales preying on fur seals, elephant seals and penguins and based on anecdotal data suspect that Patagonian toothfish may additionally form an important component of their diet. While killer whales at Marion Island appear to share certain social characteristics with resident killer whales in the northern hemisphere, their social organization in the subantarctic is likely constrained by their mixed diet, and blends social aspects of northern hemisphere "resident" and "transient" killer whales. These findings are also at odds with ecological specialisations described for killer whales in the Antarctic. This poses significant challenges to our understanding of the local ecological interactions and global ecological role of this sophisticated species. Nonetheless, these ongoing research efforts have allowed strategic positioning of research questions that will help to unravel fundamental life-history facets of this understudied subantarctic population.

44 **POPULATION STRUCTURE AND MOVEMENT OF MONITO DEL MONTE (*DROMICIOPS GLIROIDES* THOMAS 1894)**

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The marsupial *Dromiciops gliroides* is endemic to the northern portion of the temperate forests in southern South America. It is an arboreal and nocturnal marsupial associated with *Nothofagus* forest. The objective of the present study is to determine the population structure of *D. gliroides* and the relationship between individual characteristic (sex and age) with animal movement. The study was conducted at Llao-Llao in Bariloche, Argentina during the summer 2009 (January-April). Two square grids were established 150 m apart. Each grid consisted of 25 live-traps (Tomahawk-style) placed 1-2 m above ground and spaced at 10 m intervals covering an area of 50 x 50 m. Traps were run over four consecutive nights each month. Traps were checked daily and all captured marsupials were measured (weigh, total length, tail length and tail basal perimeter), and their sex and age recorded. Before releasing the animals at the point of capture they were fitted with PIT-tags (Biomark, USA). Also, total of 28 individuals were fitted with glue-on VHF radio transmitter (ATS, USA). Radio-tracking sessions were carried out during days and nights using triangulation from different fixed stations. During the whole season 73 individuals were caught: 35.6% juveniles and 64.4% adults, with 66% of males and 34% of females. The percentage of recapture was near 50% in both sites. Most recaptures occurred in the same grid where they were previously captured and liberated. Few individuals moved across both sampling grids. Overall, our results suggest that *Dromiciops* has strong site fidelity but it is capable of performing larger-scale forays.

45 **PREDATION ATTEMPT BY A DOMESTIC CAT (*FELIS DOMESTICUS*) ON INTRODUCED MARMOSET *CALLITHRIX PENICILLATA***

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The genus *Callithrix* is found from Northeastern Brazil to São Paulo. However, some species have been introduced on other places, such as Santa Catarina Island, Southern Brazil, where three species are recorded: *C. penicillata*, *C. jacchus* e *C. geoffroyi*. Data available is insufficient to evaluate this species status as invasive. In this work we report a predation attempt by a domestic cat (*Felis domesticus*) on a *Callithrix penicillata*. This record was done on Córrego Grande Ecological Park, a 21.5ha urban fragment of secondary Atlantic Forest, located in Santa Catarina Island. The attack was recorded when two groups were monitored: GG and GL, which contain 8 and 7 individuals, respectively. These groups have been systematically observed since October 2008. The event was recorded ad libitum on January 10, 2009. At 08:20 a.m. agonistic intergroup interactions were initiated between GG and GL. At 09:42 a.m. the agonistic interaction continued when a domestic cat (*Felis domesticus*), not noticed by the marmosets, climbed a tree in direction of a GG adult male, this individual suddenly moved to another tree, but individuals of the other group (GL) were there. Both groups initiated anti-predator behaviors (alarm calls and mobbing). Enclosed by their rivals GL's male moved quickly to the ground persecuted by the cat. The predator reached a short distance from their prey, which escaped climbing another tree. Anti-predator behaviors continued while the cat moved away and remained behind a shrub observing the marmosets. At 10:10 a.m. both groups moved away reducing anti-predator behaviors while enlarge the distance from the feline. This kind of record is very rare on the Neotropical primates and their predators are very poorly established. This record increases our knowledge on the *Callithrix*'s predation and anti-predator behaviors and it can also help us to evaluate these species status in their introduction areas.

46 RECORDED SOUNDS OF *MYOTIS KEYSI* IN PRESENCE OF PALATABLE AND UNPALATABLE MOTHS

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Bats use echolocation for detecting food. Recent research has shown that tiger moths emit high frequency sound that can be recognized by the bats and avoid being eaten. The sounds may either orient the bat by providing it with information that it uses to make an attack decision (aposematism) or they may disorient the bat by interrupting the normal flow of echo information required to complete a successful capture (startle, jamming). My objective was to test the insectivorous bat's change in behaviour and emitted in presence of palatable and unpalatable moths. An hungry of *Myotis keysi* individual was released in a wind tunnel (Monteverde – Costa Rica) and its sounds were recorded with a Pettersson system in the presence of the two types of moths. Bats eat palatable moths and sounds show a typical feeding behaviour. On several occasions the bat attempted to consume the unpalatable moth but never eat it. The sounds of the bat at the event were other high frequency sounds. The sound durations and pulse interval emitted by bats was different in presence of the two types of moths. This work demonstrates the emission of sounds by unpalatable moths and recognition of these sounds by bats.

47 RESOURCE AVAILABILITY AND ALTITUDE AFFECT HOME RANGE SIZE AND GROWTH RATE OF FREE-RANGING ALPINE MARMOTS (*MARMOTA MARMOTA*)

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Different resources distribution can occur within alpine meadows inducing individual behavioral adjustments in use of territory. We studied two Alpine marmot (*Marmota marmota*) groups belonging to the same population in two zones located at different altitudes (Zone 1 at 2160 a.s.l. and Zone 2 at 2350 a.s.l.) in Orvielles, Gran Paradiso National Park (North-western Italian Alps). Alpine marmots are hibernating ground-squirrels that, during the active season, forage selectively on different plants species around their home range area in order to gain a sufficient weight to face the winter. We used scan-sampling method to estimate home-range size of 44 marked marmots from April to September 2008. All marked marmots were repeatedly weighted during the summer thanks to electronic scales placed in front of the burrow entrances. Using linear mixed effects models we estimated daily mass gain for each individual and we found a strong negative linear relationship between home-range size and daily mass gain. Marmots living at lower altitude (Zone 1) had larger home-ranges and lower daily mass gain than marmots living at higher altitude (Zone 2). Data on vegetation composition of the two zones showed a higher availability of plant species preferred by marmots in Zone 2 than in Zone 1. Our results suggest that individual alpine marmots of the same population adjust their home-range according to the availability of resources of the area they inhabit.

48 SEASONALITY IN SPATIO-TEMPORAL BEHAVIOUR OF FEMALE ORANG-UTANS. A CASE STUDY IN CENTRAL KALIMANTAN, INDONESIA

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Geographic Information Systems (GIS) have become increasingly important basic analysis tools in wildlife biology in recent years. With their range of analytical tools they can improve our ability to study and understand animal movement patterns, especially where very large data sets are collected. This study aims at combining the field of GIS with primatology to model and analyse space-use patterns of wild orang-utans. Home ranges of female orang-utans in the Tuanan Mawas forest reserve in Central Kalimantan, Indonesia were modelled with kernel density estimation methods. Kernel results were compared to Minimum Convex Polygon estimates, and were found to perform better, as they were less sensitive to sample size and produced more reliable estimates. Furthermore, daily travel paths were calculated from 970 complete follow days. Annual ranges for the resident females were approximately 200 hectares and remained stable over several years; total home range size was estimated to be 275 ha. On average, females shared a third of their home range with another female. Orang-utan females in Tuanan built their night nest on average 414 metres away from the morning nest, whereas daily travel path lengths were 777 metres. A significant influence of fruiting availability on day path length was found. Sexually active females covered longer distances per day and may also temporarily expand their ranges.

49 SOCIAL BEHAVIOUR AMONG INDIVIDUAL TREE-ROOSTING BIG BROWN BATS (*EPTESICUS FUSCUS*)

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Since 2000 we have used radio-telemetry, PIT tagging and roost captures to document roosting associations by individual big brown bats in Cypress Hills, Saskatchewan, Canada. Individuals switched roosts about every 2 days on average and mid-way during the study began to shift to a new roosting area. Bats do not select or switch roost trees based on differences in microclimate or the amount of solar radiation falling on roosts, but most likely select roost trees with large cavity volumes that can hold many individuals, so they can socially thermoregulate. We assessed association frequency using a ratio index compared to expected values to show that associations between pairs of bats were non-random, consistent with the fission fusion model of social interaction. Associations were strongest during pregnancy and weakest after lactation suggesting that within the fission-fusion system, reproductive constraints

affect social cohesion. Further more, mean dyadic associations of reproductive bats were significantly higher than between non-reproductive or mixed-status pairs. Based on nine microsatellite loci and a mitochondrial DNA control region segment, we found that roosting associations were not based on relatedness or matrilineal relationships. Female-mediated gene flow was restricted between roosting areas ($F_{st} = 0.145$) but male-mediated gene flow was not (0.015). Despite female philopatry and preferred roost mates roosting associations are not based on genetic relationships within roosting groups. However, we found evidence that during establishment of a new roosting area, females who moved to the new area had higher average relatedness than those that remained, suggesting that the establishing cohort were closely related maternal kin. We suggest that fission fusion is maintained by individual benefits gained through associations with preferred roost mates (e.g., information transfer, dominance status) and membership in the group (information about roost sites, thermoregulation).

50 TEMPORAL VARIATION IN SINGING ACTIVITY OF HUMPBACK WHALES (*MEGAPTERA NOVAEANGLIAE*) IN THE ABROLHOS BANK, BRAZIL

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Temporal variation in vocal behavior usually occurs if a species is physiologically adapted to perform in the presence or absence of light, if there is variation in predation and reproductive pressure and food availability, or as a response to anthropogenic disturbances. Humpback whales produce long and complex sound sequences, known as song. Singing behavior is exclusive to males and more frequent during the breeding season. Therefore, this vocal display is assumed to have a reproductive function. We used passive acoustic monitoring tools to investigate the natural trends in humpback whale vocal activity. Our objective was to determine if there is diel and/or seasonal variation in the number of singing males in the Abrolhos Bank, Brazil. Four synchronized autonomous recording units were deployed in the bottom of the ocean to record sounds continuously at a sampling frequency of 2 kHz. We sampled 26 days in which singing males were located and counted within a one minute period chosen at random every 3 hours to avoid autocorrelation. Our results indicate that there is a seasonal trend in singing activity ($N = 157$; $R^2 = 0.0537$; $p = 0.0035$), i.e., more males are vocally active as the season progresses ($Singers = 0.1846 + 0.0046 \times \text{Day of Season}$). The 24 hours of the day were divided into six 4-hour periods to test for a diel trend. We found no significant differences in the number of singers between periods of the day (Kruskal-Wallis $\chi^2 = 5.7617$; $DF = 5$; $p = 0.3301$). We speculate that motivation to pair and mate may increase as the breeding season progresses given that individuals must leave the breeding site and migrate to feeding areas. Identifying the natural trends in singing behavior could be useful to better understand the species behavioral ecology and ultimately aid in their conservation. Thanks to FAPEMIG.

51 THE BEHAVIOR OF GIANT ANTEATERS (*MYRMECOPHAGA TRIDACTYLA*) IN JAPANESE ZOOS AND THEIR CAPTIVE CONDITION.

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The giant anteater (*Myrmecophaga tridactyla*) belongs to the order of the Xenarthra. They inhabit the neotropical regions of Central and South America. They are categorized as "Near Threatened" in the Red List, and now the preservation of the animal is urgent. However, the information of giant anteaters, especially the behavior of captive giant anteaters, is very limited. In this study we examined the behavior patterns of captive ones and how the breeding environment influences their behaviors. Nine giant anteaters kept in five zoos (Ueno, Higashiyama, Oji, Noichi and Okinawa-KDKF) in Japan were used as samples. All the appearance behaviors of each animal were recorded point by point by a continuous sampling method during the exhibition time for three days. In addition, their maintenance behaviors (eating, resting, moving, self-grooming and others) were recorded by the minute instantaneous sampling method. The numbers of behaviors and their patterns were compared between the zoos. On the other hand, the maintenance behavior ratios were also compared by Tukey-kramer multiple comparisons test. Thirty-two behaviors were found in this investigation, but five behaviors, soil-licking, digging, bathing, swimming and playing, were only found in some zoos. The behavioral patterns such as excretion and picking differed among the zoos. These differences might be related to the ground condition and/or installation of a pool and some woody objects. In the maintenance behavior ratio, there were statistically significant differences among individuals, especially in the resting and moving rates. The resting rate during the exhibition time was significantly higher in the case of Oji and one of the animals in Noichi than those in the other zoos, and it is probably due to the types of housing. It is suggested that the giant anteater's behaviors are affected by the environmental factors such as "housing type," "ground condition," "pool" and "objects."

52 USE OF CONCENTRATED FEED BY WILD MAMMALS AT A STOCK FARM IN JAPAN

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Steal of concentrated feed in a stock farm by wild mammals was investigated to clarify what species and how often steal concentrated feed. Normal daily and seasonal activity patterns of wild mammal species were also investigated by camera trapping and compared these activity patterns obtained by time-lapse video surveillance. During 1499 camera sessions, 11 mammal species (excluding Chiroptera) were recorded in the farm. But the wild boar, the raccoon dog and the red fox were the only mammal species observed to steal concentrated feed by video surveillance. The frequency of their foraging activities around cattle trough in wild boars, raccoon dogs and red fox was 1287, 584 and 6 times (30-minutes observation interval), respectively during 20 6-consecutive days of video

observation for two years (5760 observation intervals). Up to 9 wild boars appeared to steal the cattle feed at the same time. Seasonal and daily patterns of foraging activity in wild boars near cattle trough recorded by a video were correlated with the normal ones recorded by remote cameras. In contrast, the seasonal foraging activity of raccoon dogs near cattle trough was high in winter and low in summer contrary to the normal activity recorded by remote cameras although the daily foraging activity of them was same as the normal one. Up to 2 raccoon dogs foraged together the cattle feed while the red fox foraged it alone. The wild boar and the raccoon dog are more easily attracted by concentrated feed in a stock farm than the other mammal species. Therefore exclusion of these species from cattle troughs should require from concerns about economical loss of cattle feed and animal health.

53 VOLATILES IN THE URINE OF BREEDING MALE BRANDT'S VOLES (*LASIOPODOMYS BRANDTI*) ARE ASSOCIATED WITH MATURATION RATES OF YOUNG VOLES

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Using animal house experiments we demonstrated that urine odor can elicit physiological changes in the maturation rate of Brandt's vole. We showed that the urine of estrous females, anestrous females and non-breeding males had no effect on the time to sexual maturity of young voles. In contrast, the maturation rate of young female voles was accelerated, and the maturation rate of young male voles was slowed, by exposure to the urine of breeding adult males. Headspace analysis revealed significant differences in the levels of a subset of volatile constituents of urine from breeding and non-breeding males. From a total of 50 components, Propanoic acid, 2,5-Dimethylpyrazine, Dimethyldisulfide, 1-Octene, 1-Hexanol, Hexanoic acid and p-Xylene were observed only in the urine of breeding male Brandt's voles. All other substances were present in the volatiles from urine of both breeding and non-breeding male Brandt's vole.

54 WHO SUFFERS THE COSTS OF HABITAT FRAGMENTATION? LOSS OF MATING OPPORTUNITIES THREATS GENETIC DIVERSITY

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Habitat fragmentation can lead to reduced genetic diversity in many ways. One is the lowered rate of matings caused by difficulty to find receptive mates in fragmented landscape. In promiscuous species, the loss of mating opportunities would be reflected in proportion of multiple-sired litters which leads to decrease in genetic diversity. We conducted experiments in 0.25 ha enclosures where the habitat was manipulated to form one or four habitat patches with similar area of habitat. The experiment started by releasing four male and four female bank voles, *Myodes glareolus*, with their new born litters into the enclosure. Movements of the males with known dominance rank was followed by radiotracking for intensively 24 hour after releasing. After 18 days voles were brought back to lab to deliver. DNA samples from the all possible fathers, females and new born pups will yield paternity of the offspring. We hypothesized that voles are reluctant to cross the inhospitable open matrix area and therefore their chances to encounter mates is reduced leading to lower proportion of multiply sired litters in fragmented enclosures. However, dominant males should take more risks by crossing the matrix. Preliminary results show that there is no correlation between male movement areas and their dominance rank. Movement areas tended to be larger in four patches enclosures compared to one patch enclosures. In four patch enclosures males took more risk by moving in matrix than in one patch enclosures where males were moving almost exclusively inside the safe habitat patch. Paternity analyses are still in preparation. The main finding is that males take more risk in four patches enclosures probably because they try to find receptive females.

BIOGEOGRAPHY

55 BATS OF AN ATLANTIC FOREST FRAGMENT IN VIÇOSA, MINAS GERAIS STATE, SOUTHEAST OF BRAZIL

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Knowledge of bats community in Neotropical forests has grown in the late years. However, studies of these animals are still rare, in view of the great importance of this group of animals in the maintenance of forests of many biomes. One of the most important of these is the Atlantic forest, which homes great part of the Brazilian mammalian fauna. The present study intended to reevaluate the chiropterofauna of a fragment of this huge biome. Located in Viçosa, Minas Gerais state, Southeast of Brazil, the Estação de Pesquisa Treinamento e Educação Ambiental (EPTEA) da Mata do Paraíso is a small fragment of 194 hectare. In this fragment, two studies involving bats were made. A first chiropteran survey was made 13 years ago, with seven species captured. The second one started in November/07 to October/08. This late survey used mist nets to capture bats. These traps were mounted, after sunset to midnight, crossing flight routes and near sources of water and food. The total sampling effort was 5,532 h.m², with 146 specimens captured, of 11 species distributed in three families, and a capture success of 2.64%. *Carollia perspicillata*, *Anoura caudifer*, *Artibeus fimbriatus*, *Phyllostomus hastatus*, *Histiotus velatus* and *Molossus* sp. were captured for the first time in the fragment. *Platyrrhinus recifinus*, *Anoura geoffroyi* and *Epitesicus brasiliensis* were captured only in the first study, in 1996. The results corroborate other studies involving the presence of high bat diversity in regenerating rested areas due to the major availability of resources. This fact is relevant to the creation of management plans of this fauna in others Atlantic forest fragments.

56 BIOGEOGRAPHY OF THE BAT FAUNA OF NORTHWESTERN PERU

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To study the similarity of the bat fauna of the Pacific Tropical forests of Northwestern Peru with other Neotropical lowland rainforests, we reviewed the distribution of 167 species from 20 localities: three in Central America, 12 on the Amazonian basin, and five from the western Andes using a Parsimony Analysis of Endemicity (PAE) and a UPGMA. Both analyses support that bat fauna of the Pacific Tropical forests is more similar to bat fauna from Central America than to the Amazonian basin; in agreement with results based on birds (Cracraft & Prum, 1988), and beetles (Morrone, 2006); supporting as well the Caribbean subregion of Morrone (2006). Our results concur with molecular analyses on the genus *Artibeus*, *Glossophaga*, *Carollia*, and *Uroderma*, that suggest that the Andean cordillera is a great vicariant barrier, and that Central American taxa are more related to Western versant rather than Eastern versant taxa. In northwestern Peru, 42 species were reported, including nine endemics to the Caribbean subregion (*Lonchophylla hesperia*, *Artibeus fraterculus*, *A. jamaicensis*, *Dermanura phaeotis*, *Platyrrhinus matapalensis*, *Amorphochilus schnablii*, *Eptesicus innoxius*, and *Rhogeessa* sp.); and 17 species with subspecies different to those from the Amazonian basin (*Noctilio leporinus*, *Chrotopterus auritus*, *Lophostoma silvicolum*, *Mimon crenulatum*, *Phyllostomus hastatus*, *P. discolor*, *Desmodus rotundus*, *Anoura geoffroyi*, *Glossophaga soricina*, *Carollia perspicillata*, *A. lituratus*, *Chiroderma villosum*, *Uroderma bilobatum*, *Lasiurus blossevillii*, *L. ega*, *Myotis nigricans*, and *Molossus molossus*). Tumbes, in Perú, represents the southern border of the Caribbean subregion.

57 COMPARATIVE HISTORICAL BIOGEOGRAPHY OF THE HIPPOSIDERID AND THE RHINOLOPHID BATS

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Bats in the sister Palaeotropical families Hipposideridae and Rhinolophidae offer an interesting study system for analyzing the relationships between evolutionary diversification and biogeographical dispersal. As sister lineages, they share a common ancestor and originated at the same time. Besides that, they have a similar geographical distribution in the Palaeotropics. Molecular systematics analyses based on sequences of the mitochondrial gene cytochrome b and the nuclear gene for the von Willebrand factor provided a robust phylogenetic hypotheses onto which we could compare the historical biogeography of the two families with dispersal-vicariance analysis. The tree was dated under a molecular clock with multiple calibration points with soft bounds provided by the fossil record of the Hipposiderids. The Hipposiderids started to radiate at a much earlier time (about 30 mya) than the Rhinolophids (about 16 mya), and they experienced several wide dispersal episodes over most of the Palaeotropics, colonizing Australasia and experiencing regional radiations at very early times. However, the rhinolophids were apparently confined to some region of the Palaearctic for the first half of their history, and started to radiate in Africa and South East Asia at about 16 mya. This latter family seems to be still colonizing and radiating in Australasia. The important differences in the biogeographical history of the two lineages are most probably related to the different dispersal capability of the bats in the two families.

58 DIVERSITY, RICHNESS AND ALTITUDINAL VARIATION ON PHYLLOSTOMID BAT COMMUNITY (MAMMALIA: CHIROPTERA) FROM MIDDLE-WEST OF BRAZIL

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Between the several factors that influence the distribution and richness of bat community, the altitude influence in temperature, humidity (direct effects) and diponibility of food resources (indirect effect). To seasoned climate areas, it was observed an inverse relationship between altitude and bat richness, the clinal variation. However in tropical climate areas, it's verified that middle altitude presents higher richness of species, the modal variation. The objective of this study was describe the distribution and diversity of bat community along of different altitudes in Maciço do Urucum, Corumbá, middle-west of Brazil. The bats were sampled by mist-nets settled in fifteen different points between 180 to 896 m in all months from July 2003 to June 2005. During the study 282 Phyllostomid bats of thirteen species were caught. The subfamily Stenodermatinae was the more abundant, and *Platyrrhinus lineatus* was the most captured specie. More bats were collected on dry season (April to September) than on wet season (October to March). Vegetation at hillside and in the areas of middle altitudes in Urucum receive climate conditions more favorable in dry season, due to lower effects of water shortage in altitudes higher than 400m, because the precipitation tend to increase in proportion to the altitude. A higher diversity Shannon-Wiener index was noticed in middle altitude (from 301 to 600 m), corroborating with the modal variation theory, and a higher diversity Shannon-Wiener index was noticed in middle altitude (from 301 to 600 m). We think that this fact probably occurred because in this altitude the zoocoric plant richness is high than low or high altitude. Our result suggests that middle altitude vegetation works like functional island to maintenance of bat community in adverse climates conditions.

59 EUROPEAN WILD BOAR (*SUS SCROFA* L.) IN CHILE, HISTORY OF INTRODUCTION AND COLONIZATION.

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Introduction. European wild boar is first introduced to South America as earlier as 1904 to Argentina but data about this process in Chile are lacking. We present data on introductions and spread of European wild boar in Chile. Material and Methods. Personal interviews to residents living on the entire range of distribution of wild boar in Chile were carried during 1985-87. There were also

interviewed all the National Park administrators and the literature revised. Results. European wild boar in Chile has two origins. One way direct import from Germany, which stated in an enclosure until 1948 when they were released in the Andes and the most wider and "natural colonization" derives across the border from Argentina. Wild boar was present on the Andean part of Argentina since 1930-40. The first free living animals observed in Chile were around the focus of liberation of imported animals in 1950. Nevertheless wild boar coming from Argentina appeared later and at the same time on very distant places e.g. Futaleufú, Palena and Lake Pihueico (1956-58); Tapera, Lake Verde and Coihaique (1970) and Tolhuaca, Alto Biobio and Lake Icalma (1967-68). Two questions arises from this results: Why wild boar take so long time to cross the border from Argentina to Chile? ; What explains the synchronous immigration in very distant places? . The Argentinean government in the neighboring states of Rio Negro and Chubut initiated in year 1951 an extermination campaign against wild boar paying bonus due to the damage to crops. This could have contributed to relegate wild boars populations deep into the Andes e.g. border to Chile. We don't discard climate factor but we don't have had access to such data. As in other parts of the world, in Chile, valleys and river basins were used by wild boar for their advance.

60 HABITAT REQUIREMENTS AT LANDSCAPE SCALE, AND PREDICTIVE DISTRIBUTION MODEL OF THE COMMON VAMPIRE BAT (*DESMODUS ROTUNDUS*) IN CÓRDOBA PROVINCE, ARGENTINA

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The Common Vampire Bat (*Desmodus rotundus*) is a species widely distributed in the Americas, having great importance as a disease vector. Despite this, little is known about their habitat requirements, essential information for population management. This work focuses on the determination of habitat requirements at landscape scale, and provides a predictive distribution model of its distribution in Córdoba province. A total of 23 presence locations were collected through literature search, field sampling, and indirect records of attacks on livestock. Four circular concentric buffer areas of 5, 10, 15 and 20 km radius respectively were delimited for each presence location, and for 23 pseudo-absence sites located at random. Averages values of 23 topographic and bioclimatic variables were extracted for each buffer area at each location. Ten variables were significantly different between sites of presence and pseudo-absence ($Z > 2.03$ and $p < 0.05$ in all cases, Mann-Whitney U test). Only these significant variables were used to develop a predictive distribution model using the Maxent v3.2.19 software. Ten runs were performed for cross-validation, taking at random 70% of presence sites for training and 30% for test in each run. A prediction with a mean AUC of 0.87 ± 0.043 was obtained. Elevation, slope and temperature seasonality were the most important variables in model training. As the examination of the response curves suggest, the Common Vampire Bat in Córdoba province occur at sites with low values of temperature seasonality, and is absent in sites with a general slope higher than 35% and an elevation lower than 200 m a.s.l.

61 MODELING GEOGRAPHIC DISTRIBUTION OF PECCARIES (*TAYASSU PECARI* AND *PECARY TAJACU*) AND IN COLOMBIA

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Distribution and population status of peccaries in Colombia are poorly known. The only published information on peccary distribution in Colombia is general maps in mammalian books, and often they are inconsistent or contradictory. For example, in some sources, white-lipped peccary appears absent in the Orinoco basin of Colombia, whereas it appears to be within the whole country in other ones. Currently there is a concern for the potential transmission of disease between peccaries and domestic pigs in Colombia. A disease of particular interest is the classic swine fever. To evaluate potential presence of such disease among peccary populations, a previous evaluation of peccary distribution and its overlap with pig production in Colombia was needed. We modeled potential peccary distribution in Colombia by: 1) compiling and geographically referencing peccary records along the country, from national and international museum collections, field data and a national survey with researchers and institutions, 2) compiling environmental data (climate, relief and ecosystems), and modeling distribution using MaxEnt software, 3) conducting field verification along 41 localities in the country, and 4) overlapping resulting distribution models with locations of pig farms along the county. We compiled 736 peccary distribution records, 107 of which were unique localities of *Tayassu pecari* and 226 of *Pecari tajacu*. Prediction models indicated that *Tayassu pecari*'s distribution covers 436,974,75 km² (38,27% of the country) and *Pecari tajacu* 326,895,75 km² (28,63% of the country). Distribution of both species is not completely sympatric along the country. The area where peccary distribution overlaps with pig farm distribution includes the central-north area of Antioquia, Andean foothill regions, mainly along the Meta, Casanare and Arauca departments. Four areas within these regions were selected for further analysis of swine fever presence among peccary populations.

62 REVIEW ABOUT GEOGRAPHICAL DISTRIBUTION OF THE IPANEMA BAT, *PYGODERMA BILABIATUM* (WAGNER, 1983) (MAMMALIA; CHIROPTERA)

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The genus *Pygoderma* (Phyllostomidae; Stenodermatinae) form with six others genus a monophyletic group called Stenodermatina. The genus is monospecific, represented by the species *P. bilabiatum*, divided in two subspecies (*P. b. bilabiatum* and *P. b. magna*). *Pygoderma bilabiatum* is considered primary frugivorous. The objective of this study was describe the distribution of *P. bilabiatum*. We searched papers that quoted records of *P. bilabiatum* in the follow databases: ISI Web of Science, Scielo, Google Scholar and the National Database of master's and doctor's thesis. We found that the distribution of *P. bilabiatum* is restrict to South America,

comprising Brazil, Paraguay, Bolivia and Argentina. The highest and minimum latitude of *P. bilabiatum* range is 29° 42'S and 08° 08'S, respectively, and the maximum and minimum longitude is 64° 00'W and 36° 26'W, respectively. The subspecies *P. b. magna* was found only in Bolivia and North-Western of Argentina. In North-Eastern of Argentina the subspecies *P. b. bilabiatum* were found and well documented, comprising the province of Misiones. The distribution of *P. bilabiatum* in Paraguay is restricted to Eastern of Paraguay River, comprising four different fitogeographic regions (Campos Cerrado, Central Paraguay, Alto Paraná and Neembucú). In Brazil, its distribution extended from the south to north-west of the country, including regions of Atlantic Rain Forest, Cerrado (Brazilian savannah), Caatinga and transition zones. The distribution of this species in Cerrado and Caatinga are little documented, therefore its biology and ecology in this areas kept unknown. So, the rarity of this species in such fitogeographic regions shows the importance of new works about *P. bilabiatum* in savannah areas.

CONSERVATION

63 A PRECISE AND ACCURATE METHOD TO DETERMINE AGES OF BOWHEAD WHALES (*BALAENA MYSTICETUS*)

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Biologists and managers continue to search for methods by which age of individual mysticetes can be accurately and precisely determined. Efforts to date to determine the age of bowhead whales using amino acid racemization (AAR) have indicated that individuals may reach ages exceeding 100 years and have enhanced understanding of life history parameters for the species. However, utility of existing age estimates is hampered by their lack of precision and, in some cases, accuracy (e.g., some young individuals have been assigned negative ages). Using lens nuclei from bowhead whale eyes acquired during subsistence hunts by Alaska Natives, we revisited AAR approaches and have conducted experiments designed to test assumptions about important variables including: (a) optimal temperatures and times of hydrolysis of lens nuclei; (b) amino acid extract concentrations that elicit optimal resolution of d/l ratios of chromatographs; and (c) the relationship between age and racemization rate (Kasp; generally assumed to be constant). Based on our experiments and subsequent revisions to analytical techniques, we conducted blind assessments of d/l ratios for 17 whales; three replicates were done/individual. Our results produced age estimates that were generally compatible with those of previous studies, but it appears that ages based on our analyses may increase individual age estimates slightly. Our standard errors were between 2.5 and 10.6 years, much smaller than those for other studies. The troubling "negative ages" of some young whales in previous studies occurred for only one individual in our assessments. Experiments to determine the extent to which Kasp varies with age are not completed. With that component finished, we will be able to provide more precise and accurate information for bowhead whale life history and population models.

64 ABUNDANCE AND INVASION RISK OF WILD BOARS, *SUS SCROFA SCROFA* (ARTIODACTYLA:SUIDAE), IN ARAUCARIA FOREST, BRAZIL.

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Sus scrofa is one of the worst 100 invasive alien species in the world and its wild form (*S. s. scrofa*) has been released in the last decade into natural areas of Santa Catarina State, where there are the main remnants of Araucaria Forest and the main swine production in Brazil. The animals have been released either as game species or running off from meat farms. These under control wild populations are a significant environment, social and economic threat. The objective was to estimate the abundance of wild populations in areas covered by Araucaria Forest in Santa Catarina and evaluate some of its covariates: time (TM) and potential (P) of contamination and the percentage of forest (FO). Numbers of wild boar farms was used to estimate P: number of farms (P1), total number of captive animals (P2) and the average animals/farms (P3). Occupancy Probability (\pm Stander Error) was estimated as abundance index by presence-absence methods. The effort was 15 sites with 13 sampling history, totalizing 450 camtrap-nights within 2 months (dec/08-jan/09). The random sites' distribution was designed to cover a covariates' gradient. The best models that fitted the data has been ranked by Akaike's information criterion. The decrease importance of covariates was: TM, FO, P3, P1 and P2. The wild population in the region of 15 years old contamination was more abundant (85 \pm 15% of occupancy) than the 4 years old one (62 \pm 8%). The Araucaria Forest has shown an important resource for wild boar. It was not possible to confirm yet which situations represent more risk: few farms with many animals or many small ones. The wild populations can have a natural increase but the high amount of clandestine farms is likely an important cause of its spreading. The monitoring is going on and more information shall contribute to management strategies.

65 AGGREGATED RETENTION AND MAMMAL CONSERVATION IN OLD GROWTH FORESTS

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Aggregated retention and mammal conservation in old growth forests Helen Stephens^{1*}, Julianne O'Reilly-Wapstra¹, Sue Baker², Sarah Munks³, Brad Potts¹ ¹ School of Plant Science and CRC for Forestry, University of Tasmania, Hobart Australia 7001 Natural old growth forests have complex structures which provide important habitats for many animals. Traditional harvesting (clearfelling) generally removes these structures, resulting in landscapes of even-aged, uniform structures. A new alternative forestry practice in Tasmania, Australia called "aggregated retention" maintains patches of forest in operational coupes. The objective is to retain old

growth species and structures to provide wildlife habitat, refuges and seed banks. In this study, we tested the response of small to medium-sized ground mammals to aggregated retention using trapping and scat surveys. We compared species richness, diversity and population demographics of mammals in three treatments: aggregated retention coupes, clearfell coupes and unlogged native forests. Thirteen different small mammal species were recorded and results indicate clear treatment differences in native species composition and also treatment effects on the presence of non-native species. This information is crucial to increasing our understanding of the impacts of fragmented habitats on the ecology of mammals and will provide forest managers with key information on how to better manage their production old growth forests in regards to ecological biodiversity.

66 AMERICAN MINK IN THE CAPE HORN BIOSPHERE RESERVE, SOUTHERN CHILE: A POPULATION AND COMMUNITY APPROACH TO UNDERSTAND A RECENT ISLAND INVASION

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Since 2001 exotic *Mustela vison* has been known to populate Navarino, an island located in the pristine Cape Horn Archipelago (54-55°S). As an invasive predator, it could be affecting the biodiversity that evolved in absence of mammalian terrestrial predators. We report the abundance (using live-trapping and sign surveys) of mink and its seasonal impact (through bird sampling, diet analysis, and artificial nest predation) upon the wetland bird community. Mink signs were found in 79% of the surveys in all types of semi-aquatic habitats. Yet, relative population abundance (0.75 mink/km of coastline) was still below densities measured in other invaded or native areas. The habitat model accuracies indicated that mink were less specific in habitat use, probably due to the missing limitations normally imposed by predators or competitors. The selected models predicted that mink prefer to use shrubland instead of open habitat, coastal areas with heterogeneous shores instead of flat beaches, and interestingly, that mink avoid habitats strongly modified by beavers. Fifty-six bird species were registered with marked seasonal variations in richness and total number of birds. Near half (48%) of bird species were migratory, arriving to the area in summer. Seasonal differences in the diet of *M. vison* were observed ($n=414$ scats). Scat analysis showed fragments of birds in 36% of the samples collected during summer, but only 21% in winter scats. This agrees with the increase in the number of birds during their reproductive period. Species like *Chloephaga picta* and some passerine birds are at a greater risk of being preyed by mink. Conversely, predation of mink on artificial nests was very low. Our results shows that mink have colonised the entire island and is opportunistically preying on birds. For the management of mink, we suggest the establishment of rocky coastal shores as priority sites deserving special conservation efforts. Key words: Avifauna, capture-mark-recapture, *Castor canadensis*, diet, invasive exotic species, *Mustela vison*, seasonal variations, sign surveys, sub-Antarctic, wetlands.

67 ASSESSING THE IMPACT OF ROADS ON MAMMALS: OIL-ROADS IN YASUNÍ BIOSPHERE RESERVE, ECUADORIAN AMAZON

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With increasing intrusion of extractive industries into sensitive tropical areas, the rapid construction and spread of new roads constitutes a major threat. Although the impacts of roads and associated human activities are widely accepted, there is little information about the potential effectiveness that road control measures, such as those provided by oil and timber companies, could have in terms of controlling colonization, and intensification of hunting activities. In Yasuní Biosphere Reserve, an 18,000 km² protected area in the Ecuadorian Amazon, we compared the composition, population density and detection probability of medium-sized and large mammals (> 1 kg) in an undisturbed area (control), and in two representative localities along two oil extraction roads that have experienced contrasting management schemes: (i) Auca road, a 30 yr-old open access road heavily colonized since the 1970's, and (ii) Maxus road, a strictly controlled road in which the oil companies allow open transit only to local indigenous communities. Of the 17 species of mammals recorded, 16 were present in the control site, 14 in the Maxus road, and only nine in the Auca road. Detection probabilities of the species present in the Auca and Maxus road were 70 and 35% lower than in the control site respectively. In the case of species that still occur in the three study areas, population sizes have been reduced by almost 90% in the areas affected by roads, and the species most appreciated by hunters have been extirpated. The species most affected by the presence of roads and associated human activities included the white-bellied spider monkey, woolly monkey, white-lipped peccary, and lowland tapir. Our data suggest that controlling access to roads is not enough to ensure the conservation of wildlife species if it is not accompanied by clear regulations of wildlife use and sustainable economic alternatives for local people.

68 BAT CONSERVATION IN THREATENED ECOSYSTEMS OF BOLIVIA: TOWARDS A BETTER WORLD FOR BATS

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Here we present the main findings of our research and outreach programs on bats in the most threatened ecosystems of Bolivia: dry forests, montane forests and open areas. We report the presence of 91 species of bats, several of them threatened and need special attention for conservation. We used the information gathered to propose actions plans that are currently considered by the government and that will conduct conservation actions that will benefit bats, their roosts and habitats. During the period 2007-2008 we were able

to build capacities to government officials and particularly 7 students that conducted their licentiate thesis with us. Our public outreach and environmental education program also had a great impact. We were able to reach more than 1600 Bolivians directly (through workshops, museum exhibits) and at least 50,000 people indirectly (through publications and media coverage). We are certain that we changed attitudes of many people toward bats and at least gained attention to their protection and importance. We have been approached by private enterprises requesting assistance and advice on how to protect bats, or at least controlling bat populations (of vampire bats or beneficial bats under roofs) without harming beneficial bats. Our example is being replicated elsewhere, and we have supported the formation of Bat Conservation Programs in Colombia, Argentina and Ecuador. This project was funded by the Whitley Fund for Nature, through the 2007 Whitley Award to LFA.

69 BATS ALOPECIA IN VILLAHERMOSA, TABASCO, MEXICO

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Species inhabiting urban areas face stressful situations including pollutants, pathogen exposure, stress and changes in quality and availability of food and roosting resources. To understand the effect of urbanization on communities assemblages, comparative studies between urban and suburban sites are needed. We report alopecic syndrome in males and females of four frugivorous bats species (*Artibeus jamaicensis*, *A. lituratus*, *Sturnira lilium* and *S. ludovici*) within the City of Villahermosa, Tabasco, México during 2007 and 2008. The study was conducted in 60 sites distributed within urban and suburban areas of the city. Total prevalence was 5.25% (135/2567). The highest prevalence was recorded in *Artibeus lituratus* 5.6% (62/1105) followed by *A. jamaicensis* 5% (73/1462). We found higher prevalence in the dry season, more than 90% of the alopecic individuals (122) were captured in this time of the year. Higher alopecic prevalence was recorded in urban areas 80% (108) than suburban areas 20% (27). Females had higher prevalence than males principally during the dry season of 2008. Histopathological studies were conducted to identify possible causes and we did not find any infectious agent nor histopathological evidences for infections. Possible causes of the alopecia are believed to be environmental contaminants, lack of resources which in turn can cause stress and changes in the availability of essential minerals such as zinc, copper and selenium.

70 BATS IN THE SCHOOL: A CONSERVATION TOOL

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The mission of the GIM (Group for Research and Conservation of Bats from Uruguay) is to generate knowledge about bat diversity and ecology, and to educate and sensitize the society in relation to the importance of bats. One of its strategic work lines is education. Within this work line, we developed a project to work with children from the public educational system. Two schools from urban and suburban areas from the capital of the country and one from a rural area located inland were selected to participate in the project. The main objective was to evaluate attitude changes towards bats through educational activities. All the selected schools had some kind of relation with bats: roosting animals at school facility or proximity to caves with bat colonies. The project was evaluated through two questionnaires filled by each child at the beginning and at the end of the project. The education methods included workshops in the schools, with computer tools, handcrafts and games, and a field trip to one of the largest caves of the country, house of a big vampire bat colony. The evaluation allowed us to identify changes in attitudes towards bats by the children and their families associated to an increase of adequate information. Educational activities in schools showed to be effective conservation tools: more information is related to a better understanding of these mammals and consequently it is possible for attitudes improvement, which is essential for the long term objectives of conservation. Grants were received from CECN (Uruguay) and Global Greengrants Fund.

71 BUILDING PARTNERSHIP WITH LOCAL COMMUNITIES AND ENVIRONMENTAL EDUCATION FOR THE CONSERVATION THE BAT AND HABITATS IN SOATA, COLOMBIA

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The forests in southern at Soata, Colombia have threatened endemic species of bats. The forest is managed by organized local communities (Peoples Organization), each with co-management agreements with the Corpoboyaca and receiving technical and financial support from non-government organizations and the local government units. The co-management structure is a result of last years of intervention and advocacy efforts, both at the community and at the provincial level. This paper explores the strengths and weaknesses of using a collaborative management mechanism, environmental education and the impact of the initiative towards the conservation of the natural forest and threatened wildlife bats. Active participation of local community involvement in protecting remaining forest fragments and in providing solutions to lessen the use of native oak forest for charcoal and fuel wood are also discussed.

72 CONSERVATION OF BAT ASSOCIATED WITH THE MARSHES SYSTEMS IN THE CARIBBEAN REGION OF COLOMBIA

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The Caribbean region is one of the least studied areas of Colombia, where their marshes, one of its most important habitats, around which is assembled a series of specific flora and fauna, are highly threatened. Given the ecological importance of these habitats and their environmental problems, we began in 2003 the study of fauna and flora of these ecosystems, in order to outline strategies for the conservation, management and use. One of the most important elements of the biota of these ecosystems is the bats. We sampled seven Marshes of the department of Córdoba, on average, eleven species are reported, the most abundant are *Molossus Molossus*, *Sturnira lilium*, *Uroderma bilobatum*. For the swamp of Gamboa, Sucre department, fourteen species are reported, the most abundant *Artibeus obscurus*, *Carollia perspicillata*, *M. Molossus* and *Noctilio albiventris*, emphasizing the presence of *Pteronotus parnelli* (Mormoopidae) for the Cesar department. We sampled six Marshes, for which 23 species are reported, the most abundant were *Artibeus jamaicensis*, *Artibeus lituratus* and *C. perspicillata*. The predominant species that consume fish *N. albiventris*, and the insectivores like *P. parnelli*; as these swamps are offering them not only shelter but also food supply. The assemblage of bats in swamps plays an essential role in biological pest control (36%) and regeneration of forests through seed dispersal (33%), the most abundant plant species in the area correspond to pioneer species and regenerating the forest. Keywords: Caribbean, marshes, Colombia, conservation, bats.

73 CONSERVATION OF THE CAATINGA HOWLER MONKEY (*ALOUATTA ULULATA*): STARTING TO KNOW THE SPECIES' ECOLOGY.

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The Caatinga Howler Monkey, *Alouatta ululata*, is an endangered primate and probably the least known howler monkey of the world. It is an endemic primate of the northern portion of the states of Ceará, Piauí and Maranhão (NE Brazil). The known geographical range of *A. ululata* is situated in one of the poorest areas in Brazil, where the growing human communities still depend on natural resources for their subsistence. However, there is virtually no information about the interactions and conflicts between the species and the local human population, and the factors that are driving the species to near extinction. In order to answer basic questions about the species' natural history, threats and conservation priorities a one year research project was developed in the region. This study was made based on direct observations of several groups of *Alouatta ululata*, in two distinct environments, mangrove and Caatinga. Additionally, interviews with local communities were conducted intending to understand their relationship with this primate species, its habitat and to collect information about the species ecology and threats. Twenty-five plant species were observed as part of the species alimentary diet, the species home-range was estimating varying between 0.544 ha and 10.528 ha in the caatinga areas, and from 0.034 ha to 3.412 ha in mangrove areas. The mean group size was of 5.6 in caatinga areas and 5.2 in mangrove areas. The main threats to the species are the poaching and habitat loss. The priority conservation action to this primate is the establishment of new protected areas in this region and produce a conservation plan evolving the local stakeholders and the Governmental Environmental Agencies.

74 CONSERVATION OF THE EURASIAN LYNX IN FRAGMENTED HABITAT – AN EAST EUROPEAN PERSPECTIVE

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The Eurasian lynx living in NE Poland are on the westernmost limit of the natural range of the species and they occupy highly fragmented habitat. Research conducted in Białowieża Primeval Forest (BPF) showed that the lynx population is highly vulnerable to exploitation by humans. Their current range in Poland also contracted during recent 20 years despite of strict protection. Data on lynx ecology in BPF showed that these felids rely specifically on roe deer as its staple food, utilize large (up to 300 km²) home ranges, are dependent on forest habitat and the maintenance of its population should be supported via dispersal among neighbouring forest patches. We hypothesized that the ecological circumstances for lynx in NE Poland (low population size, habitat limitations) may create obstacles for their population genetic diversity. To test it, the samples were collected in a peripheral (fragmented) population of the species (NE Poland, including BPF) and compared using microsatellite and mtDNA genetic markers with those in the core range (Baltic states), where lynx occur in a nearly continuous habitat. Lynx from NE Poland had lower allelic richness than those from continuous range. There was also significant genetic structuring among the populations (F_{ST} : 0.11 – 0.15). The lynx shared most of mtDNA haplotypes throughout their range, however its diversity tended to be lower in the NE Poland with one haplotype being unique to the BPF population. The genetic results are also supported by pelage characteristics of the lynx as the individuals from NE Poland were morphologically less diverse than the cats from the continuous range. The results suggest that the Eurasian lynx may show limited gene flow between its peripheral and core populations, thus being exposed to decrease of their genetic variability and the increased risk of extinction.

75 CURRENT MAP AND CONSIDERATIONS ON THE DISTRIBUTION OF THE BOLIVIAN DOLPHIN *INIA BOLIVIENSIS* (MAMMALIA: CETACEA)

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For several years the Bolivian Dolphin was considered as a subspecies of the widely distributed *Inia geoffrensis* which inhabits the main rivers of the two most important basins of South America: the Orinoquian and the Amazon basins. Recent morphological, molecular and genetic researches have demonstrated the Bolivian Dolphin can actually be considered as a separate species isolated from *Inia geoffrensis* and called *Inia boliviensis* for been restricted mostly to the northern Bolivian Amazon. In order to establish the current distribution map of the species and consider the natural limits for it we reviewed all the information available on the species until now. We analyzed all the data obtained from technical reports, scientific publications and our own field data, to project all the sighting points for the species. With this information a simple model for the distribution range of *I. boliviensis* was developed considering geographical factors like sub basins connectivity, physical limits, altitude, and flooding areas. Some natural limits were established for the species, however in the northern Amazonian from Bolivia we observed that the formerly considered as the main barrier for the species a series of 18 waterfalls distributed along 400Km of river between Bolivia and Brasil actually counts with registration points of dolphins in segments between the waterfalls. Therefore the limit between both species of the genus *Inia* could not be established, since there are no genetic researches which could demonstrate where these river dolphins come from, the species they belong to or if there is genetic connectivity between their populations. In this work we present the actual distribution map and some of the natural limits for the range of the species showing also the waterfall series formerly considered as the main natural physical barrier between *I. geoffrensis* and *I. boliviensis*.

76 DEAD HOTSPOTS ON A BIODIVERSITY HOTSPOT – AN ASSESSMENT OF ROAD MORTALITY IN CENTRAL BRAZIL

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Due to the growing interest on Cerrado for intensive livestock, soy and, more recently, biodiesel production, this biome was considered as a world biodiversity hotspot. With the need to flow production, road network suffered a dramatic expansion, accentuating fragmentation of this biome. For the assessment of road impact in Central Brazil, road TO080, in the state of Tocantins, was chosen because it is one of the major land connections with the state of Pará. However, the most concerning issue is that this road cuts through a complex of protected areas. This 183 Km road was fortnightly monitored from 29 April 2008 to 14 April 2009 with two observers in a vehicle, at constant speed of 60Km/h. We recorded all vertebrates found dead and marked the exact location of the occurrence with GPS and car odometer. Carcasses were removed to avoid repeated counts. To determine the points with high mortality we divided the road in segments of 1Km and clustered all the occurrences within it. The observed frequency distribution was compared with the expected frequency distribution considering a Poisson distribution. All 1km-segments with a number of occurrences above the 95% probability acceptance area were considered mortality hotspots. A total of 302 individuals, from 59 species, were recorded, being the mammals the most frequent victims (58,1%), followed by birds (22,1%), reptiles (9,7%) and amphibians (7,9%). Five road segments were classified as mortality hotspots, presenting more than 4 occurrences each. These points are mainly located in areas where riparian forests are crossed by the road. Authors strongly recommend the construction of mitigation structures in these mortality hotspots, such as lateral fences, overpasses or underpasses depending on local features. Signposts alerting drivers for the presence of wild animals on the road, as well as stronger surveillance by authorities could be complementary measures.

77 DO FEMALES OF THE MARSUPIAL *MICOUREUS PARAGUAYANUS* AVOID THE EDGE OF FOREST FRAGMENTS WHEN BREEDING?

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In mammals, breeding implies in high energetic demand and vulnerability, especially for females which undergo pregnancy and lactation. In small forest fragments, one would expect that forest-dwelling mammals would be more habitat-selective when breeding, avoiding suboptimal habitats such as forest edges. The habitat selection of individuals of the marsupial *Micoureus paraguayanus* was analyzed through capture-mark-recapture in three small forest fragments (A, 7.1 ha; D, 8.8 ha; E, 11 ha) in Poço das Antas Biological Reserve, southeastern Brazil, in 1995-2006. The study assumed that fragments' cores where less disturbed than their edges, and aimed to test the hypothesis that reproductive females would be found more often than expected in the fragments' cores. Only the first capture of each female in each (monthly) trapping session was used, to assure the independence of data. Captures were grouped in classes of distances from edges. In D females were captured in the core more often than expected (Kolmogorov-Smirnov, $n=23$ reproductive females, $d_{max}=8$, $p<0.01$). In fragment A there was a similar pattern, but it was not significant, probably due to the small sample size (KS, $n=34$ reproductive females, $d_{max}=5$, $p>0.20$). In fragment E there was no trend at all (KS, $n=21$ reproductive females, $d_{max}=3$, $p>0.50$). Our results suggest that *M. paraguayanus* breeding females prefer the fragments' cores at least to some extent, although factors other than reproductive condition must also affect their preferences, as shown by fragment E. The interior habitats of fragments must either provide better resources for the young, or increased protection against predators, or both. (Fundação O Boticário de Proteção à Natureza, PROBIO/PRONABIO, Critical Ecosystems Partnership Funding, FAPERJ, CNPq, CAPES, PIBIC-CNPq).

78 DONKEY AND GUANACO ABUNDANCES AND GROUP CHARACTERISTICS BEFORE AND AFTER DONKEY REMOVAL IN NORTHWESTERN ARGENTINA

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Introduced species could negatively influence the abundance and distribution of native species. Currently, feral donkey *Equus assinus* populations inhabit northwestern Argentina even inside protected areas. In 2007, 517 feral donkeys were removed from Los Cardones National Park, Salta province, Argentina. We aimed to (1) quantitatively evaluate the effect of such removal on the abundance of donkeys and a native ungulate species, the guanaco *Lama guanicoe*; (2) analyze modifications in donkey and guanaco group size; and (3) investigate changes in age structure (number of juveniles divided the total number of individuals observed \times 100) for populations of both species. We conducted fieldwork in July 2006 (pre-removal) and August 2008 (post-removal). We estimated donkey and guanaco abundances using the line transect method and program DISTANCE 5.0. Mean abundances [95% CI; CV] of donkeys (2006: 0.82 ind/km² [0.17-3.95; 59.3%]; 2008: 0.39 [0.10-1.56; 50.9%]) and guanacos (2006: 1.03 [0.12-8.67; 78%]; 2008: 0.52 [0.14-1.92; 50.1%]) decreased by 50% after removal. These differences were marginally significant for donkeys ($p=0.08$; $t=1.639$) and non-significant for guanacos ($p=0.13$; $t=1.208$). We did not detect between-year changes in group size (mean [95% CI]) neither in donkeys (2006: 3.9 individuals [2.6-5.1]; 2008: 3.3 [2.4-4.2]) or guanacos (2006: 8.0 [6.2-9.8]; 2008: 6.7 [4.2-9.2]). We observed a sharp increment in the prevalence of juvenile donkeys within the donkey population (2006: 0.8% [0-3.7]; 2008: 5.8 [2.8-9.9]) and a modest increment in the prevalence of juvenile guanacos (2006: 6.7% [3.6-10]; 2008: 8.9 [4.4-13.1]). Our data suggest that donkey removal effectively decreased donkey abundance; however, it appears to have also enhanced the reproductive success of donkeys likely via decreasing intra-specific competition. The lack of response observed in the guanaco population may be explained by the short period of time passed since donkey removal.

79 EFFECTS OF CATTLE GRAZING ON NATIVE MAMMALS IN THE SIMPSON DESERT, AUSTRALIA

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Arid Australia harbours more than half of Australia's threatened vertebrates with one third of its terrestrial mammals already extinct. Livestock grazing is considered to be one of the biggest threats to the maintenance of biodiversity in arid Australia. Extensive spinifex (*Triodia basedowii*) dominated dune-fields of the Simpson Desert contain one the richest known assemblages of insectivorous mammals (dasyurids). These dune-fields are interspersed with small patches of gidgee (*Acacia georginae*) woodland which have been little studied, but could be an important habitat for native species as well as for cattle by providing drought fodder, minerals and shade. Small mammals (rodents, dasyurids) were live-trapped in pitfalls to quantify the effects of cattle grazing on their abundance and diversity. Abundance of kangaroos (*Macropus rufus*) and domestic cattle was measured by dung counts and sighting records along transects. Kangaroo and small mammal abundance, as well as small mammal diversity were affected negatively by cattle grazing, in particular in gidgee woodlands which were also favoured by cattle. Only two small mammal species (*Pseudomys hermannsburgensis* and *Sminthopsis youngsoni*) were recorded in sufficient numbers to allow statistical analysis, but both were not significantly affected by cattle. However, the total capture rate over three years of all the other native mammal species, including the IUCN-vulnerable Mulgara (*Dasyurus blythi*), resulted in twice as many captures in areas where cattle had been removed. We speculate that gidgee woodland patches are important not only for cattle to meet their food and shelter requirements, but also for native mammals. Therefore we suggest that these woodlands should be foci for protection and sustainable land management.

80 EFFECTS OF STOCK FENCING AND INVASIVE MAMMAL PESTS ON BIODIVERSITY CONSERVATION IN LOWLAND NEW ZEALAND

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Forest health was measured during summer (January- February) and autumn (April - May 2008) in 53 fragments of formerly extensive indigenous conifer-broadleaved forest in rural landscapes of Waikato, a lowland pastoral farming district of the North Island, New Zealand. Fragments averaging 6 ha had been fenced against livestock for different lengths of time. Invertebrates, primarily the litter-dwelling detritivores essential to the cycling of nutrients for forest health, were up to 100 times more abundant in fragments fenced for 30-40 years compared with unfenced fragments. Two key introduced pests (Australian brushtail possums *Trichosurus vulpecula*, and European ship rats *Rattus rattus*), which destroy seeds, invertebrates and nesting birds, are widespread throughout the region, and can reach high numbers especially when free of competition with stock. For example, rats in summer were more abundant in 4 fenced (mean 7.1 rats/ha) than in 4 unfenced, grazed fragments (mean 0.9 rats/ha; $p=0.01$). Rats were eradicated from all 8 fragments in January-April 2008, but reinvaded within a month. Isolation from an adjacent source of immigrants did not reduce rat abundance within a fragment in either season ($p=0.25$, 0.54). Our results identify a previously unsuspected dilemma for conservation in forest fragments. Stock fencing is a key tool to improve plant regeneration, litter decomposition and invertebrate populations, but if used alone it also encourages high numbers of ship rats and other pests. Adding pest control at the time of fencing will improve the

diversity of regeneration, and implementing it thereafter will improve leaf, flower and seed abundance, bird nesting success, and many other ecological outcomes.

81 EVOLUTIONARY RELATIONSHIPS AND CONSERVATION OF GOLDEN MOLES (AFROSORICIDA; CHRYSOCHLORIDAE) FROM SUB-SAHARAN AFRICA

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Golden moles belong to an ancient Afrotherian clade of placental mammals and represent one of Africa's most elusive and endangered mammalian families. The group comprises two subfamilies, nine genera and 21 species. Eleven species are considered threatened yet, the delineation of certain taxa based on morphology and cytogenetic grounds remain unclear. A sound taxonomy forms an essential baseline for conservation planning and within this context we present a comprehensive multi-gene molecular phylogeny for golden moles. The inferred relationships question taxonomic subdivisions in current use as distinct evolutionary lineages are clearly contained within at least two genera and three of 21 recognized species. Molecular data analyzed in combination with discrete morphological characters revealed contradicting evolutionary trends in some characters, suggesting convergent evolution and homoplasy. Due to the novelty of this mammalian family and the insights that the group can offer into the radiation of an old but range restricted clade across the African continent, we used molecular dating to tentatively place the radiation of the family within a temporal and associated biogeographic framework.

82 FERAL HORSE MANAGEMENT IN ARGENTINA

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Feral horse (*Equus caballus*) is an invasive alien species in Argentina. The highest known population occur in Tornquist Provincial Park, a natural protected area in Buenos Aires Province, where they threaten biodiversity. We study their demography from 1995 to 2009 in order to develop evidence based management. We individually identified feral horses based in coat color and marks in face and legs. We conducted ground censuses in the 2000 has study area. We calculated foaling, survival and population growth rates. The feral horse population grew from 450 in 1995 to 700 in March 2002. Mean Foaling rate for this period was $F=0.5$, mean survival rate $S=0.88$ and annual growth rate $\lambda=1.06$. We found no significant correlation between demographic parameters and density or rainfall. In 2002 a mass mortality caused by a violent rainstorm affected 192 horses. After that, the population grew slowly $\lambda=1.02$. Public perception and lack of political will preclude any feral horse management until 2006. Since then we worked cooperatively with government biologists, local rangers and other stakeholders. Based in our results we suggested a minimum horse capture quota and predict possible population growth rate. We also analyze alternative control methods and recommended the use of mobile-corral. From April 2006 to August 2007 a total of 220 feral horses were captured and relocated outside the protected area, but still no official management plan exist. After this removal the population grew again $\lambda=1.13$, foaling rate remain moderate, $F=0.5$ probably because age structure changes and dry weather in those years. In 2009 we begin working toward a draft of Feral Horse Management Plan for Tornquist Park, included in an adaptive management strategy of multiple exotic mammal species and grassland ecosystem restoration. Cooperative research appears as a fruitful path for invasive mammal management in the Neotropics.

83 FORAGING AND ROOSTING HABITAT USE OF FRUGIVOROUS BATS IN A RESTORED FOREST IN SOUTHEASTERN BRAZIL

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With the increasing number of forest restoration projects in the threatened Atlantic Forest of Brazil, development of measures of restoration success is needed to guide future restoration efforts. Due to their important role in forest regeneration, frugivorous bats are though to be good models to evaluate the success of restoration programs, and such assessment could be made by analyzing the importance of this novel habitat on their foraging and roosting patterns. This study aimed to evaluate the use of foraging and roosting habitat by the two most abundant frugivorous bat species of a 7 years restored forest area in southeastern Brazil. We radiotracked 11 adult non-reproductive individuals of *Carollia perspicillata* and 10 of *Artibeus lituratus* during five sampling periods of 10-15 days each, from July 2007 to August 2008. Bats were tracked on a whole night standardized sampling regime, and estimates of their foraging area were obtained with fixed Kernel density estimator. Compositional analysis was used to access foraging habitat preference in relation to the available habitats in the landscape. For both species, Restored Areas was the highest ranked foraging habitat, followed by Secondary Forest Remnants and Exotic forest plantations (*Eucalyptus* sp.), the three consistently preferred over Early Successional Forest Remnants and Anthropogenic Land Use. In relation to roosting habitats, *C. perspicillata* and *A. lituratus* had, respectively, 55% ($n=11$) and 69% ($n=13$) of their roosts in Secondary Forest Remnants and 45% and 31% in Restored Areas. These results show that restored forests can be readily incorporated as foraging and roosting habitat for this bat species, and that habitat complexity may play an important role on this process. Both species were able to move across the open matrix to colonize this novel habitat, but the presence of structurally more complex habitats were of paramount importance to their foraging and roosting requirements.

84 **FRAGMENTED LANDSCAPE CREATES FIELD EXPERIMENTS IN SMALL TERRESTRIAL MAMMALS**

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In the Czech Republic (Middle Europe), huge level of landscape fragmentation has restricted the European ground squirrels (*Spermophilus citellus*) into few and very isolated localities. We have analyzed ground squirrels from six localities using microsatellite loci as genetic marker. The results have shown strong genetic differentiation among the investigated subpopulations and high level of inbreeding. Abundance monitoring showed different fates of particular subpopulations. We suppose that some of them have passed a bottleneck and for future they could be successfully adapted to existing conditions. Landscape fragmentation caused by anthropogenic or natural linear barriers, such as roads, railways, and rivers, can affect dispersal pattern of organisms. Eight localities of the common shrew (*Sorex araneus*) were tested for allelic and genotypic differentiation under mentioned environmental conditions. Genetic differentiation among the semi-insulated localities was low but significant. Level of genetic variability was positively correlated with the area of the inhabited locality. Such spatial arrangement created relatively different population units useful for monitoring of influence of changing environmental conditions on the species. In some mountains, the field vole (*Microtus agrestis*) colonized secondary habitats - clearings after large-scale forest decline. Vole population showed pronounced abundance cycles under these conditions. After intensive reforestation, succession backward the forest habitat fragmented the uniform large-scale clearing into a landscape mosaic. By this change, the cycling vole population has changed into a low-abundance non-cycling one. This transition created a field experiment on crucial environmental factors in population cycles.

85 **GEOGRAPHIC INFORMATION SYSTEM OF BAT CAVES IN ARID ZONES OF NORTHERN VENEZUELA AND BONAIRE ISLAND**

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Many bat caves in northern Venezuela and nearby islands are distributed inside arid and semiarid zones. Unfortunately, most of these ecosystems are not included in systems of protected natural areas, and the chiroptero fauna that inhabit these caves is threatened by several anthropogenic activities. A detailed inventory of the principal caves used by bats in these environments is needed in order to propose effective protection measures, concordant with the specific biological and physical characteristics of each refuge. In this study, we generated a GIS of 15 caves, bats refuges, 11 of these present in arid and semiarid ecosystems of northern Venezuela, and 4 in the Bonaire Island, Netherlands Antilles. We built one database with the name and geographic location of the caves, and other with biophysical information, including: bat species composition, internal/external temperatures and relative humidity registered during each visit to each cave. Most of the caves had evidence of anthropogenic disturbances such as graffiti, garbage, remains of rituals, etc. Twelve species of bats were identified, from these, *Leptonycteris curasoae*, *Mormoops megalophylla*, *Pteronotus parnellii*, *Pteronotus davyi* and *Natalus stramineus* are particularly associated with xeric habitats and were found using the hottest places inside the caves. The species found varied between 1 and 6 in the caves monitored. The other seven species are very common in diverse types of ecosystems. *Leptonycteris curasoae* y *Glossophaga longirostris* were the most common. The lowest temperature and relative humidity registered were 22.3°C and 69% (outside) and the highest values were 34.6°C and 100% (inside). The generation of this GIS allowed us to identify new bat refuges with large colonies of gregarious species like *L. curasoae*, an important pollinator in xeric ecosystems. The information obtained so far is preliminary to a GIS which aims to represent the dynamics of use of these refuges in northern Venezuela.

86 **HABITAT USE OF JANOS-HIDALGO BISON (*BISON BISON*) AND IDENTIFICATION OF REINTRODUCTION AREAS IN CHIHUAHUA, MEXICO**

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North American grasslands have suffered large transformations and species losses, including keystone species like bison (*Bison bison*), whose population was reduced to about 1000 individuals between 1830 and 1880. Today there are ca. 600,000 bison in segregated groups, however 95% of them are managed as cattle for meat production and do not fulfill an ecological role. Even though they have recovered in numbers, strong efforts must be made before ecological recovery of the bison is achieved. This project focuses on the only free ranging bison herd in Mexico, which roams in the border area between Janos, Chihuahua, Mexico and Hidalgo county, New Mexico, USA; in the southwestern limit of their historic distribution range. The herd has been surveyed since 2003, through aerial surveys, and has been found to use grasslands with *Bouteloua* spp., *Aristida* spp., *Hilaria* spp. and shrubs (*Prosopis glandulosa*, *Yucca* sp., *Larrea tridentata*, *Gutierrezia sarathoe*). The maximum number of individuals registered in a single group has been 108, and it includes individuals of both sexes and all age classes. The average group size is 16.91 ± 24.45 SD, from mixed groups to solitary bulls. The population size has remained stable in spite of habitat availability, due to hunting in the USA. The border wall represents a threat to the free movement of the species in the region. The information obtained from this project will help advance reintroduction efforts of bison in the region.

87 HOME RANGE OF BROWN HOWLER MONKEY (*ALOUATTA GUARIBA CLAMITANS*) IN FOREST FRAGMENTS OF SOUTHERN BRAZIL.

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Howler monkeys (*Alouatta*) are known for their ability to survive in both intact and disturbed habitats of varying sizes. Their broad tolerance to changes in habitat quality has been related to high degree of folivory, a flexible diet and the use of small home ranges. These characteristics also permit their survival in very small habitat fragments. Ten groups of brown howler monkeys (*Alouatta guariba clamitans*) living in three forest Mata Atlantic forest fragments in state of Rio Grande do Sul, Brazil, were followed bimonthly from december 1999 to december 2001. Thirteen surveys were carried out and the following information was registered: date, time, location, and social composition of each group. The groups had an average size of 8.2 individuals, 1.3 adult males; 2.6 adult females; 0.3 subadult males; 3.1 juveniles and 1.0 infants. The estimated average home range of ten groups during the two-year monitoring was 4.4 ha using the minimum convex polygon method and 4.2 ha using the grid method (25x25m). The area of individual use varied between 0.2 and 1.1, with an average of 0.5 ha per individual. The number of individuals per group was not significantly relationship to the home range size. As fragment size decreased, the howler population density increased and home range size showed a negative relationship with population density. The overlap of home range varied between 0% and 39%, however showed no differences between the three fragments. Population density and size of fragments were the most important factors determining the home range size and seem to be better predictors for the species as a whole. FAPESP Grant N. 99/00024-8.

88 IMPLEMENTING CAPTIVE BREEDING PROGRAMMES: TRAITS AFFECTING PERINATAL MORTALITY IN TWO ENDANGERED GAZELLES

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The world is currently facing of an unprecedented extinction crisis. Ex situ conservation is just one of many options open to wildlife managers, but often represents the only hope for species near extinction in the wild. However, how effective captive breeding is for conservation depends on the biology of particular taxa. Reproduction problems, high mortality and low rates of success for re-introductions of captive-bred animals have delayed endangered species conservation efforts. For many mammals, perinatal mortality, the mortality during the 30 days of life, represents the highest mortality rate in captivity as well as in the wild and it has been related with different genetic and demographics factors. Populations of gazelles in Africa are jeopardized by loss of habitat and hunting. In 1971 a captive breeding program started in Almería (Spain) representing a good opportunity to study perinatal mortality in two species of threatened gazelles: *Gazella cuvieri* (Ogilby 1841) and *G. dama mhorh* (Bennett 1933). In this study we analysed maternal and calf traits that are affecting perinatal mortality during the first month of life. We analyse 623 individuals of *G. cuvieri* and 711 of *G. dama mhorh*. Only maternal experience had an effect in both species. Calves born to primiparous females had higher mortality rate than those calves born to multiparous females. In *G. cuvieri*, litter size and sex also affected perinatal mortality. Calves born to twins and males had higher mortality rate. Maternal age also influenced infant mortality, calves born to mothers who give birth when they are still growing had higher mortality. In *G. dama mhorh*, maternal inbreeding coefficient affected significantly perinatal mortality, calves born to high-inbreed mothers had the highest mortality. Our results show how which factors affect perinatal mortality in two endangered gazelle's captive population. This approach should be implemented in other captive breeding programs which help to improve their success.

89 INVASIVE BEAVERS AND NATIVE BIRDS IN TIERRA DEL FUEGO: A CONSERVATION PARADOX?

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In Tierra del Fuego, 25 American beaver (*Castor canadensis*) couples were introduced in 1946. These mammals found in Nothofagus forest a predator-free Eden, where population increased to 60,000 individuals in 1999. Today, this species continues its dispersal through Patagonia. Beaver's ecosystem engineering and impact on other wildlife has been extensively studied on its native habitat, where increased richness and abundance of waterbirds as a result of beaver activity have been described. In Tierra del Fuego, the most important exotic range of American beaver, most of its ecological effects remain hypothetical. I studied the impact of beaver invasion on waterbirds in Tierra del Fuego. Beavers have the potential to alter habitat for this group by transforming a lotic system into a lentic one when constructing dams. I conducted census to determine bird abundance and richness in beaver ponds and free-flowing rivers. I also investigated avian use of beaver ponds vs. natural lagoons, as beaver-created habitat becomes rapidly eutrophic while natural limnic systems of Tierra del Fuego are naturally oligotrophic. Results indicate that overall bird species richness and density are significantly greater in beaver ponds than in free-flowing rivers and natural lagoons. When analyzing exclusively waterbirds, richness and density remained greater in beaver ponds vs. rivers, but did not differ from lagoons. Species invasion is one of the most frequent causes of biodiversity loss, but in the case of beavers and birds in Tierra del Fuego, they seem to be an exception. Instead of questioning the level of threat imposed by exotic species on native ecosystems, this type of results should remind us that the analysis of impacts cannot be based on straightforward ideas like 'more is better'. Determining what is it that we want to conserve of biodiversity, beyond mere number of species, is a key aspect in interpreting results.

90 INVASIVE MAMMALS VS CONSERVATION IN THE ANTILLES ISLANDS

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The Antilles or West Indies are considered a world biodiversity "hotspot" supporting 779 endemic vertebrates and 7,000 species of endemic plants. More than 22 endemic terrestrial mammals have become extinct in recent times (after 1500). Around 7 to 12 extinctions and 12 to 13 extirpations have occurred among amphibians and reptiles in the last 155 years. An estimated 37.5% of world-wide modern-era extinctions occurred within the Antilles. Invasive species, especially mammals, are considered an important cause of these extinctions and extirpations. Mammals introduced to the Antilles have had a negative impact on the endemic fauna and flora after first arriving in 1492. Rats, mongooses, cats, dogs, pigs, goats, sheep and other introduced mammals jeopardize conservation efforts in all West Indian islands. Today, critically endangered species such as Cuban and Hispaniolan solenodons, several very rare capromyid rodents and many species of birds, reptiles, amphibians and invertebrates are impacted by invasive mammals. The current status of 40 introduced mammals in 140 islands of the Antilles, with their impacts (extinctions, extirpations and other harm), types of introduction, field observations in Cuba, control efforts and overall distributions are summarized. Black and brown rats as well as mice are now reported on at least 110, 24 and 40 islands and keys, respectively. Cats, mongoose, and dogs are found in more than 40 islands each, and goats on 32 insular territories. The vertebrate species extincted, extirpated or threatened by invasive mammals in West Indies is reviewed. The information about the invasive mammals as well as the control actions to mitigate their impact are only a first step. The information gathered and reviewed is an important baseline for actions in the future.

KEY WORDS: conservation, invasive mammals, introduced mammals, endemic vertebrates, extinction. West Indies

91 LIST OF BAT SPECIES (CHIROPTERA, MAMMALIA) IN THE CAMPINHOS STATE PARK, PARANA, BRAZIL

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From the biological point of view, caves are inherently fragile and singular environments, so that their inhabiting organisms have unique ecological and evolutionary characteristics. For bats (Chiroptera, Mammalia), caves are important roosts because they are stable environments, allowing social interactions and protection from weather, reducing the risk of predation and promoting conservation of energy. This study provides a bat species list of a cave in the Campinhos State Park, state of Paraná, southern Brazil, from June 2007 to May 2008. We used ten mist nets armed near Jesuítas/Fadas Cave and possible flight corridors in a 90h/net collection effort. We collected 185 specimens distributed in 11 species belonging to the families Phyllostomidae and Vespertilionidae. The recorded species were: *Anoura caudifer* (n=29), *Artibeus fimbriatus* (n=1), *Artibeus lituratus* (n=8), *Carollia perspicillata* (n=7), *Chrotopterus auritus* (n=2), *Eptesicus furinalis* (n=1), *Glossophaga soricina* (n=9), *Myotis nigricans* (n=28), *Pygoderma bilabiatum* (n=1), *Sturnira lilium* (n=2), and *Desmodus rotundus* (n=97). The latter species accounted for 52% of all captures. The list of species presented in this study complements a previous list conducted between 2003 and 2004 and includes two species of the genus *Artibeus*. Representatives of the guild of frugivores, carnivores, insectivores, nectarivorous, and mainly hematophagous were found. The recapture rate was almost 19%, suggesting roost fidelity. Most bats were captured at the cave entrances and their surroundings. *Desmodus rotundus*, *M. nigricans*, and *A. caudifer* were the most abundant species, being collected in all stages of fieldwork, especially at sunrise. Thus, we emphasize the importance of preserving natural ecosystems such as caves and to avoid excessive human activity in these sites. KEY WORDS. Fauna survey. Cavernicolous fauna. Bat. Campinhos State Park.

92 LONG-TERM EFFECTS OF ROTATIONAL PRESCRIBED BURNING ON THE HABITAT USE OF AN AUSTRALIAN MYCOPHAGOUS MAMMAL

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Fire is a natural ecological process in Australia. Prescribed burning of native vegetation is used in southern Australia to maintain mosaics of varying habitat age and reduce the risk of high intensity wildfires for humans. Despite this, there is little ecological information available about how such burns impact on fauna. The potoroids are small mycophagous marsupials inhabiting fire prone environments with dense ground level vegetation. They form an ecologically important tripartite relationship with hypogean fungi and ectomycorrhizal trees. Since European settlement, the decline in distribution and abundance, combined with the cryptic nature of potoroos, has hindered monitoring and research, making it difficult to implement management programs for their conservation. The long-nosed potoroo (*Potorous tridactylus*), while endangered in Victoria, is more abundant than other potoroids. One population persists in the French Island National Park (Victoria), where rotational burning is used to maintain varying age habitat. We investigated potoroo presence and abundance there by censusing their distinctive foraging digs in different vegetation communities and sites of varying fire age. Open swamp scrub contained the highest density of digs, while dryer sandy heath-land had the least. Potoroos remained at sites for up to three months post-fire, despite very little ground cover. They then disappeared and were rarely recorded in patches younger than 15 years since fire. Potoroos were most common at sites greater than 20 years post-fire. Current rotational burns occur at 6-12 years intervals for many vegetation communities in Victorian National Parks, a fire regime that is almost certainly detrimental to the persistence of potoroo populations. If potoroos disappear, the breakdown of the ecological relationship between this group of mammals with fungi and trees will reduce long-term ecosystem health. Our research will assist wildlife managers to tailor fire regimes to improve the chances of persistence of potoroid populations across south-east Australia.

93 MAMMALS AS INDICATORS OF THE VEGETATION CONSERVATION STATUS IN A FRAGMENTED LANDSCAPE IN SOUTHEASTERN BRAZIL

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The National Forest of Ipanema, São Paulo, located in a fragmented landscape in southeastern Brazil (5.179,93 ha) was surveyed in order to verify the conservation status of this Sustainable Conservation Unit. We used the mammal species richness, relative abundance and composition as indicators of its landscape quality. Additionally, these data were compared to Johann Natterer's inventories of the same region in the end of the 19th century to observe dissimilarities between faunal compositions. Five different habitats (semideciduous forests, cerrado sensu stricto, Eucalyptus plantation and an altered field) were studied during the dry and wet seasons of 2008. We installed mist-nets to capture bats (531 mist.net.hours), pitfalls (1.740 pitfalls.night) and conventional traps (1.827 trap.nights) to survey the small mammals, and camera traps (148 trap.nights) and track plots (820 plot.nights) for the medium and large size mammals, totaling 47 species distributed in the orders Chiroptera (19), Rodentia (8), Carnivora (7), Didelphimorphia (6), Cingulata (2), Pilosa (2), Primates (1), Lagomorpha (1) and Artiodactyla (1). The results point to a low diversity of the small non-volant mammals, which were the only group to show some habitat specificity, being represented by Cerrado and Atlantic Rainforest inhabitants attesting the transitional character of the vegetation of this region. The bats and medium and large size mammals showed a high diversity and no habitat specificity, with the majority of species being found in all five habitats surveyed. The small terrestrial mammals responded to the distinct physiognomies of the habitats surveyed, such as open and forested areas, and conserved and altered areas, and can be considered as good indicators of landscape quality. Due to the heterogeneous character of its vegetation, it is necessary a larger amount of time and effort to verify the behavior of bats and medium and large sized mammals in relation to the landscape quality.

94 METAPOPOPULATION APPROACH TO CONSERVING THE HOWLER MONKEY IN A FRAGMENTED LANDSCAPE IN MEXICO

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As a result of forest loss and fragmentation, the distribution and abundance of howler monkeys (*A. palliata*) have diminished in Los Tuxtlas, Mexico. We studied howler monkeys inhabiting a landscape of 4960 ha, where only 11% of the original habitat existed and was fragmented in 92 patches (size range: 0.5–76 ha). From 2001 to 2003, we surveyed groups and estimated the metapopulation persistence probability using the population viability program RAMAS Metapop. A total of 75 individuals inhabited 18% of all patches. The average isolation distance among primate groups was 2.8 and 5.8 km to continuous forest. No corridors connecting fragments existed. Monkeys traveled a mean distance of less than 200 m along the ground to move from one fragment to another. At landscape level, the actual connectivity of the metapopulation was therefore low (<30%). When we simulated the total number of individuals expected over the next 30 years, we found that habitat area change had a higher impact on metapopulation viability than on connectivity level. An extinction probability of 35% was estimated if the present rate of deforestation (4% annually) continues over the next 30 years in this landscape. A priority strategy must therefore address the protection of occupied fragments that are large (>20 ha size), less isolated (<200 m), and have better quality habitat (trees size DBH >60 cm), preventing further loss of area, and must support programs that favor habitat recovery and increased connectivity. Habitat restoration measures should include increasing the size of occupied fragments and creating corridors and stepping stones to reconnect fragments. An estimated 112–170 ha of recovered forest is needed in order to reduce the extinction probability to 1%. The species used in such programs must be native trees that are important to both primates and people.

95 MODELLING HABITAT-SUITABILITY OF THE EURASIAN OTTER (*LUTRA LUTRA*) TO ASSESS ITS POTENTIAL RECOVERY IN EUROPE

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In the last five decades the Eurasian otter *Lutra lutra*, has declined dramatically throughout all of Europe. Nowadays, the otter seems to be thriving in some European countries, but populations are still fragmented and the species is almost absent of central Europe. Promoting population expansion and reconnection is crucial to ensure the long-term maintenance of genetic diversity and the long-term persistence of the species. In this regard, habitat suitability models (HSM) represent powerful tools to evaluate habitat quality and produce maps of potential distribution and natural dispersion of the specie. This study aims at determining which factors influence the otter distribution and use them to predict the potential distribution of the species in Europe, under current and future climate. The environmental variables used are related to water availability, food supply, resting site and human disturbance using six different modelling approaches. Future projections are derived by running the CCM3 climate model under a 2 x CO₂ increase scenario. At the European scale, the otter is mostly influenced by water availability. The current potential distribution reveals large gaps of unsuitable habitats limiting connectivity between otter populations in Europe. Climate change would have different effects on otter habitat suitability in Europe. In the Western part, the model predicts losses of suitable habitats, whereas gains are predicted in central Europe and Eastern Europe shows equal rates of losses and increases of suitable habitat. Our results are important in helping setting up conservation actions and promote otter recovery in Europe.

96 MULTI-SCALE ANALYSIS OF THE HABITAT ASSOCIATIONS OF RIPARIAN MAMMALS IN AGRICULTURAL LANDSCAPES

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Establishing the relationship of species occurrence to environmental factors is important for monitoring biodiversity and assessing the success of conservation schemes. Failure to adequately consider the influence of spatial scale may, however, result in inaccurate associations being made. Two case studies are presented here. Firstly the character of the riparian environment across spatial scales which promotes the occurrence of European otter and American mink is investigated. The results demonstrated that mink are more closely associated with immediate riparian character whereas the otter is more closely associated with broad scale environmental character. This may have implications for the perceived benefit of riparian conservation schemes, commonly applied at fine scales, as the benefits may be seen for the non-native mink more quickly than the native otter. Secondly, inventories of micro-chiropterans; *Pipistrellus pipistrellus*, *P. pygmaeus* and *Myotis* sp. were made and the habitat associations of these species across spatial scales, between and within riparian areas, assessed. Only riparian specialist species were shown to have significant association with both river and within river scales, however, the level of importance of individual factors did change with the scale of analysis. *P. pipistrellus*, regarded as a generalist species, was shown to select for specific habitats within riparian areas. These case studies demonstrate that assessment at a single scale alone may result in inaccurate habitat association being made or key relationships overlooked.

97 MULTI-SCALE PATTERNS OF HABITAT USE BY WILD BOAR, *SUS SCROFA*, IN THE MONTE DESERT ARGENTINA

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A large number of protected areas have been impacted by biological invasions, threatening their biodiversity. Understanding habitat requirements of invasive species can be crucial for management and conservation decisions. Wild boar is one of the largest invasive species in Argentina, which occupies many ecoregions. The quality of its habitat is determined by the availability of free water and food; and by vegetation cover. The aim of our study was to assess the habitat use patterns of wild boar in the MaB Reserve of Ñacuñán, Argentina, at two scales (broad and small scale). Eighty transects of 1 km were set up, covering the study area. Transect surveys were conducted two times in the year 2008 (wet and dry season). Wild boar signs (tracks and rooting) were recorded within 3 m of either side of each transect. At each sign we established a plot (50 m²) where we recorded information on habitat and anthropogenic variables. We measured the same variables in plots where the wild boar was absent. To detect patterns of habitat use at broad scale we used Chi-squared contingency test. To analyze patterns of habitat use at a small scale we used multiple logistic regression analysis. During both seasons the wild boar showed preferences for a particular habitat (creosotebush shrubland) for feeding, avoiding mesquite forest and sand dunes ($X^2=16.83$, $df=2$, $p=0.0002$ wet season; $X^2=6.51$, $df=2$, $p=0.038$ dry season). There were not significant differences with respects to tracks. At small scale, we found that the presence of wild boar during the wet season was mainly associated to herbaceous cover and distance to nearest water source. Instead, during the dry season we found a positive association of wild boar with shrub < 1 m and with litter cover, and a negative association with herbaceous cover.

98 NESTEDNESS IN SMALL MAMMAL COMMUNITIES IN TWO FRAGMENTED ATLANTIC FOREST LANDSCAPES WITH DIFFERENT MATRICES

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Quite often vertebrate communities are nested, that is, species composition of species-poor communities is to some extent a subset of species-rich communities. However, nestedness is seldom perfect and varies widely among communities. In fragmented landscapes, community composition is strongly influenced by matrix permeability, which is assumed to be correlated with the physiological similarity between the matrix and the habitat fragments. Thus we had the hypothesis that, in landscapes formed from fragmented forest, arboreal matrices would reduce local extinctions and therefore the degree of nestedness. We also tested the hypothesis that species' distribution would be less predictable with higher permeability, because as the importance of isolation decreases, idiosyncratic factors of each species would become stronger determinants of their occurrences. We compared small mammal distributions in two fragmented landscapes, one with a low-permeability pastureland matrix (Rio de Janeiro) and the other with a more permeable matrix formed mostly by Eucalyptus plantations (Espírito Santo). The degree of nestedness was calculated using the NODF metric. NODF values were compared between landscapes and against simulated non-nested null models using Mann-Whitney tests. Results did not corroborate our first hypothesis: the degree of nestedness did not differ significantly between landscapes. This result can be explained by the longer distances among fragments in the Espírito Santo landscape balancing the higher permeability of the matrix in this system. However, our second hypothesis was supported; isolation was a weaker determinant of species distributions in Espírito Santo, autecological features of each species explained community compositions better. We conclude that, although matrix permeability is an important determinant of nestedness, other features both of the landscape and of the species must also be taken in account when setting out conservation priorities.

99 NEW RECORDS AND GEOGRAPHIC DISTRIBUTION EXTENSION OF *GLIRONIA VENUSTA* (DIDELPHIMORPHIA, DIDELPHIDAE)

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The known distribution area of *Glironia venusta* includes the east of Ecuador, Peru, northern Bolivia and western Brazil in the states of Acre, Rondônia, southern Amazonas, western Mato Grosso, and a restricted area in northern Pará. Herein we provide three new records of this rare marsupial in Brazil, extending its range ca. 750 km eastward. The first specimen was collected in March 2002 at a seasonal semideciduous forest at the Guaporé hydroelectric station, near Vale de São Domingos, Mato Grosso (MZUSP 34664). The second specimen was collected on 31 March 2002 at a semideciduous forest in Santo Antonio do Rio Bonito dam, Nova Ubiratã, Mato Grosso (UFMT 969). The third specimen was captured in April 2008 at Floresta Nacional Tapirapé-Aquiri, Marabá, southeast of Pará. It was released after being photographed. Interestingly, all these specimens were captured during a vegetation suppression activity related to either dam or mining station construction. Our records increase to 19 the number of capture localities of *G. venusta*, nine of which in Brazil, and evidence that inventories associated with vegetation suppression activities are effective ways of sampling this trap-shy and poorly known marsupial.

100 PHYSIOLOGICAL MARKERS AS INDICATORS OF SENSITIVITY TO MAN-MADE DISTURBANCE FOR TWO SPECIES OF BATS

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Understanding why some mammals are sensitive to the effects of man-made changes in the environment while others seem to be unaffected by such disturbances has strong theoretical and practical applications for conservation biology. Usually, ecological based measurements are used as a proxy to determine the extent by which different mammalian species are tolerant to such effects. Such measurement of sensitivity, however, has been questioned because it does not allow for a proper understanding of the mechanisms underpinning the differential tolerance observed between species. Measurements of hormone concentrations and body condition index could be a suitable alternative. Together, these two parameters would inform on the extent of the normal allostatic responses of the animals and, hence, could be used to assess if the effects of man-made disturbances are pushing the animals beyond their normal allostatic capacities. We used these two biomarkers to determine the effects of man-made disturbance in two areas of Atlantic Rainforest of the southeast Brazil on two species of fruit eating bats, *Artibeus obscurus* and *Artibeus fimbriatus*. Body condition was measured using standard morphological index and the levels of plasma cortisol were assessed at baseline and during stress-induced protocols. Levels of basal and stress-induced circulating cortisol did not differ for *A. obscurus* between the two areas, while we found a marked difference in these levels for *A. fimbriatus* between degraded and preserved areas, with baseline cortisol levels being 52% higher in the degraded area. Body condition index of this species was significantly lower in the degraded area when compared to the preserved area. Although we could not discard the potential confounding effects of acclimation and facilitation in these patterns, we believe that the higher levels of circulating cortisol of *A. fimbriatus* does indeed reflect a situation of stress imposed by man-made changes in the area.

101 RELATION BETWEEN REPRODUCTIVE AND OESTRAL CYCLES OF BAT FEMALES BY USING VAGINAL SMEARS

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The reproduction is an aspect little approached in researches with bats. The external description of individuals is insufficient to understand its reproductive and oestral cycles. By using vaginal smears, we compare the oestral cycle with the reproductive status of the females captured in two productive areas in Colombia. Bats were captured in August and September 2007; and in January and February 2008. With the vaginal smears, we identified the percentages of cells (parabasal, superficial or intermediate) to establish the stage into the oestral cycle. Synchronization was not demonstrated for the different species for the oestral and either for the reproductive cycle. Vaginal smears of pregnant females showed a relation with the metestrous stage of the oestral cycle; females catalogued as sexually inactive showed that this one is a subjective consideration of the reproductive condition which does not correspond to the reality; this highlights the importance of the introduction of this technique in future studies.

102 RESEARCH ON THE FORAGING ECOLOGY OF THE LONG-FINGERED BAT (*MYOTIS CAPACCINII*) APPLIED TO CONSERVATION

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M. capaccinii is one of the most endangered bats in western Europe. Until the beginning of this century, the reduced knowledge regarding its foraging ecology has limited the development of suitable conservation strategies. In 2004, the foraging ecology of 64 long-fingered bats from a population of the Eastern Iberian Peninsula was investigated by means of radiotracking, diet analysis, and

measurement of prey availability. These data, combined with results achieved in coetaneous studies on similar topics, were used to suggest conservation measures for the foraging habitat of the species. Insofar as this species is extremely dependent on aquatic habitats, the reduction in water flow of rivers and the overexploitation of aquifers should be avoided. Since the species prefers hunting in waters with smooth surface, transformation of slow flowing waters in rapid and turbulent waters should be avoided, e.g. by channeling of rivers. Small weirs are beneficial to the species, while the effect of big dams could be harmful. The ability of this bat to forage in stretches with terrestrial or floating vegetation is likely reduced. The role of riparian woodlands on its hunting behaviour is uncertain and varies locally. We believe that the water habitats surrounding the roosts should maintain a broad range of temperature and water flow values, thereby assuring the availability of prey along the period of roost occupancy. Different sources of water pollution seem to have conflicting effects on the foraging of the long-fingered bat, and this topic should be studied in detail.

103 SPECIES RICHNESS OF BATS IN PANTANAL OF MATO GROSSO DO SUL, CENTER-WEST OF BRAZIL

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Nowadays there are 61 species of bats in Mato Grosso do Sul state. The Pantanal, corresponds to approximately 25% of the all area of the state, still lacks in studies about the diversity and ecology of bats. In order to fulfill these gaps the present study evaluated the richness and abundance of species of bats in four areas of the Pantanal of Mato Grosso do Sul - Brazil. They were made 22 captures of bats between April 2008 and March 2009 in four sub-areas of the Pantanal (Porto Murtinho - SPM, Nabileque - SN, Abobral - SA and Nhecolândia - SNH) making a total of 22176 m².h of capture efforts. To capture the bats four mist nets were used (14X3m) per night. In each sub-area it was accomplished four to eight collection nights, never repeating the same sampling points. The curve of the randomized collector and the average local richness were compared through a variance of analysis. A total of 160 bats were captured, included in 24 species of 6 families: Phyllostomidae (9), Vespertilionidae (6), Molossidae (6), Noctilionidae (1) Emballonuridae (1) e Natalidae (1). The SN presented the largest number of species and the greatest average richness, not showing, however significant differences among the sub-areas' richness ($p = 0,123$). In SPM the total richness was the same as in SA, however, in relation to the medium richness of species, SPM presented inferior value among all sub-areas sampled. The largest relative abundance of bats happened in SNH (0,0091 individuals / m².h). SPM also presented the smallest value (0,0036 individuos/m².h) for relative abundance. Of the 24 collected species 16 were exclusive, captured in just a place, evidencing a high regional diversity. The rarefaction curve pointed needs of more collections for safe estimative of richness of species for sub-areas of the Pantanal.

104 SKIN LESIONS ON BLUE WHALES OFF ISLA DE CHILOE, CHILE: POSSIBLE CONSERVATION IMPLICATIONS?

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We report on three types of skin lesions in a population of blue whales, *Balaenoptera musculus*, off the northwestern coast of Isla Grande de Chiloe, Chile. These lesions were: (1) cookie-cutter shark, *Isistius brasiliensis*, bites, (2) vesicular or blister-like lesions, and (3) a tattoo-like skin disease. The presence of these lesions was determined by examining photos collected between 2006 and 2008 for a blue whale photo-identification project. Only clear, well-focused photographs of individuals were selected for examining skin lesions. Skin peeling or shedding was observed on some whales and is a normal process. Cookie-cutter shark lesions are common on these blue whales and similar to those reported from other species of cetaceans. Based on the photographs examined to date the vesicular lesions are more common than tattoo-like lesions. The tattoo-like skin lesions was observed only on one whale photographed in 2007. The blister lesions were common on whales in all years. The presence of blister lesions in both years may indicate that this "disease" will be present in the population for a long time. It is unknown if these lesions contribute to the mortality of blue whales in Chilean waters, but the tattoo-like skin lesions, if shown to be a pox virus, could cause neonatal and calf mortality. Additional investigations are needed and, as a minimum, must include the histological and genetic examination of the two types of skin disease from live or dead whales, especially the tattoo-like skin lesions. Until this work is undertaken, it will be impossible to determine if these lesions pose a conservation risk to the blue whales off Chile.

105 THE DOMESTIC DOG AS AN INVASIVE SPECIES IN THE ATLANTIC FOREST: DEMOGRAPHY, ACTIVITY AND BEHAVIOR

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The increasing urbanization is contributing to transform the domestic dog (*Cannis lupus familiaris*) into a threat to native fauna of several ecosystems. However, there are little information about abundance and behavior of this species in Neotropical forests. The objective of this study is to characterize the population of the domestic dog in the Feliciano Miguel Abdala (FMA) reserve, a 957 ha Atlantic forest fragment important for the conservation of rare and endangered primates in southeastern Brazil. The study was based in two periods of camera trapping and the analysis was carried out using the software MARK. In the first period (Jul-Dec 2007; 900 camera-days) 13 dogs were recorded 105 times, generating estimates of 0.763 (full buffer) and 1.791 dogs/km² (half buffer). The two figures refer to the two buffer lengths used for the calculation of the sampled area: mean maximum distance moved (MMDM) and half mean maximum distance moved (HMMDM), respectively. In the second period (Apr-Jul 2008; 800 camera-days) 32 dogs were recorded 229 times, generating densities of 0.806 (MMDM) and 1.526 dogs/km² (HMMDM). The dogs were mostly photographed during daytime (71%), mainly between 06:01 h and 12:00 h (45%). They generally foraged alone (81.76%) and the few observed

groups were not cohesive units. The number of dogs recorded in each sampled point was not significantly correlated with distance to the nearest forest edge or road and neither with the number of mammal species recorded in each point (Spearman correlation, $p > 0.10$ in all cases). The estimated densities are 2-3 times higher than that of the ocelot (*Leopardus pardalis*) studied concurrently in FMA. This finding corroborates recent studies carried out elsewhere and suggests that domestic dogs represent a serious threat to potential prey species in isolated forest remnants of the Atlantic forest.

106 THE IUCN/SSC CONSERVATION BREEDING SPECIALIST GROUP (CBSG): TRANSFORMING PASSIONATE COMMITMENT TO WILDLIFE INTO EFFECTIVE CONSERVATION ACTIONS

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The mission of the Conservation Breeding Specialist Group (CBSG) of IUCN's Species Survival Commission (SSC) is to save threatened species by increasing the effectiveness of conservation efforts worldwide through: innovative interdisciplinary methodologies, culturally sensitive and neutral facilitation, and by empowering global partnerships and collaborations. CBSG has over 20 years of experience in developing, testing and applying a series of scientifically-based tools and processes to assist risk characterization and species management decision making. These tools, based on small population dynamics, conservation biology (biological and physical factors) and the dynamics of social learning are used in intensive, problem-solving workshops to produce realistic and achievable recommendations for species population management. Population modeling is an important tool as part of the process and provides a continuing test of assumptions, data consistency, and of scenarios. Over 200 workshops in more than 60 countries have been conducted so far. Since its inception, CBSG has grown into a global volunteer network of 500 professionals. CBSG is coordinated by a headquarters staff of seven in the United States and assisted by nine Regional Networks on six continents. CBSG-Brasil was founded in 2004 and since then has run three Population Habitat Viability Assessments (PHVA): 1) Lion Tamarin PHVA workshop for the Golden Lion Tamarin (*Leontopithecus rosalia*), the Golden-headed Lion Tamarin (*L. chrysomelas*), the Black Lion Tamarin (*L. chrysopygus*) and the Black-faced Lion Tamarin (*L. caissara*); 2) Maned Wolf PHVA workshop (*Chrysocyon brachyurus*), and 3) Lowland Tapir PHVA workshop (*Tapirus terrestris*). Additionally, CBSG-Brasil has organized and held Population Viability Analysis workshops for four species of Brazilian primates: red handed howler monkey (*Alouatta ululata*), Coimbra's Titi (*Callicebus coimbrai*), blond capuchin (*Cebus flavius*) and black bearded saki (*Chiropotes satanas*). CBSG-Brasil is also heavily focused on training and capacity-building and has held VORTEX modelling and facilitation courses for Brazilian conservationists.

107 THE REINTRODUCTION OF SPECIES AND THEIR IMPORTANCE IN CONSERVATION: THE CASE OF THE BLACK-FOOTED FERRET (*MUSTELA NIGRIPES*) IN MEXICO

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Many grasslands associated species in Mexico have reduced their range and population numbers. Ongoing efforts to restore the grassland ecosystem in northern Mexico have included the reintroduction of North America's most threatened land mammal; the black-footed ferret (*Mustela nigripes*). As part of a tri-national effort, the species has been reintroduced throughout its original range, including one of the Continent's largest prairie dog (*Cynomys ludovicianus*) complexes in the Janos grasslands of northwestern Chihuahua, Mexico. Since 2001 we have released 299 ferrets and 11 ferrets have been confirmed as wild-born in Mexico. Survival of reintroduced (captive bred) ferrets has been up to 24 months and all ferrets observed during monitoring appeared healthy in body shape and behavior. The low number of wild-born ferrets recorded is partly related to the large size of the prairie dog town (8,000 ha) where the initial reintroduction took place, since we were only able to cover a small fraction of the town during the spotlighting surveys. Janos is considered one of the most important areas for the conservation of grassland diversity in North America, and one of few areas where a self sustaining ferret population viable in the long-term could be established. The ferret reintroduction has increased the international interest on the conservation of the prairie dog towns and grasslands of Janos, resulting in the purchase of large areas for conservation and recovery of the prairie dog ecosystem, and significantly contributed to the ongoing process to establish a half a million hectares biosphere reserve. It has also primed collaboration between NGO's, universities and institutions of Canada, the United States and Mexico, which have resulted in both collaborative conservation efforts for other species, and research on habitat restoration and management.

108 THE ROLE OF FRAGMENTED HABITATS ON BAT DIVERSITY AND ABUNDANCE IN A MEDITERRANEAN AREA

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This study was carried out in five different habitats within a fragmented landscape of Central Portugal, namely: Bussaco National Forest (mixed forest), monocultures of maritime pine (*Pinus pinaster* Ait.) and eucalyptus (*Eucalyptus globulus* Labill.), large agricultural fields and small patches of traditional agriculture. During 2008, bat communities of these habitats were monitored by line transects where bat passes were counted and ultrasound emissions recorded. These recordings were identified to the species, with appropriate software and analyzed using diversity indexes (Shannon Index (H') and Evenness Index (J')) and uni/multivariate analyses to achieve differences among habitats. The results show a higher number of bat passes in mixed forest with 36.78 ± 24.04 per km and a smaller

one in eucalyptus monocultures ($9.89 \pm 7.43/\text{km}$). In terms of diversity indexes, the small patches of traditional agriculture present the lower values ($H' = 1.31$; $J' = 0.55$) while maritime pine forest and eucalyptus reveal higher values of Shannon Index and Evenness Index (maritime pine: $H' = 1.85$; $J' = 0.67$, eucalyptus: $H' = 1.82$; $J' = 0.71$). The statistical differences among habitats were verified using analysis of variance (H' : $F(4,79) = 4.22$; $P < 0.01$ and J' : $F(4,64) = 3.02$; $P = 0.02$) and visualized through a multivariate approach. These results appear to be related with the different habitat composition (e.g. shelter, tranquility, prey availability, predators' avoidance). Considering bats' importance to ecosystems' equilibrium, this kind of studies should not be disregarded during land use planning and definition of management policies.

109 **WILD RABBIT (*ORYCTOLAGUS CUNICULUS*) MONITORING IN THE NATURAL RESERVE OF «SERRA DA MALCATA» (PORTUGAL)**

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The wild rabbit, *Oryctolagus cuniculus*, is a key specie in the Mediterranean ecosystems, playing a vital role as a prey for a wide spectrum of predators, being also the most important game specie in Portugal. In the Natural Reserve of "Serra da Malcata" (RNSM), wild rabbit populations have decreased dramatically in the last decades. This happened due to several reasons: habitat loss and fragmentation, incidence of viral diseases and excessive hunting. Since 1997 several conservation measures were applied in RNSM. The habitat improvement (creation of grazing pastures in dense scrub habitat and installation of artificial warrens) and the wild rabbit restocking actions were the principal conservation measures applied. In 1998 started an ongoing monitoring program that aims the study of this wild rabbit population. Rabbit abundance (rabbit/ha) was estimated by an indirect method, based on latrine count in line transects of 1km define in each 2x2 Km UTM squares. We use the spatial interpolator Inverse Distance Weighted (IDW) to create continuous maps of density for each season. With an initial mean density of 0,8 rabbit/ha, the RNSM presents in 2007 a mean density of 3 rabbit/ha, while in the managed area we passed from a average density of 1 rabbit/ha to 9,3 rabbit/ha. Using the repeated-measure GML we found that there are significant differences ($F = 3,76$; $p < 0,01$; $df = 8$) between the year of 2003 and the years of 2005, 2006 and 2007 ($t = 3,96$; $t = 3,58$; $t = 3,74$; $p < 0,05$; respectively). The density mean of the Management Area is statistically different from the Reference Area mean ($t = 4,34$; $p < 0,001$; $g.l. = 141$), with a mean difference of 2,6 rabbit/ha (95% confidence interval between 1,4 rabbit/ha and 3,8 rabbit/ha). This study confirms that the conservation strategy adopted in the RNSM had a positive effect on the rabbit populations, especially in the managed squares and contiguous areas.

ECOLOGY AND EVOLUTION

110 **A STUDY ABOUT CAPTURE, DIET AND METAPOPOPULATION IN BATS FROM FOREST FRAGMENTS IN SOUTHERN BRAZIL**

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One of the most common causes of the species disappearance is the lost of habitat, because of the reduction and isolation of favorable environments. Consequently, the biggest part of biodiversity is located, nowadays, in little forest areas remnant. Taking that into account, this work aimed at: identifying the species of bats collected in four different forest fragments from the north of Parana; collecting data about the captured species diet through the analysis of feces and direct observation of their eating activities; collecting data about the time capture of the different species from the place and pointing out considerations about the establishment of metapopulations among the studied places. Monthly samples were done in the fragments, from July to December 2008, totalizing 144 hours on campus with the use of 160 m² of mists nets in each sample. A total of 245 individuals were captured in 8 species from the family Phyllostomidae (*Carollia perspicillata*, *Sturnina lilium*, *Artibeus lituratus*, *Artibeus fimbriatus*, *Artibeus planirostris*, *Vampyressa pusilla*, *Platyrrhinus lineatus*, *Desmodus rotundus*), and one specie from the family Vespertilionidae (*Myotis nigricans*). The eating diet of the frugivores is basically constituted by: Moraceae, Cecropiaceae, Solanaceae e Piperaceae. The time with the biggest number of captures is about 45 minutes from the beginning of the collection. By marking done, species in more than one fragment were not recaptured. The preservation of remnant forests is necessary to diminish the disappearance of bats, once that, little fragments showed little number of species. Key words: forest fragments; bats; preservation.

111 **ACTIVITY PERIOD AND VERTICAL STRATIFICATION OF SMALL ARBOREAL MARSUPIALS USING CAMERA-TRAPS AND ARTIFICIAL NESTS**

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Different periods of activity and vertical stratification are possible mechanisms that allow coexistence of didelphid marsupials in local assemblages, but difficult to investigate using traditional live traps. We used camera-traps to evaluate activity period, and artificial nests (AN) at four heights to evaluate vertical strata preferred by *Caluromys philander*, *Gracilinanus microtarsus*, *Marmosops incanus* and *Micoureus paraguayanus* (*Didelphimorphia*, *Didelphidae*) in an Atlantic Forest area in the Serra dos Órgãos National Park, Rio de Janeiro State, Brazil. Camera-traps were used from April 2008 to April 2009, nine placed at 5m and one at 2.5m, each one in front of an AN. A total of 252 AN are used since June 2003, placed at 0, 2.5, 5 and 7.5m high (total effort=12,096 nest-inspections). A total

of 134 pictures were taken, with no significant difference in the activity period between species. In pairwise comparisons using G-tests, most species differed significantly in the preferred AN height, except for *C. philander* x *M. paraguayanus*. *Marmosops incanus* was recorded just once by cameras (0.5% of all records), which supports its habit of moving below 5m as observed in previous studies. In AN, most of its records were at 0 and 2.5m, 21% and 70%, respectively. Results with AN corroborate the vertical stratification of these species observed in previous studies with other methods, hence individuals seem to be using AN in the same strata for foraging and regular activities. The preliminary results indicate that stratification might be a factor facilitating coexistence between these species, but not period of activity.

112 BAT ASSEMBLAGES FROM CERRADO OF CENTRAL BRAZIL: A COMPARISON BETWEEN CONSERVED AND DEGRADED SITES

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Bats represent 42% of the mammal species of Cerrado. Although they are considered good indicators of preserved areas, few studies were realized in Brazil with the objective to verify the response of bats to degradation and none of these were made in Cerrado. The objective of this study was to verify if bat assemblages vary between conserved and degraded sites of Cerrado. This variation was verified by comparisons of composition, richness and abundance of bats on these sites. Differences in abundance of species between seasons and movements between collecting points were also registered. The research was carried on sites of cerrado sensu stricto of Distrito Federal – Central Brazil. Conserved cerrados s.s. were characterized by their localization in the interior of conservation units and by the absence of anthropic perturbation. Degraded cerrados s.s. were characterized by their use as pastures or by their recent degradation by fires. During the period of September of 2007 to June of 2008, 34 nights of sampling were made with the capture of 90 specimens belonging to 15 species of three families (Phyllostomidae, Vespertilionidae and Molossidae). The most abundant species were *Artibeus lituratus*, *Glossophaga soricina*, *Carollia perspicillata*, *Sturnira lilium* and *Artibeus planirostris*, that together accounted for 86,67% of all sampling. *Carollia perspicillata* and *Glossophaga soricina* were captured with greater abundance on conserved cerrados. Degraded sites presented a higher richness, otherwise none of the species captured occurred preferentially on these sites. There was no variation in the abundance of species due to seasonality. It was possible to account the movements of three specimens and recapture rate was 1,34%. The results suggest that the conservation of cerrados s.s. is very important for some species and that the presence of *Caryocar brasiliense* on degraded sites is essential for the maintenance of the richness and abundance of bats.

113 BATS OF PROVIDENCE AND ST. CATHLENA ISLANDS: TROPHIC AND POPULATION STRUCTURE (MAY-AUGUST OF 2008)

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During June, July and August of 2008 (transition dry-wet season) trophic and population structure of bats presents in the dry forest of Providence and St. Cathlena Islands, Colombia were characterized. The results were discussed using the Fragmentation's Theory and Island's Biogeography. Through the calculation of diversity, equity and dominance index, morphometric correlations, trophic and plants importance values, differences were found between assemblage of bats on each island. The species recorded in Providence Island were *Molossus molossus*, *Chilonatalus micropus*, *Rhogessa* sp. and *Artibeus jamaicensis* and only the last one also was recorded in St. Cathlena Island, but the abundance and populations characteristics of *A. jamaicensis* in both Islands were not different. Two trophics categories were identified for the islands: nomad frugivorous and air insectivorous bats. Frugivorous were dominant on St. Cathlena and air insectivorous on Providence but the food resources utilized in the diet of *Artibeus jamaicensis* were not different. Taking into account that the islands are equally distant from the continent, but that in Providence the size (17 km²), diversity of resources, number of inhabitants and the processes of disturbance and habitat fragmentation are much higher than in St. Cathlena island, which presents a size reduced (3 km²), much lower processes of disturbance and habitat fragmentation due to a low number of inhabitants and hence lower diversity of resources with high availability of the same, was recognizing the predilection of *A. jamaicensis* for the *Ficus trigonata* figs and the results agree with a possible negative effect over the structure of the assemblage and over the populations of each species due human perturbation.

114 BEHAVIOURAL RESPONSES OF AUSTRALIAN SPECIES TO INVASIVE PREDATORS

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In the constant race between predator and prey, prey species have survived by adapting their behaviour to minimize their predation risk. But what is the case if the predators and prey did not evolve together? Would prey species still be able to recognize novel predators as a threat? Australia presents the perfect setting for answering these questions. The red fox (*Vulpes vulpes*) and the feral cat (*Felis catus*) were introduced to Australia soon after European settlement and have since been successful in extirpating native species. Their success may be related to the inability of Australian species to recognize these invasive predators as a threat. Previous field studies have provided mixed results in determining whether Australian species recognize invasive predators as a predation risk. In this study I assess whether a medium sized marsupial, the common brushtail possum (*Trichosurus vulpecula* hypoleucus) alters its habitat use with increasing predation risk from foxes and cats. Results from this study will contribute towards solving the debate as to whether Australian species are able to recognize invasive predators as a threat.

115 BODY MASS OF MARMOSETS TO EVALUATE ACCLIMATION TO A NEW HABITAT

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The acclimation and adaptation of introduced species the new habitat depends on traits that favor survival and reproduction. Body weight is a trait that reflects body condition and therefore acclimation, and may be correlated with survival and reproductive success. In the state of Rio de Janeiro-Brazil there are two species of invasive marmosets: *Callithrix penicillata* and *Callithrix jacchus*, and hybrid individuals of these species. We measured the body mass of 238 individuals, 118 females and 120 males, captured between 2002 and 2007, in the São João River watershed. These body mass measurements were compared to published data of wild *Callithrix jacchus* of Rio Grande do Norte (native range). The analysis considered separately males and females, and for each sex, four age classes: infant, juvenile, subadult and adult. Mean body mass was calculated for each sex-age class and these means were compared with a Student's t test. Invasive adult females and all age classes of males except infant were heavier than their native counterparts. These results suggest that invasive marmosets are acclimatized, though introduced into small fragment, some of low quality, out of their natural range. We suggest that a factor that positively influences the success this invasive population in forest fragments of the region is the human interference through additional food supply.

116 CONIFER SEED PREFERENCES OF SMALL MAMMALS

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The preferences of the deer mouse (*Peromyscus maniculatus*), southern red-backed vole (*Myodes gapperi*), heather vole (*Phenacomys intermedius*), long-tailed vole (*Microtus longicaudus*), and meadow vole (*Microtus pennsylvanicus*) for lodgepole pine (*Pinus contorta*), white spruce (*Picea glauca*), and subalpine fir (*Abies lasiocarpa*) seeds were investigated using cafeteria-style feeding experiments. Seed selection by *P. maniculatus* and *M. gapperi* in the field was also studied. *Peromyscus maniculatus*, *M. gapperi*, *M. longicaudus*, and *M. pennsylvanicus* showed a distinct preference for lodgepole pine seeds and avoidance of subalpine fir seeds, and consumed the different species of seeds in similar relative proportions. *Phenacomys intermedius* behaved very differently from the other rodent species in that it did not show a preference among seed species, and consumed very few seeds in total. Findings from the field seed selection trials were consistent with laboratory results. We suggest that post-dispersal seed predation by small mammals could limit the recruitment success of lodgepole pine and white spruce, but would not be a major problem in the regeneration of subalpine fir stands. This could provide an advantage for subalpine fir over neighbouring competitive species.

117 DENSITY AND SITE OCCUPANCY OF COLLARED PECCARY (*PECARI TAJACU*) AT TWO PROTECTED AREAS OF COLOMBIA

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Population status of peccaries in Colombia is unknown. From a recent study, we found that collared peccaries in Colombia inhabit, among others, several areas of the Colombian Guyana Shield. This region comprises several landscapes, ranging from areas with natural savannas in the northeastern side of Colombian Orinoco basin, to dense forests in the Orinoco-Amazon basin transition. Several habitat types occur in such region and their influence on collared peccary abundance are likely. In this study we address the hypothesis that density and site occupancy of collared peccary differ among sites with dense forest and areas dominated by more open savannas. We test this hypothesis at two protected areas in the Colombian Guyana Shield, the Tuparro National Park (TNP) and the Puinawai National Reserve (PNR). TNP is located in the Orinoco basin, and it comprises mainly savannas mixed with riparian forest, and isolated forest patches. PNR is located in the transition Orinoco-Amazon basin, and it is dominated by more dense forest, with very small savanna patches. Density is estimated by distance line transect sampling. In both areas, about 10 trails were opened, ranging from 3.5 km to 6.5 km long. Trails are surveyed from 5 am to 9 am and from 4 pm to 7 pm. Density estimation is performed using the DISTANCE 5.0 software. Site occupancy is estimated using 250 sampling plots of 50 x 50 cm, set along line transects. Plots are checked for collared peccary tracks three times per month. All tracks are erased once recorded. Site occupancy is estimated with the PRESENCE 2.2 software. In order to identify which habitat traits are associated with peccary density and site occupancy differences among both sites, the following habitat variables are measured: vegetation composition and structure, palm density, and fruits, cover and water availability.

118 DEMOGRAPHY OF *PHILANDER FRENATUS* (DIDELPHIMORPHIA, DIDELPHIDAE) IN TWO SMALL FRAGMENTS OF ATLANTIC FOREST.

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Habitat fragmentation may affect demography of populations in remnants due to habitat loss, habitat structure, and resource availability. Here in, we evaluate survival, capture probability, population size, and reproductive activity of the marsupial *Philander frenatus* in two forest fragments of 8ha, which are considered as forming a single population because of the short distance between them (200m). The region consists of a mosaic of fragments surrounded by pasture and croplands in Rio de Janeiro, Brazil. Animals were

marked and recaptured every two months during 5 nights. Capture probability and population size in each sampling occasion, and the survival between the occasions were estimated with MARK software (White & Burnham, 1999). Four models were analyzed: capture probability and survival both varying between sampling periods, both constant, and each varying alone. Population size was defined as variable in all models. From July 2007 to May 2009, covering twelve sampling periods and 19200 traps-nights, 156 individuals were captured, marked and released in 533 occasions. The reproduction was continuous, with a modal 2-3 reproduction events per female, and up to four events. The model that best fitted the data (lowest AICc) had varying capture probability and survival. Survival varied between 0.32 and 0.95 (0.62 ± 0.27), capture probability between 0.18 and 0.43 (0.30 ± 0.10), and population size from 10.13 to 41.43 individuals (27.26 ± 10.27). The variation in the parameters estimated may be due to the seasonality of rain, which affects resource availability. Increased precipitation reduces capture probability, increases population size and survival with a time-lag. In a close continuous area, we also find variation in these parameters, but population size is smaller and reproduction is seasonal. The preliminary results suggest that *P. frenatus* may be favored in certain fragments as indicated by higher density and continuous reproduction.

119 DIET OF FISHING BAT (*MYOTIS VIVESI*) IN THE GULF OF BAJA CALIFORNIA, MEXICO

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The fishing bat, *Myotis vivesi* (Vespertilionidae), is an endemic species restricted to some islands in the gulf of Baja California, Mexico. Its diet is broadly described composed of marine crustacean and fish but there is no information over an annual cycle. We present information of *M. vivesi* diet throughout the year by examining the content of fecal samples collected every two months in Isla Partida Norte, Baja California. We found fragments of fishes, crustaceans and insects. Fishes were the food item more frequently found with the largest percent volume, followed by crustaceans and insects. There were significant differences in the presence of fish and crustacean remains throughout the year suggesting seasonal dietary changes.

120 DIET OF *MICOUREUS PARAGUAYANUS* (DIELPHIMORPHIA: DIDELPHIDAE) IN A BRAZILIAN CERRADO: SEASONALITY AND INTRAPOPULATION VARIATION

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Micoureus paraguayanus is a sexually dimorphic didelphid that has a markedly seasonal reproductive pattern. Although it inhabits Atlantic Forest and Cerrado (savannah-like) remnants in Brazil, studies on its diet were performed only in Atlantic Forest. We analyzed the diet composition of *M. paraguayanus* in a Cerrado remnant in southeastern Brazil through analysis of feces from live-trapped individuals, and assessed patterns of food consumption using the statistics of percentage of occurrence, number of classes of food resources and number of items from each class. We used generalized linear models to model the number of items detected in function of endogenous and exogenous factors such as seasonality, sex, resources, and interactions among these factors. Ants, beetles, termites and fruits from the genera *Miconia* were the most frequent resources detected, suggesting that *M. paraguayanus* behaves as an opportunistic forager, since these are among the most abundant taxa in Cerrado. Seasonality, resources, and interactions among them were identified in the model as significant factors affecting the number items detected in feces. In the cool-dry season fewer items were detected for both sexes, corroborating that *M. paraguayanus* forages opportunistically, since resource availability is smaller in the cool-dry season. The number of classes of resources was significantly smaller for females in the cool-dry season than for females in the warm-wet season and males in both seasons. *M. paraguayanus*' reproductive period starts with the warm-wet season when resources availability is higher. This increase in the consumption of different resources in the warm-wet season by females may be related to energetic requirements linked to the reproductive condition. Our results suggest the diet of *M. paraguayanus* in the sampled area is the outcome of complex interactions among endogenous and exogenous factors which locally generate intrapopulation variation in resource consumption.

121 DISPERSAL OF SOUTHERN ELEPHANT SEALS AMONGST THE PRINCE EDWARD ISLANDS AND ÎLES CROZET, SOUTHERN OCEAN

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The movement of organisms from one location to another is a fundamental biological process shaping the distribution, structure and dynamics of populations. Southern elephant seals *Mirounga leonina* migrate annually between terrestrial haulout sites and pelagic foraging areas. High site fidelity is evident despite these long-range migrations and dispersal of breeding individuals between major stock populations is atypical. However, non-breeding dispersion within stocks are important in population modeling, while occasional successful dispersal influence population demographics and persistence. We used mark-recapture tag-recoveries to record dispersion of seals from sub-Antarctic Marion Island (MI) to Prince Edward Island (PEI) (23km distant), and dispersion and dispersal from Ile de la Possession (IP), Îles Crozet to MI (1000km distant). During surveys at PEI during the early moult haulout of 2001, 2004 and 2008, 416 elephant seals were inspected for tags; 42 had been marked as weaned pups on MI. Individual encounter histories indicated that the tagged seals were observed during a further 46 moulting seasons on MI; but they were also absent from MI during 33 moult seasons, suggesting temporary emigration from MI and leading to heterogeneous capture probabilities. From 1987 – 2002, 184 individually identified seals born and tagged on IP hauled out on MI. Immature seals associated with winter ($n = 137$ individuals) and

moult haulouts ($n = 114$ individuals) were regularly observed. Twenty-six IP females bred 37 times on MI, and at least five adult males from IP controlled harems on MI during a breeding season. One IP male controlled harems for six consecutive years (196 females overall). Hitherto, dispersal was assumed to be negligible for elephant seal population dynamics. However, inter-island dispersal within the Kerguelen stock might be more frequent than previously recognised and considerations of multi-state capture-recapture models, metapopulation dynamics and foraging strategy of seals within this geographical province is merited.

122 DISTRIBUTION MODELS FOR THREE PHYLOGENETICALLY CLOSE RELATED SOUTH AMERICAN SPECIES OF *MYOTIS* KAUP (CHIROPTERA, VESPERTILIONIDAE)

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Species distribution models can be applied to several conservation and evolutionary issues, improving the comprehension of large scale processes in ecology and zoology. *Myotis* Kaup comprises a diverse and widely distributed genus of vespertilionid bats with 103 species, being twelve of them assigned to the South American continent. Although poor represented in scientific collections, most of these South American forms are apparently restricted to subtropical zones, with few species widely distributed across the continent. As part of an ongoing revision project of taxonomy and biogeography of South American *Myotis*, distribution models were developed through MaxEnt algorithm, for three species (*M. levis*, *M. nigricans* and *M. oxyotus*) arranged in a subclade supported by molecular evidence. This approach permitted us to test the hypothesis of subtropical pattern of distribution for *M. levis* and *M. oxyotus*, and the rarity of *M. nigricans* in the Amazon Basin, indicated by few confirmed museum records. Additionally, these analyses provide insights about correlations among species distributions patterns and ecological requirements with evolutionary affinities. For all models, empirical occurrence data were based on confirmed museum records. Seven predictive variables with 1 km of spatial resolution were used, being five Bioclimatic variables, Altitude and Vegetation Index (NDVI). The AUC values were greater than 0.85, indicating high consistency for the models, with Annual Mean Temperature and Annual Precipitation considered the most important predictive variables for all species. These models corroborated the subtropical patterns previously reported for *M. oxyotus* and *M. levis*, indicating high ecological similarity among these species. Additionally, the model for *M. nigricans* indicated absence in the most part of Amazon Basin. Distribution models can be used to test patterns of evolutionary and ecological similarities, which associated with information of divergence times, can provide insights into the biogeographic and evolutionary history of species.

123 DO EXOTIC SQUIRRELS AFFECT NATIVE BIRDS IN EXOTIC FORESTS OF THE PAMPAS?

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Biological invasions are a major threat to native species. The red bellied tree squirrel *Callosciurus erythraeus* was introduced in Luján, Argentina, in 1970 and it spread rapidly. Local inhabitants claim a negative effect on native birds; squirrels can affect birds through nest predation, interference and competition for food and nest sites. We aimed to compare bird richness and abundance in forested areas with and without squirrels. We selected 28 sites, 14 inside and 14 outside the distribution area (700 km² in 2004) of the main population of these squirrels; half of these were paired sites of similar structure and tree composition. We did 4–5 point counts in each site during spring-summer 2008-09, recording all bird individuals identifiable to species level that were seen/heard during 8 min, <10–20 m from the observer. Points were at least 100 m apart and were visited twice, in the early morning. Species richness was rarefied to the smallest number of point counts per site. We did not find statistically significant differences in bird abundance (one-tail t-test $n=14$ and paired t-test $n=7$: $t=-1.18$ $p>0.12$). Species richness only differed in paired sites with (mean \pm SD=8.27 \pm 2.65) and without (9.88 \pm 3.54) squirrels (one-tail paired t-test: $t=-2.09$ $p=0.04$ $n=7$) (one-tail t-test: $t=-1.02$ $p=0.16$ $n=14$). To assess if squirrels do consume bird eggs and if they have any egg-size preference, we conducted cafeteria experiments in a 3 \times 2m outdoor cage, offering fruit and three eggs (large, medium, and small) to locally-trapped, single squirrels ($n=25$). Squirrels consumed the yolk ($n=2$) or only broke the shell ($n=4$) of medium and small eggs. Our sampling effort prevents analyzing an effect on rare species, which could be detected with more intensive fieldwork. We have no conclusive evidence of a negative effect of squirrels on native birds, however, our results suggest that species richness may decline.

124 DO INTRODUCED NORTH AMERICAN BEAVERS ENGINEER DIFFERENTLY IN SOUTHERN SOUTH AMERICA? – AN OVERVIEW WITH IMPLICATIONS FOR RESTORATION

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North American beavers (*Castor canadensis*) were introduced to Tierra del Fuego Island in 1946 and since have expanded across the archipelago and the after the '90s across the Chilean mainland (Brunswick Peninsula). As ecosystem engineers, beavers have large impacts on terrestrial and aquatic ecosystems in their native and introduced habitats. However, while in their native range, beaver ponds may constitute a unique landscape feature, in Tierra del Fuego such beaver-mediated ponds may simply replicate natural lentic ecosystems. Additionally, Northern Hemisphere vegetation presents adaptations to beaver herbivory, while the riparian vegetation of sub-Antarctic forests has no similar experience to beaver engineering in its evolutionary history. By reviewing the literature for both biomes, we answered the following questions: Are the directions and magnitudes of change caused by beavers the

same in North and South America? Are the mechanisms by which beavers alter the environment and the resulting ecological responses the same between riparian and aquatic ecosystems? Based on current understanding of the habitat-level impacts of beavers in terrestrial and aquatic ecosystems of the austral archipelago, we found that the direction and overall extent of their effects were predictable based on expectations from their native distribution. A comparison of beaver impacts in both terrestrial and aquatic ecosystems in the Fuegian Archipelago, suggests that the consequences and persistence are greater in the riparian zones than in stream ecosystems, given the lack of regenerative strategies of plants to these disturbances. Thus to achieve restoration after controlling beaver expansion, the proposed activities must be carried out within the context of whole ecosystem management at the watershed level and with long-term commitment. Besides poorly implemented control programs may have an adverse effect on riparian vegetation, with large direct and indirect impacts.

125 ECOLOGICAL STRATEGIES OF THE DESERT MOUSE OPOSSUM, *THYLAMYS PALLIDIOR*, IN THE MONTE DESERT, ARGENTINA

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The desert mouse opossum is a small marsupial inhabiting the aridlands of South America with the largest distribution in the genus. Knowledge about its ecology is scarce being this the first ecological study of a marsupial in the Monte. The objective of our research was to characterize three aspects of its ecology (population structure, habitat use and diet) in a seasonal and heterogeneous environment. During 2005-2007 we sampled four seasons and three habitat types (Prosopis woodland, Larrea shrubland and sand dunes) in the MaB Nacuñan Reserve, Mendoza. In each habitat we set up 6 grids (36 Sherman ground traps+10 tree traps) the first year and 4 grids the second year. Individuals were measured, marked and released at the capture site. Habitat use was analyzed at three spatial scales (habitat, grid, and patch). We captured 118 mouse-opossums (capture effort: 27600 trap-nights). Our results showed that abundance and reproduction were strongly seasonal and influence by rainfall. We also found evidence of possible semelparity. Habitat utilization varied seasonally; during wet season mouse opossum used the habitat indistinctly, whereas during dry season selected areas with low complexity and high grass cover. This utilization pattern was better explained by the spatial scale of grid (1 ha). The diet is composed by arthropods (71.5%), and unlike Australian desert small marsupials, *T. pallidior* feeds also on leaves (22.44%), fruits (3.13%) and seeds (2.3%) showing a generalist feeding strategy. This composition does not vary between seasons, sex or age classes. Except for its diet, this species showed strong seasonality in many aspects of its natural history. These strategies, coupled with physiological adaptations, allow the desert mouse opossum to cope with rigorous conditions that characterize the Monte desert. (Supported by PICT-AGENCIA 11768-25778-PIP CONICET-5944).

126 EFFECT OF BANANA PLANTATIONS (*MUSA SP.*) ON BAT ASSEMBLAGES (CHIROPTERA)

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Banana is one of the most consumed fruits in the world. Brazil is its second largest producer. One alternative to the current conservation strategies is the integration between conservation and agriculture. It is important to explore how altered habitats, as plantations, affect biological diversity, since animals may also occupy these areas. The present study aimed at analyzing the effect of banana plantations on bat assemblages. Twelve sampling nights were carried out from November 2008 and April 2009, six sampling nights in banana plantations and six in adjacent forests, with a total sampling effort of 35.640 h.m². Bats were classified according to their higher trophic guild. We captured 728 individuals from 22 species: 444 in banana plantations (18 species) and 284 in forests (19 species). The number of exclusive species was similar for the banana plantations (3) and the forests (4). Only three species exhibited the insectivorous habit, all forest exclusives. Only one gleaner was captured: *Micronycteris megalotis*, with two captures in each habitat. Nectarivorous and omnivorous species were more abundant in the banana plantations (13.74 and 11.5%) than in the forests (8.1 and 1.41%). The frugivorous guild exhibited a higher relative abundance in the forests (77.11%) compared to the banana plantations (72.07%). The most abundant species in the banana plantations was *Artibeus lituratus* with 172 captures, followed by *Carollia perspicillata* with 92 captures. In the forests, *Carollia perspicillata* was the dominant species with 79 captures, followed by *Artibeus lituratus* with 72 captures. Banana plantations can maintain a high bat diversity, with an increase of biomass of omnivorous species and of certain frugivorous species as well. However, the insectivorous guild is decreasing. It is important to assess whether the usage of banana plantations instead of forests could result in the decrease of services of pollination and dispersal of native plant species.

127 EFFECT OF RODENTS ON SEEDLING EMERGENCE AND ESTABLISHMENT OF EXOTIC WOODY SPECIES IN GRASSLAND ECOSYSTEMS

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The aim of this work was to assess the effect of rodents on seedling emergence and establishment of two exotic woody species, *Gleditsia triacanthos* and *Robinia pseudoacacia*, in two successional stages in a grassland ecosystem of the inland Pampa, Buenos Aires, Argentina. The study was conducted in an enclosure area within a farm that is devoted to agriculture and livestock breeding. The design was a factorial combination of 2 x 2 treatments with five replicates each: rodent exclusion (excluded/ access) and

grassland stage (undisturbed: mature/disturbed: early stages). Both treatments were assessed within 4 m² areas fenced with a 50 cm high plastic mesh, but for the rodent access treatment we cut out nine 10 cm diameter holes in the walls of the fences to allow rodents to enter. Early successional stage was simulated by cutting off the vegetation up to 5 cm (disturbed areas). A control treatment (without fence and undisturbed) was used to detect effects of the fences on microclimatic conditions, seedling emergence and establishment. We confirmed rodent presence in the area by seasonal samplings by Sherman traps. Half of the fences were sown with 200 *Gleditsia triacanthos* seeds and the another half with 200 *Robinia pseudoacacia* seeds. Seedling emergence and establishment were estimated during two consecutive growing seasons (spring-summer-autumn 2007-2008 and 2008-2009). We captured 175 individual rodents: *Akodon azarae* (81%), *Calomys musculinus* (13%) and *Oligoryzomys flavescens* (6%), with a capture effort of 168 trap-nights per sampling. No rodent were captured in the exclusion treatments. Seedling emergence and establishment of *Robinia pseudoacacia* were not affected by any treatment while *Gleditsia triacanthos* showed higher seedling emergence in the non disturbed treatment independently of rodent presence ($F=12.5$; $p=0.002$; $gl=1$, 16). These results suggest that rodent consumption would not affect significantly the recruitment of these woody species in natural conditions.

128 EFFECTS OF MATRIX HETEROGENEITY ON THE PERCEPTION OF FOREST FRAGMENTS BY DIDELPHID MARSUPIALS IN THE ATLANTIC FOREST, BRAZIL

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The ability of animals to perceive habitat at distance, or their perceptual range, is one of the main characteristic influencing dispersal success in fragmented landscapes. Perceptual range may vary with the type of matrix surrounding habitat patches, but there is little empirical information regarding such relationship. We experimentally tested the effects of matrix heterogeneity on the ability of didelphid marsupials (*Philander frenatus* and *Didelphis aurita*) to perceive fragments of Atlantic Forest in Brazil. Animals were captured in fragments in the Macacu River watershed, Rio de Janeiro State, and released in three matrix types (manioc plantation, low pasture and tall pasture) at five distances (30 - 300 m) from a forest fragment, carrying spool-and-line devices. Orientation to the fragment was evaluated as the difference between the direction of the fragment and the direction taken by the individual. The effects of matrix type, distance to the fragment, body mass, and sex on orientation were determined using the Akaike Information Criteria. From August 2005 to May 2008, 109 paths from *P. frenatus* and 87 from *D. aurita* were tracked. For *P. frenatus*, distance was the only variable in the most plausible model, but matrix type also had a detectable effect. Orientation decreased as the distance from the fragment increased, reflecting a visual mechanism of orientation. For *D. aurita*, body mass and matrix type were the main variables. Larger individuals had better orientation, demonstrating that perceptual abilities may scale with body mass within a species. Orientation was higher in the low pasture, probably reflecting the larger flux of wind, which is used by individuals for orientation. Matrix heterogeneity affected the perceptual abilities of both marsupials, but distance and body mass were also important determinants of functional connectivity for these species.

129 ESTIMATING TANNIN INTAKE LEVEL OF FOREST-DWELLING RODENTS IN THE WILD USING FECAL PROLINE CONTENT

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Acorns (seeds of oaks) are staple resource for rodents in temperate forests, but they contain high level of tannins. Our recent experiments using the Japanese wood mouse *Apodemus speciosus* in the laboratory have demonstrated that the damage caused by acorn tannins could be reduced through acclimation, which was mediated by the increase in salivary proline-rich proteins and tannase-producing bacteria. To elucidate detailed process of the acclimation against tannins, seasonal changes in tannin intake in the wild should be clarified. Thus, our goal is to develop a method for estimating tannin intake from droppings of rodents. We conducted the feeding experiment using formula diets containing tannic acid in various concentrations. These diets were supplied to two species of mice, *A. speciosus* ($n = 7$) and *A. argenteus* ($n = 5$), and their feces were sampled. Concentrations of tannins, total phenols, and proline were analyzed for each sample feces, and relationships with intake tannin level were examined. It was proved that fecal proline level highly correlated with tannin intake in both rodent species ($R^2 = 0.79-0.89$), but tannin and phenol level did not. Salivary proline-rich proteins may bind to ingested tannins and be mostly excreted as feces. Next, we investigated seasonal changes in tannin intake of two *Apodemus* species in an oak forest in Hokkaido, Japan. Further, we also identified whether level of tannase producing bacteria correlate with tannin intake or not. The fecal proline level of both species significantly increased in fall, which suggested that they shifted their diets to those containing high level of tannin in fall. No significant changes were observed in level of bacteria according to tannin intake. Our results did not support the significance of tannase-producing bacteria in the acclimation against tannins in the field. Salivary proline-rich proteins may be more important in the acclimation.

130 EXOTIC SQUIRRELS IN ARGENTINA: THE HUMAN FACTOR

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Squirrels of numerous species have been introduced into non-indigenous regions for their ornamental value, as game animals, for their fur, or for trading as pets. The Asiatic Red-Bellied Squirrel *Callosciurus erythraeus* is the first known introduction of a squirrel

into South America, and within 30 years has achieved the status of an established invasion of major proportions. We are studying the life-history traits of the species and the features of the recipient environment that facilitate its rapid and ongoing invasion in Argentina. Association with humans already stands amongst the major determinants of its invasion success. Establishment is facilitated by habitat modification, with woodland patches of exotic trees in rural and urban areas providing suitable habitat for its arboreal habits. Spread is accelerated by translocation and commercial trafficking, followed by escape or release into the wild. The lack of native squirrels in most regions of Argentina and its charismatic appearance encourage an informal pet trade and deliberate releases. Spread is also facilitated by trees and cables along roads, railways, rivers and wind curtains, increasing the chances of long-distance dispersal. Squirrels can establish from low numbers and in highly fragmented habitats, evidenced by the main population originating from <10 individuals, and new satellite populations establishing in recent years. Our projections with a spatially-explicit model forecast a 5-fold increase in area of occupancy under the present regime of no systematic management. Repeated releases of squirrels have led to new foci of invasion in the provinces of Buenos Aires, Córdoba, and Santa Fé. Containment requires disruption of natural and human-aided dispersal. Communication to the general public is required to discourage recurrent liberations and to gain support for management actions. Control should be implemented in small, isolated foci of invasion and in priority patches within the main population, to delay arrival into valuable conservation areas.

131 EXPANSION OF THE ASIATIC RED-BELLIED TREE SQUIRREL IN THE PAMPAS

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Habitat features influencing the spread of exotic species provide relevant information to predict and control invasion. We aim to analyse the spread rate and landscape correlates of the main population of the red-bellied squirrel *Callosciurus erythraeus* that was introduced in Luján (Buenos Aires, Argentina) in 1970. Between June 2008 and February 2009 we interviewed residents in the range periphery, and expanding outwards, of squirrel's known distribution by 2004 to evaluate: (1) area of distribution, (2) spread rate, (3) correlation with forested patches and (4) opinion regarding the presence of this arboreal squirrel. Presence/absence of squirrels was entered to a GIS database and the invaded area was calculated using the minimum convex polygon method. Squirrels have almost doubled the occupied area in 5 years, now invading 1336 km². The rate of spread since liberation is 0.62 km/year, which exceeds the spread rate estimated until 2004 of 0.53 km/year. Distribution area is asymmetric, mainly elongated along the Luján river; therefore, we calculated spread rate in NE-SW (along the river, 0.67±0.01 km/year) and NW-SE (0.52±0.04 km/year) directions. Low density of forested, fragmented patches correlated with spread rate along the river (NE-SW: 0.07±0.00 forested patches/km², NW-SE: 0.04±0.00 forested patches/km², $r=0.96$, $p<0.05$, $n=4$). Patch size and spatial array will provide new evidence for or against this trend. Most (89%) of interviewed residents had a negative opinion on squirrels and 7% considered them a pest species because of the damages they cause. Landscape composition may prove relevant for containment of this expanding population, mainly regarding abundance and array of forested patches (providing suitable habitat and corridors) and matrix resistance given squirrels' aversion to cross open areas (barriers).

132 EXPENSIVE BRAINS: 'BRAINY' RODENTS HAVE HIGHER METABOLIC RATE.

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Brain mass (BrM) varies among mammals, and diverse factors have been proposed to explain this variation. A recent study provided evidence that energetics play an important role in brain evolution (Isler and van Schaik 2006, *Biol. Lett.*). Using composite phylogenies and data drawn from multiple sources, these authors showed that basal metabolic rate (BMR) correlates with BrM across several mammals. However, no such a relationship was found within rodents. Here we re-examined the relationship between BMR and BrM within Rodentia using novel species-level phylogeny. Our study provides evidence that (independent of body mass) BMR and BrM are strongly correlated. We conclude that the use of composite phylogenies may have hindered the discovery of such patterns. Large brains are thus costly and our findings predict that large brains evolve when the payoff for increased BrM is greater than the energetic cost they incur.

133 FACTORS ASSOCIATED WITH THE DISTRIBUTION OF INTRODUCED MARMOSETS IN THE BRAZIL'S ATLANTIC RAINFOREST

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During a 4-year research project in the current range of the golden lion tamarin, *Leontopithecus rosalia*, we monitored the introduced marmosets' presence, *Callithrix* spp. Generalized linear mixed models were used to explain occupancy, by evaluating the relative contribution of anthropogenic and natural variables and considering forest patches as a random effect. We examined a set of a priori hypothesized models, together with a number of additional models, and selected the best model following an information-theoretic approach. Our best model revealed that the probabilities of occupancy were mostly conditioned by an anthropogenic variable (distance to the nearest road), showing its importance as a factor which has facilitated marmosets' introduction. We also discuss the relative importance for each variable and how understanding the factors influencing the distribution of marmosets are essential for their control.

134 FAMILIARITY AND MATING IN *AKODON AZARAE* (CRICETIDAE: SIGMODONTINAE) WITH REGARD TO MATING SYSTEM.

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Akodon azarae, one of the most abundant species living in the agroecosystems of southern Córdoba Province (Argentina), presents seasonal breeding, sexual differences in home range size, and has been proposed as a promiscuous-polygynous or polygynous species. In this study we test the hypothesis: In species with promiscuous-polygynous mating system, reproductive success (RS) of females is independent of mate familiarity; in polygynous species mate familiarity increase females RS. Adult individuals were captured between May and September 2008, in 21 lines of 30 traps (203m) separated by 500m in crop-fields borders. To minimize the effect of acclimation to laboratory conditions, the mating was carry out into the first 48hs since its arrival. Males were classified as "familiar" (captured in the same line in the same trapping session than his partner), and "unfamiliar" (captured in different line in the same trapping session than his partner). Thus, we obtain two experimental groups of reproductive mates: females with familiar males (FFM); females with unfamiliar males (FUM). RS was determined from pregnancy evidence or birth. Besides, we registered litter size, post-partum estrus, and infanticide. Mates that registered non-pregnancy evidence or parturition into 45 days after mate, were assumed "non- RS". 12 of the 87 mates conformed registered injuries: 3 FFM and 9 FUM. So, we measured RS in 26 mates FFM and 49 FUM. 92,3% mates FFM and 91,8% FUM registered RS. No significant differences in RS were observed between FFM and FUM (differences proportion test $p=0,500$). Moreover, no significant differences in litter size average, infanticide and post-partum estrus were registered ($p>0,05$). *A. azarae* females show no sexual preference based on familiarity. So, our results support a promiscuous-polygynous mating system.

135 FEEDING HABITS OF PHYLLOSTOMID BATS IN THE PANTANAL WETLANDS, BRAZIL

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Studies on feeding ecology of phyllostomid bats can provide useful information for understanding the resource partitioning that affects trophic relationships, responsible for the high diversity of this group in the Neotropical region. The aim of this study is to evaluate, based on fecal samples, the importance of fruit and pollen species and of arthropod orders on the diet of 12 phyllostomid bat species mist netted in the Rio Negro region, Pantanal da Nhecolândia. In addition, we describe overlapping of food items among the most abundant species and the importance of seasonal variation on fruits, pollen and arthropods for these species. Most of the captured individuals (76%) fed on fruit parts. Arthropods and pollen were consumed by 56 and 37% of the individuals, respectively. Fruits and arthropods were more finely shared than pollen among phyllostomids. Seeds of *Ficus* spp., *Cecropia pachystachya* and *Piper* spp., pollen of *Bauhinia unguolata* and *Lepidoptera* and *Coleoptera* were the most consumed items by the bats in the Pantanal. Fruits of *Ficus* spp. and *C. pachystachya* were mainly consumed by *Artibeus jamaicensis*, *Platyrrhinus lineatus* and *Glossophaga soricina*, whereas fruits of *Piper* spp. were frequent in fecal samples of *Sturnira lilium* and *Carollia perspicillata*. *Bauhinia unguolata* was the commonest pollen species consumed by all bat species. *Lepidoptera* frequently occurred in fecal samples of phytophagous bats and *Coleoptera* was the most important food item for the insectivorous *Lophostoma silvicolu*m. Despite this concentration on certain foods, phyllostomids were more generalist in the Pantanal than in other regions. Consumption of insects by frugivorous bats was atypically high in the Pantanal, probably due to the poor assemblage of fruit species in this region. Feeding on arthropods and pollen occurred more frequently during dry season, whereas feeding on fruits occurred more frequently during wet season.

136 FERTILITY, LONGEVITY AND REPRODUCTIVE SENESCENCE IN FEMALE SOUTHERN ELEPHANT SEALS AT MARION ISLAND

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Research on ageing is fundamental to the understanding of life-history parameters and their consequences on population demography. Senescence studies in wild animals using longitudinal datasets are relatively rare, and particularly so for marine mammals. We use program MARK to analyse a 25-year longitudinal capture-mark-recapture (CMR) dataset of southern elephant seals to address questions of senescence, fertility and longevity. Evaluation of state-dependent models indicates that actuarial senescence is not evident in the species, but reproductive senescence after the age of 12 is apparent. Costs associated with the age at primiparity are illustrated through reduced reproductive output in later life. Additionally, a hypothesised decrease in the mean age at primiparity between periods of decline and increase in the population is not supported. Frequency of breeding is interrupted throughout life and unrelated to age, thereby challenging the often-cited assumption that females older than 5 years breed annually. Breeding frequency did not vary between the periods of hypothesised food limitation and abundance. We illustrate that longevity as predicted from CMR survival estimates exceed the observed. We provide unique fertility and longevity schedules for the species, based on >5000 individually identifiable female seals. Senescence is difficult to recognize in wild populations in the face of confounding intrinsic and extrinsic variables. Yet, a multifaceted approach using longitudinal data for many individuals can provide meaningful conclusions in aid of population demographic analyses and studies of the evolutionary ecology of ageing.

137 FIG DISPERSION BY *NASUA NASUA*: EFFECTS ON SEED GERMINATION AFTER PASSAGE THROUGH THE GUT

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Seed dispersal is a key process in plant's life cycle. One way to evaluate dispersal is based on postdispersal patterns, such as germination. Seed ingestion by frugivores can vary the rates of germination. Coatis (*Nasua nasua*) feeds mainly on fruits, and among them, species from the genus *Ficus* (described as keystone resource). Still, little is known about its paper as disperser. This study verified seed germination rates of *F. pertusa* that passed through the coati gut comparing with those that came from the fruit. Data were collected in Pantanal of Miranda-Abobral, Brazil. Feces were collected after the coatis eat fruits on one *F. pertusa* individual. Fruits were collected from the same tree. In laboratory, they were washed and dried. Only healthy seeds were sorted at random and deposited in 10 Petri dishes (50 seeds per Petri dish): five dishes with seeds from fruit and five with seeds from coati feces. They were maintained in constant conditions and checked daily over 36 days. The mean time of germination was obtained by the speed of germination ($1/t$, where $t = \sum ni.ti / \sum ni$ and $ni =$ number of germinated seeds in the time ti and $ti =$ the germination day). To compare the treatments ingested and uningested, the Mann-Whitney test was used. From all the seeds of both treatments, the total percentage of germination were 42, 5% on those from coati feces, and only 5% of seeds retired directly from fruits, differing significantly ($U=1635$; $p<0,001$). The seed ingestion also altered significantly the speed rate ($U= 1607$; $p= 0,001$). Coati can be classified as potential disperser of *F. pertusa* due to increase these rates of seed germination, that strongly provides the success of the initial process of establishment of this fig specie. Nevertheless, the frugivores effectiveness also depends on others characteristics to be studied.

138 FIRST REPORT OF FOLIVORY IN THE LARGE FRUIT-EATING BAT, *ARTIBEUS AMPLUS* (CHIROPTERA: PHYLLOSTOMIDAE)

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In bats, the phenomenon of folivory, or consumption of leaves, consists of chewing a fraction of a leaf to extract its liquids, and rejecting the fibrous material. Although there are 1,116 species of bats in the world, this behavior has been registered in only twenty-two species. Since this represents less than 2% of the Chiroptera species, this behavior was considered an anomalous activity five decades ago. However, in recent years it has been postulated that the nutritional and/or physiological value of leaf consumption is fundamental for reproduction because frugivorous bats may obtain some hormonal precursors from it. *Artibeus* is the genus of neotropical bats with more reports on folivory. Three species (*A. concolor*, *A. lituratus*, and *A. jamaicensis*) consume leaves of species belonging to genera *Erythrina* (Fabaceae), *Solanum* (Solanaceae), and *Ficus* (Moraceae). We monthly collected the discarded leaves (or their remains) underneath a colony located in a cave of the Venezuelan Andes, during October 2008 - April 2009. We identified and quantified the obtained material: 249 leaves of *Chrysophyllum* sp., 120 of *Couepia* sp., 106 of *Erythrina* sp., 12 of *Ficus* sp., 1 of *Brosimum* sp., 2 of *Clidemia* sp., and 1 of *Capparis* sp. This represents the first report of folivory in *A. amplus*. The great diversity of leaves from plants consumed by *A. amplus* would suggest that each one of them may provide specific nutrients to these bats. We suggest a comparative chemical analysis of these leaves to determine their nutritious quality and to explain the consumption of leaves by these bats. Keywords: folivory, leaves, consumption, frugivorous bats, *Artibeus amplus*.

139 FOOD RESOURCE PARTITIONING IN A COMMUNITY OF FRUIT-EATING BATS IN A TROPICAL FOREST, SOUTHERN BRAZIL

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Studies on diet are important for understanding how bat communities are structured. The aim of this study was to analyze food partitioning in the guild of frugivorous bats in Reserva Natural do Salto Morato (25°10'S 48°15'W), Atlantic Rain Forest, Brazil. Ten mist-nets were armed monthly from December 2007 to October 2008, totalizing 396h/net. The diet of seven frugivorous species was assessed by fecal analysis. Spearman correlation rank analysis was applied to investigate the relation between the consumption of the *Cecropia* and *Piper* fruits and the mean masses of each species. The highest Levins index of niche breadth were found for *Artibeus cinereus* and *Artibeus obscurus* ($BA=0.87$), and *Artibeus fimbriatus* ($BA=0.80$) and the lowest for *Artibeus lituratus* ($BA = 0.36$). *Carollia perspicillata*, *Sturnira lilium* and *Sturnira tildae* had niche breadth values of 0.57, 0.56 e 0.38, respectively. The lowest Pianka's niche overlap occurred between *A. lituratus* and *C. perspicillata* ($Ojk=0.13$) and the highest between *S. lilium* and *S. tildae* ($Ojk=0.69$). The Cluster Analysis showed a major similarity between *S. lilium* and *S. tildae*. The diet of *A. cinereus* was closer to that of *Sturnira* individuals while it differed greatly from the diet of its congeners. The diet of *C. perspicillata* was very different compared to the other species. There was a positive correlation between body mass and consumption of *Cecropia* fruits. Smallest species showed high consumption of the *Piper* fruits. The dimensions of fruits may have an important role on the resource partitioning of fruit-eating bats. The great diet similarity and the feeding niche overlap among *Sturnira* species showed no clear food partitioning to explain their coexistence. Conversely, our results suggest the importance of feeding resources partitioning on the coexistence of the bat species studied herein.

140 FRUGIVORY AND SEED DISPERSAL BY TAPIRS (*TAPIRUS TERRESTRIS*) IN THE ATLANTIC FOREST OF NE ARGENTINA

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As part of an ongoing study on spatial patterns of seed dispersal by mammals and their role in community structure in subtropical forests, a preliminary study on fruit consumption and seed dispersal by Lowland tapirs was carried out at the Iguazú National Park. Identified latrines were followed and a total of 51 fecal samples were collected between 2007 and 2009. Dry weight composition was analyzed and all seeds identified to species. Tapir's diet was composed by similar proportions ($t=0.05$ $p=0.95$) of seeds and fruits ($50.2\pm 21.2\%$) and leaves and fiber ($46.3\pm 20.5\%$). These proportions did not differ among seasons ($H=2.5$ $p=0.47$). Tapirs dispersed a large number of seeds (249 ± 418 seeds/sample; range=4-2206) from 10 species and 19 morphospecies, including an exotic species (*Hovenia dulcis*). There was no seasonal pattern in the total number of seeds ($H=4.4$ $p=0.22$) and the diversity of seeds (3 ± 2 species/sample; $H=5.5$ $p=0.14$) dispersed per sample. Fruits of the pindó palm (*Syagrus romanzoffiana*) were present in 97% of the samples with an average of 108 ± 110 seeds/sample. Besides *S. romanzoffiana*, other four species were present in multiple samples: *Enterolobium contortisiliquum* (13%), *H. dulcis* (11%), *Ficus* spp. (10%), *Chrysophyllum gonocarpum* (7%) and *Holocalyx balansae* (6%). In contrast, species like *Jacaratia spinosa* and *Campomanesia xanthocarpa* were abundant in only one of the samples. Only *E. contortisiliquum* and *C. gonocarpum* seeds showed damage. These results indicate that tapirs disperse year round a large quantity and diversity of undamaged seeds to sites potentially favorable for establishment (as suggested by the presence of saplings in latrines), suggesting their key role as seed dispersers in the processes responsible for the maintenance of diversity in the Atlantic Forest communities.

141 FRUGIVORY IN NEOTROPICAL BATS: PATTERNS EMERGING FROM META-ANALYSIS OF DIET

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Phyllostomid bats are principal seed dispersers and pollinators of Neotropical rainforests. Literature on phyllostomids abound in dietary studies, yet achieving an adequate synthesis of assemblage patterns, evolutionary patterns, or both, remains elusive. We set out to uncover those patterns via a meta-analysis of the dietary information available. We choose nine independent publications carried out in localities from 5 major biomes of Central and South America. These studies thoroughly sampled diet of most phytophagous phyllostomid species present syntopically in the corresponding study localities, comprising roughly 65% of all available dietary records and representing fruit removal records for 46 plant genera. We recoded the dietary data on an ordinal scale to make records comparable across studies, solving conflicts when present. With those records we built a composite dietary matrix that included 28 species of phyllostomid bats in the genera *Artibeus* (10 species), *Carollia* (4), *Sturmira* (4), *Vampyressa* (3), *Phyllostomus* (2), *Chiroderma* (1), *Glossophaga* (1), *Platyrrhinus* (1), *Uroderma* (1) and *Rhinophylla* (1). The recoded data matrix was submitted to Correspondence Analysis (CA) controlled by phylogeny. Members of each major clade tended to cluster together and be associated with specific plant genera in close agreement with previous hypotheses advanced on the basis of much less inclusive sampling of bat diversity or restricted to single well-sampled localities. However, species from marginal areas of the generic distributions, remarkably species of *Artibeus*, showed important shifts from the core diet of their respective genera toward plants available in their habitats that were typical resources of other bat genera. Modeling of dietary responses within the CA ordination exposed subtle segregation of bat species within a genus along the resource axes. This reveals a hierarchical assemblage structure at the regional scale that is connected with cladogenetic events reconstructed along the evolutionary history of phyllostomid bats and their plants.

142 HABITAT SELECTION BY SYMPATRIC SEMIAQUATIC SMALL MAMMALS: *CHIRONECTES MINIMUS* AND *NECTOMYS SQUAMIPES* IN ATLANTIC FOREST STREAMS

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We studied the habitat selection by the water opossum *Chironectes minimus*, the World's only semi-aquatic marsupial, and the water rat *Nectomys squamipes*, a similar sized sympatric species. The study was carried out via capture-mark-recapture from October 2004 to July 2008 in an Atlantic Forest river basin in southeastern Brazil. The aims of the study were to identify the habitat variables associated to the occurrence of both species, and to test the hypotheses that they could compete for the same habitats in Atlantic Forest streams. We evaluated 26 habitat variables, but dropping redundant (correlated) variables dropped this number to 12. The numbers of captures of the water opossum and the water rat were not correlated across river stretches ($r_{\text{Pearson}} = -0.35$; $n = 15$; $p = 0.21$). A stepwise multiple regression model with all 12 habitat variables explained 65.9% and 77.7% of the water opossum ($R^2 = 0.66$; $F = 3.87$; $df = 5.10$; $p = 0.03$) and the water rat ($R^2 = 0.78$; $F = 6.95$; $df = 5.10$; $p = 0.005$) numbers of captures, respectively. Riverside tree densities (+), brush (+), sand (-), river width (-) and roads within 5 m of the river (-) were the main determinants of the numbers of captures of the water opossum. Forest within 5 m of river (+), human buildings within 50 m of river (+), river width (-), roads within 5 meters of river (-) and within 50 m of river (-) were the main determinants of the numbers of captures of the water rat. We concluded that water opossum and water rat do not compete for habitat, and they select rather different habitat characteristics. We strongly recommend the preservation of riverine forests as an important strategy for water opossum conservation.

143 HABITAT USE BY RODENTS IN INTENSIVE PIG PRODUCTION FARMS

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In order to identify the rodent species inhabiting intensive pig production farms and to analyse their habitat use we sampled three pig farms during spring 2008 and summer 2009. Rodents were captured using Sherman and cage traps set in the perimeter of pig buildings, human buildings (houses, sheds), and in vegetated areas. The presence of food, shelter, inorganic waste, type of substrate, etc., was registered in a 2x2m area for a subset of trap stations. Digital maps of the farms were performed locating the pig and human buildings, all sources of food and shelter for rodents, bodies of water, bare and paved surfaces, and all patches of vegetation with height <15cm, 15-30cm, 30-50cm and > 50cm. The surface occupied by these elements in each trap station was quantified using a circular area of 10m radius. The distances of each trap to the closest food source or pig building, the closest human building, and the closest patch of vegetation over 15cm tall were also estimated. A total of 37 rodents were captured with an effort of 754.5 cage trap-nights and 794.5 Sherman trap-nights. *Rattus norvegicus* was the most caught species, followed by *Mus musculus*, *Rattus rattus* and *Akodon azarae*. *R. norvegicus* presented the highest mean trap success in pig buildings and their catches were associated to the abundance and proximity to food and shelter, being rare the captures away from pig buildings. *M. musculus* was captured close to human buildings and food. *A. azarae* was captured exclusively in patches of spontaneous vegetation with height >50cm and away from buildings. According to these results *R. norvegicus* is the dominant species in these types of farms and it uses mainly the pig buildings where it can find adequate sources of food and shelter, while *M. musculus* uses human buildings.

144 INVESTIGATIONS OF AMERICAN MINK DIVING IN INVADED AREAS: ENGLAND AND PATAGONIA

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The American mink (*Neovison vison*) is an invasive species that has spread (via the fur trade) from its native North America to Europe, the former USSR and South America (Patagonia). American mink are hugely adaptable in terms of prey they can consume, habitats and climates that they can exist in. They are particularly interesting because they are adapted to foraging both in water and on land. However, until recently little was known of the diving behaviour of wild mink, and the methodology to study diving in small, shallow-diving species was lacking. The deployment of temperature depth recorders (TDRs-CEFAS Technology) adapted for shallow divers allowed us to investigate the diving ability and behaviour of wild mink on lowland rivers in southern England. We deployed 31 TDRs on 24 mink and obtained data for 16 individuals (6m; 10f). The total number of dives recorded per individual (over the 5-6 day recording period) ranged from 5 to 789. Mean dive depth was 0.53 m (maximum 2.96 m); mean dive duration was 13.1 s (maximum 57.9 s) - both were similar between sexes and seasons, and were significantly higher than recorded in earlier laboratory studies. Per day, the total number of dives ranged from 12 to 189, with females diving significantly more than males. Surprisingly, most dives occurred during daylight. We discuss the relevance of this type of information for understanding the adaptability of mink, their behavioural ecology and intraguild interactions. Finally, we outline our future goals for mink studies, in England and in Argentinean Patagonia, using this technique.

145 IS THE MATRIX REALLY INHOSPITABLE? THE USE OF A FRAGMENTED LANDSCAPE BY SMALL MAMMALS

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The matrix of altered habitats, in which the forest patches are inserted in the fragmented landscapes, has been considered homogeneous and inhospitable. Nevertheless, this conception may change regarding the target species and evaluated habitats. Small-mammal guilds that use forest habitats, open areas or both (generalists) may alter their habitat preference due to a highly altered landscape. We investigated (1) if there is variation in the use of different habitats by the small-mammal community and (2) if small-mammal guilds use the fragmented landscape differently or if they respond differently from the expected. This study was conducted in severely fragmented landscape of Atlantic forest in southeastern Brazil. We used pitfall traps installed in six sites. In each site, we sampled five habitats: forest fragments with streams, forest fragments without streams, forest edge, pasture matrix with streams, and pasture matrix without streams. We evaluated the abundance, richness, composition, and diversity of the small-mammal community and habitat-related guilds. We observed a high similarity in the composition of the community in the forest habitats and in pasture matrix with streams. Matrix without streams harbored a smaller species abundance than all other landscape units. The guilds responded differently to the different landscape units. However, in general they followed the expected, less tolerance of the forest guild to the matrix without streams. The matrix is inhospitable for forest species which, even for generalists, suffer their effect, decreasing in abundance. A slight increase in the complexity of the vegetation, as observed in riparian matrices, mitigates its negative effect, making the abundance, richness and diversity of matrices with streams comparable to forest habitats. These results indicate that specific habitat characteristics, such as the presence of streams, may facilitate the use of the matrix, contributing for the maintenance of the original community in the fragmented landscape.

146 MICROHABITAT PREFERENCE BY THE GREY SLENDER MOUSE OPOSSUM *MARMOSOPS INCANUS* (DIDELPHIMORPHIA: DIDELPHIDAE) IN AN ATLANTIC FOREST AREA, SERRA DOS ÓRGÃOS NATIONAL PARK, BRAZIL

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The processes that lead to habitat selection and preference are one of the mechanisms responsible for the species richness and diversity found in ecosystems. This study investigates microhabitat preference by *Marmosops incanus* in an area of Atlantic forest using variables related to vegetation structure as a measure of habitat and abundance as a measure of habitat use by the species studied. *M. incanus* was captured in live-traps (Sherman and Tomahawks) set during five consecutive nights every other month from February 1998 to December 2007 in three 5 x 5 grids, totaling 75 trap stations. In the same trap stations, eight variables related to vegetation structure, referred to as 'microhabitat variables', were also measured. Based on a correlation matrix between these variables, four out of eight were chosen. A Poisson regression was performed between these four variables and the abundance (total number of captures) of the species in the area. The analysis indicated that litter and rock outcropping cover are important variables to determine habitat quality for *M. incanus* because they were positively related to species' abundance. We can infer that litter may represent a source of food items, since it can support an abundant fauna of macroinvertebrates, specially arthropods. Rock outcroppings can be used as shelter and protection.

147 MORPHOMETRIC ANALYSIS OF CHARACTER DIVERGENCE BETWEEN TWO SYMPATRIC AND CLOSELY RELATED SPECIES OF BATS

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When ecologically similar species develop overlapping distributions, natural selection may favor the evolution of morphological differences that reduce the negative effects of competition. Therefore, closely related species are almost always recognizably different where they live together (in allopatry), yet some are scarcely distinguishable where each occurs alone (in sympatry). Ecological character displacement is the term first used to describe the pattern of sympatric-allopatric contrasts. Here we evaluated character divergence between two species of bats; *Carollia perspicillata* and *C. brevicauda* which have partially overlapping distribution in Colombia. We imaged jaws and skulls from 11 localities, produced geometric descriptors of shape by using the geometric morphometric method of thin-plate splines and, used partial-warp scores to estimate differentiation in jaw and skull shape among sympatric and allopatric populations. A major pattern of morphological differentiation in this species is attributable to localized components of shape at smaller geometric scales associated with specific morphological units of the cranium. In sympatry and allopatry, both *C. perspicillata* and *C. brevicauda* show significant differences in jaw and skull shape that suggest that divergent phenotypes do not arose as an evolutionary consequence of competition as predicted by ecological character divergence hypothesis. In addition, there is considerable intraspecific variation in shape among sympatric and allopatric populations within both species. These results indicate that hybridization or geographic variation may account for differences in morphology between intraspecific and interspecific populations of these species.

148 PRELIMINARY STUDY OF THE DYNAMIC OF FOLIVORY IN THE FRUGIVOROUS BAT *ARTIBEUS LITURATUS* (CHIROPTERA: PHYLLOSTOMIDAE) IN VENEZUELA

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Although folivory was first described as an anomalous behavior in bats, it is currently accepted that the nutritional contribution of leaves and/or the importance of some chemicals as hormonal precursors are important factors that explain this consumption. Frugivorous bats do not swallow the chewed leaf, but only the liquids, discarding the fibrous portion. Several species of neotropical bats, especially those of the genus *Artibeus* are frequent leaf consumers. Leaves of plants consumed by *Artibeus*' species belong to *Erythrina*, *Solanum* and *Ficus*. In 2003, during a population biology study of *A. lituratus* in the Venezuelan Andes, leaves were found below the principal colony roosting in a palm. However, this study did not include a systematic and continuous examination of leaves consumed by this species. In this study, we identified leaves consumed by *A. lituratus*, and quantified them on a monthly basis, collecting them below the bat colony. During the period October/2008–April/2009 we have identified 26 leaves from genus *Erythrina*, and 24 from *Acnistus*. For this period, the consumption of leaves of *Erythrina* sp. and *Acnistus* sp. was continuous because both plants were present each month. The presence of *Erythrina* in the diet is known for *A. lituratus* (Brazil), but this consumption was restricted to August–September, and March. On the contrary, we found that folivory in *A. lituratus* at our study site is a continuous phenomenon. It has been reported that several species of *Erythrina* have steroidal alkaloids that could function as hormonal precursors, thus frugivorous bats may use these compounds during hormonal synthesis. However, *Acnistus* is a genus with an unknown chemical profile. Next step in our investigation is to perform a chemical analysis of *Acnistus* sp. to determine its nutritious quality and establish similarities or differences with *Erythrina*, which will allow us to understand the possible reason for its consumption. Keywords: folivory, leaves, consumption, frugivorous bats, *Artibeus lituratus*.

149 RANGELAND MANAGEMENT AND SMALL MAMMAL FUNCTIONAL DIVERSITY LOSS IN THE MONTE DESERT, ARGENTINA

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Rangeland production in arid ecosystems uses artificial watering points, generating radial grazing gradient patterns called piosphere. We analyzed the effect of piosphere over the structure and functional diversity of small mammal assemblages under two grazing systems. Three radial transects with ten sample points each were placed in an experimental rangeland with rotational grazing (RG) and in a neighbor rangeland with continuous grazing (CG), in the Monte desert, central-west Argentina. Sample points were separated by 50, 50, 50, 100, 200, 400, 600, 600, and 600 m from each other. Community structure was represented using range-abundance curves. Functional diversity (FD) was calculated using Rao's index with 11 traits regarding nutrient cycling function and habitat use. Using Syncca software we separated traits that maximized assemblage divergence patterns along the gradient. In both rangelands, community structure close to the watering point was highly dominated by one species with ecomorphological adaptations to open habitats (*Eligmodontia* sp.). Only under RG did the community diversify away from the water, with an exponential increase in FD beyond 1200 m ($r=0.82$, $p<0.001$). Under CG, FD values did not increase with distance, but had the maximum in two outliers close to water. Traits that maximized divergence were significant only in RG, and were related to diet (insectivorous, granivorous and omnivorous) and bipedal locomotion ($r=0.652$, $p<0.01$). These traits represent ecomorphological characters that vary the most within the community, improving ecosystem functioning. Away from watering points under RG, more complex habitat structure allows more diverse life strategies, increasing trait divergence. The loss of these traits at higher livestock densities and under CG may have significant effects over ecosystem functioning by diminishing the diversity of nutrient cycling strategies. We suggest long-term rest RG strategies to avoid small mammal functional diversity loss (Partially supported by PICT-Agencia and CONICET).

150 REPRODUCTIVE PATTERNS OF *PHILANDER FRENATUS* (OLFERS, 1818) IN ATLANTIC FOREST, SOUTHEASTERN BRAZIL

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Neotropical marsupials are well-known for their seasonality in reproduction, but a study in Atlantic Forest fragments suggests continuous reproduction of the didelphid marsupial *Philander frenatus*. In that study, reproductive season was estimated based on the presence of pouch young and lactating females, which may not be receptive to mating even if carrying or nursing young. To avoid this pitfall, we determine the reproductive season of *P. frenatus* based exclusively on estimated dates of succeeded mating, using data of fragmented and continuous areas of Atlantic Rainforest. The study was conducted in 15 fragments from 2005 to 2008, and in an area of continuous forest from 1998 to 2009, all in Rio de Janeiro State, Brazil. Circular statistics were used to test the seasonality of reproduction in the fragmented and continuous forest separately. Date of mating was estimated as age of pouch young plus 15 days of gestation period. Age of pouch young was estimated from a nonlinear function with individual body size (D'Andrea et al. 1992). A total of 114 females (34 carrying pouch young) were captured in the fragments, and 38 females (11 carrying pouch young) in the continuous area. The reproductive season in the fragmented areas occurred from July to January ($p < 0.001$), with most mating in September ($n = 13$) and July ($n = 10$), and in the continuous forest occurred from July to December ($p = 0.013$), with most mating in July ($n = 7$). The beginning and end of the reproductive season matches the seasonal increase and decrease of precipitation, respectively. In August and December of 2000 in the continuous forest one female had two consecutive litters, which indicates *P. frenatus* can occasionally reproduce twice a year. Reproduction of *P. frenatus* was not continuous when estimated using the date of the mating.

151 SCHEDULE INTERVALS AND SEASONAL OF CAPTURE OF BATS (MAMMALIA: CHIROPTERA) IN FRAGMENTS OF FOREST ESTACIONAL SEMIDECIDUAL IN THE NORTH OF THE PARANA, BRAZIL

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Information about schedule of the activity and seasonal standards can contribute in the agreement of questions related to the biology and ecology of bats. The present study had for objective to analyze intervals schedule and seasonal of the collections of bats, in the different stations of the year, in two different forest remaining of Estacional Semidecidual forest, in the city of Rancho Alegre, PR, Brazil. The samplings had been carried through during the period of april/2007 to march/2008, being two consecutive nights in each fragment, using eight "mist nets" installed to the level of the ground and opened by six hours from the sunset. The capture effort was of 2,76.103 h. m² in each area. It had been captured 502 bats (397 in native forest and 105 in the reforestation), being *Artibeus lituratus* the more captured species in the two remainders, followed for *Artibeus jamaicensis* and *Artibeus fimbriatus*. The hourly of capture of the bats concentrated in first three hours after sunset, with a peak of activity in the first hour in both the fragments. In relation to the stations of the year, in the native forest the number of collected individuals was bigger than reforestation in all the stations, being the autumn the station where it had more captures, as much in the number of individuals as of species ($N=156$, $S=9$; $N=45$, $S=4$) in the forest and reforestation respectively. In the forest, the general sampling of species was bigger in the spring ($S=12$), and in the reforestation in the autumn and summer ($S=4$). These results contribute to the knowledge of the group biology and they supply to subsidies the implementation of conservation plans and handling in the region.

152 SEASONAL VARIATION OF ABUNDANCE AND SURVIVAL OF THE RED-BELLIED TREE SQUIRREL (*CALLOSCIURUS ERYTHRAEUS*) INTRODUCED IN ARGENTINA

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Following a biological invasion, introduced populations are expected to show marked differences in demographic parameters from their native ancestors. A wild population of the Asiatic red-bellied tree squirrel has established in the Argentine Pampas from a few individuals introduced in 1970. We present results from the first study to estimate population parameters for this exotic squirrel in Argentina. Our objective is to estimate abundance and survival by fitting statistical models to capture-recapture data. Mark-recapture methodology was used at two study sites between October 2007 and November 2008. Squirrels were live-trapped seasonally in a 40x40 m grid over a total of 1370 and 1600 trap days per site. Each individual was tagged with a permanent internal transponder allowing individual recognition on recapture. A record was kept of its sex, weight, and reproductive status. Capture histories of individuals are being used to estimate population size, capturability, and survival rates, using open and robust design methods in MARK software. The best-fitting model in each design is selected on the basis of its AIC. The number of squirrels per hectare is estimated to average 13.3 ± 9.8 s.d. for the open model and 14.9 ± 12.3 s.d. for the robust model. Since capturability estimates are low in both models, minimum number alive (8.3 ± 2.3 ind./ha) may underestimate true abundance. However, extremely low values in some seasons (2-15%) seem to inflate estimations. Survival rates were relatively high throughout the year (open model: 0.82 ± 0.13 , robust model: 0.85 ± 0.11). We discuss how the ranging and dispersal behaviour of this invading squirrel is likely to influence capturability and the estimation of density and survival in these populations. Overall density and survival rates estimated in this study are higher than those previously reported for *C. erythraeus* in its native range. Biological traits favouring invasion success of this squirrel are further analysed.

153 SEASONALITY EFFECTS ON BATS DIVERSITY IN EASTERN AMAZON, AMAPÁ, BRAZIL

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Chiropters represent 45% of the Amazonian mammalian fauna and several factors influence their diversity patterns. Rain and seasonality have a strong influence over bats richness and abundance, through changes in food availability and reproductive patterns. Therefore, the aim of this study was to evaluate changes on bats diversity during dry and rainy season in a mosaic of vegetational types (flooded areas, savannas, riparian forest and forest islands), in southeast Amapá state. The study site was located 50 km from the Amazon rivers base line, in W 050°49'80", N 01°16'80". Two rapid assessments, one in July 2008 (rainy season) and another in November 2008 (dry season), sampled for 10 nights each from 18:00h to 00:00h, using 10 mist nets (12 m x 2.5 m at three meter above the ground) per night. A t test compared the Shannon diversity index of both seasons. With an effort of 615 net/hours we captured 294 bats of 35 species belonging to four families during the rainy season. In the dry season we captured 278 bats of 31 species of six families (Phyllostomidae, Emballonuridae, Mormoopidae, Vespertilionidae, Noctilionidae e Thyropteridae), being Noctilionidae and Thyropteridae the ones exclusive in this season. Shannon index were 2.74 and 2.33 for the rainy and dry season respectively, with a significant difference $t = -3.64$; $p = 0.005$. The most abundant species (*Carollia perspicillata* e *Artibeus planirostris*) represented 37.1% of the captures for the dry season. That may be related to reproductive periods, as majority of females of these two species were lactating and pregnant. Therefore, seasonal differences may be related to migration between vegetational types during reproductive period by this two species on dry season.

154 SEED DISPERSAL BY BATS IN A OPEN ZONE ADJACENT TO A GALLERY FOREST IN COLOMBIA

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Transformation of forest to pastures and tillage zones is one of the most important causes related to the formation of fragmented landscapes, and before this phenomenon, the seeds rain towards open areas becomes an essential component in the recovery of these ecosystems. This study characterizes the type of plants that are being dispersed by bats in an open area adjacent to a gallery forest in Trinidad, Casanare, Colombia. The seeds were collected from feces of fruit bats and seed traps located in the open zone. A total of 307 bats belonging to 26 species were captured. Bats with some degree of consumption of fruits in their diet represented 83% of the captures, and accounted a total of 15 species. Altogether, 97 feces were collected, of which 82 contained seeds. *Carollia* (38.4%) and *Artibeus* (32.4%) were the best represented genera as far as the abundance of captured individuals. The feces contained samples of at least eight species of plants belonging to five families. As for the type of plants that are being consumed, a clear dichotomy exists: bats considered as nomads (subfamily Stenodermatinae) consumed mainly fruits of plants of the *Ficus* and *Cecropia* genera, whereas the bats belonging to *Carollia* genus consumed fruits of plant species of the *Piper* and *Vismia* genera. Plant species that were more frequently found in bats feces were *Piper aduncum*, (36.9%), *Cecropia obtusifolia* (15.5%), and *Cecropia peltata* (7.76%). The dispersion of five species of plants consumed by bats is reported towards the open zone where distances oscillated between 20 and 40m, what shows the importance of the bats in the process of colonization of plants in areas that have been disturbed by human action. Additionally, it emphasizes the importance of conducting this type of studies as well as the increasing challenges for their application in conservation and handling processes.

155 SEED DISPERSION BY THE ENSEMBLE OF FRUGIVOROUS BATS IN TWO PRODUCTIVE SYSTEMS IN EJE CAFETERO, COLOMBIA.

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Seed dispersion by frugivorous bats was compared in two farms one with a system of mixed crops and another with extensive cattle in Eje Cafetero, Colombia. On each farm bats and seeds were sampled during 15 nights per survey area. Three field studies were accomplished (July-October) in 2008. On each area 15 mist nets of 3x6 m and 96 seed traps among different habitats (Forest, coffee crops and gradual in the farm with mixed crops and grassland and gradual in the farm with extensive cattle) were installed per night, and bat's fecal samples were taken. In addition ingested seed germination tests were made from frugivorous bats collected. Seeds were sowed in petri dishes under controlled conditions. Differences were not found in the structure and composition of frugivorous bat species between the two farms, neither seed species that comprise the diet of these bats nor seeds that have been potentially dispersed by bats. *Artibeus lituratus* and *Carollia perspicillata* were the most abundant species in both areas. The seed rain in Topacio (mixed crops) was represented primary on *Cecropia* sp. and Floresta (extensive cattle) for *Piper aduncum*. Seed dominance of pioneer plant species in seed traps shows that bats favor dispersion on disturbed areas. Differences were not found neither in effects of seed passage through digestive tract on seed germination among species of frugivorous bats nor in seed controls.

156 SEEDS DISPERSED BY BATS ON DIFFERENT DEGREES OF CATTLE RANCHING IMPACTED AREAS AT PANTANAL, BRAZIL

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Frugivorous bats are important seed vectors for several plant species, promoting seed dispersal of 96 genera and 49 families of plants in the whole world helping in the regeneration of degraded areas. Our objective were to report which are the endozoochorous seeds dispersed by bats, also the bat species dispersors on areas with high and low cattle ranching impact in the Pantanal de Aquidauana region, Mato Grosso do Sul, Brazil. Seven field expeditions were made between 2006 and 2007. Bats were captured with mist nets totalizing a 62496 h.m2 of nets. On low impacted areas five seed species were found, being *Ficus* sp. the most frequent, present on 43% fecal samples, *Ficus obtusifolia* (26%), *Piper tuberculatum* (13%), *Ficus pertusa* (12%) and *Cecropia pachystachya* (2%). These seeds were found on the feces of *Artibeus planirostris* (68%), *Platyrrhinus lineatus* and *Carollia perspicillata* (10%), *Sturnira lilium* (6%), *Lophostoma silvicolu* (2%), *Noctilio albiventris* and *Lophostoma brasiliense* (1%). On high impacted areas five seed species were found being *Ficus* sp. the most abundant (67% of feces samples), followed by *Ficus pertusa* (17%), *Piper tuberculatum* (8%), *Ficus obtusifolia* (4%) and *Maclura tinctoria* (2%). The dispersor bats were *Artibeus planirostris* (78%), *Platyrrhinus lineatus* (8%), *Carollia perspicillata* (6%), *Lophostoma brasiliense* and *Phyllostomus hastatus* (1%). The most consumed plant species on both areas was *Ficus* sp1. In contrary than expected *Cecropia pachystachya* seeds were founded only on low impacted areas, while *Maclura tinctoria* was founded on high impacted areas only. *Artibeus planirostris* was the main dispersor of the majority seed species on both areas. *Phyllostomus hastatus* and *Noctilio albiventris* defecated seeds only on low impacted areas. Despite the changes on the environment caused by cattle ranching, there were no differences on seed species richness consumed by bats on low and high impacted areas.

157 SELECTION AND HABITAT PREFERENCE OF NECTARIVOROUS BATS IN TWO PRODUCTIVE SYSTEM FROM ANDEAN REGION (COLOMBIA)

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The purpose of the study was to evaluate the selection and habitat preference of nectarivorous bats in two farms from the Andean Region situated in Colombia. One farm is dedicated to extensive cattle (Floresta) and Topacio is dedicated to mixed plantation. To reach that objective fifteen mist nets were installed in the two farms. Floresta had grassland and bamboo habitat meanwhile Topacio had bamboo, mixed plantation, forest and a social area (where was used as a cellar). Additionally, there were made two parcels of land of 10 x 10 meters to characterize the vegetation (complex structure, understory height and the vegetation cover). With respect to the results, Topacio farm had more nectarivorous bats than Floresta. In addition to this, the social area in Topacio was more important than the others habitat because it was used like refuge. In Floresta we capture more individuals in the Bamboo area than grassland area. With regard to the complex structure, the presence of nectarivorous bats increased while the complex structure increased.

158 SIMILARITY OF THE CHIROPTERA OF SERRA NEGRA, MINAS GERAIS STATE IN THE BRAZILIAN ATLANTIC FOREST

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The Serra Negra region is located at S 21° 59' 16.6" W 43° 56' 30.6", in Minas Gerais State, S.E. Brazil. It features mountainous relief with dense rain forest vegetation and campos rupestres. The studies were conducted at altitudes between 800 and 1.200 m, where mist-nets were installed, mainly in or at the edge of the forest, to capture bats. During the period, November 2007 to December 2008,

14 field campaigns were carried out, resulting in catching 246 bats, distributed among 15 species, 13 genera and 2 families: Phyllostomidae (12 species) and Vespertilionidae (3 species). The more frequent species were: *Sturnira lilium* (E. Geoffroy, 1810), 33.7%; *Carollia perspicillata* (Linnaeus, 1758), 21.1%; *Desmodus rotundus* (E. Geoffroy, 1810), 19.1%, and *Artibeus lituratus* (Olfers, 1818), 16.3%. Analysis of the grouping among the Chiroptera fauna of Serra Negra and of that obtained in another 12 surveys of Atlantic Forest areas, showed significant resemblance between the study area and National Park of Serra dos Órgãos, Rio de Janeiro State, S.E. Brazil, whose predominant vegetation is dense rain forest, found in the altitude range 500-1.500 m. Besides the type of vegetation, the two localities present further similarities regarding altitudinal gradients and mean annual rainfall. In both regions, the environmental conditions are very alike, the vegetation forming a continuum of dense rain forest, which provides food resources akin to the Chiroptera fauna. The analysis shows that the grouping occurred due to the environment and the proximity. This information must be considered when performing studies aimed at the implementation of ecological corridors in high altitude environments of the Atlantic Forest.

159 **SIZE AND SHAPE IN *DIDELPHIS* AND *PHILANDER* (DIDELPHIMORPHIA, DIDELPHIDAE)**

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Size and shape are important biological properties of organisms arising from their genetic basis in complex association and interaction with external and internal environment. Combining classical and geometric morphometric techniques we analyzed size and shape differences in *Didelphis* and *Philander* based on an ontogenetic sample of 1419 skulls. Ontogeny, allometry and shape variation were compared in order to describe similarities and differences between them. Variance/covariance matrices, extracted for each genus (removing species and sex variation), were compared and found quite similar ($r=0.95$, $P<0.0001$). Size vectors (PC1) were obtained for all 7 age classes and two genera and compared, being highly similar. A Size-scaling technique (MASS) was used to remove all information related to size while adjusting skull shape to account for allometry. These MASS data were used to explore whether the differences between genera were merely a consequence of size differences, comparing the results of a Discriminant analysis before and after correction. We found that besides size, shape also account for the differentiation between them. Landmarks' configurations were obtained for each genus and age class along an axis of a Principal Component X centroid size, using geometric morphometric data. They were compared throughout ontogeny using the average landmark configuration for each age class and taking the differences between each successive age class and comparing those differences using vector correlation. All these vectors comparisons were similar both within and between genus. Our results suggests that the two genera share a common allometric trajectory and that size variation is pervasive both within (around 90% of the total variation) and between genera. However, newborns of *Didelphis* are significantly larger than those of *Philander* suggesting that intra-mother growth rate is larger in the former and that after being born allometric trajectories are parallels, implying in size and shape differences throughout their trajectories.

160 **SMALL MAMMALS ASSEMBLAGES IN FRAGMENTED LANDSCAPE IN CENTRAL BRAZIL**

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The Cerrado biome is high fragmented and endangered by extension of monocultures, less than 2% are protected in conservation units. This study was conducted from January 2008 to March 2009 in Jatobá farm (109,000ha) located in southwestern Bahia, Brazil in Cerrado-Caatinga ecotone. This area is a mosaic landscape of native formations (mainly cerrado sensu strictu) and productive areas (*Pinus* spp. and soybean plantations). Animals were captured in bi-monthly sessions of 5 consecutive nights using 60 liters pitfalls and Sherman live traps positioned in transects at nine areas divided by three formations (*Pinus* plantations, continuous and fragments of cerrado s.s.) totaling 28,000 trap-nights. We recorded 464 captures of 403 individuals of 6 marsupials and 11 rodents. Six species represented 78.7% of all individuals, being *Calomys expulsus* was the most abundant (18.1%), followed by *Gracilinanus agilis* (15.6%). The continuous area of cerrado s.s. presented higher richness ($S=17$), followed by fragments ($S=15$), and *Pinus* ($S=14$). We used Sorensen similarity index to compare these areas. Continuous areas of cerrado s.s. had higher similarity with *Pinus* ($J=0.90$), followed by continuous and fragments of cerrado s.s. ($J=0.88$) and at least, *Pinus* and fragments of cerrado s.s. ($J=0.83$). However, in relation of Shannon-Wiener's diversity and evenness indexes, *Pinus* areas were most diverse and had higher evenness ($H=0.9903$; $J=0.8641$), followed by continuous areas ($H=0.9583$; $J=0.8148$), and fragments of cerrado s.s. ($H=0.8847$; $J=0.7719$). Cerrado biome has marked seasonal variation (dry and wet season) and we sampled two wet and one dry seasons. *Pinus* plantations presented higher diversity and evenness in all seasons, followed by continuous areas. These results are different in relation to other studies in fragmented landscape, because *Pinus* plantations had closed understory composed by native species and near of plantations studied had native formation.

161 **SMALL RODENTS ON THE DIET OF THE PETERS'S WOOLY FALSE VAMPIRE BAT *CHROTOPTERUS AURITUS* (CHIROPTERA)**

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The bat *Chrotopterus auritus* is widely distributed through South America and is present in Guiana, Peru, Bolivia, Brazil and Argentina. In Brazil, it was registered in 16 states throughout the country. This is considered the second biggest Neotropical bat and his diet has been studied by analysis of its fecal samples and remnants of food or stomach contents. Due to this studies it has been possible to

know more about the diet of this specie. The studies done so far has shown that 61% of its diet consist of small vertebrates, such as amphibians, birds and small mammals (rodents of Cricetidae family) and some bats such as *Carollia perspicillata*, *Glossophaga soricina*, *Peropteryx macrotis*, *Furipterus horrens* e *Myotis* sp. Our aim was to investigate which rodents are part of the diet of the bat *Chrotopterus auritus*. We have collected 26 grams of this animal feces in a colony located in an area of mesophyll semideciduous forest, nature reserve of Centro de Arte Contemporânea Inhotim, Brumadinho, state of Minas Gerais. The feces were treated and sorted in a laboratory and the molar teeth founded were separated for future identification by comparison, using reference collection. As a result of the identification we listed for this sample new registers of *Chrotopterus auritus*'s predation. They are the rodents genus *Akodon* sp. (n=1), *Calomys* sp. (n=2) and *Oligoryzomys* sp. (n=2). The rodents body mass average was approximately from 14 g (*Calomys* sp.) to 44 g (*Akodon* sp.). One more time it has been registered the predation of the Chiroptera *Myotis* sp. (n=1). The results are preliminary but we conclude small mammals in special the rodents constitute important diet resource for this species and more studies are necessary to diagnosis the true importance of these animals in diet of *C. auritus*. Apoio: Centro de Arte Contemporânea Inhotim FAPEMIG

162 TRANSFORMATION OF CENTRAL EUROPEAN AGRICULTURE LANDSCAPE AND ITS INFLUENCE ON SMALL TERRESTRIAL MAMMAL COMMUNITIES

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During the past 50 years the agriculture landscape in previous Czechoslovak Republic markedly changed. Small mammal species were investigated as to species composition, variation in numbers, and habitat requirement in two periods. In 1956 trough 1961 when socialist collectivization started, still agriculture landscape under management of smallholders was of high diversity of crops with meadows, ridges and small watercourses. Average field area was about 0.2 km². During 54 444 traps nights we captured 3970 small mammals. The same snap-trapping method was used repeating the investigation in 1983 to 1989, i.e. after marked changes in agriculture landscape. The number of crops decreased, meadow and ridges were ploughed out and ameliorated, and brooks were canalized. Average field area markedly increased to 1.06 km². During 53 240 traps nights we captured 6165 small mammals. In both periods *Apodemus uralensis*, *Apodemus sylvaticus* and *Microtus arvalis* were the dominant species forming 86% resp. 77% of the community. But the percentage representation of each of these species changed. Dominance of *A. uralensis*, preferring weedy seeds as a food, decreased from 43 to 26%. Opposite tendency was in *M. arvalis* (from 12.6 increased to 22%) under increased productivity of fields. Intensive application of fertilizers and pesticides lowered the number of Insectivores (from 3 to 0.5%). Large maize fields and windbreaks influenced increase of the forest species as *A. flavicollis* (from 1.3 increased to 11%) and *M. glareolus* (3.1 to 9.6%). Species richness remind the same (16 species) but most of the rare species number drastically decreased. This research was supported by financial means of the NAZV QH72075.

163 URBANISATION AND ITS EFFECTS ON THE DISTRIBUTION AND ACTIVITY OF INSECTIVOROUS BATS IN SYDNEY, AUSTRALIA

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Urbanisation affects indigenous fauna in many ways; some species persist and even increase in urban areas, whereas others are lost. The causative mechanisms for success or failure of wildlife in the urban setting remain especially elusive but these must be resolved if the impacts of expanding urbanisation are to be managed. This study examines the impacts of urbanisation and habitat loss on insectivorous bats across the urban landscape of Sydney, New South Wales, Australia. We present data on species richness and activity (bat passes per night) collected systematically using ultrasonic bat detectors from 30 randomly selected landscapes (each 25 km²). To compare the relative effects of habitat cover and level of urbanisation, landscapes were categorised using a Geographical Information System (GIS) into classes including: urban (>5 dwellings/ha and <10% vegetation cover); cleared (10-40% vegetation cover); and vegetated (<5 dwelling/ha and >40% vegetation cover). Within the 'cleared' landscape category, we also investigated a landscape productivity hypothesis and compared the relative effects of contrasting geology on species richness and activity. Four landscape elements were sampled within each landscape, including remnant bushland (>2 ha), riparian areas, open space/parkland and residential/built space (n=6 replicates of each landscape, 120 survey sites total). Species habitat relationships were analysed using environmental data collected at two spatial scales; site level and landscape level. The abundance and distribution of individual species was also compared to site specific biotic and abiotic factors, such as insect biomass, insect size class, vegetation cover at multiple spatial scales, urban index and vegetation clutter. We predicted that a species ecomorphology largely determines its sensitivity to urbanisation and habitat loss. But for all species we expect that insect biomass and its association with site biophysical characteristics will strongly influence bat species richness and activity.

164 USE OF SPACE BY THE MARSUPIAL *PHILANDER FRENATUS* IN CONTINUOUS AND FRAGMENTED ATLANTIC FOREST AREAS

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Space use by animals should be affected by habitat fragmentation, particularly if animals are restricted to live in small fragments of the original forest. We compare movements and vertical use of the forest of *Philander frenatus* (Didelphimorphia, Didelphidae) between a large continuous area and two small Atlantic Forest fragments. Space use was evaluated by daily home ranges (DHR),

and by diameter and slopes of supports used in the vertical strata. The study areas were located in municipalities of Guapimirim and Cachoeiras de Macacu, State of Rio de Janeiro, Brazil. In the two fragments, 35 males and 36 females were tracked from July 2007 to March 2009. The continuous forest was in the Serra dos Órgãos National Park, where 23 males and 16 females were tracked from April 1998 to February 2006. The effect of different path lengths tracked for each individual was removed by Analysis of Covariance (ANCOVAs). Diameters and slopes of supports were measured in four vertical strata, and grouped in categories of diameter and slope. Availability of use in each category was measured in points regularly spaced along transects in the continuous forest and fragments. Male had larger DHR than females in fragments and in continuous areas, but seasonal differences in DHR were detected only in the continuous area. Frequencies of support diameter and slope differed significantly in G-tests between fragments and continuous area, and between used and available frequencies. The larger male DHR was expected based on the polygynous or promiscuous mating system of didelphid marsupials, male DHR containing several female DHR. The larger DHR in the fragments may reflect reduced habitat quality regarding resource availability. Apparently, individuals choose the diameters and slopes of supports they use in most strata. Differences in the support diameter and slopes between areas may reflect differences in forest structure.

165 WHAT WOULD ANCESTRAL DIDELPHIDS LOOK LIKE? INSIGHTS FROM COMBINED PHYLOGENETIC, MOLECULAR AND GEOMETRIC MORPHOMETRIC TOOLS

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The purpose of this work was to reconstruct shapes and images of cranial and post-cranial elements of ancestral nodes along a known phylogeny of the Didelphidae, using geometric morphometric tools, in order to infer on the evolution of their morphology. For this, a tree of 32 didelphid species including almost all valid genera was created using sequences of the nuclear IRBP gene. Taxa were chosen based on the availability of both sequences and morphometric data. These consist of configurations of homologous landmarks set on digital images of the skull in dorsal, lateral and ventral views, of the mandible, scapula and pelvis of over 1,500 specimens. For each taxon and structure, "average" images were constructed to be used as terminals. For this, landmark configurations set on each view were submitted to a Generalized Procrustes Superimposition, and all images were warped onto the species consensus using the Thin-Plate Spline function. Then the hypothetical shape for each node was reconstructed using squared-change parsimony, weighed by branch lengths derived from the sequence data. Finally, for each hypothetical ancestral shape, images from the terminals were again warped to provide hypothetical images of the cranial and post-cranial elements. The estimated configuration at the base of the didelphid tree is similar in size and shape to present species of the genera *Micoureus* and *Marmosa*, both for cranial and post cranial elements. Most divergent taxa in terms of shape vary with structure: most divergent skulls are found in the big-bodied Didelphini, but for mandibles these include also Caluromyines, besides Didelphini. While most divergent scapulae are those of several Didelphini and Monodelphis, most divergent pelvises are found in larger species or with more specialized locomotions, such as Didelphis, Metachirus and Chironectes. Morphological diversification in the Didelphidae appears to be strongly, but not solely, related to size variation.

166 WHITE-EARED OPOSSUM (*DIDELPHIS ALBIVENTRIS*) GROWTH IN SOUTHEASTERN BRAZIL

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Marked white-eared opossums (*Didelphis albiventris*) were recaptured in an urban park during a wider biological study. From November 2006 to February 2008 opossums of both sexes (40 females, 37 males) were captured monthly, with up to 12 individual recaptures for females and six for males (total captures). In August 2007 nine females carried pouch young, and four had second litters in November. Second litters did not occur in 2006. Traps documented recruitment from November to February (body weights of 100 to 260g). Females lost weight in conjunction with sores and broken teeth in May and June, suggesting fights. Weight loss was also associated with marsupium lactation (January - February), and with the dry season when food seems scarce (August - September). Individual recapture sequences gave weights from 100 g at 4 months old (when young opossums started to appear in traps), up to 1800g at 19 months. Maximum weight for females (including pouch young) was 1350g. By 13 to 14 months old, all females had lost weight at least once. At 4-month-old females weight increased by 65% per month, decreasing to 25% at 6-7 months, and to 5% per month until 17 months. At 4-month-old males had a monthly weight increase of 100%, decreasing to 55% at 5-6 months, and to 10% per month until 14 months old. The faster male growth rate was mostly responsible for the pronounced sexual size dimorphism in *D. albiventris*.

GENETICS

167 GENETIC STRUCTURE OF THE INVASIVE *CASTOR CANADENSIS* IN THE ARCHIPELAGO OF TIERRA DEL FUEGO

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Biological invasions have been identified as the second main cause of biodiversity loss and the main cause of species extinctions in island ecosystems. The introduction of 25 pairs of North American beaver (*Castor canadensis*) in the Isla Grande of Tierra del Fuego (Argentina) in 1946 has become a serious problem. Despite control efforts, the population has increased considerably; today, there are approximately 100,000 individuals. Although the ecological and economic effects of invasive species have sometimes been evaluated, there has not been much attention devoted to the genetic structure of invading mammals. We have conducted molecular analysis of beavers from 3 subpopulations of the Archipelago of Tierra del Fuego as a means of characterizing the genetic structure (at a macro and micro geographic scale) of the invasive population. We identified 7 D-loop haplotypes among 111 individuals. Our results of AMOVA ($F_{ST}=0.104$, $p<0.001$) suggest geographical barriers to gene flow and strong sociality and territoriality in beaver population. We found a positive and significant autocorrelation out to 800 m ($r=0.193$, $p=0.003$) and the greatest haplotype diversity ($d=0.83$) in the National Park subpopulation, which could probably be explained by the control plan used in this area. We suggest to develop control strategies based on the demographic spatial dynamics and the spatial genetic structure not only for beavers, but also for others invasive species.

168 HISTORICAL INVASION PATTERN OF INTRODUCED MINK (*NEOVISON VISON*) IN THE SOUTH OF CHILE

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Introduced species are considered one of the most important causes of anthropogenic environmental change and loss of biodiversity by modifying interactions among species and even whole ecosystems, homogenizing the global diversity and inducing extinction of the native fauna; furthermore, this is enhanced by the reproductive potentiality of these species. North American mink (*Neovison vison*) has been extensively introduced in Europe, Asia and South America having devastating effects on the biodiversity. It is suggested that in the years 1967 – 1973, the species was either introduced by deliberate releases, or accidental escapes from fur farms in southern Chile. To understand mink invasion patterns in Chile, we collected, up to date, 40 tissue and fecal samples from Neltume (39° S) to Magdalena Island (44° S) 435 km apart, to study mitochondrial DNA control region sequences, and thus understand lineage divergence in comparison to original native populations. We found a reduced diversity which can indicate a single introduction event. According to our preliminary results we suggest higher genetic diversity in the mink introduction areas in Chile, compared to lower diversity found in areas recently invaded such as the northern limit of present distribution (36°S latitude) and southern limit in Cape Horn (56°S latitude) and the southern remote small islands due to founder effect. Understanding the species invasion pattern and possible barriers to colonization events can be the baseline for conservation plans in the region.

PARASITOLOGY

169 STREBLID BAT FLIES ON TWO *PHYLLOSTOMUS* SPECIES IN A CERRADO AREA OF MATO GROSSO, BRAZIL

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Streblid bat flies are viviparous and hematophagous ectoparasites exclusive of bats. Their wings may be functional, for short flights, reduced, or absent. Highly specialized parasites can be sensitive to the loss of the host species, and useful as indicator-species. Several species of bats are infected by different ectoparasites over its known geographic distribution in Brazil. This study was conducted in a flowering pequi (*Caryocar brasiliensis*) plantation, adjacent to a patch of cerrado in the Municipal Park of Bacaba in Nova Xavantina, Mato Grosso. The bats were captured with mist nets set before sunset and put in individual cloth bags that were used only once a night, to avoid accidental contamination by parasites. The total mist netting effort was 288m².h. The ectoparasites were collected with fine-point tweezers and conserved in ethanol 70%. We collected 225 individuals of 10 species of streblid bat flies from 46 phyllostomid bat hosts of six species. The most abundant ectoparasites were *Trichobioides perspicillatus* (n=57), *Trichobius joblingi* (n=41), and *T. costalimai* (n=36) collected on *Phyllostomus discolor*, *P. hastatus* and *P. discolor*, respectively. Each bat fly species was found parasitizing a single bat species, except for *T. joblingi*, recorded infesting *P. hastatus* and *Carollia peripicillata*. Two species of hosts were infested by more than one species of ectoparasites (*P. hastatus* (n=4) and *P. discolor* (n=3)). *Phyllostomus hastatus* (n=22) and *P. discolor* (n=15) were the most common bat species in this study and had 100% and 81.8% prevalence rates of infestation, respectively, probably due to the aggregation behavior in the roost and flock foraging. This is the first record of these species of bat flies in the state of Mato Grosso, expanding their known geographic distribution in Brazil.

SYSTEMATICS

170 A PHYLOGENY OF MEGABATS (FAMILY PTEROPODIDAE) BASED ON 8 CONCATENATED GENES

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Megabats, Old World fruit bats, or megachiroptera are all terms that refer to bats included in the Family Pteropodidae. These bats have a mostly tropical distribution and are found in the continents of Africa, Asia, and Australia. The last formal classification of the

group was published by Bergmans in 1997. Since then, a number of phylogenetic studies based on both morphology and molecular data have suggested that at least some of the groupings proposed in that classification may not be monophyletic. Most of these studies, however, were based on incomplete data matrices that lack important taxa and/or have a substantial amount of missing data for some taxa. Here we present a phylogenetic hypothesis for Pteropodidae based on sequence data of 8 genes. We assembled 2 data matrices: one that includes 37 of the 42 currently recognized genera and a second matrix including 5 additional genera for which sequences of only two of the 8 genes were available. The data was analyzed with both maximum parsimony and maximum likelihood methods. For the maximum likelihood analyses several partition schemes were tested in order to find an optimal scheme. Our results revealed 7 or 8 main clades that were congruent among all the different analyses and show high levels of statistical support. Within these clades, at a lower hierarchical level, some highly supported clades were revealed that can also be useful in classification. Relationships among the main clades, however, are not clear, suggesting an explosive radiation of the megabats shortly after they first appeared. The recovered trees show that all but one African genus fall in the same main clade. Biogeographic scenarios may involve two to four independent colonization events of the African continent. Nevertheless, in the former case, it would also involve two independent backward migration events to Asia.

171 MORPHOLOGICAL ASSESSMENT OF CRYPTIC *MICRONYCTERIS* (CHIROPTERA: PHYLLOSTOMIDAE) FROM BOLIVIA

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The bat genus *Micronycteris* is represented by at least nine small to medium-sized species. While many species of this genus are widely distributed, they are not frequently captured and therefore are relatively uncommon in Museum collections. In Bolivia, six species of this genus have been recorded: *M. hirsuta*, *M. megalotis*, *M. microtis*, *M. minuta*, *M. sanborni*, and *M. schmidtorum*, although the most recent literature does not include *M. microtis* and *M. schmidtorum*. Overall, Bolivian *Micronycteris* have not been well studied in the past. Sampling efforts carried out in Bolivia from 2004 to 2008 resulted in the capture of 6 individuals of *Micronycteris*, representing at least three different species (*M. cf. sanborni*, *M. cf. microtis*, and *M. sp.*). In this work, preliminary data on these specimens are presented to help identify distinguishing morphological characters useful for delimiting species of *Micronycteris*. The skulls of these bats were measured (eight cranial measurements) and compared using Principal Components Analysis, with specimens of *M. microtis*, *M. minuta*, *M. schmidtorum*, and *M. megalotis* representing 5 countries. The first 3 principal components (PCs) explain 88% of the total variation. All cranial characters have a positive loading for PC1, of which greatest length of skull has the highest value. PC2 contains positive and negative values, of which mastoid breadth has the highest value. Bolivian specimens cluster with the smallest and medium sized *Micronycteris*; *M. cf. sanborni* is grouped with *M. minuta* from Trinidad and *M. schmidtorum* from Honduras; *M. sp.* and one of the *M. megalotis* is grouped with *M. minuta* from Trinidad, while the other individual of *M. megalotis* groups with *M. minuta*, *M. megalotis*, and *M. microtis* from 4 different countries. The variation in the Bolivian *Micronycteris* is greater than previously thought and further analysis is needed to fully understand this complex genus of Neotropical bats.

172 NEW INSIGHTS ON HIGHER TAXA RELATIONSHIPS OF BATS BASED ON THE UPPER TOOTH MORPHOLOGY

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Morphological patterns of variation of the upper dentition of bats are reviewed under a phylogenetic framework. Based on the outcomes added to an edited version of the morpho-based matrix of Gunnell & Simmons (2005), new evidences regarding higher taxa relationships of Chiroptera are put forward. First, two new structures are indicated, named mesoconule and mesoconular crest. Forty eight (48) characters are formulated, most of them (45) being original hypothesis of primary homology. These transformation series have therefore substantially increased the number of dental information available for phylogenetic studies focus on relationships among families and subfamilies of Chiroptera. Analyses of parsimony were carried out using tree bisection and reconnection (TBR) algorithm from TNT software. The results obtained can be summarized as follows: (1) the monophyly of Yinochiroptera, Nataloidea, and modern bat families are supported; (2) *Mystacinidae* is rooted as sister-group of *Molossidae*, and *Antrozoinae* branches off from the base of this clade; (3) *Vespertilionidae* (except *Antrozoinae*) comes out as a monophyletic taxon, and a sister-group relationship between *Myotinae* and *Miniopterinae* is supported by several upper molar synapomorphies, contesting recent studies that suggested *Miniopterinae* as a separate family from *Vespertilionidae*. New investments are needed in order to have a more fully understanding on the evolution of the masticatory apparatus of bats. Key words: Chiroptera; Morphology; Tooth; Upper Molars; Phylogeny.

173 TAXONOMY AND DISTRIBUTION OF THE BIG-EARED BATS OF THE GENUS *HISTIOTUS* (VESPERTILIONIDAE) IN COLOMBIA

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OTHERS

174 ECHOLOCATION CALLS OF SOME INSECTIVOROUS BATS OF OAXACA, MEXICO

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Echolocation calls provide a better understanding of the biology and ecology of bats. The ease of recording the biosonar emissions of bat species living-prey eaters (insectivores, piscivores, and carnivores) have been used for elaborating taxonomic lists as well as evaluating their habitats and forage. In Mexico, the acoustic monitoring of insectivorous bats is restricted to some species and regions. The purpose of this study is to characterize the vocalizations of *Balantiopteryx plicata*, *Mormoops megalophylla*, *Myotis californicus*, *Pteronotus davyi*, *Pteronotus parnellii*, *Pteronotus personatus*, and *Saccopteryx bilineata* of the State of Oaxaca, Mexico. The recordings were made using Anabat SD1. The sample sites were located in three physiographic sub-provinces of Oaxaca: The Coastal Plain of the Pacific and The Coastal Plain of Tehuantepec, both with vegetation of lowland deciduous forest, and The Central Valleys with pine and oak forests and scrub vegetation. Results revealed that 64% of 398 analyzed recordings corresponded to *M. californicus* and *P. davyi*. The Emballonurids showed frequency ranges between 40.06 and 49.62 kHz while mormopids ranged from 46.45 to 81.08% kHz and the only vespertilionid, *M. californicus*, ranged from 42.47 to 49.62 kHz. The duration of calls ranged from 1.25 milliseconds in *M. californicus* to 18.27 in *P. parnellii*. This is the first study of acoustic characterization of insectivorous bats in Oaxaca showing the necessity of making a more detail and complete study of regions in this Mexican state in order to characterize the echolocation of these bat species.

175 EXOTIC LAGOMORPHS IN ARGENTINA: CURRENT STATUS AND CONTROL PRACTICES

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The European hare (*Lepus europaeus*) and European wild rabbit (*Oryctolagus cuniculus*) are the two introduced species of lagomorphs in Argentina. There is also one native species of this group, the Tapetí (*Sylvilagus brasiliensis*) that inhabit in the North of the country. The INTA has carried out studies on the bio-ecology of these exotic invaders, including monitoring their geographic expansion. The current distribution of the European hare covers practically all of Argentina (with the exception of Tierra del Fuego Island). In contrast, the rabbit inhabits mainly the Patagonian region, although it is currently undergoing a process of expansion into new areas. Although the information on the impact of these species is small, they are both considered pests throughout the country. In some cases estimates have been made of their impacts on livestock (sheep), tree plantations, and damage to grasslands, crops and orchards. The effects of these exotic lagomorphs on the native fauna is not known, however, its presence could cause population decline of some species. On the other hand, the European hare is also a highly lucrative wildlife commodity in Argentina, where approximately 2.5 million animals are killed annually for their meat. There are no official programs to control the dispersion and/or impact of hares and rabbits, and the effected people generally resort to individual attempts to control them and prevent damage. Exclusion (fencing, tree trunk guards) and repellents (chemicals) are the methods most often used to prevent damage. Shooting (commercial hunting and /or routine shooting) and snares (cable neck snares) are most frequently used to control the populations. The myxoma virus is also used by the rural people to control of rabbits, although this is illegal.

176 GUANACO VS. DONKEY: WHAT ARE THEY EATING AT ISCHIGUALASTO PARK (SAN JUAN)?

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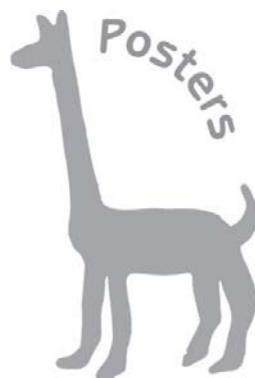
Lama guanicoe and Equus asinus are native and exotic herbivores that coexist at Ischigualasto Park. This study analyzed and compared diets during the wet and dry seasons of 2006. To quantify food supply, plant cover was estimated on 4-m² plots along 15-m long transects. Diet was analyzed by microhistological analysis of fecal samples (N=42 for guanaco; N=13 for donkey). Kruskal-Wallis test was used for comparisons. Food supply in both seasons (% wet season vs. % dry season; significant difference) was composed of: *Zuccagnia punctata* (3.12 vs. 1.73), *Cactaceae* (1.86 vs. 2.60; $p=0.02$), *Prosopis torquata* (1.47 vs. 1.70) and, with percentages below 1%, *Capparis atamisquea*, *Trichomania usillo* ($p=0.01$), *Cyclolepis genistoides* and *Pappophorum philippianum* ($p=0.02$). In the wet season, the guanaco mostly consumed shrub like *Z. punctata* (mean frequency 22.5), *C. atamisquea* (15.3), *P. torquata* (11.3) and *T. usillo* (8.2), whereas in the wet season it also incorporated grasses (16.2) and *Cactaceae* (14.2). In both seasons the guanaco consumed *Tillandsia* sp. The donkey's diet was primarily composed of grasses in both seasons (*Tricloris crinita*, *Distichlis scoparia*, *Pappophorum philippianum*, *Asistida mendocina*). The donkey also consumed *Deutherocohnia longipetala*, *C. genistoides*, *P. torquata* and *Solanum* sp. In comparing the diets of both herbivores, differences emerged in consumption of *P. torquata*, *Z. punctata*, *Cactaceae*, *T. usillo*, *C. genitoides* and grasses ($p=0.0001$). The guanaco eats primarily shrubs and uses *Cactaceae* and grasses in lower proportion. On the other hand, the donkey selects primarily grasses and consumes shrubs in lower proportion

177 NEW RECORDS OF *MONODELPHIS KUNSI* FROM MINAS GERAIS AND BRAZIL, WITH AN EVALUATION CAPTURE METHODS

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The recent use of new capture methods, pitfall traps, has provided new information of small mammals in Brazil and principally on the Minas Gerais state. In the years 2008 and 2009, six specimens of pygmy short-tailed opossum (*Monodelphis kunsii*) has been captured in different studies, including environmental studies and scientific researches. In Minas Gerais state, we received two specimens from an environmental field work conducted on northern Minas Gerais region, that was compared with data available on the literature, the taxonomics caracteres matchs the species description. Another one was deposited from a research project in central-west of Minas Gerais, as *Monodelphis* sp. and recognized as *M. kunsii* by specialists. In a long term study conducted in Serra do Cipó National Park (central region) by the Mastozoology laboratory of the Museum of Natural Sciences of PUCMinas, Belo Horizonte, Minas Gerais (MCN PUCMinas) that recently included pitfall traps on the small mammals survey in the area, we had captured one specime. Another specime was recently captured in an urban area, metropolitan region of Belo Horizonte. These material were deposited in the mammalian collection of the MCN PUCMinas, Belo Horizonte, Minas Gerais (MCN-M 1256; 1420; 1421; 1465; 1507). With a criterious evaluation of these specimens this work provides a significant extension on the species distribution and its first record on the Minas Gerais state. Probably the restricted distribution on its species on Brazil was a result of the capture technics problem and with the increase and recent use of pitfall traps in environmental studies may extend more then these, the *M. kunsii* distribution in Brazil.



Friday, August 14th

ANATOMY, MORPHOLOGY AND PHYSIOLOGY

1 COMPARISON OF WRIST BONES BETWEEN GROUND, TREE AND FLYING SQUIRRELS USING MIMICS IMAGE PROCESSING SOFTWARE

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We examined the carpal and metacarpal bones of a prairie dog (*Cynomys ludovicianus*), tree squirrel (*Sciurus niger*), and flying squirrel (*Glaucomys sabrinus*), using MIMICS image processing software, to reveal differences in the mobility and functional morphology between the three major groups of Sciuridae. A greater curvature of the proximal carpal joint, between the carpals and the forearm, permits more medio-lateral movement in the flying and tree squirrels than in the prairie dog, with flying squirrels permitted more deviation than tree squirrels. The prairie dog has more robust metacarpals and phalanges than the other squirrels and hence broader distal carpal joints, which are matched with an overall flatter proximal-distal arrangement of the carpal bones. The differing morphological characteristics of ground, tree and flying squirrels reflect their adaptations respectively to digging, which emphasizes ventro-dorsal flexion; climbing, which requires more medio-lateral movement; and gliding, which requires more mobility yet for control of the wingtip. This exercise demonstrates how MIMICS can be utilized to access, compare and display the mobility of joints in small vertebrates.

2 DESCRIPTION OF THE AXIAL SKELETON OF THREE GENERA OF SIGMODONTINAE: *ELIGMODONTIA*, *PHYLLOTIS* AND *ANDINOMYS* (RODENTIA: CRICETIDAE: SIGMODONTINAE)

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Most of the investigations about sigmodontine rodents, whose objectives were the resolution of systematic and phylogenetic problems, have included only cranial and dental morphology, without considering postcranial information in their analyses. For this reason, we have started the study of postcranial skeleton, mainly in species of filotines, a tribe that is quite well studied but that still needs revisions since several phylogenetic relationships are still conflictive. Here we present a detailed description of the axial skeleton of three genera of sigmodontine, from different habitats and body size. These are *Eligmodontia*, *Phyllotis* and *Andinomys* (the last considered a filotine by some authors as well as *inserta sedis* by others). We established differences and similarities in appearance, size, surface, and orientation of the skeletal structures. *Andinomys* showed the greatest differences both in the degree of development as in variation of the vertebral structures. We mention the characters with most morphological variability in *Andinomys*: dorsal tubercle of atlas well developed (less developed in *Phyllotis*, absent in *Eligmodontia*); spinous process of axis posteriorly extended (no extended in *Phyllotis* and *Eligmodontia*); spinous processes of the cervical vertebrae well developed (less developed in *Phyllotis*, absent in *Eligmodontia*); cranio-caudal length of hemal arch of thoracic vertebrae proportionally larger than in *Phyllotis* and *Eligmodontia*; transverse processes of lumbar vertebrae cranio-caudally expanded (less expanded in *Phyllotis* and *Eligmodontia*). These differences reflect possible functional implications associated to diet and postural patterns, since the more evident variations were observed in those skeletal structures where muscles involved in head and flexion movements of the body, are originated and/or inserted.

3 DISTRIBUTION AND ABUNDANCE OF RODENTS AND MARSUPIALS IN ALTO PARANAPANEMA REGION, SOUTHERN SÃO PAULO, BRAZIL

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Land use in the countryside of the state of São Paulo is currently shifting from a matrix of pastures to sugar cane and eucalyptus plantations due to economic reasons. Such alterations in the landscape composition may result in dramatic changes in the distribution and abundance of vertebrates, in especial those with small body size and home range like rodents and marsupials. In this study, from

August 2007 to July 2008 we surveyed small rodents and marsupials in recent (up to 18 months old) eucalyptus plantations on a former cattle ranch in Southern São Paulo, where this culture is becoming widespread. In order to do so, we used a grid of 28 km² with 30 sampling unities 1 km far from each other. Each sampling unity was composed by 4 pitfall stations (100 L each) distributed in Y-shape on the ground, 15 m far from each other and connected by a plastic grid (50 cm above ground, 10 cm underground). Both rodents and marsupials were more abundant inside the eucalyptus plantations than on the abandoned pastures and the native vegetation (a second growth semideciduous forest with elements of Cerrado) around. However, species richness was similar in the three environments. Cattle extirpation may be beneficial for small rodents and marsupials as the cattle can compact the superficial layer of the soil and exhaust food sources for native herbivores. *Oligoryzomys flavescens* and *Calomys tener* were the most abundant species, which is compatible to other agricultural landscapes in the region. As rodents and marsupials are prey for a great number of predators, such as snakes, birds and carnivores, the present results suggest that silvicultural landscapes may have a significant conservation value.

4 **EXPLORATION OF THE MICROFLORA PRESENT IN THE SEASONAL DORSAL PATCH OF *LEPTONYCTERIS CURASOAE***

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Olfactory communication in bats is associated with production of many substances, some derived from specialized glandular structures, and others produced by combination of secretions of multiple origins. It has been suggested that many of the chemical signals associated with these substances are the outcome products of microbiological breakdown of proteins, carbohydrates, and cholesterol, among others. It has also been suggested that individual scent profiles could originate from the unique microflora composition present in each individual. Male individuals of the Curaçaoan long-nosed bat, *Leptonycteris curasoae*, develop an odoriferous dorsal patch during the mating season, containing substances possibly involved in chemical communication related to mate choice. In this study, we characterized the microflora present in the dorsal patch of this species, and compared it with the microflora present in the regular pelage of male and female individuals. We hypothesize that the complex of substances present in the dorsal patch allows the proliferation of a microflora with higher species richness than the one present in the regular pelage. Determination of species composition was based on Gram staining, cellular morphology, and several commercial analytical profile indexes. We identified 24 species of bacteria corresponding to 10 genera. Overall, 14 species were associated with the dorsal patch compared to 10 and 8 species found in male and females specimens without dorsal patch, respectively. Five genera, *Brevibacillus*, *Corynebacterium*, *Providencia*, *Proteus*, and *Morganella*, were exclusively associated with the dorsal patch. Three species were found in all the dorsal patches examined: *Proteus mirabilis*, *Morganella morganii*, and *Enterococcus* sp. Our results show slightly higher microbial species richness associated with the patch, and several patch-specific bacteria, two of the most common are normally found in the intestinal tract of mammals. This finding confirms one of the proposed sources of secretions used by *L. curasoae* to produce the patch: anal secretions.

5 **FIRST POSTCRANIAL RECORD OF *DIDELPHIS* SP. (DIDELPHIDAE, MAMMALIA) IN THE PLEISTOCENE OF CHACOPAMPEAN REGION, ARGENTINA**

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The marsupials are among the oldest mammals in South America. In particular the didelphoids are the most generalized of Neogene didelphimorphians and represent the largest group to the present. In relation with the fossil record, the oldest known species of the genus *Didelphis* sp. comes from the late Miocene deposits of Brazil. In Argentina Didelphinae subfamily is well represented in Plio-Pleistocene deposits in the pampa region, through two extinct species *D. crucialis* (late Pliocene) and *D. eregi* (late Pliocene-early Pleistocene). The living species *D. albiventris* appear since the latest Pleistocene in South America (age/state Lujanian). The purpose of the present contribution is to promote a new material assigned to *Didelphis* sp. in sediment certainly relate, from the mammal fauna association, to the Pleistocene s.l. Carriers crop levels in the town of Manucho, Departamento La Capital, Santa Fe province. Geo-paleontological studies now underway will clarify, in the future, the age of this fauna association. The specimen consists of a complete humerus (MFA-PV sin N°). This is the first postcranial fossil record of Didelphidae within the chacopampean region in the Pleistocene of Santa Fe. Currently this family is widely distributed and presents a great tolerance to diverse habitats conditions, from subtropical rainforest to open settings (grasslands, even deserts), along natural and artificial forests. From a paleoenvironmental point of view, based on fossil fauna found in the area, could be inferred similar circumstances to savannah woodlands.

6 **GEOMETRIC MORPHOMETRIC ANALYSIS OF PROXIMAL RADIAL HEAD SURFACE IN CAVIOMORPHS (HYSTRICOGNATHI: RODENTIA)**

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The South American hystricognath rodents (caviomorphs) comprise a wide variety of adaptive types in terms of body size, habit and locomotor mode. This diversity is reflected in skeletal and joint morphology of limbs. The relative elongation of the proximal radial head (radial fovea) has been functionally interpreted as closely related to supination ability in mammals. The goal of this work was to perform the first quantitative analysis of foveal shape for a wide sample of caviomorphs, including assessment of the influence of phylogeny and locomotor habit. The shape of the radial fovea was studied through geometric morphometrics using one landmark

and semilandmarks to capture its bidimensional shape (outline). Representatives of 21 species from the four caviomorph superfamilies were analyzed. According to the multivariate analysis (Relative Warps Analysis), shape variation expressed along the first axis (RW1, 41.62% of explained variation) corresponded to mediolateral elongation of the fovea; although no defined groupings of taxa were observed, this axis ranged from *Coendou* and *Dasyprocta* with most negative values, to *Abrocoma*, *Hydrochoerus*, *Lagidium* and *Chinchilla* with extreme positive scores (greater elongation). The second axis (RW2, 19.43% of explained variation) expressed differential symmetry of the foveal shape; on this axis, *Hydrochoerus* and *Ctenomys australis*, with a more developed medial lobe, were apart from the remaining taxa with more symmetrical foveal shape. A preliminary analysis of phylogenetic influence revealed low phylogenetic inertia associated with shape variation of the radial head outline, whereas locomotory habit was only partially associated to shape changes along RW1 and not associated with changes along RW2. Our results suggest that the relationship between radial fovea elongation and supination ability is not strong in these rodents, in agreement with previous qualitative studies.

7 IDENTIFICATION OF SPECIES OF THE GENUS *MONODELPHIS* (MAMMALIA: DIDELPHIMORPHIA) THROUGH THE STRUCTURE OF GUARD-HAIR.

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Although it is the most diverse genus of the Didelphidae family, the genus *Monodelphis* still has its systematics, morphology and biology poorly known. The microstructure of hair was used in this study to distinguish four species of this genus (*M. americana*, *M. scalops*, *M. iheringi* and *M. brevicaudis*) with occurrence in the Rio de Janeiro State, Brazil. Specimens deposited in Museu Nacional/UFRJ collection had their hair collected and photographed using a scanning electron microscope. Different parts of the hair cuticle were measured and described. The discriminant analysis performed wasn't able to separate the studied species, distinguishing only *M. brevicaudis* from the others. In the same way the Cluster analysis wasn't able to establish groups equivalent to the previous identification of the specimens. Even after the analysis of variance, the species *M. scalops* and *M. brevicaudis* couldn't be distinguished among each other, with the exception of the tests that evaluated the hair total length and the maximum size of the hair tip scale. The species *M. americana* and *M. iheringi* couldn't be separated by any of the tests, which reinforces their unclear taxonomic status. The total length of the hair was the only characteristic capable of distinguishing all species among each other, with the exception of *M. americana* from *M. iheringi*. The most easily measured characteristics were the most valuable ones for the identification of these species. Therefore, the use of scanning electron microscopy wasn't able to improve or facilitate the identification of this genus species, since their diagnostic characteristics can easily be visualized through optical microscopy. Unlike the other regions of the hair, only one cuticular pattern was observed for the hair shaft and the hair tip of each species. That pattern was similar among all species analyzed, except for *M. brevicaudis*.

8 INTRASPECIFIC MORPHOLOGIC VARIATION OF *CRYPTOTIS COLOMBIANA* (SORICIDAE) FROM THE CENTRAL ANDES OF COLOMBIA

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Small-eared shrews of the genus *Cryptotis* are endemic to the New World, from eastern North America (SE Canada) to northwestern South America (N Peru). Although phylogenetic affinities among *Cryptotis* species are not well established yet, two groups are recognized for South America; the *C. thomasi* group, with at least eight species, and the *C. nigrescens* group, with six species, including two in Colombia (*C. brachyonyx* and *C. colombiana*). Studies related to the last two species are scarce, mostly because few specimens are available. By analyzing more than 100 specimens from the Central Colombian Andes, this study evaluates intraspecific variation of *C. colombiana* along its geographic range, based on detailed comparison of morphological traits and morphometric analyses (Principal Component Analysis) of 22 craniomandibular measurements. Major findings include a wide distribution in the morphometric space (PCA scatter-plot), which identifies three populations differing along size and shape axes; each of these populations can be geographically delimited. Nevertheless, morphologic traits of skull (e.g., shape of mandibular process, disposition of unicuspid and cusps of M1) associated to these populations show high variation and hereby limit consistency of a diagnosis for *C. colombiana* or even Colombian species of the *C. nigrescens* group. These preliminary results represent an important insight into the morphometric variability as well as the identification of distinctive morphological traits exhibited by this soricid group in the Andean ecosystems.

9 INVESTIGATING THE LANDSCAPE OF TOLERANCE FOR PUMAS (*PUMA CONCOLOR*) IN THE ARAUCANÍA LAKE DISTRICT OF CHILE

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Several trends combine to create a global challenge of human conflict with big cats in general and pumas in particular. Pumas are a protected species in Chile, and apparently relatively abundant. However, the human population and its environmental footprint are also increasing almost everywhere, so these modern pumas often live alongside people, and the two come into conflict when pumas prey on domestic animals. Among stakeholders living in closest direct contact with pumas and suffering the highest costs of coexistence, we investigated whether the tolerance of livestock losses was related to size of livestock holdings and other economic measures; or, whether demographic variables such as stakeholder age, particular beliefs or common interests produce a good model for tolerance?

Tolerance was measured by asking respondents how many sheep they were willing to lose per year without killing the predator responsible. Variables such as number of livestock, sheep holdings as a percentage of total capital base, depredation history, stakeholders' age and beliefs were tested for correlation with the index of tolerance. Tolerance was strongly negatively correlated with stakeholders' age (Fig. 4.a; Spearman's correlation: -0.331, N = 58, P = 0.011), and the extent they worry about the problems that pumas might cause (Spearman's correlation: -0.366, N = 58, P = 0.005.). Tolerance was positively correlated with the sense of enjoyment derived from pumas (Spearman's correlation: 0.280, N=58, P= 0.034). 50% of stakeholders were willing to accept the loss of ?1 sheep but <4 to pumas per year (Fig. 3.b). On average, tolerant stakeholders were willing to lose approximately 15% \pm 2.5 of their total sheep holdings to pumas per annum, without seeking retribution. As long as pumas and people inhabit the same areas, some level of depredation will likely occur. Deeper understanding of the drivers of tolerance will help to inform puma conservation in an increasingly populated environment.

10 INVESTIGATING THE ROLE OF WILD CARNIVORES IN THE EPIDEMIOLOGY OF BOVINE NEOSPOROSIS

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Neospora caninum is a protozoan parasite primarily associated with bovine abortion and hind limb paralysis in dogs. Many intermediate hosts of *N. caninum* have been identified but the only definitive hosts discovered (dogs, *Canis familiaris* and coyotes *Canis latrans*) are carnivores. Carnivores have increased opportunity of contracting the parasite through ingestion of infected prey and carrion. This project aims to identify wild carnivores' role in the epidemiology of neosporosis. Banks of serum, faecal and brain samples from all Irish wild mammal carnivores has been established to test for *N. caninum* (192 American mink (*Mustela vison*), 157 red foxes (*Vulpes vulpes*), 62 pine martens (*Martes martes*), 50 badgers (*Meles meles*), 41 stoats (*Mustela erminea*), 32 otters (*Lutra lutra*) and 4 feral ferrets (*Mustela putorius*). IFAT tests on mink and fox serum have shown positivity of 0.88% (n=141) and 0.99% (n=101) respectively. This is believed to be the first case of neosporosis discovered in wild mink. No other carnivore serum tested positive. DNA extraction and PCR assay techniques have been developed to test brains for presence of *N. caninum* finding 2.6% (n=39) positivity in foxes. The need to test two target parts of the brain in order to avoid false negatives was also identified. A similar PCR technique has been developed to test for *N. caninum* oocysts presence in faeces. Results of untested samples will be all obtained by June 2009. Results have shown *N. caninum* prevalence in Irish wild carnivores to be relatively low but its presence warrants monitoring. The absence of *N. caninum* in species in Ireland, that have been shown to be carrying the disease in other countries, shows that it is not just the presence of certain species that influences wildlives' role in the epidemiology of neosporosis. The local ecology of a species also has an important role.

11 LINGUAL MORPHOLOGY OF *PYGODERMA BILABIATUM*: ANATOMY AND HISTOLOGY

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Pygoderma bilabiatum is a bat of the family Phyllostomidae scarcely known with respect to its biology and anatomy. In this work a contribution to the knowledge of the anatomy of the tongue is presented, showing macro and microanatomy characters. Histological techniques were used under optical microscopy to infer correlations between morphology and the type of food preferred by this species. At the tip of tongue fungiform papillae with gustative corpuscles are located. The dorsal surface has a plane keratinized stratified epithelium, and mechanical filiform papillae with different degrees of keratinization. These papillae have a single "keratinization center" unlike other species of bats. At the anterior end of the tongue there is a large papilla of that kind. In the posterior third there are a small number of circumvallate and filiform papillae with taste corpuscles associated to them. Amongst the muscles located beneath the papillae of the posterior region, there is a prominent lymphocytic infiltration and at the dorsal posterior region there is a nervous ganglion and a lymphatic tonsil. In the posterior region, between the muscles, serous glands were observed, which react with PAS. The dorsal musculature is placed laterally along the body of the tongue. At the medial region there are several transversal and some dorsoventral fascicles. The ventral region is coated by keratinized plane stratified epithelium, being remarkable the presence of a hyper-keratinized area that was not observed in any other species of bat. The tongue of this species do not show a specialized muscular morphology, and the most outstanding details are the hyper-keratinized area of the ventral epithelium, and the presence chemical sensors at the tip of the tongue.

12 MAMMALS FROM THE CALIMA LAKE: A LOCALITY IN THE SOUTH-WEST MOUNTAIN RANGE OF COLOMBIA

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Colombia had registered 471 species of mammals (434 verified presence and 37 potential presence). Most of this diversity appears in the low lands of the Pacific Coast (Biogeographic Chocó) and the West of the Amazonia. However, there is not sufficiently research about mammals in the Mountain range of Colombian Andes, one of the areas with a high diversity of habitats and fauna in the country. With the intention of contribute to the knowledge on the mammals of this area; two rapid surveys were done in the 2005 and 2009 in the Calima Lake an important hydroelectric dam and a tourist place in the South-West Mountain range of the Colombian Andes, where the natural habitats has been transformed. The presence of mammals was confirmed by direct (mist net, nocturnal transects, Sherman traps, among others), indirect (foot prints, scats and burrows) methods and interviews) A total of 47 species of

mammals were determined in the locality, five species are threatened at global (IUCN red List)) and 18 at local levels. The diversity was representing by bats (28 %), carnivores (24 %), rodents (21%) and marsupials (9 %) of the species. The covertures and habitats associated to the forests of the Calima Lake seem to be a refuge for some species recognized by not being tolerant to habitat transformation. In spite of the visible transformation of the area, the Calima Lake lodges an important diversity of mammals that must be greater taking into account that the fieldwork was short in this research.

13 MAMMALS USED IN POPULAR MEDICINE IN THE SEMI-ARID REGION OF NORTHEASTERN BRAZIL

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Mammals are among the animal species most frequently used in traditional folk medicine, and their role in folk practices related to the healing and/or prevention of illnesses has been recorded in different social-cultural contexts throughout the world. The present work addresses to identify the species of mammals used as zootherapeutic in a rural community, in the semi-arid region of northeastern Brazil. Information was gathered through the application of semi-structured questionnaires to 46 respondents that indicated the therapeutic use of 19 mammals' species, in which are used to treat 36 diseases. The animals are used entirely or by-parts: "mocotó" (paw), urine, fel (bilis), penis, teeth, testicles, milk, fur, feces, fat, tail, meat, among other derived. The knowledge about medical zootherapeutic practices is acquired and transmitted orally from generation to generation, demonstrating that these healing methods have strong cultural aspect in the region. The use of wildlife as a form of therapy is an alternative to low-income populations, which have access to precarious health system or even nonexistent ones, as it happens in the region. In the studied community, considering that available medical care is inadequate, animals and medicinal plants represent a common usage to the lack of allopathic medicine. Besides the economic and socio-cultural aspects, the study on zootherapeutical practices is also extremely important from a conservationist point of view and should be taken into account when it comes to management plans and conservation outlooks, seeking sustainable exploitation of mammals resources in the researched area.

14 MORPHOLOGICAL EVIDENCE FOR THE EXISTENCE OF *TURSIOPS GEPHYREUS* LAHILLE 1908, IN THE RIO GRANDE DO SUL, SOUTHERN BRAZIL

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There are currently only two valid species for the genus *Tursiops* in the world: *T. truncatus* distributed worldwide and *Tursiops aduncus* (Ehrenberg 1832), restricted to Indo-Pacific Ocean. *Tursiops gephyreus* Lahille 1908, was described in the Atlantic coast of South America but until now it has been considered a synonym of *Tursiops truncatus* (Montagu 1821). Recently, the existence of two forms of *Tursiops* in the southern Brazil, Uruguay and Argentina was proposed (Barreto 2000). In order to review and clarify the taxonomy of the genus *Tursiops* in southern Brazil, we examined 41 skulls of adult bottlenose dolphins stranded in Rio Grande do Sul (29°19'S;049°42'W to 31°21'S;051°02'W). The specimens were classified a priori into two morphological groups. The results indicated that 15 specimens belong to *T. truncatus*, 24 to *T. gephyreus* and two specimens showed intermediate characters, suggesting possible cases of hybridism. Thirty six (78,26%) of the 46 skulls measurements differed significantly ($p < 0.05$) (t test and Mann-Whitney) among groups. The condylobasal length (CBL) of the skulls of *T. gephyreus* (mean=580,04mm) are larger than *T. truncatus* (mean=518,93mm) and in 78% of the measurements, the mean of *T. gephyreus* is bigger than *T. truncatus*. The specimens determined a priori as *T. gephyreus* were compared to the holotype of *Tursiops gephyreus* Lahille (MACN54.113) and all morphological characteristics were in agreement with it. These findings have important implications for the conservation of bottlenose dolphins in the region, since each species should be managed separately. Financial and logistical support: UERGS, UFRGS and CNPq (Project # 572180/2008-8).

15 PELAGE VARIATION RELATED TO SEXUAL DIMORPHISM AND ONTOGENY IN THE THREE-STRIPED MOUSE OPOSSUM

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Monodelphis is the most diverse genus among didelphid marsupials, comprising about 20 species. It also presents the widest range of pelage variation, and is one of the least known taxonomically. A sample of 52 three-striped mouse-opossums was obtained from a single locality during a yearlong survey in the Atlantic Forest of southeastern Brazil. Specimens varied drastically in size, pelage color, extension, appearance and width of dorsal stripes. Molecular analyses indicated that two species were represented among them, with cytochrome b divergence levels reaching 10%. Subsequent morphological analyses enabled us to assign the specimens to either *M. americana* or *M. iheringi*. The main differences were overall size, shape of skull, and size of pre-molars relative to canines, along with subtle differences in ventral pelage color, and darkness and width of dorsal stripes. We also detected a marked difference between species, with *M. americana* showing a very striking pattern of pelage variation related to sexual dimorphism and ontogeny. Male *M. americana* tend to gradually loose their stripes with age, and acquire an almost uniform reddish pelage color, while both adult male and female *M. iheringi* retain their stripes. This study helps elucidating the taxonomy of this poorly known genus, since many species were described and are traditionally and still currently identified based upon the presence and appearance of dorsal stripes. It also highlights the difficulties in identifying three-striped mouse opossums in the field based on external characters

only. This is especially true when these two species are sympatric, since adult males and females of *M. iheringi* and juveniles and female sub-adults of *M. americana* are cryptic, both being extremely similar in size, pelage color, and pattern of stripes. Funding: FAPES, FACITEC, CEPF.

16 PRIMARY ANALYSIS OF THE ONTOGENETIC CRANIAL DEVELOPMENT OF THE GENUS *LESTODON* (XENARTHRA, MYLODONTIDAE)

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We are studying several cráneo-mandibular remains of the giant mylodontid ground sloth *Lestodon*. The remains came from sediments assignable to the late Pleistocene located in the Department of Colonia (Uruguay) and are deposited in the Paleontological Collection of the Museo Nacional de Historia Natural y Antropología (Montevideo, Uruguay). The cráneo-mandibular anatomy of the genus *Lestodon* differs markedly from other quaternary mylodontids in the upper and lower first teeth modified as caniniforms and separated from the rest of the series by a long diastema. Until now two species are recognized among the genus *Lestodon* (*L. armatus* and *L. trigonidens*) which are differentiated by the degree of development of the caniniforms. However, many authors have suggested that this difference is due to a marked intraspecific sexual dimorphism within the two species of *Lestodon* which would be a single species (*L. armatus*). The goal of this paper is to analyze the morphological and ontogenetic variations within the genus since there have been no studies of this type so far. As a preliminary result we can conclude that the existence of a long diastema separating the caniniforms from the rest of the teeth is a feature that is present in all stages of ontogenetic development, not the case with the projection of the labial caniniform which gradually changes during the lifetime of the specimens. None of the young specimens analyzed have shown a significant development of the caniniforms but we need to analyze more remains to conclude whether this feature is subject to ontogenetic variation.

17 SEX & AGE DIMORPHISM OF PELVES OF *SOLEX SONOMAE* (SORICOMORPHA: SORICIDAE)

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Bones of shrews (Soricomorpha: Soricidae) in pellets regurgitated by owls (Strigidae and Tytonidae) and fossil matrix commonly include the pelves of many individuals. When researchers are interested in the population dynamics or ecology of a fossil or extant community of small mammals, it would be useful to be able to identify the sex and age of individuals from the pelves. In an attempt to determine if sex, age, or subspecific designation of *Sorex sonomae* shrews could be distinguished or determined by either morphometric dimensions or shape differences of their pelves, 76 females and 145 males were examined. Coordinate data were exported and dimensions of 14 morphometric characters for each pelvis were calculated based on the coordinates of the landmarks. Pelves of the subspecies of *S. sonomae* are indistinguishable by statistical analyses of morphometric data or landmark analyses. Although size and shape of pelves among males in age classes 3–4 vary considerably, they form a coherent group completely distinguishable from males in age classes 1–2 and all females. Pelves of males within age classes 1–2 (maximum testes dimensions = 2 x 1.5 mm) and those of females in all 4 age classes are indistinguishable based on size or shape. Time of year collected and cohort to which individuals belonged had no impact on the ability to distinguish sex or among age classes based on size or shape of pelves. Dimensions of testes exceeded 5 x 3 mm for all males in age classes 3–4, thus these males were presumed to be reproductively active. The wide range of robustness of pelves of these males could be an indication of individuals belonging to different behavioral components within their populations. Perhaps the larger pelves are from more-dominant individuals.

18 SEXUAL DIMORPHISM OF BODY SIZE IN THE JAPANESE RED FOX *VULPES VULPES JAPONICA*

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I provided representative values of morphometrical parameters for the red fox (*Vulpes vulpes japonica*) in Honshu, Japan. Also I analyzed 13 parameters of external morphology, based on 120 specimens collected by the Tochigi Prefectural Museum during 1981–1991 and by the author during 1986–1994. Using univariate and multivariate analyses, sexual dimorphism was confirmed: body weight was significantly larger (23 %) in males; linear parameters including head and body length (HBL) and tail length (TaL) were significantly larger (5–6 %) in males. Mahalanobis' generalized distance between males and females was 0.97 using four linear parameters: total length, HBL, TaL, and hind foot length (HFL), the accuracy of the discrimination was 100 %. Furthermore, analysis of these parameters using an allometric formula showed that relative growth patterns, in which the growth of TaL and HFL was regressed to HBL stops earlier. Differences between sexes were observed in the relative growth of these parameters. The growth of body thickness, such as circumferences, continued after the linear growth stopped, especially in males. Greater thickness gives a visual impression of largeness when observed squarely, providing advantages for males to be selected by females, causing, at least partially, male-bias size dimorphism.

19 SKELETOGENESIS IN THE AFRICAN STRIPED MOUSE *RHABDOMYS PUMILIO*

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Data on skeletal development in rodents are limited to a few model species; this shortcoming restricts studies exploring the

developmental basis for the morphological and ecological diversification of this group. Here we present comprehensive data on the onset of ossification in the South African muroid *Rhabdomys pumilio* maintained under laboratory conditions. A total of 60 pre- and postnatal specimens were prepared using standard enzymatic 'clearing and double staining'. The earliest sign of ossification was recorded for each skeletal element based upon uptake of alizarin red. Sequences of onset of ossification in 24 postcranial and 18 cranial elements were coded, in addition to a detail consideration of 61 autopodial elements. Since *Rhabdomys* pups develop rather quickly, being mobile from day 2 and being weaned by day 16, we expected accelerated development, especially of the autopodial elements. To test this hypothesis we compared ossification sequence and timing in *Rhabdomys* with other rodents (*Mesocricetus*, *Peromyscus*, *Meriones*, *Rattus*, *Mus*), and found differing degrees of altriciality and precocity at birth do not influence the overall pattern of ossification sequences. The examination of a large sample also provided the opportunity to examine intraspecific variation in the sequence of ossification, which was found in some areas (autopods) that otherwise behave as modules with regard to other portions of the skeleton. Autopodial sequence variation is seen in the position of the first metacarpal with respect to the rest of the elements in the hand, and in the cuboid and the fifth medial phalange with respect to all other elements in the foot. Nonetheless, the ossification of cranial and postcranial elements in *Rhabdomys* adheres to the general pattern documented for mammals, and unexpected variation recorded in the autopods does not exceed that observed at present for reptiles.

20 THE STUDY OF MEDIUM-SIZE AND LARGE TERRESTRIAL MAMMALS IN URUGUAY: CONTRIBUTIONS AND PERSPECTIVES

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MamSUR (Mamíferos Silvestres del Uruguay) is an investigation group born from the interest in the study of medium-size and large terrestrial mammals. Among its purposes are generating data that could contribute to understanding mammals, and using dissemination as a conservation tool. Currently Uruguay is developing a National Protected Area System (SNAP). Some of the proposed areas for incorporation into the SNAP are: Cerro Verde and Islands of La Coronilla (Departament of Rocha), Esteros de Farrapos and Islands of the Uruguay River (Río Negro), Quebrada de los Cuervos (Treinta y Tres), Humedales de Santa Lucía (Montevideo), and Valle del Lunarejo (Rivera). It is in these areas where the group has been working, gathering information apt for conservation use. To make this possible, we have been carrying out in situ research, and practicing non invasive methods, some of these new in our country. The research carried out by the group was complemented with contributions from local people and local authorities, which became an essential source of knowledge for the achievement of our objectives. Altogether, MamSUR's research has allowed an update of existing data for these areas, contributing to their future management plans; we have deposited new material in national scientific collections; and we have strengthened ties with other investigators and with local communities. We aspire to continue with richness surveys and optimizing our field methods. We also expect to extend our project objectives in order to cover a bigger range of aspects of Uruguayan mammal ecology.

21 THREE-DIMENSIONAL CT EXAMINATIONS OF THE MASTICATION SYSTEM IN THE GIANT ANTEATER

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The elongated splanchnocranium of the giant anteater (*Myrmecophaga tridactyla*) are morphologically adapted for feeding on ants and termites. The giant anteater uses its extraordinarily long tongue to transfer food to the esophagus, and the elongated oral cavity provides the space where the long tongue is housed. In spite of these clear adaptational forms, the size and position of the mastication muscles and the movements of the mandible have functionally remained unclear. In this study, therefore, the mastication system of the giant anteater was examined by means of gross anatomy and three-dimensional CT image analysis. The anteater medio-laterally rotates the mandibular bodies to control its tongue when it is elongated and to house it when it is relaxed. Three-dimensional CT image analysis pointed out that the shape and size of the oral cavity rapidly changes when the mandibles are rotated. The oral cavity expands bilaterally when the dorsal part of the mandibles bend medially. Macroscopic observations and muscle weight data demonstrated that the superficial temporal and the lateral pterygoid muscles act as the main motors of the medial rotation of the mandibles. The low height of the mandibular ramus and the incomplete zygomatic arch in this species are morphologically adapted to the rotational movement of the mandibles, as they contribute to the medially-oriented transmission of the force from the temporal muscles and to avoid collision between the mandibles and the cranium during the rotational movement. These specialized characters of the mastication mechanisms have been derived from those of the non-derived mammals through the evolutionary history of the Family Myrmecophagidae.

BEHAVIOUR

22 A SURVEY OF URINE BASED ATTRACTANTS FOR JAGUAR (*PANTHERA ONCA*) AND OTHER CARNIVORES

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Carnivores are known for their relative low abundance and elusive behavior, factors that make them a problematic guild to work with.

That is a reason for researchers to be interested in assessing the effectiveness and convenience of different attractants. In this work we took advantage of the logistics involved in an ongoing jaguar (*Panthera onca*) density pilot study with camera trapping. This study took place in a Mexican subtropical forest of San Luis Potosí state, Mexico, to evaluate the usefulness of five scent lures to attract carnivores, specially the endangered jaguar. Because urines are among the most effective scent lures according to literature, we conducted a 508 trap nights design, testing the following: (1) a female felid urine cocktail, (2) a male felid urine cocktail, (3) female jaguar urine, (4) male jaguar urine and (5) a commercial perfume; each lure tested synchronically in four stations against four control stations. Of 12 carnivores confirmed to exist in the study place, only *Panthera onca*, *Nasua narica* and *Eira barbara* were photographed in the scent photographic stations. We did not obtain enough photographs to compare each lure's performing. We compared the population proportions of photographic captures in stations with and without attractant by means of the normal distribution as an approximation to the binomial and did not found significant difference neither for the carnivore ensemble ($Z=1.08$) nor for jaguars ($Z=0$). Though, we observed an unusual photographic pattern for a jaguar that suggests the commercial perfume might be useful to attract this species. Surprisingly, more photos of non carnivore medium and large mammals were obtained in lured stations than in control one's. We believe these results are not conclusive because the trapping effort was both spatially and temporally insufficient, so we point at the need for further investigations.

23 DENNING ECOLOGY OF CONEPATUS CHINGA IN A FARMLAND AREA IN THE PAMPAS GRASSLAND OF ARGENTINA

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Virtually nothing is known about the ecology of the common Molina's hog-nosed skunk *Conepatus chinga*. Since dens are essential components of most carnivore's life and may be a limiting factor affecting abundance and distribution of populations, understanding denning habits of species is important to make management decisions. In this study we describe den site-selection and use of this mephitid in an unprotected farming area in the Pampas grasslands of south-western Buenos Aires province, Argentina. We identified 240 (male: $n=91$, female: $n=149$) den sites used by 9 radiocollared skunks (3 males and 6 females). There was no significant difference in the number of dens used by females and males ($U=6.5$, $p=0.517$). Most dens were found in underground burrows (81.7%), but males used more rock burrows than females ($X^2=15.41$, $df=1$, $p=0.001$). The mean number of dens was 4.7 ± 3.4 in the border region of individual home ranges and 12.2 ± 5.7 in the core areas, where the density of dens was significantly higher ($T=-3.01$, $n=9$, $p=0.002$). The distribution of den sites was not homogeneous among habitats for either males ($X^2=72.51$, $df=2$, $p<0.001$) or females ($X^2=80.64$, $df=2$, $p<0.001$). Both sexes displayed a preference for native grassland and pasture. Den sites and random points did not differ in the distance to stream ($U=2825$, $p>0.65$). However den sites were located closer to fences ($U=20952$, $p<0.001$), roads ($U=15112.5$, $p<0.001$), grass patches ($U=15292.5$, $p<0.001$), abandoned ($U=21310.5$, $p<0.001$) and used farmsteads ($U=24500.5$, $p<0.001$), and habitat edges ($U=16015$, $p<0.001$) than random points. On average 29% of den sites were reused by a skunk, with no intersexual variation ($U=2889.5$, $p=0.2258$). The association of *C. chinga* dens with areas of dense and moderate cover appears to make the species susceptible to changes in vegetation structure that could reduce protective habitat and a constant availability of food resources.

24 FEEDING ENRICHMENT AND HERBAL MEDICINE IN A JAGUARUNDI (*PUMA YAGOUAROUNDI*) IN THE BAURU PARK ZOO

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This study in the park zoo in Bauru, Brazil, aimed to verify the effectiveness of food enrichment and herbal medicine to minimize stress behavior and its variation throughout the day of a jaguarundi (*Puma yagouarundi*) male one of its premises because of its great time performing stereotyped behavior, in this case, the pacing. The occurrences of such behavior may indicate bad health of the animal when under captivity. Taking this into account, zoos take extreme important measures in terms of environmental enrichment to minimize such behavior. For this, the used feeding enrichment was to divide the time, before one, now to two meals and the use of a method rarely studied in what is said about the animal behavior, the herbal medicine. The results showed a change in the effective the change in time of feeding to reduce the pacing behavior, thus minimizing anxiety for food near the time of feeding as promoted a greater repertoire of appetizing behaviors with increased activity and consequently less stereotype of the animal, but herbal medicine has proved ineffective, causing an increase in pacing and reduction of other activity behaviors, perhaps by a soothing effect of the drug.

25 GROUP SIZE DEPENDENT ASSOCIATION BETWEEN FOOD PROFITABILITY, PREDATION RISK AND SPATIAL DISTRIBUTION OF FREE-RANGING BISON

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Group living is an adaptive strategy observed in many animal species. Individuals can reduce predation risk by becoming part of a group. Group members may also gain social information that can increase foraging efficiency. Competition among individuals, however, can impose foraging costs. By altering the cost-benefit tradeoff of foraging, variations in group size can influence the spatial association that herbivores share with plants and predators. This influence may vary seasonally, depending on how foraging constraints vary throughout the year. Empirical evidence of such combined effects remains limited, especially in natural settings. The

bison (*Bison bison*) of Prince Albert National Park (Saskatchewan, Canada) can maximize their energy intake rate by selectively feeding on slough sedge (*Carex atherodes*). On this basis, we evaluated the spatial relationship between slough sedge and bison foraging under predation risk during summer and winter. We found that the strength of selection for foraging sites with slough sedge decreased with increasing risk of wolf encounter in winter, but not in summer. Selection for slough sedge was further influenced by group size. Larger bison groups displayed stronger selection for slough sedge in winter but weaker in summer. Seasonal variations in group size effects can be explained by changes in the relative costs and benefits to social foraging. Because bison groups are much larger in summer than winter, competition for slough sedge should be stronger in summer than winter. Slough sedge is more inconspicuous in winter than in summer, thereby increasing the value of social information during winter months. We suggest that predation risk and spatial heterogeneity of highly profitable food influence the foraging decisions of bison differently in summer and winter because seasonal differences in cost-benefit tradeoffs.

26 IMPLEMENTATION OF A PROGRAM OF ENVIRONMENTAL ENRICHMENT IN *PUMA CONCOLOR*. ANALYSIS OF ASSOCIATE CONDUCTS

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The aims of this study were to determine the effects in the structure of the post enrichment conduct, measured as guidelines apparition frequency, to stimulate predatory behaviour by means of the application of enrichment and to establish the effects and quantitative differences between two enrichment techniques. This study, carried out in the Zoological Garden of the City of Buenos Aires, Argentina, took as population study, a captive group of *Puma concolor* (Linné, 1758), consisting of four females and a male. In the data collection were employed animal-focal observations and scanning techniques (Altmann, 1974), registering behaviour and spatial location. It was performed twice a week with five intervals of one-hour working days interspersed with scanning observations every five minutes. The work was divided into three phases: Control: It was based on the data collection previous to the application of both enrichment techniques. Predatory enrichment: implementation of the enrichment techniques first of all with dead fish and in its second application with a live fish. In each one, a pond was placed in the external precinct and three *Cyprinus carpio* (Linné, 1758) inside. Environmental Post-enrichment: data collection for five hours, during the day after the enrichment. Exploratory and capture behaviours were registered during the presentation of dead fish and unregistered during the phase control. Specific predatory behaviors of the species were observed during the live fish presentation. A greater use in the spatial disposition of the precinct was registered. The difference of contacts between both presentations allows to affirm that this second method of presentation results in a greater enrichment. At the same time, the differences observed in the comparison control/Post Enrichment show a greater state of warning, territorial mark, and exploration of the individuals, that can be interpreted as a change in the relation of the individuals with the precinct.

27 THE INFLUENCE OF ZOO VISITORS ON CAPTIVE *PITHECIA IRRORATA* (PITHECIDAE) BEHAVIOUR

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Animals can display different behavior patterns according to their surrounding environment and stimulus. Primate behavior studies in zoos are important to promote animal welfare and a positive experience for visitors. Significant correlations have been reported between zoo visitors and captive animal behavior. Primates show increased aggressive behaviors and decreased social non-aggressive behaviors or increased locomotion in the presence of visitors. *Pithecia irrorata* (Pitheciidae) is an endemic Amazonian saki monkey, with thick dark gray hair and living in small social monogamous groups. This study was conducted at the Fundação Zoobotânica de Belo Horizonte (FZB-BH), Brazil, with a male, a female and a young female of *P. irrorata*. Data was collected over a 10-day period, between May and June of 2008, for three consecutive hours per day (1:00 to 4:00 p.m.). The behavior of each subject was recorded (instantaneous samplings) at every one minute and categorized into walking, feeding, playing, scratching, hanging to liana, hidden, walking on grid, standing on grid, standing still, jumping, social behavior, vocalizing or others (behaviors not described previously). At the same moment, visitor density (number of visitors) and visitor intensity (noise level) were recorded and qualified from 1 to 5. Data was analyzed by the non-parametric Mann-Whitney test (SYSTAT 11). It was not observed a peak of primate activity nor a peak of visitor intensity and density. The hidden behavior of the male and the juvenile decreased at some moments on high visitor density and intensity days. The time spent feeding by the female and juvenile was higher on more visited days. Visitor intensity and density in FZB-BH did not alter significantly the behavior of the primates. Probably the animals are used to the captive environment as the adults live in the zoo for more than 5 years and the juvenile was born there.

BIOGEOGRAPHY

28 A MULTISCALE APPROACH TO DISTRIBUTION MODELLING AND SEARCHING FOR DISJUNCT POPULATIONS OF HIGHLY ENDEMIC OR POORLY KNOWN SPECIES

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Although species geographical distribution represents a fundamental issue for biogeographical research and conservation actions,

information about the geographical distribution remains very poor for many taxa. This knowledge gap, known as Wallacean shortfall, becomes severe in megadiversity regions and hinders several conservation actions. However, understanding species distribution is not a trivial matter, as this entity is shaped by complex interactions between intrinsic (organism) and extrinsic (environment) process, which operate at multiple scales of space, time and biological organization. In this context, our aim here is to present a multiscale spatially explicit approach to distribution modelling and searching for disjunct populations of highly endemic or poorly known species. We applied GIS and machine-learning tools for modelling species distribution in a multiscale framework: species (global), metapopulation (regional) and population (landscape). The developed approach follow four steps: (1) modelling potential distribution with the available data for optimizing regional occurrence field surveys; (2) modelling potential regional distribution with enhanced occurrence data and assessing the species environmental signature; (3) modelling potential global distribution for optimizing the search for new and disjunct population; (4) modelling final potential distribution at landscape, regional and global scales. To illustrate this approach we taking as a case of study the Black-Faced Lion Tamarin (*Leontopithecus caissara* Lorini & Persson, 1990), an endangered primate recently discovered in the Brazilian Atlantic Forest hotspot. We found the species to be endemic of quaternary coastal forests, and stenobiont with a narrow environmental signature. The distribution is very diminute and restricted to only two municipalities, Guaraqueçaba (PR) and Cananéia (SP), with no disjunctions. The framework was also able to support population spatial structure analysis and conservation status assessment (*sensu* IUCN). We suggest that such multiscale modelling approach may prove very useful for highly endemic or poorly known species, specially in tropical areas where the Wallacean shortfall affects even well-studied groups.

29 **A ROLE OF PLEISTOCENE REFUGIA IN SHAPING GENETIC DIVERSITY OF THE JAPANESE HARE, *LEPUS BRACHYURUS*.**

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The Japanese archipelago is composed of four main islands, Hokkaido, Honshu, Shikoku, Kyushu, and hundreds of peripheral small islands, extending from 22°N to 46°N. The archipelago has high mountains and several peninsulas and contains various environments, which could offer many kinds of habitats to terrestrial animals and plants. Then, the archipelago harbors high levels of species and genetic diversities despite of its relatively small area. To better understand factors affecting the genetic diversity of Japanese mammals, here I examined phylogeographic patterns of mitochondrial and nuclear gene sequences in the Japanese hare, *Lepus brachyurus*, occurring in Honshu/Shikoku/Kyushu area. In the analyses of the mitochondrial (Cyt b) and Y chromosome (Sry) genes, two distinct lineages appeared dividing its distribution range into two parts, northern and southern, although with different geographic borders located around the Chugoku (southern Honshu) and Kanto (eastern Honshu) districts, respectively. Similar north-south phylogeographic patterns have been observed in the mtDNA studies of some other Japanese mammals. Besides, a comparatively high genetic diversity was observed in a southern area in each of the distribution ranges of the two mitochondrial phylogroups. The spatial patterns of the markers suggested that population expansions have occurred from two or more refugia lying somewhere southern parts of the distribution ranges. We examined allele frequencies in five autosomal loci and found moderate geographic clines with higher levels of allelic diversities from the Chugoku to Chubu (central Honshu) district at the central part of the species range. It is suggested that alleles from different source areas have been mingled in the central part, being consistent with the above results of phylogeographic analyses. Hence, we could conclude that multiple refugia in the Pleistocene glaciations played an important role for preventing the loss of genetic diversity due to population contractions in the Japanese hare, as well as other mammals.

30 **A VARIABLE DEMOGRAPHIC HISTORY OF THE HOLARCTIC TUNDRA SHREW (*SOREX TUNDRENSIS*)**

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The tundra shrew is currently recognized as the only holarctic soricid (Family: Soricidae), ranging from eastern Khazakstan in Eurasia eastward to the Yukon Territory in North America. The limited North American distribution of the tundra shrew suggests the possibility that North American populations are the result of recent expansion from Eurasia, eastward across the Bering Land Bridge. We test these hypotheses and report on range-wide genetic signatures of the history of occupation for this species. Two genetic loci (sequenced for 65 individuals), mitochondrial Cyt b (1000bp) and nuclear apolipoprotein B (ApoB; 594bp), were used to investigate multiple populations from both Siberia and Alaska. Bayesian and distance analyses revealed relatively deep genetic structure within Siberia as opposed to shallow structure in Alaska. Population genetic analyses pinpoint stable populations within Siberia but signatures of population expansion in Alaska. Phylogeographic breaks between well supported clades are consistent with mountainous regions dissecting lowland areas where populations now occur and suggests persistence in discreet areas of ice-free Siberia during the last glacial episode. Alaskan shrews form a well supported monophyletic group but are minimally diverged from Eurasian shrews suggesting a recent expansion eastward through Beringia.

31 **ASSESSING THE POTENTIAL DISTRIBUTION OF JAGUAR IN ARGENTINA**

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Jaguar is the largest felid species of the American continent and considered near threatened by the IUCN (2008). Its present distribution is reduced to 46% of its original range, and the species is already extinct from Uruguay, Chile, and El Salvador. In

Argentina it only persists in 10-15% of its original distribution and it faces extinction problems. In Argentina, it occurs in three disjoint areas: the Yungas region in the northwest, the Atlantic forest in the northeast, and the Chaco region in north-central Argentina. However, its distribution is only known from spotted records throughout its range. As the species is endangered in Argentina, it is crucial to know its distribution to establish conservation priorities. In this study, we extrapolate the relation between presence points of jaguar and environmental variables using the software MaxEnt to present a probability distribution map for the species in Argentina. We ran the model 100 times, randomly splitting the data into 75% to calibrate the model and 25% to test it. Of the total potential distribution in Argentina, less than 10% is within protected areas. Some areas of high probability of occurrence are represented in protected areas (Yungas Biosphere Reserve, Iguazu National Park). However, very little of its distribution is under protection in the central portion of its range (Chaco region). We hope that this map will help direct new survey studies and provide guidance to conservation managers and decision makers.

32 **BERGMANN'S RULE IN *AKODON CURSOR* (WINGE, 1887) (SIGMODONTINAE)**

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Akodon cursor, a medium-sized sigmodontine (adult body mass up to 40-45 g), ranges from southeastern and central Brazil through Uruguay, Paraguay, and northeastern Argentina. We studied body size variation in 70 Brazilian populations spanning 18.5 degrees latitude (6.83°-25.33° S), 14.23 longitude (34.57°-48.80° W) and 1170 metres (1-1170 m elevation, with relation to environmental factors in order to test Bergmann's rule intraspecifically. Body size estimators for males and females were, Head and Body Length (mm) and Body Mass (g) both log10-transformed for statistical analyses. Geographic body size variation was analyzed with SAM (Spatial Analysis in Macroecology v. 3.0) software. Relative age was estimated by tooth wear. Independent variables included mean, maximum and minimum ambient temperatures, annual, maximum and minimum rainfall, the coefficients of variation of temperature and rainfall, actual and potential evapotranspiration, and water balance, calculated for each locality. In view of collinearity of many of the climatic factors, PCAs were performed and the first three or four PCs (delimited by the broken stick method) were used as independent variables for simultaneous autoregressive analyses (SAR). PCs not significantly correlated with body size estimators, were discarded and climatic parameters with high loadings on the remaining PCs were used as single or combined independent variables in further SARs. The Akaike Information Criterion (AIC) was used to determine the best predictive model for body size geographic variation. In both females and males, mean annual temperature was highly negatively correlated with body size indicating that, *A. cursor* follows Bergmann's rule. This results also concord with the fact that the genus *Akodon*, as a whole, also agrees with Bergmann's rule at the across-species level.

33 **BIOGEOGRAPHIC ANALYSIS OF THE MARSUPIAL FAUNA OF PARAGUAY: WHERE THE ATLANTIC FOREST MEETS THE CHACO**

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Estimates of biodiversity in the Neotropics are still poorly understood. This is particularly true for small marsupials, even in the better known areas and countries of the Neotropics. Within South America, Paraguay is among the most poorly understood biological region, although it was among the first to be explored by naturalists in the late 18th century. As a consequence, the documented ranges for many species actually end at Paraguay's political boundaries. To address this problem a revision of the marsupial fauna of Paraguay has been conducted with the aim of clarifying the species which are found in the country, their distributions, and their richness per bioregion. This revision has included the study of nine museum collections, various private collections, and multiple personal field expeditions. Using Geographic Information Systems (GIS), collecting localities were superimposed on Bioregions creating distribution maps for 19 species of marsupials now known to occur in the country. As a consequence of this revision, the first records for *Monodelphis kunsii*, *Gracilinanus microtarsus*, *Micoureus constantia*, *Philander opossum*, and an unidentified *Gracilinanus* sp have been documented for Paraguay. Most species have strong affinities to specific biogeographic units. Furthermore, the clarification of distributions has allowed the testing of the hypothesis that the Rio Paraguay and the Humid Chaco bioregion act as barriers or filters for small mammal fauna. The Atlantic Forest has a much larger diversity than other bioregions in the country. I suggest that the apparent dichotomy between the east and the west in Paraguay is due not to the presence of the Rio Paraguay per se, but rather to the existence of the Humid Chaco. This type of study helps to better understand the natural history, distribution and taxonomy of marsupial species in Paraguay.

34 **BIOGEOGRAPHY OF COMMON DOLPHINS (GENUS *DELPHINUS*) IN THE SOUTHWESTERN ATLANTIC OCEAN**

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35 COMMENTS ABOUT THE DISTRIBUTION AND MORPHOLOGICAL VARIATION OF *VAMPIRISCUS NYMPHAEA* IN COLOMBIA

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The genus *Vampyriscus* comprise three species: *V. bidens*, *V. brocki* and *V. nymphaea*, all these species are found in Colombia. The distribution of *V. nymphaea* extends from western Ecuador to Nicaragua, in Colombia its distribution is known in the Pacific Region, although it has raised the possibility of be present in the Caribbean region and interandean Valleys, but these records may correspond to misidentified specimens or records without voucher specimens. With the objective of elucidate the distribution of *V. nymphaea* in Colombia and its morphological variation, we examined specimens deposited in Colombian collections and supplemented our observations with data from databases of North American collections and with records in literature that include voucher specimens. All specimens conform closely with descriptions in literature, no individual variation was found and the lack of material limits the analysis of geographic variation. However, we present a detailed description of the species and comments about the morphological variation detected. We drew a map with the localities recorded and we concluded that the distribution of *V. nymphaea* in Colombia covers the Pacific and Caribbean regions and the lower valley of Cauca river, this distribution coincide with the biogeographic region of Chocó-Magdalena, including the lowlands of Sinú-San Jorge district and possibly toward forested lands at south and southeastern of Nechí district, these regions are known for connecting elements of biotas from west and east of the Andes.

36 DISTRIBUTIONAL ANALYSIS OF CRICETIDAE (RODENTIA) IN AMAZON ENDEMIC AREAS INSIDE THE PARÁ STATE, BRAZIL

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Five of the eight recognized Amazon endemic area based on terrestrial vertebrate studies are represented in Pará State, Brazil: Belém, Xingu, Tapajós, Rondônia and Guiana. However, studies to evaluate rodent distribution on these areas are poor. To understand this distribution, we examined all Cricetidae specimens (skin and cranium) deposited in the mammal collection of the Museu Paraense Emílio Goeldi, and determinate their distribution inside the Pará State through the geographical coordinates obtained from the locates available in the specimen label and the museum registry book. These data allow us to make distributional maps in ARCGIS9.1 program, and identify sample lacks into the State. *Holochilus sciureus* are distributed in Belém and Xingu endemic areas and Marajó Island; *Nectomys melanius* in all endemic areas and Marajó Island; *Oxymycterus amazonicus* in Xingu and Tapajós; *Euryzomys macconnelli* in all areas except Rondônia; *Hylaeamys megacephalus* in all areas; *Hylaeamys yunganus* in Belém and Rondônia; *Necomys lasiurus* in Belém and Tapajós; *Neacomys spinosus* in Xingu, Tapajós and Rondônia; *Neacomys paracou* and *Oligoryzomys cf. fulvescens* in Guiana; *Oligoryzomys cf. microtis* in Belém, Xingu, Tapajós and Marajó Island; *Oecomys bicolor* in all areas except Belém; *Oecomys paricola* in Belém; *Oecomys roberti* in Belém, Tapajós and Rondônia; *Oecomys auyantepui*, *Oecomys trinitatis* and *Oecomys rex* in Xingu and Guiana; *Rhipidomys emiliae* in Belém and Xingu; *Rhipidomys nitela* in Xingu, Tapajós and Guiana. *Rhipidomys leucodactylus*, *Sigmodon alstoni* and *Zigodontomys breviceaudata* were expected to occur in these areas, but we didn't find it in our sample, probably because their area of occurrence, Guiana, is under sampled. We concluded that there is no distributional pattern of the cricetid specimens in relation of the recognized Amazon endemic areas and that the largest Amazonian rivers don't constitute a geographical barrier to these species. More studies with other rodent groups are needed to confirm our hypothesis.

37 FIRST RECORD OF A *NIVIVENTER LANGBIANIS* IN EASTERN CAMBODIA

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A *Niviventer* sp. was captured with Sherman LFA traps set up on the ground at a subtropical evergreen broadleaved forest patch along a canal surrounded by deciduous dipterocarp forest in Mondulkiri Province, eastern Cambodia in August, 2008. In Cambodia, *N. langbianis* has been only found on Cardamom Mountains of southwestern part of the country so far. This is a first record for eastern Cambodia. The upper part was orange-brown with dark brown spines and long guard hairs; the under part was white and tail was monocolored dark brown without hairs at the tip. In Cambodia, three *Niviventer* species are known to occur: *fulvescens*, *langbianis*, and *tenaster*. The tails of *N. tenaster* are bicolored; the tails of *N. fulvescens* are usually monocolored, but often bicolored. We identified the voucher as *N. langbianis* by different pad pattern of hind feet between *N. langbianis* and *N. fulvescens*. *N. langbianis* is described as having tuft of tails at tail tips from references, but this character did not found from the voucher. *N. cremoriventer* is usually undistinguishable from *N. langbianis* in terms of outer appearance, although they do not overlap in range. Exact identification will be confirmed after skull examination.

38 GEOGRAPHIC VARIATION IN SKULL AND MANDIBLE SHAPE AND SIZE IN *CALUROMYS PHILANDER* (DIDELPHIMORPHIA: DIDELPHIDAE)

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Caluromys philander has a distribution that includes Venezuela, Trinidad and Tobago, Guyana, Suriname, French Guyana, eastern Bolivia and Brazil and currently has four valid subspecies (*C.p. affinis*, *C.p. dichurus*, *C.p. philander* and *C.p. trinitatis*). To assess geographic variation in *C. philander* we examined 268 adult specimens (137 males and 122 females) from 68 localities in 5 countries.

Localities were grouped based on location and samples sizes from geometric morphometric analyses. We placed 29, 36, 22 and 14 landmarks in digital images of the skull in dorsal, ventral and lateral views and of the mandible, respectively. Size sexual dimorphism was detected only in the Guyana+Suriname populations in the skull and mandible and in the Pará/Amapá sample, in the skull. Shape sexual dimorphism was detected only in the Pará/Amapá (skull and mandible) and the southeastern Brazil samples (mandible). Therefore, due to the small size and shape dimorphism, sexes were pooled in all subsequent analyses. Analyses of Variance (ANOVA and MANOVA) showed significant size (Guyana+Suriname populations in all views) and shape differentiation (southeastern Brazil samples in all views) between populations. Roughly, in decreasing order of size they can be ordered as follows: French Guyana+Suriname > Pará/Amapá > Amazonas > Central west Brazil > Venezuela > Trinidad > Southeastern Brazil > Northeastern Brazil. The population from Trinidad (*C.p.trinitatis*) showed little overlap with others in both skulls and mandibles views, and in general is characterized for having a wider and shorter skull. The southeastern Brazil populations (*C.p.dichurus*) showed no overlap as well with all other populations, and are characterized by narrow braincases and frontal bones. These results indicate marked morphological discontinuities between some of the analyzed populations, particularly the southeastern Brazilian populations (mainly) and Trinidad samples, that merit a taxonomic reevaluation.

39 **GEOGRAPHICAL DISTRIBUTION AND DIVERSIFICATION IN SOUTH AMERICAN OCTODONTID RODENTS (RODENTIA, CAVIOMORPH)**

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The Octodontidae is a characteristic family of rodents inhabiting South American aridlands and scrublands. The octodontids date back to late Miocene with a major diversification during the Plio-Pleistocene. Is an ecomorphologically diverse group, composed of 13 species, with their geographical ranges extending along both sides of the Central-Southern Andes. In this presentation we propose a biogeography hypothesis for their major clades and explore the evolutionary history of their ecological characters (e.g. modes of life). We used a phylogeny of 11 Octodontids. The distributional ranges were estimated from Nature Server Database and geographical regions were based on WWF Ecoregions. We used DIVA to identify putative ancestral areas for each node. This, together with the divergence time estimated for this group, served to compare with geologic and climatic events, such as Andean uplift, and major climate changes from Plio-Pleistocene to Holocene. Parsimony ancestral reconstruction for ecological character was performed using Mesquite. Our results show that the ancestral area (i.e. ecoregions) for the Octodontids includes: Northern Monte, Mediterranean shrubland, central Puna and Andean steppe. Two vicariant events, related with the Andean uplift occurred during its evolution. The first one split two clades, separating species of restricted lowland areas of Monte from Chilean and high mountains species of Argentina. The second event could be related with the formation of high altitude habitats generate for the paulatine Andean uplift, splitting Chilean species from species that inhabit the Bolivian and Argentinean Puna. Divergence of Chilean octodontids was characterized by more recent dispersion events. Terrestrial habits are suggested as the ancestral character whereas fossorial habits could be associated to "new" habitats which emerged after the Andean uplift. We highlight the role of the Andes associated and environmental changes in the biogeography and ecology of this lineage (Partially supported by CONICET (PIP 5944) and AGENCIA (PICT 1176).

40 **INTER AND INTRA GENETIC BIODIVERSITY IN SOUTH EAST ASIAN RODENTS : NEW INSIGHTS FOR THEIR CONSERVATION**

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Southeast Asia has a high level of mammal endemism and the highest number of threatened and data deficient mammal species. The first aim of our communication will be therefore to present first data on a biodiversity inventory of the Murine rodents (Rattini group) from this region based on molecular markers. Our second aim will be to present original data concerning the intraspecific genetic structure of some rare and threatened South East Asian mammals species (the newly described *Laonastes aenigmamus* and *Leopoldamys neilli*) endemic to karst habitats. Our results evidenced a high geographic structure of the genetic diversity of these two species. The observed highly divergent genetic lineages would have to be considered as distinct evolutionary units or Management units. These results are essential for the best conservation issues of species endemic to karsts and to South East Asia in general. We therefore evidence that South East Asia is a biodiversity hotspot not only on the interspecific but also on the intraspecific point of view.

41 **LATITUDINAL DISTRIBUTION OF MAMMALS IN COASTAL LOMAS, PERUVIAN AND ATACAMA DESERT**

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Coastal Lomas ecosystems are like islands of vegetation separated by a hyper arid matrix in the Peruvian and Atacama Desert. Their mosaic-like distribution is determined by fog distribution which depends mainly of topography of the Coastal Range. These ecosystems have been studied by botanists since 18th Century; however, knowledge of their fauna is limited. Most importantly, the effect of lomas distribution on mammal species turnover and similarities has not yet been studied. We used clustering methods and resampling procedures to detect mammal assemblages in Lomas of Peru in a latitudinal gradient. Additionally, we used Moran's index and

Mantel's test to characterize the spatial auto-correlation and the effect of geographical distance and extension of lomas on index values. Multivariate analysis combined with resampling procedures revealed the existence of five distinctive mammal clusters. We conclude that the set of mammal species from Lomas of Peru exhibits a non-random geographical distribution, displaying an ordered geographical pattern related with latitude. We discuss the role of ENSO events in turnover of mammal species and connection of Lomas ecosystems.

42 **MAMMAL RICHNESS AT THE BIOGEOGRAPHIC PROVINCE OF SIERRA MADRE ORIENTAL, MÉXICO**

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Geographic Information Systems (GIS) and predicting species distribution models are useful in preserving species. Here, we use niche modeling for mammals and gap analysis to compare the potential mammal richness within the eight protected areas of Sierra Madre Oriental (SMO) México, located along the eastern Mexican states, Coahuila, Nuevo Leon, Tamaulipas, Guanajuato, San Luis Potosi, Hidalgo, Queretaro, Puebla and Veracruz in order to identify if the potential distribution areas of mammals are located within the biogeographic province of Sierra Madre Oriental. We use 74 species and 5,099 geopositioned data to generate the predicting distribution models with the Genetic Algorithm for Rule-set Prediction (GARP), then places with the highest richness were located so that these could be compared with the protected areas. Results reveal that six of the eight protected areas in SMO have the highest richness: Cumbres de Monterrey, Nuevo Leon, Sierra del Abra Tanchipa, San Luis Potosi, Sierra Gorda, Queretaro, Sierra Gorda de Guanajuato, Guanajuato, Barranca de Metztitlan, Hidalgo and Cuenca Hidrografica del Río Necaxa, Hidalgo and Puebla. It is important to consider that models reveal potential diversity sites in the central region of SMO which are not included in protected areas. Keywords: gap analysis, mammals, protected areas, distribution, Sierra Madre Oriental.

43 **MAMMALS OF THE MID KWANZA RIVER BASIN (ANGOLA): DIVERSITY, LANDSCAPES AND CONSERVATION ISSUES**

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After three decades of civil war in Angola, which impacted landscapes and their faunas and floras, we have recently started a survey of the mammal diversity of the mid Kwanza river basin. Nearly all material evidence regarding the mammal diversity from Angola corresponds to pre-war records and this is no exception for the mid Kwanza region. This ongoing research enterprise thus offers a unique opportunity to evaluate the effects of this impact in this specific region of Angola. The mid Kwanza landscapes are broadly represented by the Miombo savannas. Based on satellite images and georeferenced evidence gathered during two expeditions to a central area of the Kwanza region, the vegetation types were sorted into six classes from dense-shadow forest to herbaceous Miombo. Preliminary mammal surveys conducted in these different vegetation classes so far revealed the presence of 36 wild mammal species: Orycteropodidae: *Orycteropus afer*; Manidae: *Manis* sp.; Macroscelididae (indet.); Procaviidae: *Heterohyrax* cf. *brucei*; Elephantidae: *Loxodonta africana*; Galagidae: *Otolemur crassicaudatus*; Cercopithecidae: *Chlorocebus pygerythrus*, *Papio cynocephalus*, *Papio* cf. *ursinus*, and *Miopithecus talapoin*; Nesomyidae: *Cricetomys* sp.; Sciuridae (indet.); Bathyergidae: *Cryptomys* sp.; Hystricidae: *Hystrix africaeaustralis*; Thryonomyidae: *Thryonomys swinderianus*; Leporidae: *Lepus* cf. *saxatilis*; Pteropodidae: *Epomophorus wahlbergi*; Nycteridae: *Nycteris* cf. *grandis*; Rhinolophidae: *Rhinolophus clivosus*; Hipposideridae: *Hipposideros ruber*; Vespertilionidae: *Eptesicus* sp. and *Nycticeinops schlieffeni*; Molossidae: *Mops* cf. *condylurus* and *Chaerodon* sp.; Felidae: *Leptailurus serval*, *Panthera pardus*, and *Panthera leo*; Viverridae: *Genetta* sp.; Herpestidae: *Atilax* cf. *paludinosus* and *Ichneumia albicauda*; Suidae: *Phacochoerus africanus* and *Potamochoerus larvatus*; Hippopotamidae: *Hippopotamus amphibius*; Bovidae: *Syncerus caffer*, *Kobus ellipsiprymnus*, and *Philantomba monticola*. Pre-war records from Angola are currently being assembled and mapped, together with our recently sampled material from the Kwanza region. This will allow the development of biogeographical and ecological studies contrasting these data related to the two quite different environmental contexts of pre and after war scenarios.

44 **PATTERNS OF ECOLOGICAL DIVERSITY IN NEOTROPICAL PRIMATES (PLATYRRHINI)**

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We studied the spatial variation in ecological diversity in neotropical primates and the relationship between those patterns and primate species richness. Using information from bibliography we elaborated a database which contains ecological attributes from the 127 species. We selected features related to 1) activity patterns, 2) vertical use of space, 3) home range, 4) diet, 5) type of locomotion, 6) type of vision, 7) body mass. Using the Gower's Index we obtained a dissimilarity matrix, from which we elaborated a dendrogram of the ecological relationships between neotropical primates species and we determined functional-ecological groups. Using the distributional maps available from Nature Serve we calculated two measures of ecological diversity per cell (based on a grid map of America at a resolution of $1^\circ \times 1^\circ$): 1) the number of functional-ecological groups and 2) the average ecological diversity per species pairs. Finally, we elaborated a map of species richness that we compared with maps obtained for each ecological variable.

45 **POTENTIAL AREAS OF CONFLICT BETWEEN *NEOVISON VISON* AND THREATENED PREY SPECIES IN THE IBERIAN PENINSULA**

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The American Mink (*Neovison vison*) is an invasive species that has been reported to have a negative effect on populations of several species in Europe and South America. This species prey on several terrestrial vertebrate species, among them *Rana iberica*, *Salamandra salamandra*, *Galemys pyrenaicus*, *Arvicola sapidus* and *Lacerta schreiberi*, which are considered as Vulnerable or Nearly Threatened either internationally (IUCN red list) or at national level (Spanish red list). They are all related to riverine habitats and have been reported to be prey for the American mink or considered as potential prey in the Iberian Peninsula by specialists. Presence/absence data for *Neovison vison* and prey species was digitized at 10x10 km resolution from the Spanish atlas of mammals (2007) and amphibians and reptiles (2004). A set of 41 environmental variables and 23 land use variables were used to train the models. All species were modeled separately using Stepwise Binary Logistic Regression and applying the favourability function developed by Real et al. (2006). The favourability model of each prey species was overlaid with the American Mink model. A conflict area was defined as the one with high risk of native population decline or local extinction due to mink presence. Therefore they were considered to have the following characteristics: 1) presence of the vulnerable or threatened prey species; 2) low favourability for that prey species; and 3) high favourability for the American Mink. This methodology helps to identify the most vulnerable areas for the target prey species regarding a specific threat (here, the expansion of the American Mink) which can be useful to focus conservation or predator control efforts.

46 **PRELIMINAR DATA ON SPATIAL DISTRIBUTION OF *TRYPANOSOMA CRUZI* IN SYLVATIC MAMMALS FROM SEMI-ARID CHILE**

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One of the most relevant aspects in the maintenance of vector-borne diseases is the rate of effective contacts among vectors and susceptible hosts. This probability of contact depends, among others factors, on spatial distribution, behaviour, and host/vector abundances. One approach to understand how these factors are linked is using geographical information systems (GIS). GIS are useful tools to describe the distribution of parasites, vectors and hosts, as well as to quantify its relationship, and to generate disease risk maps. The wild vector of Chagas disease in north-central Chile, *Mepraia spinolai*, is found in arid and semiarid environments, such as stony areas close to mammal burrows or bird nests, bromeliads and occasionally nearby dwellings or human constructions. In the present study, we examine the spatial distribution of *Trypanosoma cruzi* infection in native mammal hosts and its association with populations of the wild vector at Las Chinchillas National Reserve, a protected wildlife area of north-central Chile. We trapped mammals and vectors during the summer of 2009, and each point of capture was geo-referenced. The proportion of infected mammals infected was detected by PCR assays to amplify *T. cruzi*-DNA minicircles. The distribution of infected animals was evaluated by mammal species and proximity to vector colonies. In addition, we examined the presence of clusters of infected mammals in the study area. Overall, prevalence reached 21.6%, with four out of seven species carrying the parasite. Infected mammals were captured as far as 890 m from *M. spinolai* colonies. Results revealed a cluster in only one mammal species, *Phyllotis darwini*, Moran's $I = 0.055$; $Z = 2.13$; $p < 0.05$. A posteriori analysis is performed to assess if this aggregated pattern is maintained for this species, which corresponded to the most abundant one during the research period. Supported by: CONICYT PBCT/PSD66, FONDECYT 1085154 & 1070960

47 **RICHNESS OF SMALL MAMMALS IN THE CENTRAL ANDES OF ARGENTINA: ENVIRONMENTAL AND GEOGRAPHIC CONSTRAINTS**

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Interest in species richness patterns along altitudinal gradients has increased in the last decade. Among predominant patterns we can mention: a monotonic decrease in richness with increasing elevation and a hump-shaped pattern where richness peaks at an intermediate elevation. Several hypotheses about which environmental factors are responsible for species richness have also been made, for example: richness will decrease with a diminishing temperature and will increase with an increment in precipitation or show a hump shape pattern (as in most arid mountains). Other factors that can influence altitudinal richness gradients are geographic constraints (mid-domain null models) and historical evolution of lineages in the area.

We examine the shape of Andean small mammal's altitudinal gradient and the role of climatic parameters in determining this gradient.

Four altitudinal transects (from 32° S to 35°S) were sampled (from 1300 m to 3300 m, at an interval of 500 m); 150 Sherman like traps were set at each site, during 3 consecutive nights. Climate data included 4 variables (Annual Mean Temperature, Temperature seasonality, Annual Precipitation, Precipitation seasonality) obtained from WorldClim database. Mid domain null models were performed using Range Model. To assess the best model which explains richness altitudinal gradients we performed generalized linear model (GLM). Models were selected according Akaike information criteria.

Our results show that environmental variables (temperature and precipitation) explain more than 85% of species richness along elevation gradients. Furthermore, richness shows a negative relationship with temperature ($R: 0.3546$, $p: 0.005603$) and a positive

relationship with precipitation ($R: 0.5858$, $p: 8.417e-05$). On other hand our data suggests that geographic constraints do not play a major role in structuring small mammal assemblages along the Andes. The inverse relationship of richness along elevation supports the long history of the sigmodontine rodents in the Andes.

48 **SÃO FRANCISCO RIVER: BARRIER OR SECONDARY CONTACT ZONE FOR NORTHEASTERN ATLANTIC FOREST SMALL MAMMALS?**

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The northern portion of the Atlantic Forest (AF), the Pernambuco Endemism Center (PEC), is recognized as an important center of endemism for several taxa, and is separated from the remaining AF by São Francisco River (SFR). Contrary to the main AF, widespread species as *Philander frenatus* and *Marmosops incanus* are not present in PEC. *Cerradomys* species have their limits defined by the river, and phylogeographic studies indicated its basin as a divergence region for populations of *Akodon cursor*, *Calomys expulsus*, *Didelphis aurita* and *Rhipidomys mastacalis*. From January/2008 to July/2009 small mammals were surveyed in 13 localities in PEC ($6^{\circ}48'21.4''S$ to $10^{\circ}54'34.35''S$), totaling 24.800 trap-nights. Vouchers were karyotyped and deposited in the Coleção de Mamíferos da UFPE as skins, partial skeletons and tissues, and distribution maps were built. Twenty measurements of 497 skulls of *A. cursor*, covering the occurrence area from the species in AF, were also analyzed through discriminant analyses. Ten marsupials (*Caluromys philander*, *Cryptomys agricolai*, *Didelphis albiventris*, *D. aurita*, *Gracilinanus agilis*, *Marmosa murina*, *Metachirus nudicaudatus*, *Micoureus demerarae*, *Monodelphis americana* and *M. domestica*) and 14 rodents (*Akodon cursor*, *Calomys* sp., *Cerradomys languthi*, *Holochilus sciureus*, *Hylaemys oniscus*, *Necomys lasiurus*, *Necomys rattus*, *Oecomys bahiensis*, *Oligoryzomys nigripes*, *Oxymycterus angularis*, *Rhipidomys mastacalis*, *Thrichomys laurentius*, *Phyllomys blainvillii* and *Galea spixii*) were recorded. *Necomys rattus* and *C. languthi* occur only on the left margin, a new karyotype, related to *R. mastacalis*, and an undefined *Calomys* species, based on morphological cranial differences, were also registered. *Akodon cursor* cranial measurements indicate a differentiation between PEC and southern AF populations ($p < 0.01$). In this way, we can suggest that PEC exhibits a particular small mammal fauna and that the SFR might be considered as a barrier. The hypothesis of a secondary contact zone, with taxa that evolved elsewhere needs further analysis. Support: WWF, CAPES, CNPq, FAPERJ, FACEPE, UFPE e UERJ

49 **SMALL MAMMALS OF THE ATLANTIC CONTINENTAL SECTOR OF CENTRAL PATAGONIA: TAXONOMY AND GEOGRAPHIC DISTRIBUTION**

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In extraandean Patagonia diverse environments are found, from shrubby formation of the northeastern to the arid steppes of the south. The knowledge about the small mammal assemblages in vast areas of this region is still very poor. The aim of this contribution is to improve the knowledge of small mammal assemblages that occur throughout the Atlantic sector (ca. 30 km from the coast line) of Chubut province (42° - $46^{\circ}S$). The field work was carried out in 7 localities: Puerto Lobos ($42^{\circ}00'02''S$, $65^{\circ}04'10''W$), Bahía Cracker ($42^{\circ}57'02''S$, $64^{\circ}28'45''W$), Bajo de los Huesos ($43^{\circ}11'42''S$, $64^{\circ}51'52''W$), Isla Escondida ($43^{\circ}41'46''S$, $65^{\circ}20'36''W$), Cabo Raso ($44^{\circ}20'22''S$, $65^{\circ}14'59''W$), Puerto Piojo ($44^{\circ}53'00''S$, $65^{\circ}40'19''W$) and Pico Salamanca ($45^{\circ}24'32''S$, $67^{\circ}24'58''W$). In these localities 200 traps (Sherman) were used, remaining in the field between 2-5 nights in each locality. We captured 324 specimens, totaling at least 13 species of small mammals: 2 of marsupials, 9 of sigmodontine rodents and 2 of caviomorph rodents. The taxonomic structure reflects a change between northern and southern assemblages, coherent with the two major floristic units (FU) present in the area: Monte Phytogeographic province (Pp) and Patagonica Pp. Monte Pp (until $44^{\circ}S$) is represented by an exclusive species: *Akodon molinae* (5,98% [percentage of capture in each FU]), another species captured in this FU were *Eligmodontia* sp. (42,66%), *Akodon iniscatus* (25,78%), *Graomys griseoflavus* (19,65%), *Thylamys pallidior* (4,23%), *Reithrodon auritus* (1,70%), *Calomys musculus* (0,85%) and *Ctenomys* sp. (0,85%). In the Patagonica Pp were exclusively captured *Abrothrix olivaceus* (17,07%), *Phyllotis xanthopygus* (11,21) and *Lestodelphys halli* (1,46%), together with *Eligmodontia* sp. (29,30), *G. griseoflavus* (14,63%), *R. auritus* (9,26%), *A. iniscatus* (9,26%), *C. musculus* (3,41%), *Microcavia australis* (1,95%), *Ctenomys* sp. (1,95%) and *T. pallidior* (0,48%). The changes between the small mammal assemblages of these two Pp seem to be tie with latitudinal and altitudinal gradients that influenced the geographic distribution of taxa.

50 **SOUTH AMERICAN MAMMAL DIVERSITIES AND DISTRIBUTIONS DURING THE MIOCENE**

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The Miocene Epoch was a time of major change in the composition of South American terrestrial mammal faunas. Rodents, which dispersed from Africa by the earliest Oligocene, and primates, which reached South America by the latest Oligocene, diversified morphologically and taxonomically during the Miocene. Endemic ungulates, which reached their peak diversity in the middle Cenozoic, gradually declined in diversity during the Miocene, though many species remained abundant. Xenarthrans reached their peak diversity during this interval, and marsupials persisted at moderate diversity. The end of the Miocene witnessed the early stages of the Great American Biotic Interchange, essentially the final step in the modernization of terrestrial mammal faunas. Our current understanding of Miocene faunal patterns is primarily based on data from the southern part of South America. The Neotropics are relatively poorly sampled – despite representing nearly 80% of South America's surface area – although this situation has gradually improved in

recent years. The earliest Miocene is perhaps the most poorly sampled interval. Excellent faunas are known from Argentina and Chile, but none has been identified north of 35° S latitude. Moreover, these faunas may be flanked by significant temporal gaps in the fossil record. In contrast, late early Miocene faunas, some extremely rich, are present in Argentina, Bolivia, and Chile. These have permitted assessments of broad biogeographic patterns during this interval. The middle Miocene includes the best sampled Neotropical Miocene fauna, La Venta (Colombia), which is contemporaneous with a diverse fauna from Bolivia and perhaps others from Argentina, Chile, Ecuador, and/or Peru. Slightly older and younger middle Miocene faunas occur in Argentina, Bolivia, and Chile, many inadequately characterized. The late Miocene is represented throughout South America, although even the best sampled faunas require additional taxonomic investigation.

51 THE BIOGEOGRAPHICAL HISTORY OF CINGULATA (MAMMALIA, XENARTHRA) AND THE GREAT AMERICAN BIOTIC INTERCHANGE (GABI)

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The latest finds from northern South America, have brought about a new interpretation of the evolutionary and biogeographical history of the major groups of Cingulates on and around the GABI. This can be summarized in the following points: 1) unfortunately, there are still only poor records of dasypodids in the Pliocene of Northern South America, but the first remains of *Propaopus* have been exhumed from San Gregorio Formation (late? Pliocene), Venezuela; 2) morphological evidence suggests that the glyptodonts from the middle Miocene-Pliocene of northernmost South America (Colombia and Venezuela) do not belong to *Propalaeohoplophorinae*, but actually represent the first stages in the cladogenesis and later dispersion of the *Glyptodontinae*, and they represent the oldest records for this subfamily. So, the *Propalaeohoplophorinae* were restricted to southernmost South America; 3) the oldest records of *Glyptodontinae* in southernmost South America (latest Miocene and Pliocene), and partially coincide with the peak of the "age of southern plains", that could have acted as a "biogeographical corridor"; 4) during the Pliocene, the glyptodontines (probably together with the "glyptatelines") passed onto Central and North America. At present, *Glyptotherium* and *Pachyarmatherium* are the only genera recognized in those areas; 5) the presence of *Glyptotherium* and *Pachyarmatherium* in the latest Pleistocene of Venezuela suggests a re-entry into South America at some point during the late Pleistocene, probably associated with "biogeographical corridors" formed during glacial periods; 6) a similar bidirectional migratory pattern has been observed for the pampatheriids, they migrated into Central and North America. Later, this clade re-entered into South America, following two alternative routes, one "para-Andean", and another parallel to the eastern coast. The cyclical climatic-environmental fluctuations occurred during the Pleistocene would have triggered speciation processes that gave rise to endemic South American species.

52 THE ELEVATION GRADIENT OF RODENT ENDEMISM ALONG THE EASTERN SLOPES OF THE ACONQUIJA MOUNTAIN RANGE, NORTHWESTERN ARGENTINA

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During the last four years I studied small mammal fauna along elevation gradients of mountain ranges in NW Argentina. The results of the direct trapping protocol used for terrestrial small mammals, revealed a hump shaped pattern of species richness along elevation. Among the several hypotheses proposed to explain this pattern, that one dealing with rates of speciation lie at the core of evolutionary process. Rodents, as the more diverse group of mammals are frequently the most important part of small mammal assemblages concerning to the number of species. Additionally, rodents have shown to form quite conspicuous assemblages and therefore, seem to be particularly useful to analyze endemism patterns on mountain slopes. The concept of endemism implies geographic restriction of a taxon to a particular area; thus it is relative to geographic area under study. In this study, I considered as endemic species those which are restricted to the Aconquija and adjacent Cumbres Calchaquies mountain ranges. For this study I compiled distributional record of rodents inhabiting the eastern slopes of these mountain ranges from specimens deposited in museums and direct trapping. Then I listed species within 500m elevation belt for assess the variation of richness and endemism along the elevation gradient (500-4500m). Endemism was expressed either as the number of endemic species in each elevation belt or as the percentage of endemic species relative to the total species number in that belt. I recorded 37 species of rodents, of which 11 are endemic. Species richness showed a peak at the 1000-1500 elevation belt. The elevation pattern of endemic species was hump-shaped. For the raw number of endemic species per elevation belt the peak was located between 1500-2500m. For the percentage of endemic species per elevation belt the peak was located at the 2000-2500 elevation belt.

53 THE INSECTIVOROUS MAMMALS OF VIETNAM

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The representatives of two recent orders (Soricomorpha and Erinaceomorpha) of insectivorous mammals distributed in Vietnam. In total, 23 species of this group currently known in the country. Shrew *gymnure Neotetracus sinensis* occurs at the highlands of northern Vietnam, whereas short-tailed *gymnure Hylomys suillus* distributed through all country. Distribution of Vietnamese talpids are scattered in the montane regions. Most of species (*Euroscaptor longirostris*, *Scaptonyx fuscicaudus*, *Mogera latouchiei*) distributed in the northern provinces only. Small-toothed mole *Euroscaptor parvidens* found in the highlands of central and southern Vietnam. Seven genera (*Crociodura*, *Suncus*, *Blarinella*, *Chodsigoa*, *Episoriculus*, *Anourosorex*, and *Chimarrogale*) of soricids occur in Vietnam.

The species of Soricinae subfamily except *Chimarrogale himalayica* found only in north of Vietnam. Crocidurinae species also distributed in central and southern parts of country. Eight species of largest mammalian genus *Crocidura* are currently recorded from Vietnam. Some of them are widely distributed SE Asian shrews (*C. attenuata*, *C. fuliginosa*, *C. indochinensis*, and *C. wuchihensis*), another recently described species known as endemics of Vietnam (*C. kegoensis*, *C. zaitsevi*, *C. sokolovi*, and *C. phuquoensis*). The endemic species of insectivorous mammals distributed in montane areas of northern and central continental Vietnam.

54 ZOOGEOGRAPHY AND DIVERSITY OF THE MAMMALS IN VENEZUELA, A GUIDE FOR CONSERVATION OF THE BIODIVERSITY

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Zoogeography and diversity of the mammals in Venezuela, a guide for conservation of the biodiversity Madi, Yamil (*) 1 2; Linares, Omar 2; Rivas, Elmara 2; Vázquez, José Gonzalo 1; Martínez, Jean Carlos 1 2; León, Adrian 1; Rodríguez, Luzbranif 1; Gil, Nereida 1; Henríquez, Arelis 1; Delgado, Mariangelica 1 Santander, Juan Carlos1. 1. Ministerio del Poder Popular para el Ambiente. (yamiluk@yahoo.co.uk) 2. Universidad Simón Bolívar (USB). Words: Biodiversity; Mammals; Zoogeography; GIS Thematic: biodiversity, conservation, taxonomy Summary With the purpose to produce a tool useful as a base to diagnose the situation of biodiversity in Venezuela using as a guide to the mammals since their action spheres are wider than other equivalent taxa, We compiled, put up to date and systematize the taxonomic information, attributive and of dispersion areas for each species which generated (produced) cartographic information with distribution range of themselves and from the analysis as a whole of these ranges we get a geographic representation of the distribution pattern of the richness of species (S) for three hundred sixty one (361) species represented at 1:2.000.000 with pixel of 10x10 km. and a list with the three hundred eighty (388) proposed species for the country in the last six decades which include, among other things: conservation state location by bioregions, taxonomic inconsistencies, disagreements about presence or absence in national territory and proposals of presence on function of zoogeographic variables. This tool that can be submitted to hypothetical tests and integrated, as it is, to geographic information system (GIS) which will permit the study, monitory and diagnoses such as of the classed of mammals as well as of the biodiversity in Venezuela by means of different techniques such as multitemporary studies of changes related to the hypothetical richness pattern proposed or the spatial covering grade estimation about different areas of species richness (S), from those legal figures that offer direct protection to fauna already done. The information will polish as we work at bigger scales, we annexes the distribution of other kinds, the knowledge of biodiversity progress and the practical and theoretical tools improve for analysis and interpretation. The results will be put up to date in accordance with taxonomic changes and spatial temporal dynamic of patterns associated to the richness of species (S).

CONSERVATION

55 CAPYBARA MANAGEMENT IN VENEZUELA: COMPARISON OF TWO CONTRASTING RANCHES

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The capybara, *Hydrochoerus hydrochaeris*, is an important wildlife species in Venezuela, due to the value of its dried meat during Lent. In this study, we compared two populations of capybaras, using material collected during the annual slaughter: one located in a ranch with a simple water management system consisting of dykes (Hato El Cedral: the average ranch), and one with a sophisticated program of irrigation and the introduction of exotic, highly nutritious grass species (Hato Santa María: the special ranch). We found that primary productivity was higher in the special ranch, as well as N2 and other nutrient contents in the grasses. The average weight adult of male and female capybaras were not different between ranches, although total body length was greater in the average ranch. We then compared the residuals of the body weight-body length regression, a common index of condition, and found that the special ranch was significantly above the average ranch, i.e., capybaras there were in better condition. Age distribution is known to be affected by the management program but the age distributions of both ranches were similar. Litter sizes were not different between females of the two ranches, nor were the numbers of resorbed embryos. The maximum size attained by unborn fetuses was greater in the special ranch, i.e., they would be born heavier. The results suggest that the ranch with greater primary productivity leads to capybaras being born heavier and grow to be in better condition, though not of greater skeletal size.

56 COMMUNITIES, BORDER EFFECT AND METHODOLOGY IN MAMMALS IN FOREST FRAGMENTS FROM THE NORTH PARANÁ, BRAZIL

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In the state of Paraná, there are about 186 mammal species, from which at least 21 of them are in endangered. This way, the qualitative and quantitative loss of vegetal surrounding deprives the fauna from its habitat and puts in danger its survival towards the incapacity of maintaining viable genetically populations. This work aimed at identifying the species; collecting data about the community structure; investigating if there is any influence of border effects on the species and verifying the efficiency of the different methods

used. Eight monthly observations, during nine months, were done in four different forest fragments in the north of Parana. The methodology used is based on the search for evidences to identify these animals through their footsteps in sand portions, direct search by vestiges (feces, hair, regurgitation, footprints, vocalizations) and visualization of the animals in linear transects, in the surroundings and inside the forest. It was possible to identify thirteen mammal species from medium and large size included in six orders: Didelphimorphia, Cingulata, Primates, Rodentia, Lagomorpha, Carnívora. The structure of the community is structured so that, the animals avoid competition among themselves. The coexistence of these animals can be explained, by combining eating habits, activity schedule and forests extracts where they live. In relation to the border effect some species such as: *Cuniculus paca*, *Hydrochoerus hydrochaeri*, *Eira bárbara* e *Galactis cuja* look for the interior land, differently from other species. The applied methodologies presented different register numbers; however, they showed to be complementary. It is possible to conclude that any forest fragment must be preserved at any need, once that, it contributes to the maintenance of the species. Key words: mammals; forest fragments, species preservation.

57 **CONFLICT BETWEEN WILD CARNIVORES AND LIVESTOCK IN THE MEDITERRANEAN ECOSYSTEM OF CENTRAL CHILE**

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Conflict between people and wild carnivores is one of the most urgent issues worldwide, impacting humans (economic losses), wildlife (carnivore persecution and hunting) and ecosystems (carnivores are necessary to maintain functional equilibriums). In Chile, this conflict is evidenced by the high number of complaints received by the Chilean Agriculture and Livestock Service (SAG), mainly of attacks by Puma (*Puma concolor*) and Foxes (*Lycalopex griseus* and *L. culpaeus*). Our study consisted of an assessment of this conflict in six rural places in the Mediterranean ecosystem of central Chile (29°50'S - 34°15'S). We applied questionnaires (N=60) to evaluate conflict perception by farmers, and studied the diet of the carnivore assemblage, identifying undigested remains in 102 scats collected opportunistically. We inquired about livestock type, management practices and predation history. Livestock types present were goats, sheep, cattle and horses. Management practices were scarce, and herds were free ranging most of the year. Every surveyed household declared livestock losses to predation, 97,4% of respondents declared that carnivores affected them. Mainly by puma (28%) followed by foxes (27%). Diet analyses of dogs (N=7) presented the highest livestock consumption (40%), followed by foxes (N=27; 13%), puma (N=27; 9%) and small wildcats (N=41; 7%). All of the species studied showed a high consumption of exotic european hare (*Lepus capensis*), puma being the highest (81%) and dogs the lowest (30%). We conclude that the conflict between wild carnivores and farmers shows no relation to the low livestock presence in the diet. Further studies about other causes of livestock mortality and causes of conflict should be done.

58 **DECLINE OF LARGE MAMMALS IN PARAGUAY INFERRED FROM DISTRIBUTION PATTERN**

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From 1997 to 2001 an interviewing survey on large mammals was conducted at 358 locations throughout the country of Paraguay (406,750km²), asking local residents the presence and population trend. Extinction Ratio (ER = number of locations where the subject species is extinct / number of locations with information of the species) was about 20-40%, and higher in Eastern Region than in Western Region for the following six species once broadly distributed in both regions: *Myrmecophaga tridactyla*, *Puma concolor*, *Panthera onca*, *Tapirus terrestris*, *Pecari tajacu*, *Tayassu pecari*. ER tended to be high in the area where Forest Cover Ratio (FCR) was low, and ER was particularly high in the area with FCR under 20% for all the six species. For *Mazama americana* and *M. gouazoubira*, although ER was not high, Decrease Ratio (DR = number of locations where the population was decreasing / number of locations where the species occurred) tended to be high in low FCR areas. The results also suggest that, among the related species, *P. onca* is more susceptible to habitat alteration than *P. concolor*, *T. pecari* than *P. tajacu*, and *M. americana* than *M. gouazoubira*. The deforestation has been continued, and a survey on the current status is urgently required.

59 **DEMOGRAPHY OF OWL MONKEYS (*AOTUS AZARAI*) IN PILCOMAYO NATIONAL PARK (FORMOSA, ARGENTINA).**

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The conservation status of owl monkeys in Argentina is largely unknown. The only protected populations are found in Pilcomayo National Park in the Province of Formosa. We conducted a preliminary evaluation of the species in the park during 2007-2008. Our goals were to conduct a qualitative evaluation of the owl monkey population to quantify basic demographic parameters (group size and age structure) of it, and to compare it with the well-studied owl monkey population from Guaycolec Ranch, Formosa studied since 1997. Demographic data were collected from 16 social groups in the gallery forest along the Pilcomayo River and from 9 groups in patches of forest immersed within the park's savannahs. Individuals (n=86) were assigned to the different age classes (adult, juvenile, independent infant, or dependent infant) based on their relative size when compared to other members of the group. The groups ranged in size between 2 and 5 individuals. There were 16% of infants, 18% of juveniles and 59 % of adults. The remaining individuals (6%) were not classified. The groups in the forest patches tended to be smaller than those in the gallery forest (2.4 vs. 3.3 ind/groups), but there were no clear differences between the demographic parameters of the Pilcomayo population and the one in Guaycolec Ranch.

60 DIET AND HABITAT USE OF MANED WOLF IN A DISTURBED AREA OF SOUTH-EASTERN BRAZIL

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The maned Wolf (*Chrysocyon brachyurus*) is listed as "Vulnerable" in the Brazilian Red List. Habitat loss and fragmentation, invasion of exotic species, diseases, ecotourism and mining activities are among the main threats. Most previous studies have been carried out in relatively undisturbed areas, mainly in nature preserves. Few studies were based in unprotected areas where the species is more severely impacted by anthropogenic disturbances. Here the main objectives are to analyze the diet, the parasite infection and the habitat used by the species in a landscape where mining activities, urban areas, roads and burned fields occupy more than 30% of the land cover. Fecal samples ($n=95$) revealed a diet composed mainly by small mammals (16.21 % of items), particularly *Cavia* sp. and *Necromys lasiurus*, and by *Solanum lycocarpum* (12.23% of items). The vegetation cover of the places containing feces did not differ significantly of the study landscape as a whole. However, the areas containing the highest concentration of feces (=kernel nuclei), presented a higher than expected proportion of burned areas. This suggests that the maned wolf prefer burned fields, probably because they harbor greater abundance of granivore and folivore rodents, as has been observed elsewhere. The main parasites found in feces were of the *Acanthocephala* Phylum (80.95%) and of the *Trichuridae* family (78.57%). The infection of *C. brachyurus* by these parasites might be intrinsically linked to the diet, since invertebrates and rodents, respectively, are intermediate hosts of these parasites. The results indicate that although the study area is impacted and closely located to a densely populated urban center, it harbors a resident population of *C. brachyurus* which presents a diet similar to that found in less disturbed places, indicating that the maned Wolf has a high capacity of adaptation to environments disturbed by man.

61 DIET AND SANITARY STATUS OF CANIDS AND FELIDS IN A SILVICULTURAL LANDSCAPE OF BRAZIL – PRELIMINARY RESULTS

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Agricultural activities usually reduce and fragment natural ecosystems. In addition, it increases the contact between wild and domestic animals, in especial canids and felids, and humans, what can result in competition for food and spread of parasites and pathogens. However, information about it is still scarce in the Neotropics. In this study we are analyzing dietary contents and endoparasites in feces from wild and domestic canids and felids in a silviculture landscape on Alto Paranapanema region, southern Sao Paulo, Brazil. From May 2008 to date, 172 scats have been collected from Canidae ($N=100$) and Felidae ($N=72$). The following Canidae have been found in the area: *Chrysocyon brachyurus*, *Cerdocyon thous*, *Lycalopex vetulus* and *Canis lupus familiaris*. The following Felidae have also been detected: *Puma concolor*, *Puma yagouaroundi*, *Leopardus pardalis*, *Leopardus wieddi*, *Leopardus tigrinus* e *Felis catus*. The following food items have been found: seeds (mostly from *Solanum lycocarpum* and *Syagrus romanzottiana*), rodents (hair, bones and jaws with teeth), crustaceans, fish (scales), insects (antennae, wings, mandibles), leaves and fruit pulps. Specific diets and niche overlap will be determined intra and inter families. Endoparasites will be determined for each species from fresh excrements' samples. This research aim to contribute to knowledge of illnesses dynamics and predation by domestic and wild canids and felids for wildlife conservation, mainly in agroecosystems, since these environments already constitute most of the landscape of the Neotropics and the World.

62 DIFFERENTIAL RESPONSE OF JAGUARS (*PANTHERA ONCA*) AND PUMAS (*PUMA CONCOLOR*) TO ANTHROPOGENIC LANDSCAPE TRANSFORMATIONS

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Jaguars and pumas are the largest felids of the American continent. They are similar in size and behavior, but pumas show larger distribution range and appear to be more resilient to human impacts. Our objective was to compare the response of both species to landscape characteristics in a highly modified environment, the Upper Parana Atlantic Forest, where both species had continuous distribution in the past. We used presence-only data collected through a monitoring program between 2002-2008 along the study area (106 jaguar and 241 puma points). Using Ecological Niche Factor Analysis (ENFA) and discriminant analysis, we characterized species-specific habitat requirements, built habitat suitability maps and examined interspecific differences in niche parameters related with landscape characteristics. Both species showed high dependence on native forest and habitat protection, and avoided highly modified environments and areas more accessible to humans. However, jaguars showed higher differences between their optimal habitat and the available landscape (ENFA-Marginality $M=2.584$) and lower tolerance to deviations from their optimal habitat (ENFA-Tolerance $T=0.644$) than pumas ($M=1.749$; $T=0.833$). Though their niches highly overlapped (Pianka's $O=0.751$), pumas presented a broader niche (std Levins' index: puma $B^*=0.681$; jaguar $B^*=0.544$) that resulted in a larger area suitable for pumas. All jaguar suitable areas were also suitable for pumas; however 54% of puma suitable habitat, characterized by higher fragmentation and less protection, was unsuitable for jaguars. Our results support the hypothesis of higher puma adaptability to human-altered environments. It has been suggested that this adaptability is related to puma's ability to survive on smaller and more diverse prey species than jaguars, but their differences in life history patterns and relationship with humans are probably also influencing their differential response. This difference may explain why pumas are now the only large cats in vast portions of a previously shared range in the Americas.

63 ECOLOGY OF AN INVASIVE PREDATOR ON AN ISLAND: THE CASE OF AMERICAN MINK (*NEOVISON VISON*) IN THE FUEGIAN ARCHIPELAGO

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The American mink (*Neovison vison*) escaped from fur farms on Tierra del Fuego Island in the 1940's, subsequently spreading to adjacent islands of the entire Fuegian Archipelago. Its introduction to other insular systems around the world has caused the reduction, and even local extirpation, of prey populations and the displacement of native mustelids, becoming one of the main threats to biodiversity in those areas. Knowledge of the ecology of this invasive predator is essential for the planning of control strategies. We, therefore, evaluated abundance, distribution, habitat characteristics and seasonal diet (summer and winter) of American mink in different habitats (marine and freshwater shorelines within forested, shrubland, peatbog, grassland, and pebble/mud beach ecosystems) of Tierra del Fuego Island. We constructed a habitat suitability model based on the location of mink signs (scats and dens) and environmental characteristics of habitats, using generalized linear model (GLM). American mink distribution was heterogeneous and the GLM that best fit the data included habitat type, distance to coastline and coastline slope (for marine coasts). Most dens were found in forest and shrubland habitats in both marine and freshwater ecosystems. Human presence showed no relationship to mink presence. Diet analysis, based on scats, showed differences between marine and freshwater environments, but not between seasons. Mammals were the most consumed item in all sites. Although statistically insignificant, in summer, the consumption of fish and birds increased in all habitats, while crustaceans and insect increased only along marine and freshwater shorelines respectively. From these data, we have also developed a spatially explicit habitat suitability map for entire archipelago that will allow planners to develop management policies aimed at controlling the American mink population in the Fuegian Archipelago.

64 EFECTIVIDAD DE LA IMPLEMENTACIÓN DE REFUGIOS ARTIFICIALES PARA MICROMAMÍFEROS, EN LA REGIÓN MEDITERRÁNEA DE CHILE CENTRAL

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En Chile los planes de rescate y relocalización de fauna comienzan a ganar terreno, en el campo de la ecología aplicada. No obstante, se carece de información que permita evaluar la efectividad de este tipo de medidas. En este contexto la construcción de artificios o estructuras de refugios para pequeña fauna vertebrada es una opción que debería ser evaluada. El objetivo de este trabajo fue analizar la efectividad de dos estructuras de refugios para micromamíferos por medio de un monitoreo de marcaje y recaptura. Para ello se compararon las siguientes tres situaciones: un área control sin intervención (825m²), una exclusión tipo jaula cerrada (900 m² y de 2 metros de alto) y una Pircas o muralla de piedras (cubriendo un área estimada de 750 m²). En los tres sitios se instalaron grillas con trampas Shermann de captura viva durante tres años de monitoreos estacionales. Por medio del software MARK se determinaron valores de sobrevivencia y otros parámetros poblacionales para cuatro especies de micromamíferos que ocuparon los refugios artificiales. Se observó respuestas diferenciadas en el uso de los refugios por especie. La exclusión tipo jaula favoreció la sobrevivencia para el Octodontidae *Octodon degus*, lo que redunda en tamaños poblacionales mayores a los observados en las otras dos situaciones. Para las especies de Muridae *Phyllotis darwini* y *Oligoryzomys longicaudatus* los refugios artificiales no tuvieron un efecto significativo en su sobrevivencia respecto al del sitio control, sin embargo para *Phyllotis darwini* las pircas permitieron una mayor densidad poblacional. La sobrevivencia del marsupial Didelphidae *Thylamys elegans* mostró ser independiente a las situaciones de monitoreo. Este estudio demuestra que los artificios evaluados en una localidad de Chile central, tuvieron efectos diferenciales para las especies de micromamíferos del área de estudio.

65 EFFECT OF TOURISM ON HÁBITAT USE OF *DOLICHOTIS PATAGONUM* AT THE ISCHIGUALASTO PROVINCIAL PARK, ARGENTINA.

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The presence of tourists leads to changes on ecological processes, e.g. affecting use and habitat selection. The aim of this study was to assess the direct impact of tourism on the habitat use the *Dolichotis patagonum* at the Provincial Park Ischigualasto. We recorded habitat use in two situations: near the tourist circuit (30 to 150 m) and away to it (more than 1500 m) in two plant communities: Jarillal and Zampal. In each community we made a total of 40 transects (60 m long): 20 near the tourist circuit and 20 away from tourist circuit. In each one (sampling unit) we recorded the presence of *D. patagonum* in 10 sub-samples of 3 x 3 m separated by 3 m. The presence of *D. patagonum* was evaluated through clear evidence such as fresh feces and footprints. Also we registered the percentage of vegetation cover. For statistical analysis we used ANCOVA, using plant cover as covariate. Results showed that *D. patagonum* used more frequently the sites away from the tourist circuit compared with near ones ($F(1,79) = 11.59, p = 0.0007$). Thus, *D. patagonum* was negatively affected by the presence of tourists, reducing the use of the habitat near the tourism circuit, perhaps in order to avoid human disturbance. This information is essential in order to make a proper planning of protected areas for the tourist uses, reducing in this way, the negative impact on the species, focusing mainly on those species vulnerable, as population of *D. patagonum* that occur at the Ischigualasto Provincial Park, where tourism is higher each year.

66 EFFECT OF TOURIST ON BEHAVIOR OF *LAMA GUANICOE* IN PROVINCIAL PARK ISCHIGUALASTO, SAN JUAN, ARGENTINA

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Given the importance of the tourism sector to Provincial Park Ischigualasto, the lack of information of the effect of tourism on wildlife is a significant concern. The aim of this study was assessment the effect of presence human in different time the pressure touristic on behavior of *L. guanicoe*. We registered behavior using scan and focal sampling, in three times: maximum tourist pressure, medium, and minimum ones (tourist pressure). Also, we considered the group size and presence or absence of tourists (tourist). For analyses was used ANCOVA and group size as covariate. An analysis with all data demonstrated that behavior of guanacos was significantly affected by group size: ? 4 and ? 5 ($F(2, 142)=15.66$; $p<0.0001$). Interaction between group size-time was also significantly. Consequently we analyzed these two group size separately. When the group size was ? 4, the behavior was significantly affected by "tourist pressure" and "tourist", and also the interaction between tourist pressure and tourists (all $p < 0.0001$). At maximum and minimum tourist pressure, guanacos vigilance more in presence of tourists, and forage more at minimum tourist pressure with respect to medium and maximum tourist pressure ($p<0.05$). When the group was ?5, we do not found a significant effect of the "tourist pressure". The guanacos vigilance more when tourists are present ($p<0.05$), but differences in foraging behavior is not significant. The presence of tourists affected the trade-off between vigilance and foraging, and the decision is affected by the group size. Then, the impact on small size groups of guanacos is biggest. This result highlights the importance of the tourist impact in those protected areas that receive a large number of tourists per year because it could endanger their conservation.

67 ESTIMATING OCCUPANCY OF *LEOPARDUS GUIGNA* FROM CAMERA TRAP DATA IN THE ARAUCANÍA OF SOUTHERN CHILE

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Leopardus guigna is one of the world's smallest cats. Its IUCN conservation status is "Vulnerable, with a declining population trend". In Chile, it has recently been classified as "Rare and data deficient". Habitat loss and retribution killing are considered the main conservation threats. Our study area in the Araucanía district of southern Chile, represents the northern limit of the temperate rainforest in Chile (39°15' S, 71°48' W). During spring-summer 2008/2009, 25 camera trap sites (™Trailmaster Inc.) were deployed in the study area, spaced at least 2km apart. The study recorded a total of 2080 trapping days during the season. We used the software PRESENCE™ 2.2 (USGS-PWRC) to estimate occupancy (psi) and detection (p) probability for continuous forest (CF) (n=16 sites), fragments (F) (<20há; n=9) and both in combination. The analysis covers 9 sampling occasions made up of 10-day units. Landscape variables - distance to main rivers and roads; altitude; and human settlement density surrounding the camera (within 1km radius) - were used as covariates for logistic regression. For forest fragments, we also included rodent capture success rate as an index of relative prey abundance. Akaike Information Criterion (AIC) values were used to rank candidate models. The simplest model for all sites (i.e. constant model) estimated values of psi 0.47 ± 0.169 S.E. and p 0.131 ± 0.05 S.E. Applying the same model, CF showed similar psi than F (CF psi 0.52 ± 0.28 S.E., p 0.097 ± 0.06 S.E.; F psi 0.45 ± 0.24 S.E., p 0.17 ± 0.08 S.E.), suggesting that fragments should be considered valuable habitat. In all scenarios, models that allowed psi to change with one variable showed higher ranking than the constant model, suggesting that the inclusion of covariates in the model selection procedure improved model fit. We explore relationships between covariates and psi for the orientation of conservation management guidelines in our study area.

68 EVALUATING METHODS FOR MAMMALS SURVEY IN NEOTROPICAL REGIONS

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Studies involving mammal's species richness in tropical regions of the new world face some challenges. Indirect observation techniques are useful tools for food preference and species richness studies of this group. The aims of this study were to evaluate the efficiency of species richness rapid sampling through footprint of medium and large size mammals in two habitats of Cerrado: Gallery forest and Cerrado sensu stricto, comparing this data with previous studies using camera traps. The survey was carried out in the Serra das Araras Ecological Station, Porto Estrela city, Mato Grosso, Brazil. The footprints were observed on 22 km of trails during three days on March 2009 and the camera trap data was obtained between May 1999 and January 2000. In total were recorded 15 species through footprints, same recorded by camera traps. The species richness was 10 and 3 species in the Cerrado sensu stricto and 10 and 14 in gallery forest recorded by footprints and camera traps respectively. The collector curve has shown that only gallery forest sampled with camera trap had reached asymptote. Despite the need of greater efforts, this method has sampled 71% of the species previously recorded with cameras traps in the gallery forest. In Cerrado the traces method sampled 70% more species compared to camera traps. Although the indirect observation demonstrate some restrictions as the substrate needs to be on favorable conditions and the importance of experience in observing and identifying these signals, the use of this method was considered efficient to estimate species richness of medium and large size mammals, due the speed in gathering data, easy visualization of tracks and its low cost.

69 HEALTH PROMOTION AT SERRA DA CANASTRA NATIONAL PARK: BRINGING TOGETHER PUBLIC HEALTH AND ENVIRONMENTAL CONSERVATION

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Diseases transmitted among wildlife, humans and domestic animals have a great impact on public health, livestock and biodiversity conservation. In the Serra da Canastra National Park the contact between domestic and wild carnivores is frequent and may favors disease emergence. Therefore, in order to improve quality of life and environmental conservation, it is important to develop integrated programs that could reduce both human exposure to zoonotic diseases, as well as disease transmission from domestic to wild animals. Here, we propose a health promotion strategy based on three steps: (1) the diagnostic of local farmers' behavior towards wildlife and domestic carnivores and their perception of zoonotic disease transmission risk, (2) the elaboration of an educational material about zoonotic diseases and (3) the development of a participative education program regarding environmental conservation and public health. For the diagnostic, we had interviewed 53 farmers. In general, farmers (n=53) perceived dogs as other domestic animals like cows and chicken, besides the close contact between dogs and farmers. Only in three of the farms visited the dogs were correctly vaccinated, which reinforce the farmers' low perception of zoonotic disease transmission risk. We designed an educative brochure using easy and comprehensible language and well illustrated. The brochure included suggestions about good health habits, proper domestic animals management and environmental awareness. In parallel, we produced a video about the possible routes of parasite transmission in daily rural activities. The next step will be to use both the brochure and the video in communitarian meetings, farms and schools to imprint the relationship between the environmental conservation and animal and local people health. Then, community members will be invited to collaborate with us to design, implement and interpret a continued education project to improve human health and environmental quality.

70 HUNTED MAMMALS IN TWO INDIGENOUS VILLAGES OF WAYANA AND APARAI IN BRASILIAN AMAZON

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The game is very important for the maintenance of traditional ways of life of indigenous peoples in the Amazon. This study aims to characterize the use of mammals in two indigenous villages of Wayana and Aparai who lives in Parque Indígena do Tumucumaque, northern Pará State, in Brazilian Amazon. The hunting data was monitored with 29 hunters in 60 days of data collection. The hunted animals were weighed, identified by sex and age. The interviews have raised 45 species of mammals occurring in the area, 25 of this are considered by hunting. Altogether 140 mammals were hunted from 20 different species, totaling 2,381 kg of biomass. The species more hunted was *Tayassu peccary* (n = 50; 1,350 kg), second was *Ateles paniscus* (n = 30, 261 kg). All the *A. paniscus* hunted were females. The survival curves of the most hunted mammals, *T. peccary*, *A. paniscus*, *Cebus apella* (n = 16) and *Cuniculus paca* (n = 12) points to a sharp withdrawal of adult and senile animals. The favorite game species were, in descending order, *A. paniscus*, *C. apella*, *C. paca*, *T. peccary*, *Pecari tajacu*, *Tapirus terrestris*, *Alouatta macconnelli* and *Mazama americana*. The analysis of sustainability of hunting suggests that only *C. apella* and *A. paniscus* are being over-exploited.

71 HUNTING STATISTICS REVEAL INFLUENCE OF CLIMATIC OSCILLATIONS AND DENSITY DEPENDENCE ON IRISH HARE POPULATIONS

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Game bag records for Irish hares (*Lepus timidus hibernicus* Bell 1837) from throughout Ireland for the period 1846-1970 were analysed to assess long-term historical trends. Prior to 1914, bag indices fluctuated markedly but there was no overall trend. Thereafter, the annual hare index declined markedly (-88%), consistent with declines in hare bags elsewhere in Europe, reflecting a major decline in the number of hares shot. Time-series analysis suggests that the Irish population exhibited periodicity both before and after the initiation of the population decline. Prior to 1914 a significant decadal anti-phase was detected. Further analysis suggests that population growth rate was regulated by both intrinsic delayed density dependence, principally determined by the abundance of hares in the previous year, and extrinsic climatic factors, specifically the weather in autumn, described by the Northern Atlantic Oscillation (NAO) index. The NAO also exhibits a decadal periodicity and we suggest that the interaction of density dependent processes and the autumn NAO gives rise to the significant decadal periodicity observed in the Irish hare population prior to the major population decline. After 1914, there was a reduction in the amplitude and frequency of periodicity and the relative importance of the long-term decline in accounting for variance in abundance increased markedly. There is no reason to discount the marked influence of climate and related periodicity in contemporary hare population dynamics but the decline of game shooting has removed one tool for detecting this influence.

72 INTERACTION BETWEEN WILD CARNIVORES AND DOMESTIC DOGS AND ITS INFLUENCE ON DISEASE TRANSMISSION IN CHILE

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The domestic dog is the most abundant and widely distributed carnivore worldwide and is known to carry many infectious diseases

that affect wildlife. This study describes the degree of interaction between wild and domestic carnivores and its effect on interspecific disease transmission in the surrounding of the Fray Jorge NP in Coquimbo region, Chile. A cross-sectional questionnaire survey was conducted from 2005 to 2006. From the analysis of questionnaires the abundance of wild carnivores, the livestock predation and the interaction between domestic dogs and wild carnivores was estimated. Additionally, the relative abundance of wild carnivores was determined using the scent-station method. Blood samples from owned domestic dogs and free-ranging foxes were taken. A total of 320 blood samples of domestic dogs were analyzed. The canine distemper virus (CDV) and canine parvovirus (CPV) seroprevalence in domestic dogs ranged from 34 to 76 % and from 65 to 93% in the different study sites. The analysis of 33 blood samples of wild foxes indicated a CDV and CPV seroprevalence that ranged from 0 to 80% and from 25 to 83%, respectively. This study indicates that in the area there are many opportunities for domestic/wild carnivore interactions, as for example by approaching to peridomestic environments searching for livestock as alternative prey, facilitating the transmission of CDV and CPV. If interspecific disease transmission is occurring, this can have important consequences to the persistence of wild carnivores in the region. Nevertheless, further studies are needed to determine whether wild carnivores living in sympatry with domestic dogs are being exposed to generalist pathogens and what are the risk factors that could facilitate disease transmission between these species.

73 JAGUAR (*PANTHERA ONCA*), HUMAN AND THEIR PREYS, THE INTERACTION

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During 2007 and 2008, at the ecotone (oak and tropical forest) located in Ejido San Nicolas de los Montes in the Huasteca Potosina, México; we studied the abundance and density of *Panthera onca* and the relative abundance (IAR) of six preys (*Cuniculus paca*, *Dasyus novemcinctus*, *Nasua narica*, *Mazama temama*, *Odocoileus virginianus* and *Pecari tajacu*). Jaguar abundance was estimated using camera trapping and its density by CAPTURE. We calculated the IAR by two methods. In addition, through informant consensus, we calculated the cultural importance index (IIC). As results 16 jaguars photographs (in total 5 jaguars were identified, 3 ? in 2007, 2 ? and one ? in 2008) were obtained and for both years the density estimated was 5 ind/100 km². IAR (transects 2007) indicated that deer species got the lowest value (0.05), *D. novemcinctus* (0.13) the greater one. At 2008 were *C. paca* (0.005) and *D. novemcinctus* (0.144) respectively. Photo trapping in 2007 revealed null presence of *M. temama* (0.00), *D. novemcinctus* had the greatest abundance value (3.33). At 2008 *M. temama* showed the lowest (0.416) and *N. narica* highest (2.916) abundance value. The IIC suggests that: *O. virginianus* (2.717), *M. temama* (20.61) and *P. tajacu* (19.34) were the most used species by human. The principal value that respondents gave to the species was as food, 89 % thinks of jaguar as an "enemy", they argue jaguar kills livestock. Based on the results, when compared with other distribution area in Mexico, was found that jaguar abundance is low and it may be reflect of their prey abundance. The IIC suggests that most of the people use ungulates. Therefore, the low abundance of their prey, competition, poaching, conflicts with ranchers, the change of land use and habitat fragmentation are factors that jeopardize the continuity of the jaguar in the site study.

74 LARGE MAMMALS OF CERROS DE AMOTAPE NATIONAL PARK - PERU

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El Perú es uno de los llamados países megadiversos, gracias a la presencia de la cordillera de los Andes y la Corriente fría de Humboldt, que han dado lugar a la formación de hábitats únicos y singulares. La región biogeográfica del Bosque Seco Ecuatorial, es uno de ellos, que a pesar de encontrarse al lado occidental de los Andes presenta una fauna de origen amazónico. Sin embargo, investigadores revelan mayores afinidades con la fauna de la vertiente occidental del Ecuador que con la amazonía. Voss y Emmons denominan a esta región como Bosques lluviosos Trasandinos porque la fauna tropical presente es distinguible a la del Bosque Tropical Amazónico y porque estos bosques están separados por los Andes. Los Bosque Tropicales del Pacífico, como también suelen llamarse, ocupan una pequeña porción en el departamento de Tumbes, en el norte peruano, frontera con Ecuador, donde la fauna que alberga actualmente viene siendo fuertemente amenazada por la actividad humana, a pesar de que gran parte del área está protegida en el Parque Nacional Cerros de Amotape, dentro de la Reserva de Biosfera del Noroeste. La investigación tenía como objetivo determinar las especies de mamíferos grandes presentes en el ecosistema. Los muestreos se realizaron durante la época seca y húmeda de los años 2004, 2005 y 2006. Se trazaron transectos lineales, pudiendo evidenciar a través de registros directos (avistamientos 74%) e indirectos (huellas heces, osamentas, entrevistas 26 %) la presencia de 19 especies de mamíferos grandes. Destacan *Cebus albifrons aequatorialis* y *Alouatta palliata aequatorialis*, como los únicos primates en el PNCA y *Bradypus variegatus* como un nuevo registro para la zona de estudio. Palabras Claves: Diversidad, mastofauna, bosque seco, bosque tropical del Pacífico

75 MAMMAL CONSERVATION FROM A HIGH SCHOOL PERSPECTIVE: A FIRST APPROACH TO THE PORTUGUESE REALITY

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Nature conservation has higher probabilities of being successful when it has the public support, or when arising from public needs or willingness. However, it has to be anchored on knowledge and values, most of which theoretically derive from high school curricula,

experiments and activities. Within conservation issues, mammalian conservation has a particular importance, due to this species' aesthetic value, media visibility, resilience and wide distribution. This is especially important in urban or sub-urban areas where adolescents have none or few contact with wildlife or any kind of wilderness. Based on these assumptions, we implemented a study which aimed to evaluate several issues related with nature conservation, focusing also on mammalian conservation. The study was based on an inquiry, divided in six main issues: 1) Factors that might influence how people subscribe to different reasons for conserving biodiversity (cultural heritage, social values, tourism, medicine, ecosystem services, science, intrinsic value and industry); 2) Factors that might affect nature conservation at local, regional and national levels; 3) Adequate criteria to identify conservation priority species; 4) Taxa that should be more subjected to conservation measures; 5) Mammalian groups with higher threatened status in Portugal; 6) Adequate recovery measures for conservation priority species. Our sample included 89 students from the 7th and 8th grade (12-15 years old) from Escola Secundária Ferreira Dias, located in Cacém, a suburban area of Lisbon (Portugal - south Western Europe). Our results show that while medicine values overcome nature conservation for most students, tourism and industry values are subdued to conservation. Although considering habitat loss as the major criteria to define threatened species, students consider that cetaceans are the most threatened mammalian group, and point out that recovering natural habitat is the most efficient mammalian conservation measure. This results corroborate the common believe that the perception of the species conservation status is mainly driven by aesthetic values and media visibility.

76 MAMMALIAN DIVERSITY IN SHANNON COUNTY, SOUTH DAKOTA (USA): IMPLICATIONS FOR CONSERVATION AND CULTURAL HERITAGE

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The biological diversity of a region is not only regarded as a parameter of environmental health, but also as part of the cultural legacy of traditional people. The Oglala Sioux Tribe is committed to maintain and promote species and community diversity as critical components of its ecological and cultural heritage. However, detailed information on the mammalian diversity for this region is lacking. Several mammal species indigenous to this region are now extinct or currently threatened, and re-introduction programs are being planned or implemented. As a result, detailed diversity surveys for this region are paramount to establish a reliable biological framework upon which important and future conservation decisions will be based on. Here we present the preliminary results of an extensive non-volant mammalian survey carried out across the Pine Ridge Reservation area, Shannon Co., since 2007. Sampled areas encompassed as many distinct habitats as possible within the Great Plains ecosystem, all characterized by a semi-arid climate, with hot-dry summers and cold-dry winters. Sampling was performed using a combination of live trapping, spotlighting, road kill, footprints, and scat surveys data. Our results indicate the presence of 27 species in 15 families of mammals: 2 Leporidae, 1 Castoridae, 1 Erethizontidae, 1 Geomyidae, 2 Heteromyidae, 7 Cricetidae, 3 Sciuridae, 2 Canidae, 2 Felidae, 1 Mephitidae, 1 Mustelidae, 1 Procyonidae, 1 Antilocapridae, 1 Bovidae, and 2 Cervidae. These results represent 56% of species of possible occurrence (48 spp), 10 of them firstly recorded for this area. Considering that our results are preliminary there certainly underestimate the faunal richness. Our ongoing studies on mammal richness and density aim to facilitate proper management and conservation actions, especially regarding the re-introductions of endangered species (e.g. *Vulpes velox*, *Mustela nigripes*) and proper decisions concerning the sylvatic plague, rapidly spreading on this region.

77 MAMMALS FROM QUADRILÁTERO FERRÍFERO, MINAS GERAIS, BRAZIL: KNOWING THEM TO PRESEVE THEM

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Brazil is considered a megadiverse country having in its territory four of the richest biomes of the planet (Amazon, Cerrado, Atlantic Forest and Pantanal). Together with this fact there are many endemic animal and plant species of the Cerrado and Atlantic Forest biomes, which are presently highly threatened (hotspots). Besides this, it is acknowledged that there is a lack of knowledge about the mammal fauna of the country, and due to the increasing economic development this information could be lost. The goal of this project was to know the mammal fauna of the region of Quadrilátero Ferrífero, located in the State of Minas Gerais, Brazil, and with this knowledge to determine viable forms of environmental preservation in the State, to this end Companhia Vale do Rio Doce (Vale) is developing a fauna database of the Quadrilátero Ferrífero, BDFAUNA. In this database are being registered information provided by the many environmental studies in the region where Vale undertakes studies and also from Conservation Units (RPPNs – Private Reserves of the Natural Patrimony), besides scientific studies developed in municipalities located in Quadrilátero Ferrífero. These being criteria for the selection of data to be inserted in the database. Two hundred and forty-seven studies undertaken between 1997 and 2008 were analyzed; and 777 mammal species were registered. From these studies, nine species threatened with extinction according to the official red lists of Brazil and IUCN, nine species endemic of the Atlantic Forest and two endemic species from Cerrado. We highlight that these are preliminary results, especially due to the fact that many areas are constantly being monitored and new information being acquired. Future analysis of these data will allow increased knowledge about the mammal fauna of Quadrilátero Ferrífero: to understand its dynamics and the influences of the impact of mining.

78 MAMMALS OF MALARGÜE DISTRICT, MENDOZA PROVINCE, ARGENTINA AS TOOL FOR THEIR CONSERVATION

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Malargüe is the largest District in South-West of the province of Mendoza. It includes four protected areas where the landscapes and

ecosystem biodiversity, species and cultural heritage are protected. One of them is a RAMSAR site. We have developed the first list of mammals for Malargüe District to supply it to the relevant bodies in Conservation and Management Areas. We have also incorporated data of mammal species from the following sources: collected samples (by capturing the animals or recognizing pellets of birds of prey), observed specimens, records obtained from technical reports, information provided by key persons and scientific publications. In Malargüe, 60 mammalian species can be found. This represents some 17.42% of the Argentinean mammal species; 24% of genera, 41.46% of families and 58.33% of orders. The phyto-geographical regions settled in Malargüe are Monte, Andina, Alto Andina and Patagónica. Many species of mammal in Malargüe reach their distributional limits corresponding to the presence of ecotonal areas. As a few taxonomical and ecological studies and no macroecological patterns were carried out in the District, we consider this to be the first approach in the digging for knowledge about the biodiversity of this region. One of the ecotones more valuable topics is the presence of many carnivores, considered as umbrella species due to their occupation of the high levels of the trophic nets.

79 MEDIUM AND LARGE MAMMALS OF THE PROTECTED AREA «QUEBRADA DE LOS CUERVOS», TREINTA Y TRES, URUGUAY.

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Quebrada de los Cuervos, located in the Department of Treinta y Tres, was the first area to enter the National Protected Areas System (SNAP). A project that started in August 2008 involving medium-size and large mammals is taking place in the area. The undertaking includes two main pillars: investigation and education. The research component implies a survey of medium-size and large mammals using non-invasive methods, with the objective of obtaining information capable of contributing to the management of the protected area. Until this moment 16 species have been identified. It is important to point out the presence of *Leopardus geoffroyi* and *Dasypus hybridus*, both of them catalogued as Near Threatened by the IUCN and considered as species of priority for the SNAP; and of *Sus scrofa* for being considered an invasive species in Uruguay. The presence of species that have not been seen for several years, or ones mentioned by local people, is still expected to be confirmed. The educational component has the objective of encouraging the knowledge of these species, by carrying out environmental education activities. Said activities consist of workshops in schools of the Department, elaboration of dissemination material, and lectures for the local people and general public. We believe this project is of importance for the development of the Quebrada de los Cuervos because, it will generate revenues that can be used in the creation of a management plan, it is a good baseline for future research and conservation, and it raises awareness in the local people of the importance for the conservation of this area.

80 NON-FLYING MAMMALS IN THE SEASONAL FLOODED AREAS IN EASTERN AMAZON, AMAPÁ, BRAZIL

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Information on mammal's diversity is a key element to understand the ecological processes, such as dispersal, pollination, predation, that cause their spatial patterns in the Amazon region. In this study, we carried out two inventories of non-flying mammals in June (rainy season) and November (dry season), 2008. The study took place in São Bento farm, a private reserve in Eastern Amapá state, located 50 km from the Amazon rivers base line, in W 050°49'80", N 01°16'80". We sampled forest islands rounded by flooded areas; our methods included traps (Shermann and Tomahawk), direct and indirect incidental observation. With a sampling effort of 2950 traps/day and 130.88 hours of active search we captured 36 species of non-flying mammals pertaining to eight orders, 19 families and 30 genera. Shannon index were 2.74 and 2.33 for the rainy and dry season respectively. Rodent was the order with most species. Four species of the primates was observed in the forests islands. Among the mammalian species recorded in the studied area, we found 4 listed (*Panthera onca*, *Tapirus terrestris*, *Pteronura brasiliensis* and *Myrmecophaga tetradactyla*) as threatened according to the Brazilian and IUCN red-list and 2 that are endemic from the Guyana Shield (*Bradypus trydactylus* and *Monodelphis brevicaudata*). São Bento farm's ecosystems have undergone significant pressures such as buffalo breeding and predatory hunting. This urges for actions that could minimize these threats and a monitoring plan for the mammalian species in the region.

81 NONINVASIVE GENETIC STUDY OF THE ETHIOPIAN WOLF (*CANIS SIMENSIS*) OF MENZ, NORTHERN ETHIOPIA

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With an estimated total of about 500 individuals, the Ethiopian wolf (*Canis simensis*) is the world's most endangered canid. Its distribution is restricted to a few remote and isolated peaks of the Ethiopian highlands, where it is threatened by habitat destruction and fragmentation due to increasing agricultural activity. Being the top-predator of the Afroalpine ecosystem, disappearance of this species may have major effect on the dynamics of the eco-system. Very little is known about the wolves, thus, finding reliable methods for population monitoring is imperative for their future survival. Here we present the first population genetic study of a small and isolated population of Menz, northern Ethiopia. We evaluate levels of genetic diversity and relatedness among individuals, and quantify population divergence from the larger population of the Bale Mountains, Southern Ethiopia. We first conducted a pilot-study

in order to evaluate the feasibility of noninvasive genetic sampling based on faecal samples. The main factors affecting amplification and genotyping success were determined, and additional samples were collected following the new guidelines. We experienced a significant increase in the amplification rate of both mitochondrial and nuclear markers, which confirms the importance of conducting a pilot-study when using noninvasive sampling. Amplification of a panel of 8-10 microsatellite loci (PIDsibs < 0,01) and 2 sex-markers allowed us to identify 23 individuals. Comparison of allelic richness and expected heterozygosity confirmed a substantial loss of alleles in Menz compared to the Bale population, and the northern and southern populations are highly differentiated ($F_{ST} = 0,26$). Our study demonstrates that noninvasive sampling is a valuable tool for the study of this elusive and highly endangered canid.

82 PATTERNS OF DISTRIBUTION OF THE ENDEMIC MAMMALS IN ECUADOR

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Categorized as one of the world's megadiverse countries, Ecuador shows a high level of endemism for several taxa. The most recent checklist of mammals recognizes 382 species, including 38 endemics. In spite of their importance, no formal analysis has been conducted on the historical and geographic determinants that explain endemic species distribution in the Ecuadorian territory. The main goal for this study was to identify the geographic affinities among Ecuadorian endemic mammalian records and to analyze the spatial relationship between endemic sampling localities and the areas included in the Sistema Nacional de Areas Protegidas (SNAP). We analyzed public and museum records collected from 1859-2004, housed in 24 museums. Identified endemic records were georeferenced and mapped. A polygon layer representing eight bioregions in Ecuador, available at <http://www.worldwildlife.org>, was used to determine the samples ecogeographic origin. To verify the spatial relationship between endemic localities and conservation areas, a polygon layer representing SNAP, was overlaid on top of the endemic sampling localities in ArcGIS 9.3. Of the 23,000 mammalian records analyzed, we recovered 409 endemic records, containing only 265 with confirmed localities in our samples. Most of the recovered endemic records are deposited in the AMNH (N=119), followed by the FMNH (N=58), ASU (N=57), MVZ (N=52), TTU (N=43), and other records (N= 81). The majority of our endemic records were located in the Andean Region (N=123), followed by the Galapagos Islands (N=100), the coast (N=43), and the Amazon (N=2). Surprisingly, only 5 records, representing three species were collected in currently identified conservation areas. A sample bias is suggested by the presence of 99 records in areas surrounding Quito. In general, these results position the Andes as a main hotspot for endemic species which contrasts with the few protected areas in the region.

83 PEOPLE & WILDLIFE: CREATING CONSERVATION SOLUTIONS FOR LIVING TOGETHER

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With increasing competition for natural resources it is inevitable that the interests of wildlife and people come into conflict. Resolving such conflicts is at the heart of biodiversity conservation and a challenge that conservation biologists cannot afford to shun. While most solutions to emerging conflicts must be developed on a case-by-case basis to fit a unique set of ecological, cultural and economic circumstances, commonalities do exist, and sharing experiences is therefore essential. Unfortunately, efforts to mitigate conflict are often fragmented, localized, and sometimes duplicated due to poor communication. P&W initiative (www.peopleandwildlife.org.uk) originated as a response to this challenge, in order to provide a creative and dynamic communication forum for all involved in human-wildlife conflict issues. Since its inception in 2004 P&W has become 'the' information hub and communication channel for all conflict issues, promoting non-lethal innovative solutions and amassing a network of experts, managers, institutions and the communities affected by conflict.

84 POPULATION AND HABITAT OF THE ENDEMIC PEROTE GROUND SQUIRREL (*SPERMOPHILUS PEROTENSIS*) IN VERACRUZ, MEXICO

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The Perote ground squirrel known locally as moto or chichilote (*Spermophilus perotensis*) is an endemic species from the semi-arid lands of the State of Veracruz. It is considered by Mexican laws as threatened and in danger of extinction by the IUCN. Actually this land is suffering from a desertification process due to sheep and goat grazing, deforestation and agriculture practices. To date, we have very poor information about the biology and ecology of this squirrel. With the aim of producing basic data to be useful for the conservation of this species, and to know the human impact in the use of land, we established three sampling sites following a perturbation gradient in order to compare density, population structure, changes in corporal mass and habitat. We captured 116 individuals (48 females and 68 males), using capture-mark-recapture methods and we found that density and body mass is higher in the more altered site, the highest density correspond to the post hibernation period (March-April), and the heaviest individuals were found in August. There were no significant differences in sex proportion and between sites and months. Breeding season was in April-May with a probable delay season in July, lactation time occurred during June. Juveniles emerge at the end of July meanwhile the latest emerged in October. Hibernation for adults began since early October and the juveniles remained active until November. We have registered five important food plants for this squirrel (*Scleropogon brevifolius*, *Argemone mexicana*, *Brassica campestris*, *Verbena ciliata* and *Bidens anthemoides*), the last four are weeds from the secondary succession stages.

85 POPULATION DECLINE OF NORTHERN MURIQUI (*BRACHYTETES HYPOXANTHUS*) IN HISTORICAL TIMES

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The miquis, genus *Brachyteles* (Primates, Atelidae), are endemic to the eastern Brazilian Atlantic Forest. Currently two species are recognized, the southern miqui (*B. arachnoides*) and the northern miqui (*B. hypoxanthus*). The last is considered critically endangered by the IUCN as well as the official Brazilian red list of endangered species. Available data suggest that the historical distribution of the northern miqui encompasses the states of Bahia, Espírito Santo, and Minas Gerais, along the eastern Brazilian Atlantic Forest, but its limits are not well defined. In this work we organized a database of past and current locations where northern miqui have been recorded, based on museum specimens and literature. We have found 43 confirmed localities of historical presence of miquis, but the species today only survives in 12 of these places. After georeferencing the localities, we have used the points and geographic land marks to define the northern and southern limits of the species' historical distribution, and have used the limits of the Atlantic Forest, to define the eastern and western limits. So, we estimated an area of historical distribution of about 290,000 km². We also estimated that the northern miqui population, before Atlantic Forest fragmentation, reached more than one million individuals, even considering a low population density. Current data indicates a remaining population of about 1,000 individuals, distributed in small to medium sized forest remnants (60 to 42,000 ha). Analyzing the current forest sizes within the geographical distribution, we concluded that the species could be present in, at least, hundreds of forest remnants, including protected areas, where it is absent today. The data suggest that deforestation is the main cause of the decimation of the miqui population in historical times. However, without other impacts, like hunting and diseases, the remaining population could be tens of times larger than it actually is.

86 POPULATION, MANAGEMENT AND PREDATION OF DOMESTIC CAT (*FELIS CATUS*) ON THE FAUNA OF ILHA GRANDE, RJ.

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The domestic cat is an invasive alien species capable of impacting wildlife immensely, mostly by preying on small mammals, birds, reptiles and amphibians (Brikner, 2003). Additionally, they are intensive breeders and adapt well to new habitats, even on islands. This study was conducted in Vila do Abraão, Ilha Grande, Rio de Janeiro, Brazil, an island covered mostly by Atlantic Forest. The following questions were posed in the context of this research: (1) What's the density of domestic cats inside this area? (2) What's the effectiveness of male neutering campaigns to reduce population growth? (3) What are their preying habits (4) What is each cat owner's level of interest in participating in this study by counting and categorizing prey? Population size was determined in a six-month census (direct questioning of local inhabitants) and a 21Km line transect covering an area of 37 ha. The census resulted in the identification of 160 individuals, and 58 individuals were sighted in the transect, resulting in a high density (662 individuals / sq. Km). The extrapolation of population growth over a 10-year period was designed by Vortex 5.0 software. The modeling accounted for male neutering campaigns in which 99% of fertile males were removed from the population. As a result, should current reproductive rates be maintained, the population will only decrease after 10 years. The cat owners (62 households) participated by collecting prey brought home by cats, and were assessed by their level of interest in the project. In five months 92 prey items were collected, 54% of which invertebrate, 20% of which mammalian, 12% birds, 6% reptiles and 4% amphibians. The total number of prey was positively related (ANOVA, $F=12,987$ and $p<0,001$) with the level of interest shown by participants. At least 2,683 animals are predated in Abraão annually, a habitat rich in avian and amphibian diversity, with the caveat that invertebrate and mammals increased the rate of alien species. It is imperative that the cat population in Ilha Grande be controlled urgently, as a population growth will impact even more the rich biodiversity of Ilha Grande.

87 PRELIMINARY RESULTS OF A POPULATION VIABILITY ANALYSIS FOR *CEBUS KAAPORI*, A CRITICALLY ENDANGERED ENDEMIC PRIMATE OF BRAZILIAN EAST AMAZONIA

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The *Cebus kaapori* was described very recently in 1992 by Queiroz. The species occurs in east Amazonia, in zones of transition between the Amazonia forest and the Cerrado (Brazilian savannah), in some areas of the states of Pará and Maranhão (Queiroz 1992; Ferrari and Queiroz 1994; Ferrari and Souza Jr 1994; Lopes and Ferrari 1996; Silva, Jr. and Cerqueira 1998; Carvalho, Jr et al. 1999; Cunha et al. 2007). There is very few information about the populations and biology of this species, that has been classified as critically endangered by the IUCN 2008 red list (Kierulff 2008). This work presents the preliminary results of the investigation that is being made by the author as a master research work project of the Máster in Primatología in the University of Barcelona. The objective was to identify, through an analysis of population viability with the Vortex program (Lacy 2005), which parameters have greater influence on the population viability of a species with general characteristics of the genus *Cebus*, under the general threats present in the region of occurrence of *Cebus kaapori* (Queiroz 1992). Among the biological parameters tested, the reproductive system and the mortality rates had more important impacts, and the values of these parameters must be used of available for *C. olivaceus*, the closest species. Different changes in the environmental parameters (intensity and frequency of catastrophes, loss of carry capacity, initial carry capacity, amount of hunted individuals and sex proportion of hunted individuals) and demography (population size, number of populations and different population sizes of populations) have had important impacts in the simulated population

and must have their values refined with probable numbers of populations and tested in small populations. Key-words: Cebidae, Primate, Cebus kaapori, capuchin monkeys, conservation, population viability analysis (PVA), Vortex

88 REPRODUCTIVE DATA OF CAPTIVE LESSER ANTEATERS (*TAMANDUA TETRADACTYLA*) AT FUNDAÇÃO PARQUE ZOOLOGICO DE SÃO PAULO.

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The captivity breeding programs are essential for the knowledge and preservation of various species. Despite the Lesser Anteater (*Tamandua tetradactyla*) has large distribution and is well represented in protected natural areas, some factors as deforestation, fire, trampling road and hunting have reduced local populations, and information on its biology are scarce. The Fundação Parque Zoológico de São Paulo (FPZSP) has developed husbandry techniques (nutritional, breeding, veterinary and hand-rearing) in order to a better understanding and contribution for the species conservation. This study presents some reproductive data from 105 individuals of Lesser Anteater that have been or are in captivity in FPZSP, since 1970. The information were obtained from the collection of the Mammal's section of FPZSP. From all 48 females, 6 reproduced, one of which was born in captivity. This one had her first offspring when she was 44 months. Among 39 males, 6 reproduced, two of them were born in captivity and had their first offsprings when they were 38 and 21 months. We registered 29 births, of which 48,28% of the individuals born reached the first age or more. The data don't demonstrate a specific breeding season, corroborating the records found in the literature. In 2007 we had the first case of twin's birth for the specie in Brazil, and this is a rare event, reported only twice in literature. The parents came from Iguape's region (SP) and arrived as a young at Fundação. This was the first litter for both. The cubs, two females, didn't survive: one of them showed hydrocephalus and the other one was well formed, but died in the same day of hypoglycemia and hypothermia, because there wasn't parental care. There are so many gaps to be filled with knowledge of the biology of this specie, and more specific researches could maximize breeding success.

89 RESEARCH AND CONSERVATION OF THE THREATENED *CALLICEBUS COIMBRAI* IN THE ATLANTIC FOREST OF NORTHEASTERN BRAZIL

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Coimbra's titi, *Callicebus coimbrai* Kobayashi & Langguth 1999 (Primates–Pitheciidae), was discovered ten years ago and immediately considered in risk of extinction, due to the long history of forest devastation in its restrict distribution. In 2004 we began an inter-institutional effort to research and conserve this species. The survey of populations in Sergipe state confirmed the species' presence in 21 forest fragments, besides the 17 previously registered and the three recorded in Bahia state. Based on these localities, the extent of occurrence was calculated to be ca.25.000km², while the total area of occupancy was estimated in ca.150km². More than 60% of the confirmed sites do not exceed 100ha, thus supporting few individuals, and 25% are below 25ha, the medium home range for titis' social groups in the Atlantic Forest. The loss and fragmentation of habitats are undoubtedly the highest threats for the species' survival, followed by the unselective hunting and the opportunistic captures to keep animals as pets. The species' abundance in southern Sergipe was investigated with the line transect sampling and revealed a density of 12.6 ind/km². Thus, we inferred a total remnant population below 2.000 individuals. The populations' viability and the demographic and genetic effects of different management scenarios were analyzed through simulations with Vortex. The protection of the largest remnant habitats was the most effective alternative, followed by the reconnection of fragments. The translocations or reinforcement of smaller populations were not sustainable without the interruption of threats and the expansion of those fragments. As a major pragmatic result, we participated in the creation of a public (300ha) and a private (300ha) reserves, which are the only protected areas with *C.coimbrai* populations. The survey, PVA and other ecological studies of the species are still ongoing, and the implementation of actions to protect and recover its habitats are planned.

90 SETTING UP CONSERVATION PRIORITIES FOR THREATENED NEOTROPICAL CANIDS

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Contemporary canids are the most widely distributed family of the Carnivora, with members on every continent besides Antarctica. The Neotropics support 11 out of 35 extant canid species, of which nine species, and four genera (*Chrysocyon*, *Otocyon*, *Pseudalopex*, *Speothos*), are restricted to South America. Another South American endemic, the Malvinas fox (*Dusicyon australis*), was the only Canidae to go extinct in recent history. While most Neotropical canids are widely distributed, several *Pseudalopex* species in the Southern Cone are persecuted as livestock raiders, others have very restricted distributions. The Darwin's fox (*Pseudalopex fulvipes*) is endemic to coastal forests in southern Chile, the hoary fox (*P. vetulus*) is endemic to Brazil's cerrado, whereas the Sechuran fox (*P. sechurae*) is a restricted to the coastal deserts of north Peru and south Ecuador. Due to its small population size and disjunct distribution the Darwin's fox is listed as Critically Endangered by the IUCN, and four species are listed as Near Threatened. The short-eared fox (*Atelocynus microtis*) and bush dog (*Speothos venaticus*) are two forest specialists of particular concern, due to the rapid fragmentation

of their forest habitats and our insufficient understanding of their biology. This review will set the scene for a debate on research and conservation priorities for these threatened species in the Canid Conservation in the Neotropics Workshop.

91 SHORT TERM EFFECTS OF TRANSLOCATION ON LONG-HAIRED FIELD MICE (*ABROTHRIX LONGIPILIS*)

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Wildlife relocation is often used as a tool to mitigate environmental impacts on animal populations. In Chile, more than 30% of development projects are required to implement the rescue and translocation of some wildlife even though the use of this technique has not been sufficiently documented. During the breeding seasons of 2008 and 2009 we studied the behavior of Long-haired Field Mice (*Abrothrix longipilis*) translocated at different distances from their territories in Quirihue (36° 15'S, 72° 31'W), central Chile. We live-trapped mice at ten sites with forest cover. At each site we selected four adult males, to which we attached a 3.6 g radiotransmitter, and then released individually at 0 (control), 100, 500 and 1300 m from the capture site, in areas with suitable habitat and continuous forest cover between capture and release sites. After release, we recorded the location and survival of each individual during three days. Our experiment showed that total distance traveled was positively related to translocation distance ($p=0.02$), and that there was a higher probability of returning to the capture site at shorter translocation distances ($>100\text{m}$, $p=0.0002$). We also observed that at release distances $>500\text{m}$ mortality was higher (22%) than that of individuals released close to the capture site (0%) (chi-squared=4.97, $p=0.03$). High return rate at short distances and an increased mortality at longer release distances underscore the need for a strong justification of wildlife "rescue and translocation" given that alternative techniques might be more effective in mitigating environmental impacts on animal populations. Financial support by project FONDECYT 1080463.

92 SIGNS AS A TOOL FOR DETECTING TRENDS IN CARNIVORE POPULATIONS FROM SOUTHERN ARGENTINE PATAGONIA

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We developed and tested a simple method to monitor population trends in three carnivore species: culpeo and grey foxes (*Lycalopex culpaeus* and *L. griseus*) and pumas (*Puma concolor*) by sign quantification. From 2002 to 2008 we searched for carnivore feces in 4-km² square plots in the protected area "Monumento Natural Bosques Petrificados" (MNBP) located in southern Argentina Patagonia. The mean number of surveyed plots per season was 86 (range 45-116), and the mean sampling effort was 3 km per plot (range 2.5–4.1). The number of feces found in plots, corrected by sampling effort, were used to analyze population trends applying log-linear models with the program TRIM (TRENds & Indices for Monitoring Data, Statistics Netherlands). From 2002 to 2008, the overall population trend for culpeos was negative corresponding to an annual decrease of 11.6% (trend value 0.8800; $p<0.05$) and was considered as a moderate decline. Nevertheless, this decline was not steady over time, and population fluctuations were detected between years: decrease until 2003 (Wald test = 18.66, $df=1$, $p<0.001$); increase from 2005 to 2007 (Wald test = 18.46, $p<0.001$), and decrease from 2007 to 2008 (Wald test = 14.05, $df=1$; $p<0.01$). In contrast, the overall trend for grey foxes was positive (trend value 1.133 $p<0.01$), and corresponded to an annual increment of 13.4%, considered as a strong increase. No trend was detected for the puma during the study period (trend value = 1.0736). This methodology, simple and inexpensive, although time consuming, allowed us to detect population changes in both fox's species. Our results can be discussed in the context of competitive interactions among this carnivore species.

93 SPECIES DIVERSITY, RELATIVE ABUNDANCE OF MEDIUM-LARGE SIZE MAMMALS IN TWO PROTECTED AREAS IN SOUTH BRAZIL

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Medium and large size mammals were studied in São Francisco de Paula National Forest (SFPNF) in Rio Grande do Sul state, south of Brazil with camera-trapping (1725 trap-day) from January/2005 to December/2006. SFPNF is a national protected area located between geographical coordinates 29°23' to 29°27'S and 50°23' to 50°25'W, area size 1,606.7ha. Vegetation is a mosaic of native pine tree forest (*Araucaria angustifolia*), plantation of this native pine tree and exotic pine tree *Pinus* sp. During this period, we detected 15 species. Most frequent species were *Procyon cancrivorus*, *Dasyprocta azarae* and *Mazama gouazoubira*. Most frequent feline was *Leopardus pardalis*. We compared our results with those of medium-large size mammals of Turvo State Park (TSP). TSP is located at 27°00'S to 27°20'S and 53°40'S to 54°10'W and is a province protected area, with 17,491ha. Vegetation in this area is native rain forest of Uruguai river (Brazil and Argentina frontier). We identified 29 species of medium-large size mammals in SFPNF. Species richness of medium-large size mammals was smaller in SFPNF than in TSP. *Dasyprocta azarae* was very frequent in both areas and *Leopardus pardalis* was the most frequent feline in both areas too. The largest carnivore in SFPNF was *Puma concolor*, also present in TSP. The largest carnivore in TSP was *Panthera onca*, absent in SFPNF. The area of SFPNF is about 10% of the size of TSP. Intensive agriculture is practised at TSP surroundings. Otherwise, cattle raising and silviculture are the main economic activities in the region of SFPNF. Besides, the last protected area form with natural vegetation present in canyons nearby a biological corridor.

94 STOO AS A TOOL FOR MAPPING MAMMALIAN DIVERSITY

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Environmental management requires frequent and spatially detailed assessment of species diversity and distribution. Particularly for rare species, living in remote and inaccessible habitats, traditional methods may be logistically difficult, time consuming, expensive, and in many cases intrusive. During the last decade faeces have become an increasingly important source of DNA for non-invasive genetic studies of mammals. However, low yield and poor quality of DNA is still a general obstacle. As commercial kits for faecal DNA extraction primarily aim at pathogens and parasites we have developed a cost-effective protocol where the target is the genome of the defecating animal. Even though the faecal DNA will always be degraded into relatively short fragments it may be used for multiple purposes. We present several examples from our on-going studies of Neotropical mammals where a non-invasive genetic approach is used. These include: genetic diversity of the endangered mountain Nyala of the southern Ethiopian Bale Mountains (we investigate e.g. connectivity among subpopulations and MHC variability), population genetics of a small population of the world's rarest canid, the Ethiopian wolf, and a survey of cryptic biodiversity in the highlands of northern Ethiopia.

95 SURVEY OF GAME MAMMALS IN THREE CONSERVATION UNITS OF COAST OF SÃO PAULO STATE, BRAZIL

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Medium and large mammals in Brazilian Atlantic Forest hotspot are the main vulnerable hunting animals. Estuary-Lagoon Complex of Cananéia (south coast, São Paulo State), is one of the largest remnants of these ecosystem. This study aimed to verify the occurrence of medium and large game mammal (vulnerable to hunting) in three islands conservation units (CUs): Ilha do Cardoso State Park, Iguape-Cananéia-Peruíbe Federal APA (both in Cananéia, SP) and Ilha Comprida State APA (Ilha Comprida, SP), where game activities are practice by caiçaras and indigenous guarani M'bya. First, a questionnaire was applied to 39 local people (37 caiçaras and 2 indigenous guarani M'bya). They were questioned about 20 game species/morpho-species (through pictures) found in the region, belonging to the orders Didelphimorphia, Cingulata, Pilosa, Primates, Carnivora, Perissodactyla, Artiodactyla and Rodentia. All 20 species/morpho-species were observed by respondents in the last five years in the region (Ilha do Cardoso=19 species; Ilha de Cananéia=17; Ilha Comprida=18; CUs' adjacent continental area=20). About the observations of mammals crossing the channels between the islands and the continent, were recorded 18 species/morpho-species (Didelphimorphia, Cingulata, Carnivora, Artiodactyla and Rodentia), indicating the occurrence of flow of animals between these locations. Through camera traps, analysis of tracks and animals' direct observations, from those 20 game species/morpho-species studied, 17 were recorded (Ilha do Cardoso=15; Ilha de Cananéia=8; Ilha Comprida=10). Considering other survey studies in these CUs, rises to 21 the number of game species (Ilha do Cardoso=21; Ilha de Cananéia=13; Ilha Comprida=14). Given the presence of game species in the CUs, their demand for hunters, and the possibility of be confirmed a higher number of species in the region (indicated in the interviews and not included in these), were asked to the CUs and administrative sectors for more inspection and support for studies on the status of these species in the CUs.

96 SURVIVAL, HOME RANGES AND ACTIVITY PATTERNS OF REINTRODUCED GIANT ANTEATERS (*MYRMECOPHAGA TRIDACTYLA*) IN CORRIENTES, ARGENTINA

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We present preliminary results from the first giant anteater reintroduction in the Neotropics, which is being carried out in the Iberá Natural Reserve, Northeast Argentina. The objective of this study is to evaluate the behavior and survival of captive reared giant anteaters in the wild. Between October 2007 and April 2009 the project released three females and three males fitted with VHF transmitters. We radio-tracked each individual on a 24 h basis during different periods from October 2007 to April 2009. We estimated home ranges with 100% Minimum Convex Polygon (MCP) and 95% fixed Kernel Method. We determined if animals were active and compared their daily activity patterns between seasons. Of the six released individuals, one female lost its radio signal four months after being released and one male died in the wild 2 months after being released; the other four individuals are still alive with a mean minimum survival time since release of 11.75 ± 7.50 months. MCP home ranges varied from 1.50 to 8.12 km² (N=5) and from 1.28 to 13.30 km² with Kernel analysis (N=4). Animals were diurnal during autumn-winter and nocturnal during the spring-summer months (Mardia-Watson-Wheeler test $X^2 = 25.13$, d.f. = 2, $P < 0.001$). Variation in home range size among individuals was high but within the limits of home ranges reported for wild animals. The changes in activity pattern observed between seasons may result from the strong seasonal changes in temperature and the need for thermoregulatory balance, due to the low metabolic rate of this species. More animals are necessary to generalize these patterns, but these reintroduced captive reared animals show behaviors similar to those of wild animals, and have good chances of becoming part of the first reintroduced population of giant anteaters.

97 TERRESTRIAL CARNIVOROUS ANIMALS (MAMMALIA) IN THE ATLANTIC RAINFOREST ON PARANÁ STATE COAST, BRAZIL

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This study was carried out between march 2008 and april 2009 to map the terrestrial carnivorous registers in the coastal Atlantic rainforest of Paraná State and to identify knowledge gaps in order to provide support for conservation strategies. A bibliographic review was performed concomitantly with museum occurrences about terrestrial carnivorous animals in the study area. A search was also done about skulls lodged in Capão da Imbuia Natural History Museum, in the zoology Museum of PUC-PR, and in the Mastozoologic Scientific Collection of UFPR Zoology Department. Bibliographic review of conservation plans, macro-scale zoning and environmental impact studies were also investigated. The following species were registered: *Leopardus pardalis*, *L. tigrinus*, *L. wiedii*, *Puma concolor*, *P. yagouaroundi*, *Panthera onca*, *Cerdocyon thous*, *Eira barbara*, *Lontra longicaudis*, *Galictis cuja*, *Procyon cancrivorus*, *Nasua nasua*. Nineteen publications and ninety-eight occurrences in the museums were compiled. The most studied city is Guaraqueçaba, with 31% of the publications. The other 14 municipal areas have no more than 10% each one. From the registers of museums, Guaratuba has the biggest number of registers (19) and Campina Grande do Sul has the smallest (1). No bibliographic and museums registers were found from Bocaiúva do Sul and in Pontal do Paraná, only bibliographic ones were found. The species most cited in the bibliography were *P. concolor* (8) and *C. thous* (28), and the least cited were: *L. wiedii*, *P. yagouaroundi* (1) and those most observed in museums were: *E. barbara*, *P. onca* e *P. yagouaroundi* (1). The coast of Paraná still has significant areas of Atlantic rainforest, mainly in the Serra do Mar and on the coastal plains, but these areas are under strong anthropogenic pressure. Mapping the species distribution is essential to understand knowledge gaps and to identify priority areas for conservation and the need of inventories and monitoring.

98 THE ECORAT PROJECT: DEVELOPING ECOLOGICALLY-BASED RODENT MANAGEMENT FOR THE SOUTHERN AFRICAN REGION

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Since the 1999 seminal book by Singleton et al. on ecologically-based rodent management (EBRM), the field of rodent management research has been re-invigorated to look beyond the use of rodenticides. Despite this, and considering their multiple impacts across health and agriculture, rodents continue to be a relatively neglected field of research, and research capacity on rodent biology and control remains deficient in developed and developing countries. The Ecorat project contributes to the field of EBRM research by generating basic ecological knowledge and building research capacity, and then using these resources to implement EBRM in collaboration with African farming communities to provide practical pest management solutions. Since January 2007, Ecorat has been carrying out many different research activities related to rodent ecology, taxonomy and biology, rodent-human interactions (disease risks, spatial proximity) and the social sciences (knowledge, attitudes and practices of agricultural communities and the pre-existing costs of rodent damage). This multidisciplinary team of researchers work together within a consortium drawn from institutions in Namibia, South Africa, Swaziland and Tanzania, coordinated by the Natural Resources Institute in the UK and assisted by an international panel of expert evaluators. Based on the information collected about rodents and rodent managers, the Ecorat project has recently begun an intervention programme in cooperation with communities that involves intensively trapping rodents to reduce populations and environmental management activities which reduce rodent access to stored food, water and harbourage within communities. Monitoring the impact of the EBRM intervention involves monitoring changes to the rodent population and working with the communities to measure the impact of the EBRM intervention on levels of field crop and stored food damage and other observed effects (e.g. rat bites, damage to blankets).

99 THE GIANT ANTEATERS (*MYRMECOPHAGA TRIDACTYLA*) ROAD-KILLS IN SOUTHEASTERN BRAZIL

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Millions of animals are run over and killed each year in Brazil and yet there is little information about the impact of these occurrences on fauna. The giant anteater is a typical mammal of the South American 'cerrado' (tropical savanna ecoregion of Brazil), which appears as near threatened on the IUCN's list. Despite various records of anteaters being run over, this factor is still not given due consideration for the conservation of the species. We quantified the number of giant anteaters being run over, and analyzed how road conditions contributed to these occurrences in southeastern Brazil. From February, 2002 to April, 2009 (excluding 2004), we recorded 35 giant anteaters run over while driving twice a month along motorways in western Minas Gerais and northeastern São Paulo state (19° 21'-20° 32'S and 46° 50'-47° 50'W; ca. 30000 Km). It was possible to identify the sex in fifteen (66% males, 34% females). In 23, 88% were adults, 8% were sub-adults, and 4% were young. There is a tendency to have more collisions during the dry season ($p=0.09$), with the main cause of these occurrences being motorways straight stretches ($p<0.01$). Anteater road kills were not related to topography, existence of roadside shoulders, presence of constructions or native vegetation. Therefore, vehicle speed, combined to nocturnal activity, dark coloration and confounding shape of the anteater impair a fast recognition by the driver, who cannot avoid the target without risking its own safety. The presence of ants and termites in highways, together with habitat fragmentation, contribute to the increased use of roads by giant anteaters during periods of food shortages, resulting in such collisions. Considering

the decline in their population, management practices should be taken to deal with and decrease such accidents on motorways and areas surrounding natural habitats for the integral protection of the species. Support: Fundação de Amparo a Pesquisa do Estado de Minas Gerais – FAPEMIG Grupo ZEMA – Projeto Estrada Ecológica.

100 THE IMPACT OF CATTLE AND ITS MANAGEMENT ON THE FORESTALL UNGULATES CONSERVATION IN AN AREA OF PANTANAL

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Actually, habitat loss and desestructuration are the major threatens to global biodiversity conservation. In the Pantanal Wetland lands, two cattle management are applied: (1) cattle management inside of forested areas and (2) conversion of forest to pasture with exotic grasses. The effect of cattle grazing on the shrub cover was measured inside forested areas in the private lands of Pantanal, and the occupancy probability of forestall ungulates was modeled, in micro-habitat scale, according a shrub cover and, in landscape scale, according the forest availability. The cattle decreased the small, medium and high shrubs cover, but it did not affected the palm acuri cover (*Scheelea phalerata*) and caraguatá bromeliad cover (*Bromelia balansae*). Only *Mazama gouazoupira* presented occupancy probability affected negatively for a medium shrub, that was cattle decreased. *Tayassu tajacu* occupied ever micro-habitat, regarding the shrub cover, while *Tapirus terrestris* and *Sus scrofa* preferably occupied palm acuri predominated areas. *Tayassu pecari* avoided bromeliad caraguatá predominated areas and *Mazama americana* occupied mainly areas with minor shrub cover, however, the model estimated to this species was imprecise. In the landscape scale, *Mazama gouazoupira*, *Mazama americana*, *Tapirus terrestris* and *Tayassu tajacu* shown the major occupancy probability in the predominated forested areas, while *Tayassu pecari* avoided predominated forested areas and *Sus scrofa* occupied areas with higher water availability. The results suggests that the cattle grazing drastically affected the shrub cover and, then, could affect the *Mazama gouazoupira* populations. In other hand, the Pantanal deforestation could affect strongly the populations of four from six forestall ungulates in the Pantanal Wetland.

101 THE IMPACT OF OIL EXPLORATION ON CARNIVORE AND PRIMATE POPULATIONS IN THE NORTHERN PERUVIAN AMAZON

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The western Amazon is experiencing unprecedented levels of oil exploration, a trend of particular concern given the high levels of biodiversity found in this relatively pristine and unstudied region. Despite the widespread use of seismic reflection technology for oil exploration, no studies have investigated its impact on tropical wildlife populations. We conducted trail camera and line-transect surveys inside a large oil concession (Block 39, operated by Repsol Exploración Peru) in the northern Peruvian Amazon with ongoing 2D seismic explorations to investigate its effects on carnivore and primate populations with particular focus on the ocelot (*Leopardus pardalis*) and two primates of conservation concern, the white-bellied spider monkey (*Ateles belzebuth*) and the lowland woolly monkey (*Lagothrix poeppigii*). Ocelot activity and estimated population size before and during exploration operations indicated a lack of spatial or temporal avoidance of this disturbance. Primate groups were encountered with similar frequency before and during seismic activities, and abundance of woolly monkeys, the most common primate, remained unchanged during the disturbance. However, group size and individual encounter rate of spider monkeys were significantly lower during seismic operations than before; potential reasons for apparent differential effects of disturbance on these two similar species are discussed. Our ocelot density (#/100 km²) estimates from before (75.2) and during (94.7) seismic operations include the highest reported for the species, and represent the first ocelot density estimates from this region. In addition, densities of spider monkeys and woolly monkeys in our study area equal or exceed the highest reported for these species, both of which are severely threatened by hunting pressure throughout their range. Although our data indicate short-term impacts of these operations under certain conditions are likely minimal, potential long-term impacts of these operations must be considered.

102 THE URBANISATION OF THE GREY-HEADED FLYING-FOX, *PTEROPUS POLIOCEPHALUS* IN EASTERN AUSTRALIA

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The Australian endemic Grey-headed Flying-fox (*Pteropus poliocephalus*) has a life history that puts it at the extreme slow end of the slow-fast continuum: it is slow to mature, long lived, has a low reproductive rate and its young are dependent for an extended period of time. Species with such life histories characteristically have low mortality but historically, *P. poliocephalus* has suffered high levels of mortality and until 1986 was officially considered a "pest species". It is now considered "vulnerable" but its current survival is linked to various strategies involving its use of its habitat, and its ability to change and modify its behaviour in line with alterations in its environment. *P. poliocephalus* is a highly mobile species and generally considered to be panmictic throughout its distribution. Its relatively large population is spatially structured so that concentrations of animals are located at traditional sites (generally in remnant forest) regularly spaced throughout its distribution along the east coast of Australia. The usage and location of these sites have changed rapidly within the last 20 years subsequent to an estimated population decrease of more than 35%: major sites have become deserted while minor occasionally used sites have been used with increasing frequency. In particular the species has occupied more sites in urban locations and used them for longer periods of time. Urbanisation of the species has decreased the average distance between sites and may have reduced the foraging and migrational movements of *P. poliocephalus*. The impetus for

such changes must be that flying-foxes perceive an advantage in urban living however this perception may be deceptive and if urbanisation results in a reduction of mobility within the species it may have widespread ecological consequences as *P. poliocephalus* could be less effective in its ecological roles of long-distance pollinator and seed disperser.

103 THE USE OF ARTIFICIAL RESERVOIRS AND STREAMS BY MIDDLE- TO LARGE-SIZED MAMMALS IN A SILVICULTURAL LANDSCAPE OF SOUTHERN SÃO PAULO, BRAZIL

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Livestock production is being currently replaced by Eucalyptus plantations in Southern São Paulo, Brazil, especially in areas with poor soil fertility and harsh topography. In such situation a relatively large number of small artificial reservoirs originally built for cattle water supply remain on site. In addition, industrial Eucalyptus plantations usually keep areas of reserve, according to the Brazilian Environmental Law. These characteristics may be potentially beneficial for the wildlife, especially generalist species of middle- to large-sized mammals. In this study we are surveying their frequency of occurrence by vestiges (i.e., tracks, scats, burrows and markings) and sights around 50 artificial reservoirs (originally built for cattle water supply) and streams in five remaining gallery forests associated with a new (1 – 2 years) Eucalyptus plantations in Três Lagoas Ranch, in Southern São Paulo, Brazil. This study is being carried out from August 2008 to July 2010 in bimonthly field campaigns. As a result we so far (3/12 campaigns) detected a total of 17 species, 11 around artificial reservoirs and 10 in streams of gallery forests. Although preliminary, these results stress the possible importance of the remaining fragments of native vegetation in silvicultural landscapes. They also suggest that artificial reservoirs may increase habitat carrying capacity for middle- to large-sized mammals in such circumstance.

104 THIN LAYER CHROMATOGRAPHY (TLC): A TOOL FOR THE IDENTIFICATION OF WILDLIFE SPECIES

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Field collected scats are used as a source of information to do studies on diet, population dynamics and species distribution in wild life. However, time modifies the external characteristics being difficult to do a correct identification of feces. Thin Layer Chromatography is used to determine the fecal bile acid pattern, which is specie-specific and it is not affected by diet composition. The aim of this study was to determine the bile acid pattern in some species of herbivores, carnivores and omnivorous animals. Bile acids were extracted from one gram of feces with benzene: methanol and were spotted on silicagel plates together with standards and extracts from known feces. Plates were eluted with a solution of toluene: acetic acid: water and revealed with anisaldehyde: glacial acetic acid: sulphuric acid. Differences among the bile acid patterns of carnivores, herbivores and omnivorous were established. In omnivorous species such as armadillos, it was observed a great variation in the colour of the extracts, being yellow or brown in the common pichi (Zaedyus pichi) and the lesser hairy armadillo (Chaetophractus vellerosus), and green in the large hairy armadillo (*C. villosus*) and the southern lesser long-nosed armadillo (*Dasypus hybridus*). Feces from puma (*Puma concolor*) and jaguar (*Panthera onca*) were differentiated by the presence of chenodeoxycholic acid in puma; tapir (*Tapirus terrestris*) feces showed a low concentration of lithocholic acid. Moreover, TLC allowed the differentiation of feces from sympatric carnivores collected in the wild, such as snow leopard, lynx and wolf in Armenia. This work showed the usefulness of TLC for the correct identification of carnivore, herbivore and omnivorous species by their fecal bile acid patterns. Its application is a useful tool for studies about distribution and population dynamics in wildlife species.

105 URBAN ECOLOGY – POPULATION DYNAMICS AND THE EFFECTS OF MORTALITY SOURCES ON GREY-HEADED FLYING-FOX POPULATIONS

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In Australia the status of the endemic Grey-headed Flying-fox (*Pteropus poliocephalus*, Megachiroptera: Pteropodidae) is a topic of debate and controversy in public and political life. This has been brought about by the increasing overlap of the animal's east-coastal distribution with human settlement, resulting in conflict over land and resources. Historically, *P. poliocephalus* has been perceived as a common pest in commercial fruit orchards and killed in large numbers, a practice that continues to this day. At the same time, serious declines in population numbers were reported throughout the 20th century, resulting in the species being nationally listed as vulnerable in 2001. The continuing population decrease was linked primarily to the destruction of natural feeding and roosting habitats for this animal. Consequently, within the last 20 years, flying-foxes have started moving into urban environments, where they establish permanent colonies occupied throughout the year. This influx of bats from other areas gives the false impression that the population of *P. poliocephalus* is in 'plague proportions'. Instead, we show that the urban populations are prone to decline, mainly due to high anthropogenic-related mortality (bats being shot in orchards, and death of individuals on power lines, entanglements in barbed wire and netting, and plane collisions), as well as increased incidence of mass mortality in colonies from temperature extremes. A preliminary time-invariant, density independent population matrix model showed a negative population growth ($\lambda = 0.898$), identifying the urban colony sites as potential 'attractive sinks', where mortality from anthropogenic factors cannot be replaced by the number of births within a colony. Population age-structure, recruitment rates, age at first reproduction and longevity are also explored. In addition, we quantify the effects of different mortality sources on the population and hope that this study can provide a baseline for future research and management of *P. poliocephalus*.

106 UNRAVELING THE SECRETS OF THE SHORT-EARED DOG (*ATELOCYNUS MICROTIS*), AN AMAZONIAN ENDEMIC

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The short-eared dog (*Atelocynus microtis*) is an elusive, medium-sized canid, largely restricted to undisturbed lowland Amazon forests. Very little is known of its biology and ecology, although it is considered rare and Red Listed as Near Threatened. There are only 69 museum specimens worldwide, and only 12 individuals have been recorded in captivity since the species was described over 120 years ago. Here we summarize findings from work carried out from: 1) interviews of biologists working in the species range to determine its current distribution; 2) trapping and radio-tracking in SE Peru; 3) camera-trapping surveys. We found that the present range of short-eared dogs extends through Bolivia, Brazil, Colombia, Ecuador and Peru and it has a patchy distribution. Five short-eared dogs -three females and two males- were captured and radio-collared (for periods ranging from one week to one year), and their home ranges varied from 1-8 km². These included a mother and a juvenile caught three days apart. They stayed together until the juvenile was six months old, then the adult moved and established a new home range 8km away from the juvenile's home range. Over 100 camera-trap events revealed aspects of the short-eared dogs' diet, as well as circadian activity and denning behaviour. The dogs ate mainly fruit and carrion; droppings included seed of 50 plant species, pointing to a role as seed dispersers. The dogs' activity peaked during dawn and dusk. Burrows used included several of giant armadillos (*Protonotus maximus*). Dogs used up to nine different burrows within a day, resting inside for periods of up to two hours. Jaguars, pumas and boas were observed taking short-eared dogs, and are likely to be their main predators.

107 VISITOR-ANIMAL RELATION, EMPHASIZING COATIS (*NASUA NASUA*) AND DIET'S IMPLICATION: TWO BRAZILIAN'S CONSERVATION UNITS COMPARISON

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The coati (*Nasua nasua*) is the animal-symbol of two Brazilian important parks which receive many visitors: Parque Municipal das Mangabeiras and Parque Nacional do Iguaçu. The P.M. Mangabeiras, one of Brazil's biggest urban parks, located in Belo Horizonte, MG, is covered by vegetation transition Cerrado-Mata Atlântica. It is used as recreation area, besides sheltering species of birds, amphibians, reptiles and 13 species of non-flying mammals. The Parque do Iguaçu, biggest Brazilian conservation unit of Mata Atlântica, in Paraná State, near Foz do Iguaçu city, receives tourists from all world. It houses species of birds, amphibians, reptiles and approximately 50 mammals species. Coatis are frequently seen feeding of waste in urban areas and feeding by visitors heeding by visitor frequently, despite it's forbidden. To assess the relation in visitor's perception about animals, mainly the coati, and the influence of visitor-animal interaction on feeding, 30 visitors interview were made in each park. In both parks, 93% of interviewees had seen animals, and despite of P.N. Iguaçu biodiversity, the most viewed was the coati (100% of interviews). On the other side, in P.M. Mangabeiras, it was: coati (50%) and *Callithrix penicillata* (35%). Although most of visitors affirm that the most important animal's food source is the forest (P.M. Mangabeiras: 52%; P.N. Iguaçu: 48%), a part of interviewees think that employees are responsible for animals feeding (P.M. Mangabeiras: 16%; P.N. Iguaçu: 11%). Other interviewees claim that animals' main way of food acquire is feeding by visitors (P.M. Mangabeiras: 12%; P.N. Iguaçu: 22%) and parks dumps (P.M. Mangabeiras: 12%; P.N. Iguaçu: 15%). The results shows a visitors' knowledge deficiency about wild animals, mainly in P.M. Mangabeiras. This lack of information could be the cause of visitors' choice to feed animals, without concerning about the consequences of it. The food supply, combined with an easy access to dumps may be contributing to changes on coatis feeding habits. Two solutions suggested by interviewees were: dumps refitment, to difficult the animals access; making environment education programs to guide visitors and employees.

108 WINTER SURVEY OF MARCO POLO SHEEP (*OVIS AMMON POLII*) IN THE WESTERN PAMIRS, TAJIKISTAN

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The status of Marco Polo sheep, which are listed in Appendix II of CITES, in the Pamir region of Tajikistan is uncertain. The most propitious time for surveys is during winter (November-December) when both sexes congregate and are readily visible. During surveys conducted in late November 2005 and 2007 within an area of 292km², a total of 2689 and 2000 sheep were observed, respectively. The male to ewe ratio was 51: 100, and the lamb to ewe ratio was 47: 100. Estimated population density was 2.7 sheep per km² which equals the highest recorded densities of argali sheep in central Asia. All sheep appeared in good health. The lamb:ewe ratio indicates an increasing population. The next phase of this project will concentrate on conducting a 3-year study to determine population dynamics including domestic animal impacts on the forage resource.

ECOLOGY AND EVOLUTION

109 AGRICULTURE EFFECTS ON RODENT DIVERSITY AND ABUNDANCE IN AGRARIAN LANDSCAPES OF THE INLAND PAMPA, ARGENTINA

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These study goals were to evaluate the diversity and relative abundances of small rodents in pampean agroecosystems, and relate the observed patterns to agricultural managements. We conducted three trapping sessions (spring, summer and autumn) between 2004 and 2006. We selected 6 sites where we set multiple capture traps at 30 m intervals. In each site we identified three habitats with increasing agriculture disturbance: Not disturbed habitat (woodland and postagricultural enclosure), middle disturbed one (ecotone) and highly disturbed habitat (cropfield). Considering the two most abundant species in agroecosystems, accounted by capture frequency, *Akodon azarae* abundance varied significantly among habitats and was more frequently found in less disturbed habitats (enclosures and ecotones). *Calomys laucha* capture varied seasonally: in autumn, captures were more frequent in cropfields than in less disturbed habitats, while in spring, the abundances were similar among the three habitats. Rodent diversity was significantly greater in undisturbed habitats. The highest diversity occurred in autumn when abundance peaked all over the landscape. Regardless of the season the diversity was high in the ecotones and low in cropfields. From Barn Owl pellet analysis (n=84), the 82% was *Calomys* spp., 11% *Oligoryzomys flavescens* and 7% *A. azarae*. The diversity from pellets did not differ from those of capture data relative to habitat availability in the landscape (0.59 and 0.424 respectively, $p=0.078$). Summer data was not included in the analyses due to the low number of captures (n=6). Habitat, season and weed-insect management were the best agronomic variables that explained the variation of the rodent community composition (80.9% of the total variance). The Axis 1 (eigenvalue=0.324) was related to habitat and agrochemical use, while Axis 2 (eigenvalue=0.084) was associated to season. The availability of less disturbed habitats enhances rodent diversity and modifies the seasonal assemblages.

110 AVERSION TO BROMADIOLONE IN THE PRESENCE OF AN ALTERNATIVE FOOD, IN WILD HOUSE MICE (*MUS MUSCULUS*) CAPTURED ON POULTRY FARMS

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This study tests the hypothesis that populations of *Mus musculus* (Rodentia, Muridae) present on poultry farms applying bromadiolone as rodenticide have aversion to bromadiolone. The hypothesis was tested by a two-choice trial carried out on 60 mice captured on poultry farms in the County of Exaltación de la Cruz (Buenos Aires province, Argentina). Mice were maintained in individual cages under laboratory conditions and, after a minimum of 7-days acclimatisation, were randomly divided into three groups, consisting of 10 females and 10 males, that daily received the following feeding treatments: (group B) 6g of bromadiolone; (group T) 6g of wheat grains and (group BT) 6g of bromadiolone and 6g of wheat grains. During a 10-days period, all remanent of the offered food was daily collected and weighed to estimate daily consumption. Food preference-rejection was estimated in group BT using the Ivlev's Electivity Index, while the curves of consumption of bromadiolone were compared between groups B and BT. Moreover, the cumulative consumption of bromadiolone and the cumulative total consumption were also compared between those groups and sexes using ANOVA (when possible) or Kruskal-Wallis test. The Ivlev's Index indicated that both sexes reject bromadiolone. Group B showed curves of consumption of bromadiolone with a final increase, consistent with a change in the food election, while group BT showed curves of consumption of bromadiolone that decline to the end. The cumulative consumption of bromadiolone resulted lower in group BT than in group B, while there were not differences in the total consumption between groups, indicating that group BT compensated its total consumption by eating wheat grains. We conclude populations of *M. musculus* present on poultry farms have aversion to bromadiolone in presence of wheat grains as alternative food. As food for chickens contained wheat, we suggest bromadiolone should be applied in the breeding midtime.

111 BAT GUILDS STRUCTURE ASSOCIATED TO PRODUCTIVE SYSTEMS IN COLOMBIAN CENTRAL ANDEAN REGION

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In Colombian Central Andean Region, particularly in the area known as the «Coffee Zone», approximately 78% of the Andean forest has been transformed into cattle and agricultural systems. For this reason, it is important to determine how these new systems contribute to bat diversity conservation. Through capture-recapture techniques using mist nets (18:00-6:00 hrs) we described the structure and composition of bat guilds present in seven farms in the departments of Risaralda, Quindío and Valle del Cauca (2005-2008) and two protected natural reserves (Bremen and Otún Quimbaya), according to the kind of productive system to which each site was immersed (forest, agricultural and cattle systems). With exception of protected areas, the forests were found as small fragments (1-5 Ha). We capture 679 bats, representing 36 species and five families. Although species richness was homogeneous among the three productive systems, the similarity (Morisita-Horn) was low. In terms of trophic guilds, we found that frugivorous and insectivorous bats were more abundant in forest areas while nectarivorous and haematophagous were captured with a higher

frequency in agricultural and cattle systems respectively. The increased regional habitat complementarity shows an alarming differential response from bat guilds (frugivorous, insectivorous, nectarivorous and haematophagous) to the type of productive system (forest, agricultural and cattle systems). As a consequence there is a direct effect over the processes in which bats are involved (i.e. seed dispersal, pollination, pest control, among others). Conservation of forest fragments is important in order to maintain bat diversity in transformed habitats and in most cases constitute the last refuges for many species.

112 BODY SIZE IN BATS: EVOLUTION FROM EOCENE FOSSILS TO EXTANT DIVERSITY

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Size is the single most important factor affecting physiology, locomotion, ecology, and behavior of mammals. Understanding evolution of size is especially important in groups like bats which exhibit many unique or energetically expensive behaviors (e.g., powered flight, echolocation, torpor and hibernation, long-distance migration). In addition, bats have the most diverse array of dietary habits of any mammalian Order. Most bat species are small: the central tendency in size in extant bats, as estimated by the median value, is around 14 g. However, bat size spans three orders of magnitude, with a few species exceeding one kilogram. Variation is not evenly distributed across groups, and there is no specific hypothesis accounting for size variation in bats. In search of evolutionary patterns, we first estimated mass in key Eocene fossils via allometric relationships. Least midshaft diameter of limb bones yielded accurate models of variation in size (body mass) in extant bats at the interspecific level (error <2%), thus providing a solid basis for size estimation in fossils. We then mapped size on current bat phylogenies including Eocene fossils. On these phylogenies, mass decreased along stem chiropteran nodes until a range of 14 -17 g was achieved in the crown clade including Palaeochiropteryx and extant bats (or microbats, depending on the topology). Remarkably, this estimated range includes the median of size for extant bats and was conserved along the backbone of all major bat clades with minor variations, strongly suggesting that an efficient combination of factors, including energy expenditure and cost of transport, was achieved at the base of the crown clade and was maintained through the evolutionary history of bats. Departures from this range were reconstructed as nested within bat families and were associated with major changes in diet, particularly carnivory and frugivory.

113 CLIMATE INFLUENCES ON THE UPPER RANGE LIMIT OF A COMMON HERBIVORE IN SUBALPINE AUSTRALIA

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Alpine ecosystems are particularly susceptible to climate change. Climate models in Australia predict a substantial reduction in the snow cover, and this could result in range shifts of species to higher altitudes. Of particular concern is the movement of herbivores to higher altitudes and their potential impact on grazing-sensitive alpine ecosystems. However, the distribution of key habitat resources may constrain the range of herbivores and prevent any upward migration. This study examined the local resource constraints on the distribution of a large herbivore in Australia, the common wombat *Vombatus ursinus*, along an altitudinal gradient above the winter snowline in the Snowy Mountains. Logistic regression analyses of environmental and habitat predictors were conducted on the presence / absence of animal signs recorded during winter and summer. Wombats responded strongly to the altitudinal gradient and shifted to higher altitudes during the snow-free period. Maximum snow depth was the most influential variable in wombat occupancy in both seasons, but other habitat covariates were also important predictors. Rugged, high-relief terrain was important to wombats in winter, allowing individuals access to a wider range of altitudes and snow depths. During summer, high soil bulk density was an important predictor of occupancy, and in both seasons, occupancy declined in response to a higher cover of burnt grass. These models demonstrate that, for some animal populations, local habitat factors are important even where there are strong regulating environmental factors. For wombats, this may limit future range expansion into the alpine zone despite the potential for an increase in abundance at their present range limit. These findings highlight the importance of conducting local ecological studies in parallel with broad-scale climate modeling, to understand and manage shifts in species distributions as the climate rapidly changes.

114 CLIMATIC-ENVIRONMENTAL CHANGES AND BODY MASS EVOLUTION IN SOUTH AMERICAN MAMMALS: THE ABDERITIDAE'S CASE (MARSUPIALIA: PAUCITUBERCULATA)

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The Abderitidae are a monophyletic group of small sized marsupials, recorded in South America during Late Oligocene-Middle Miocene. They are represented by three genera (i.e., Parabderites, Abderites, and Pitheculites) and eight species, all of them showing dental specializations (e.g., plagiaulacoid molariforms) convergent with those of other mammals (e.g., burramid marsupials, plagiaulacoid multituberculates, carpolestid plesiadapiforms). The objectives of this presentation are: (1) to understand the body mass evolution in the Abderitidae; and (2) to explore its possible linking with the climatic-environmental changes recorded in South America during the middle Cenozoic. Body mass was estimated from the area of the M2 using a linear regression equation derived from living marsupials. To understand its evolution, body mass was mapped on the Abderitidae's cladogram using the Line Parsimony Method (LPM) implemented in Mac Clade (version 4.02). The results show that: a) Parabderites has species of small (*P. minusculus*, 75 g) and medium size (*P. bicrispatus*, 572 g); b) all the species of Pitheculites has small size (*P. minimus*, 32 g; *P. rothi*, 52 g; and *P.*

chenche, 94 g); c) the species of *Abderites* occupied the range of the medium (*A. crispus*, 232 g; and *A. meridionalis*, 450g) to medium-large size (*Abderites* sp., 720 g); (d) only *Abderites* shows a clear pattern of body mass evolution across the time (from lower to higher body mass species). All these body mass changes occurred during a lapse characterized by a progressive decrease in temperatures, and an increase of aridity, that produced a reduction of the warm and wet forested environments, and the initiation of the expansion of the more open, drier and colder ones (e.g., savannas, grasslands) in southern South America. As colophon, we discuss the probable influence of these climatic-environmental changes on the body mass evolution of the *Abderitidae*.

115 COMPARISON OF LONG-DISTANCE MOVEMENTS BETWEEN TWO SYMPATRIC UNGULATES IN SOUTHEASTERN GOBI, MONGOLIA

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Asiatic wild ass (*Equus hemionus*) and Mongolian gazelle (*Procapra gutturosa*) inhabit dry steppe and semi desert sympatrically in southeastern Gobi, Mongolia. Both species have ability to move long distance, but details of their movements and habitat selections are still unknown. Movement patterns, movement factors, and habitat selections of both species would be different because their body sizes and digestive systems are different; body weights of Asiatic wild ass and Mongolian gazelle are about 250 kg and 30 kg, respectively, and the Mongolian gazelle is a ruminant species, but the Asiatic wild ass is a non-ruminant species. To track their movements, we collared satellite transmitters of Argos system on 16 animals of each species in May and June 2007. Location data were collected in 8 days interval. We could track most gazelles for 1 year, but the tracking of many wild asses were intermittent and stopped because antennas were probably broken. Comparing the moving distances for 8 days, mean distance was longer in the wild asses than the gazelles, although both species recorded more than 100 km movements within 8 days. It suggests that wild asses tend to move continuously, but gazelles have resident periods in small areas and moving periods for long distances, and that survival strategies of both species in the drylands would be different. To consider conservation strategy for both species, analyzing relationships between moving pattern, habitat selection, and environmental factors would be important.

116 COMPOSITION, RICHNESS AND ALTITUDINAL VARIATION OF THE COMMUNITY OF SMALL MAMMALS IN A MONTANE FOREST OF BOLIVIA

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Humid montane forests are complex formations consisting of various habitats. Due to the characteristic topography of the region, which makes it very difficult to carry out research, only a few places have been examined. Here we aim to compare species richness, composition and altitudinal variation of the communities of small mammals in the Cotapata National Park. We sampled small terrestrial mammals at three localities: Páramo Yungueño, Bosque Nublado and Bosque Yungueño, by 150 removal trapping (Museum special and Victor) and 15 pitfalls, for 7 consecutive nights per locality during the dry season (June to August) and during the transition between the dry and wet season (September to November) in 2007. We caught 174 animals and previous analysis shows that they correspond to 19 taxa of rodents and 2 of marsupials. Páramo Yungueño was the locality with the largest number of captures; we observed the highest species richness in Bosque Nublado. The lowest number of animals was captured in Bosque Yungueño. The differences in the composition and species richness between the habitats can be attributed to climatic conditions, spatial heterogeneity, age of the ecosystem, level of disturbance, as well as to resource availability, predation and competition. All these factors are subject to altitudinal variation at the study sites.

117 DETERMINANTS OF HABITAT PARTITIONING BY UNGULATES IN THE NORTHERNMOST BRAZILIAN AMAZONIA

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Large mammals in the northernmost Brazilian Amazonia remained relatively inaccessible for centuries; studies in Roraima are relatively recent and have shown that diversity and abundance is a function of fruit productivity. During 1 year (1998) intensive systematic surveys were carried out through the line transect method in Maracá Ecological Station, and revealed a terrestrial mammalian community more abundant than the arboreal one, with ungulates presenting the highest densities and biomasses. In this scenario, we assessed habitat partitioning by the occurring ungulates (*Mazama americana*, *Pecari tajacu*, *Tapirus terrestris* and *Tayassu pecari*) in five distinct forest types, which were used differentially ($X^2=38,406$ df=4 $p=0.0001$). Densities and biomasses were a function of fruit availability, measured by kilograms of fruit on the forest floor. The richest forest type, the floodable Buritizal (fruit availability: 5,274.7 kg/ha) was the most exploited by all ungulates, being *Tayassu pecari* the most abundant (78.57 ind/km²; 2,533.88 kg/km²). In Terra Firme forest (284 kg/ha) the most abundant species was *Tayassu pecari* (3.74 ind/km²; 120.61 kg/km²), whereas Mixed forest, which has slightly less fruit available (229.5 kg/ha), was less exploited than Terra Firme forest, *Pecari tajacu* being the most abundant (1.76 ind/km²; 37.68 kg/km²). Only *Tapirus terrestris* occurred in the low highly-entangled by lianas, Carrasco forest (no fruit available), although in low density and biomass (1.77 ind/km²; 422.15 kg/km²), possibly using it as a refuge. The highly-deciduous monodominant Pau Roxo forest (829.9 kg/ha) was not used by any ungulates because the Pau Roxo fruit is not edible. Habitat heterogeneity and the high differential fruit productivity in each of the forest types were the key determinants of the co-existence and high abundances of the ungulate community in this metapopulation.

118 DEVELOPMENT OF SEXUAL DIMORPHISM IN EASTERN GREY KANGAROOS

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In many polygynous vertebrates, inter-male competition has led to the evolution of male-specific morphological features and increased male size. Adult male eastern grey kangaroos (*Macropus giganteus*) appear substantially larger than adult females and also seem to have proportionally longer limbs. The developmental timing of these differences, however, has not been examined in detail. This study thus aimed to describe the development of mass and size in both male and female eastern grey kangaroos. Morphological data from 264 males and 471 females were collected between 1994 and 2007 on individuals culled from three locations across southern Australia. Body mass, body measurements (arm, foot and leg length) and the ratios of those measurements were compared with age from 1.0 to 16.3 years, as determined by a molar index. Males soon became larger than females according to mass and every body measurement and ratio studied, except for the ratio of leg:foot. Dimorphism arose at approximately 2 years, with mass and most measurements reaching a plateau in development at about age 6 in both sexes. In contrast, males showed continuous growth of the arms throughout life, so that ratios involving the arms also did not reach an asymptote in males. Both body size and the degree of sexual dimorphism increased with decreasing population density, indicating the effect of resource competition.

119 ECOLOGY AND BIODIVERSITY OF SMALL MAMMALS IN A HIGH ANDEAN PÁRAMO AND POLYLEPIS FOREST OF ECUADOR

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The Neotropical alpine shrub-grassland known as páramo and the adjacent montane *Polylepis* woodland are among the world's most threatened ecosystems and are limited to elevations greater than 3,000 m in Venezuela, Colombia and northern Ecuador. The historically widespread *Polylepis* forests are presently highly fragmented and remain in discontinuous patches often along steep rock-strewn slopes and isolated ravines. Páramo, dominated by *Espeletia*, occurs above treeline and is interspersed among fragmented woodlands. During five nights in June 2007, January 2008 and September 2008; we determined habitat affinity, abundance, demographics and distribution of small mammals in a páramo and an adjacent *Polylepis* forest. The forest and páramo of our study site are contiguous with those of the ecological reserve of El Ángel in Carchi province of Ecuador. Each habitat was sampled using transects of Sherman live traps. The forest revealed 12 species of three orders (Paucituberculata, Soricomorpha and Rodentia) denoting an exceptionally high biodiversity. Five species were also present in the páramo. In total, we had 329 captures-recaptures of 186 individuals, nearly half of which were *Thomasomys paramorum*, the most abundant species in both habitats. Two species of *Akodon* were also common, but while *A. mollis* was captured in both the forest and páramo, it was more abundant in the latter. Only one *A. latebricola* was caught outside of the forest suggesting habitat segregation by *Akodon*. *Caenolestes* and *T. aureus* were only found in the forest and often in trees. *Cryptotis* sp., *Microrzomys altissimus*, *Reithrodontomys soderstromi*, *T. rhoadsi* and *T. baeops* were also caught. Because juveniles of *T. paramorum*, *T. aureus*, *A. mollis* and *A. latebricola* were only frequently caught in September, breeding is correlated with the dry season. Few other tropical habitats possess such diversity and abundance of terrestrial, nonvolant, small mammals.

120 ENVIRONMENTAL FACTORS THAT AFFECT A RODENT COMMUNITY AT 2000-2500 METERS ALTITUDE IN THE CENTRAL ANDES OF ARGENTINA (MALARGÜE, MENDOZA)

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Malargüe, Mendoza. Email: gdiaz@infoar.net The highlands of the south of Mendoza province (between 2000 and 2500 m) have a combination of mountainous and arid conditions. These ecosystems have been poorly studied regarding their ecology, particularly regarding the small mammal community. In our current research, we sampled with Sherman live traps the following micromammals species: *Eligmodonit* typus, *Phyllotis xanthopygus*, *Abrothrix xanthorhina*, *A. longipilis*, *Chelemys macronyx* and *Euneomys mordax*. Furthermore, we determined plant cover, number of plant species and altitude in 6 different plots separated by 100 meters, where we made 3 transects of 10 points each as replicate samples. The Jaccard similarity coefficients showed positive association between all species, typical of ecosystems modulated by a reduced number of limiting factors. Each rodent species was tested for altitude, vegetation cover and plant species richness using a stepwise linear regression as direct gradient analysis. Vegetation cover affected mainly the *Phyllotis* and *Abrothrix* species, and plant species richness was shown to affect *Euneomys*. We discuss the results of our study in the light of the theory of resource partitioning in mountain arid environments, with special reference to ecophysiological aspects. (Partially funded by ICES and Municipality of Malargüe).

121 FACTORS AFFECTING SMALL CAT ABUNDANCE IN THE HIGH ANDES OF ARGENTINA

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The ecological factors affecting the distribution and abundance of both species of small cats occurring in the High Andes, the Andean cat *Leopardus jacobita* and the Pampas cat *L. colocolo*, have not been explored. We examine here the patterns of relative abundance of these cats in Argentina as a function of topography, prey availability and other habitat characteristics. Cat signs of presence were

counted while walking 400 m-long line transects and their relative abundance was estimated as the number of cat sites/km. For each transect (n=121, in 10 areas) we also recorded the presence of Mountain vizcachas *Lagidium viscacia*, small cats' main prey, and of other carnivores, as well as altitude, slope, terrain ruggedness, habitat composition, human activity at 2721 sampling points along transects. The average (\pm SD) number of cat sites/km was 3.02 ± 4.71 . As expected, cat site abundance increased with that of their prey ($R^2 = .122$, $p = .0001$), estimated through 4 categories of visually-estimated fecal pellet abundance. Nevertheless, this regression had a lower predictive value than that with terrain ruggedness as independent variable ($R^2 = .316$, $p = .0001$). Using all variables in a stepwise procedure, only ruggedness, prey abundance and mean slope had significant ($p < .1$) contributions, and the resulting model explained only a slightly larger proportion of data variability ($R^2 = .369$, $p = .0001$). The values of indices for terrain ruggedness and abundance of Mountain vizcachas were 1.7 and 1.6 times greater in the areas of cat high density (defined as those with > 4 cat sites/km, n=23 transects) than in low abundance areas (no cat sign recorded, n=47). Although it cannot be excluded that ruggedness is indicative of patches preferred by cats as defecation sites, we suggest that this parameter is related to vizcacha preferred habitats and thus that prey abundance and availability would be the key environmental variables affecting cat abundance in the High Andes.

122 FIRST DENSITY ESTIMATES OF SMALL ANDEAN FELIDS: WHICH IS REALLY THE RAREST?

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The Andean cat (AC, *Leopardus jacobita*) is one of the least known and most endangered felids in the world. The Pampas cat (PC, *Leopardus colocolo*), another poorly known felid, shares its habitat with the AC in the Andes. The AC is considered to be less abundant than the PC; however, previous attempts to estimate abundance have not accounted for the probability of detection which can greatly bias such estimates. To improve estimates of density for these two species, we carried out a camera trapping survey in northwestern Argentina, at approximately 4000 m of elevation. Sampling was conducted during October-December 2006 and April-June 2007. In each year, we deployed 22 pairs of camera traps, which were strategically placed. For the PC, we photo-captured 7 individuals in 2006, 9 individuals in 2007, and 6 individuals in both years. For the AC, 2 individuals were photo-captured in 2006, 6 individuals only in 2007, and 1 in both years. We used a Bayesian spatial capture-recapture model to estimate the density of both species and activity centers of captured individuals. The estimated densities were 0.754 and 0.748 individuals/km² for PC and 0.070 and 0.130 individuals/km² for AC in 2006 and 2007, respectively. The baseline detection probabilities were low (0.018 and 0.069 for PC and AC, respectively). The estimated locations of the activity centers for both species do not appear randomly distributed across the study area. Results indicated that PC density estimates were consistent across both years whereas the AC results varied more between years. We suspect that while the AC occurs in low densities in this area, where prey appear to be abundant, its density may be even lower in other regions throughout its distribution. We note that detection probabilities are important in making reliable estimates of density, a key parameter in conservation and management decisions.

123 HABITAT SELECTION BY *CALOMYS MUSCULINUS* IN CROP-FIELD BORDERS OF PAMPEAN AGRO-ECOSYSTEM

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Crop-field borders are fairly undisturbed habitats within agro-ecosystems, otherwise highly human modified landscapes. *Calomys musculus* (Muridae, Sigmodontinae) is numerically dominant in border habitats and selects them over crop-fields. Overall, 96 crop-field borders of Córdoba province, Argentina were seasonally sampled for rodent capture from spring 2005 to winter 2006. Simultaneously, we registered vegetation composition and structure of border and contiguous crop-field, from both local surveys and remote sensing. We assessed habitat selection using Generalized Linear Models (GLMs). A total of 1169 individuals of eight rodent species were captured along the year, with *C. musculus* representing the 34% of rodent assemblage. GLMs of spring and summer explained almost the 75% of *C. musculus* abundance variation, whilst models of autumn and winter reached less than 40% of explanation. In spring and summer models, *C. musculus* abundance appears positively related to border width size and negatively associated to the presence of trees within the border. Besides, a positive association with vegetation cover of borders' vicinities was found through the remote sensing variables. However, this relation seemed to invert in autumn, when the surrounding vegetation was negatively associated to *C. musculus* abundance. In spring, summer and autumn we also detected differences in the use of borders by *C. musculus* in relation to the relative cover of some plant species. The global low numbers of captures in winter did not allow evidencing habitat association distinctions between borders. Variations in habitat use by *C. musculus* may be related to the reproductive behavior of the rodent, which extends its breeding season from spring to late summer, reaching its population peak in autumn. Since *C. musculus* is the natural reservoir of the Junin virus, etiological agent of the Argentine Hemorrhagic Fever, understanding its habitat requirements, throughout its yearly cycle, results essential to promote adequate control practices and optimizing efforts.

124 HOW TAXONOMIC MISIDENTIFICATION IMPACTS PHYLOGENETIC INFERENCES: THE CASE OF THREE-TOED SLOTHS

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In this study, we analyzed molecular and morphological data from three-toed sloths, *Bradypus variegatus* and *Bradypus tridactylus*, which are believed to represent a case of taxonomic misidentification. When analyzing five museum collections we observed that most of sloth specimens belonging to *B. variegatus* species were erroneously attributed to *B. tridactylus* specimens. These misidentification events encompassed 27% of the 246 analyzed sloth specimens. Most of these events were recorded to the North central region of Brazil, where these species are sympatric. We did not observe morphometrical similarities between these two species, even when considering only specimens from the North Central Brazil in the comparative analysis (Wilk's lambda = 0.021, $F = 3.427$, d.f. = 68.0 and 40.0, $P = 0.000$). We only confirmed the similarity in color of facial hair, already described for some populations in these geographical region. Also, using a molecular phylogeny approach we observed that phylogenies inferred from mitochondrial DNA, obtained only from morphological reviewed specimens, reflect sloths taxonomy. However, when comparing our molecular phylogeny to previously published mitochondrial DNA sequences, available on public genetic data basis, we observed taxonomic inconsistencies. All Cytochrome b and 16S mitochondrial DNA sequences available on the Genbank® genetic sequence database, which were attributed to *B. tridactylus* species, matched the molecular diversity of *B. variegatus* sloths. This incongruent topology could be due to taxonomic misidentification, possibly associated to the similarities in color of facial hairs. Due to the taxonomic incongruence a previously published study on sloths phylogeny estimated the split between the brown and the pale three-toed sloth about 0.4 MYA. In our study, similar divergence times were observed when considering the split among some *B. variegatus* mtDNA lineages. However, according to our results the split between *B. variegatus* and *B. tridactylus* were estimated in 6.6 to 5 MYA.

125 **LAMA GUANICOE (MÜLLER 1776) BODY SIZE IN CONTINENTAL PATAGONIA AND TIERRA DEL FUEGO**

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The estimation of body size is a relevant issue in many ecological, adaptive, and microevolutionary studies of mammals. Body size cannot be directly estimated on paleontological or modern osseous remains, but in a derivative way using measurements taken on bones whose dimensions are correlated with overall body size. In this paper we evaluate appendicular bone size differences between modern regional samples of *Lama guanicoe* (Müller 1976) (guanaco), the widest distributed camelid in South America. The whole sample was composed by 120 fully fused individuals drawn from three different guanaco populations from continental and insular Patagonia (Río Negro, Santa Cruz, and Tierra del Fuego), covering the latitudinal strip between 40° and 54° south lat. One hundred and sixty four humerus, 146 radioulnae, 124 femora, and 214 metapodials were measured. The obtained result show that specimens from Tierra del Fuego (54°S) are, on average, bigger than those from Santa Cruz (50-52°S) and that, in turn, the latter are bigger than those from Río Negro (40°S). Statistically, this latitudinal variation is significant for distal epiphyses of long bones and for metapodials. The observed pattern is consistent with biogeographic generalizations like the Bergmann's rule. However it is contended that factors other than local adaptation and limited rates of gene flow can account for at least part of the observed differences. Among these factors we may consider differential competition with sheeps during the last 100 years, higher predation pressure in continental Patagonia than in Tierra del Fuego, and the so-called «island rule» that operated since the complete separation of Tierra del Fuego from the continent after the opening of the Magellan Strait during the Early Holocene.

126 **LIFE TRAITS OF *RATTUS NORVEGICUS* AND *MUS MUSCULUS* IN DIFFERENT HABITATS AND GEOGRAPHIC REGIONS**

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In order to relate life traits of *Rattus norvegicus* and *Mus musculus* with the environmental characteristics of their habitats we sampled two urban sites in the city of Buenos Aires and we compiled demographic information available in bibliography. Habitats were classified as urban, rural and natural and climatograms of each of the studied localities were constructed. We analyzed those variables most found in bibliography including estimated abundance, changes in abundance and reproductive activity through out the year, presence or absence of a reproductive break, number of embryos per pregnant female and growth rates. None of the urban populations of *R. norvegicus* and *M. musculus* studied showed a break in their breeding cycles. In both species pregnancy prevalences and abundance changed through out the year, pregnancy peaking in spring and summer and abundance generally in autumn. Rural populations of *R. norvegicus* living in regions where freeze and frost occur showed breaks in there breeding cycle while these breaks were absent in rural populations living in warm regions. In rural populations pregnancy prevalences peaked in spring and summer. Rural populations of *M. musculus* did not interrupt its breeding cycle in farms while they did so in most crop fields. Pregnancy prevalences were highest mostly in spring. Little demographic information of these species in natural habitats was available. These species showed two life history strategies characterized by: 1) an interruption of their reproduction during the cold season in the least favorable habitats or 2) a decrease in the reproductive investment during the cold season in more favorable habitats. According to the data found, we can conclude that these species always show seasonality in their reproductive investment, even in those habitats which appear more favorable for them such as urban areas in temperate regions.

127 **NEW RECORDS OF THE ENDANGERED ANDEAN CAT *LEOPARDUS JACOBITA* PROVE THAT IT IS NOT AN ENDEMIC OF THE HIGH ANDES**

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Until recently the endangered Andean cat was considered an endemic of the High Andean and Puna biogeographic provinces at altitudes above 3000 m.a.s.l. Combining genetic identification of skins and scats, morphometric analysis of skulls, and one sighting, we report here eight new confirmed records of this species in southern Mendoza and northern Neuquén provinces, Argentina at elevations as low as 650 m.a.s.l. Using field interviews we also present 17 unconfirmed reports of the presence of the species. These records show that the Andean cat is widely but patchily distributed in northern Patagonia and, in addition to occupying habitats of the high Andes mountains, also extends into two new habitats outside of the Andes: the Patagonian and Monte biogeographic provinces. Our findings demonstrate that the Andean cat is not an endemic of the high Andes, and that the species' habitat plasticity is greater than previously known. In the northern Andes the main threats to the species were identified as habitat loss followed by hunting for religious purposes. In these newly identified habitats the main threats appear to be hunting because of predation on goats, oil activity that opens roads to poachers, and climate change that can affect the distribution of the Andean cat's main prey.

128 POSTGLACIAL COLONIZATION OF BRITAIN BY BANK VOLES FROM DIFFERENT GLACIAL REFUGIA

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The bank vole, *Myodes glareolus*, provides an excellent model for studying the genetic response to climate change. We demonstrate that bank voles from peripheral parts of Britain had different ancestry from those in parts of Britain closer to continental Europe. It therefore appears that at the end of the last glaciation, bank voles colonized Britain from two different source populations that were already genetically divergent. We suggest climate-driven diversification in different glacial refugia as the probable explanation. (Supported by the Academy of Sciences of the Czech Republic, grant IAA600450701).

129 PRELIMINARY ACOUSTIC ANALYSIS OF *MYOTIS CHILOENSIS*, VESPERTILIONIDAE, AN ENDEMIC BAT OF SOUTHERN TEMPERATE RAINFOREST

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Echolocation is typical of microchiropteran bats and the detection of ultrasound calls has led to important advances in our knowledge about their distribution and habitat use. To date, monitoring of echolocation calls has been used most commonly for vespertilionids in different ecosystems. This has not been the case in Chile, where studies based on mist net trapping have provided our current knowledge about chiropteran biology. With the aim to broaden this knowledge, we recorded echolocation calls of *Myotis chiloensis*, an endemic bat of the temperate rainforest of Chile and Argentina, using the Pettersson D240X ultrasound detector (Pettersson Elektronik AB, Uppsala) in 10X time expansion mode, connected to an Edirol R-09 digital recorder. The recordings were analysed with Avisoft SASLab Pro 4.51 (R. Spetch, Germany) using 22,050 sampling frequency, FFT length 256, Hamming window and Overlap of 75%. The recordings were obtained from male bats, caught with mist nets near Pucón city (39°15'S 71°00'W), Araucanía Region, southern Chile. A total of 22 echolocation calls of captured and released individuals and 75 calls of individuals flying near the shelter were recorded. The files of 12 captured and released individuals have been analysed. The search phase pulse analysis showed that the terminal frequency characteristic for this species is 20.8 ± 0.6 kHz, with duration of 5.3 ± 2.5 ms and pulse interval of 149.9 ± 24.1 ms. The call is FM - QCF type - pulses start with a large narrowband (Frequency-Modulated), and then continue with frequency changes of a few kHz between the onset and the end of the component. This call is distinctive for the family Vespertilionidae. These are the first time the calls of *M. chiloensis* have been published, and this work opens up opportunities for future studies better to understand the foraging behaviour and habitat use by this species. Key words: Bats, *Myotis chiloensis*, echolocation call, temperate rainforest, Chile.

130 PRESENCE OF GEOFFROY'S CAT (*LEOPARDUS GEOFFROYI*) IN AN AGROECOSYSTEM OF THE BUENOS AIRES PROVINCE, ARGENTINA

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Geoffroy's cat (*Leopardus geoffroyi*) is a little poor-known South American felid. Most of its range includes arid and semi-arid environments, but it also uses a wide range of habitats including grasslands, open forests, and wetlands. Geoffroy's cat has been described as an opportunistic predator, feeding mainly on small rodents and waterbirds in the Pampas grasslands of Argentina. The goal of the present study was to assess if the Geoffroy's cat is present in an area characterized by the presence of small woodlots within a cropfield matrix. The study was carried out in the Exaltación de la Cruz Department, north-west Buenos Aires province, Argentina. The study area is devoted to agricultural activities like culture of corn, sorghum, wheat, soybean, sunflower, and to the poultry farming. We looked for cat scats within the woodlots and recorded the characteristics of the woodlots and of the surrounding fields. We only found Geoffroy's cat signs in old woodlots with trees of medium and large size, like the Ombú (*Phytolacca dioica* L.) and Eucalyptus (*Eucalyptus* sp.). These trees had the fork between one and two meters of height and, in general, were pruned or broken making additional surfaces that were used by the Geoffroy's cat. We found *L. geoffroyi*'s scats in 8 out of 33 woodlots inspected in 3 areas of 25 m² each one, confirming that it can use this small forest patches.

131 RATS DO READ PAPERS: DIFFERENTIAL EFFECTS OF DEFAUNATION ON SMALL MAMMALS IN BRAZIL'S ATLANTIC FOREST

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132 SPATIAL ECOLOGY OF THE PAMPAS FOX /SPATIAL ECOLOGY OF THE PAMPAS FOX /PSEUDALOPEX GYMNOCERCUS, IN THE ARGENTINE PAMPAS GRASSLAND/

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The Pampas fox, *Pseudalopex gymnocercus*, is a medium-sized South American fox, actively persecuted by men for preying upon livestock. In spite of its wide distribution and relative abundance, the knowledge on social and spatial organization of this canid is extremely scarce. The spatial ecology of pampas fox was examined from February 2001 to May 2007 in two study areas in the south-west of Buenos Aires Province, central Argentina. The first area was located in the Tornquist Provincial Park (PPET), a protected mountain grassland area with a high density of wild horses, and the second area was near the village of Aparicio (APA), a typical cropland and cattle ranching region.

Twenty six foxes were radio-tracked (16 at PPET and 9 at APA). The average annual home range size (HR), estimated by the minimum convex polygon, was 213.3 ± 136.8 ha. HR size varied more among individuals than between areas and sexes. Nevertheless, at PPET HRs tended to be smaller and their sizes decreased more than at APA when the 5% most external positions were excluded.

Breeding pairs used overlapping HRs, remained stable for several years and showed strong site fidelity. At both areas, HR overlap was larger intersexually (29.8 ± 41.1) than male intrasexually (16 ± 10.4). However, while female core areas overlapped 73.2% at PPET, no overlap between females was observed at APA.

Foxes spent 38.5% of their time active. Nocturnal activity (35.6%) was significantly greater than during the rest of the day (range 14.4%-27.3%), but activity patterns were flexible: foxes were almost exclusively nocturnal at APA and showed diurnal activity at PPET, where hunting is prohibited.

Monogamous breeding pairs appear to be the basic component of the social organization in Pampas foxes, but flexibility was observed in the degree of interindividual tolerance, group size, HR size and strength of territoriality.

133 THE COMPLEMENTARY ROLES OF SCIENCE AND PHILOSOPHY IN CONTENDING WITH CREATIONISM

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Despite Douglas Futuyma's assertion that "... no biologist today would think of publishing a paper on new evidence for evolution, any more than a chemist would try to publish a demonstration that water is composed of hydrogen and oxygen", some evolutionists insist that the only valid argument against creationism (and narrative-biased evolutionism) is empirical evidence. Several biologists, surely including Futuyma, are aware of the critical challenges evolutionary theory faces today (e.g., its difficulties to offer accurate predictions for environmental mammalogists), but they realize that only some of these challenges can be answered resorting to "evidence". While empirical evidence has a role in inspiring evolutionary research problems, testing hypotheses, and refuting pseudoscience, it should be complemented with philosophical assessment in order to understand, and sometimes resolve, various ontological, epistemological, methodological, and sociological-ethical challenges. Decisions on the impropriety of assertions like (a) religious belief is compatible with evolutionary biology, (b) the theory of evolution is irrefutable and non strictly scientific, (c) both evolution and creationism are scientific doctrines that deserve equal time in classroom, or (d) evolutionary science denies the existence of a deity, as well as any basis for rules of ethical conduct, need philosophical scrutiny: empirical evidence is only subsidiary. The scientific status of Popperian falsificationism, as well as the foundations of naturalism (i.e. the materialistic view) and secular ethics, all deserve philosophical –not only empirical– inquiry. Here we assess the philosophical foundations of the previous assertions on the basis of naturalistic and realistic (i.e., as opposed to merely empiricist) perspectives in order to show the fertility, for evolutionary science, of joining philosophical and scientific argument. [We acknowledge CASEB for financial support].

134 THE ROLE OF SMALL RODENTS IN MOUNTAIN FOREST REGENERATION IN A NATIONAL NATURE RESERVE (CZECH REPUBLIC)

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The population dynamics of dominant rodents, yellow-necked mouse (*Apodemus flavicollis*) bank vole (*Myodes glareolus*) and field vole (*Microtus agrestis*) and their influence on forest regeneration was studied in National Nature Reserve Kněžín in the Beskydy Mts. (Czech Republic). Good crop of beechnuts influenced above all population dynamic of yellow-necked mouse but also of the bank vole. About 13% of beechnuts were calculated as a mice crop lost until the spring in old beech forest. Considerable extent of bark damage was found on young trees (19%) in spring after the field vole peak abundance in combination with long and snowy winter. In contrast to that low damages of young trees were noted (GOF test for all species $p < 0.001$) under high densities of bank vole with lower snow cover the following winter. Bark of deciduous trees was more attractive for voles (22% damaged) than coniferous

(8%). Girdling round the stem occurred only in beech and rowan (7.22%). The young trees growing in open and grassy localities were more damaged by vole species than those in forest stands ($\chi^2 = 44.04$, $p < 0.001$). In our case negative impact of rodent species on forest regeneration arose only under influence of specific factors. It was related above all to good beechnuts harvest (at *A. flavicollis* and also *Myodes glareolus*), higher population densities (at all rodents but above all in *M. agrestis*) and snow condition during the winter. Under conditions of these factors impact of rodents on forest regeneration can be predicted. The research was supported by financial means of the NAZV QH72075 and MSM 6215648902.

135 THE USE OF SCAT DETECTOR DOGS TO FIND JAGUAR SCATS IN THE SOUTHERN PANTANAL, BRAZIL

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The use of scat detector dogs have been pointed out as one the most promising techniques to study cryptic and endangered species occurring at low density. The advantage of the method is the increased number of scats collected in a short period of time, mainly due to samples a human observer would not detect. The objective of this study was to analyse the aptitude and efficiency of two scat detector dogs (one Malinois Belgian shepherd and one Labrador Retriever) to detect jaguar scats at the Caiman Ecological Refuge, Miranda sub-region of the Pantanal, Brazil. Efforts comprised 26 survey days in the rainy season and 27 survey days in the dry season. From the scats collected in the rainy season, 38 were attributed to jaguars, while in the dry season 96 scats were attributed to the species. The Malinois dog was more efficient in finding scats with an average of 0.72 ± 0.37 scats detected/hours, while the Labrador dog found an average of 0.60 ± 0.37 scats/hours. Both dogs were able to find old scats, and covered by vegetation, under termite nests and in the water. There was no significant correlation between kilometers walked and the cumulative number of scats collected in both seasons. The cumulative average of scats collected in each 30 minutes interval showed that after three and a half to five hours, depending on the dog and the season, scat detection stabilized. At this point the effort should be finished, respecting the dog's limits and assuring the success of the surveys. Although the method is considered efficient and advantageous, the high costs in training and purchasing the dogs, the handler's experience, and the environmental factors that can influence the dog's performance all should be considered in planning scat detector dog studies. Key words: scat detector dogs, Pantanal, jaguar.

136 USING HISTORICAL MUSEUM SPECIMENS TO RECONSTRUCT THE EVOLUTIONARY HISTORY OF THE SOUTHEASTERN POCKET GOPHER (GEOMYIDAE)

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There has been a great deal of uncertainty regarding the evolutionary history and taxonomy of the southeastern pocket gopher (*Geomys pinetis*). We collected mitochondrial cytochrome-b sequence data from modern and historical museum specimens to determine 1) whether the *G. pinetis* subspecies occurring west of the Apalachicola River warrants species status relative to the eastern subspecies, 2) whether the Apalachicola-Chattahoochee-Flint River drainage serves as a boundary for these two groups, 3) whether three rare subspecies of conservation concern are genetically distinct compared to more widespread subspecies of *G. pinetis*. Results from maximum-likelihood and Bayesian analyses indicate that there are two major taxonomic units within *G. pinetis* (average sequence divergence = 8.5%), which may be separated by the Apalachicola-Flint Rivers. Using cyt-b sequences from additional pocket gopher genera and a fossil calibration point, we estimate the divergence between the eastern and western clades of *G. pinetis* at approximately 1.5 million years ago. This is consistent with the age of the Apalachicola drainage system, and suggests that these taxa have remained isolated for a considerable time, and certainly since the last glacial maximum. Overall this study points out the need for revision of the taxonomy and distribution of *G. pinetis*, suggests that geology, climate, and habitat structure in the southeastern U.S. have influenced this taxon, and highlights the utility of museum specimens for investigating rare or extinct populations.

GENETICS

137 ABRAWAYAOMYS: A NEW MEMBER OF TRIBE AKODONTINI (SIGMODONTINAE, RODENTIA)?

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Abrawayomys ruschii Cunha and Cruz 1979 is the unique species known only from the states of Espírito Santo and Minas Gerais, Brazil, and Misiones province, Argentina. Recently one individual from Rio de Janeiro, Brazil, was reported. Up to now we barely know the geographic distribution and the suprageneric status of the genus. "Enigmatic affinities" was the term used for *Abrawayomys*, whose diagnostic traits were firstly mentioned as a combination of aspects found in *Neacomys*, the previous "*Oryzomys*" and *Akodon*, and that is why the genus was considered a "*Sigmodontinae incertae sedis*". We present here a new record for *Abrawayomys*: Biritiba Mirim (23°57'S; 46°03'W), state of São Paulo, Brazil, a locality with about 780 meters of altitude, medium temperature of 15°C, and basically composed of Atlantic rainforest. The animal (UNIBAN-2149) was a male captured in a pitfall trap in January 2002. Cytogenetic preparations were performed from fibroblast culture and the karyotype encompasses 58 chromosomes predominantly acrocentrics; sex chromosomes were easily identified after conventional staining and C band: the X is a medium-sized metacentric

and the Y, a medium submetacentric. Fluorescence in situ hybridization using telomeric probes evinced interstitial signals in both X and Y besides the telomeric signals at telomeres of all chromosomes. The matrix of 755bp of the mitochondrial cytochrome-b was composed of 21 Akodontini taxa, two Oryzomyini (Euryoryzomys and Oecomys), and Peromyscus and Neotoma. Phylogenetic reconstruction, employing parsimony, recovered a clade including Abrawayaomys and Kunsia and both as sister group of Scapteromys, which are nowadays considered members of tribe Akodontini. Although the bootstrap support for Akodontini using these taxa has been weak, this preliminary information represents a new perspective on the phylogeny of Abrawayaomys, which was until now a "Sigmodontinae incertae sedis".

138 CYTOGENETIC CHARACTERIZATION OF *DROMICIOPS GLIROIDES*, AND THE ANCESTRAL KARYOTYPE OF AMERICAN MARSUPIALS

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Dromiciops gliroides is the only living representative of the Microbiotheriidae, an ancient family of marsupials. *D. gliroides* has 14 chromosomes, although males generally lose the Y chromosome in somatic cells. The classical hypothesis of chromosomal evolution claims that the $2n = 14$ karyotype is ancestral for the American marsupials. A second hypothesis suggests ancestry from a 22-chromosome karyotype, so that the karyotype of *D. gliroides* would be derived, resulting from robertsonian fusions. This hypothesis was tested by FISH using the telomeric universal probe. Additionally, constitutive heterochromatin and AT-CG rich regions were analyzed with C- and fluorescent banding, respectively. No evidence of interstitial signals indicating chromosomal fusions were detected since only telomeric regions fluoresced with the appropriate probe. Centromeric constitutive heterochromatin is observed in one pair of small chromosomes whereas C-positive banding was detected in the telomeric regions of two large submetacentrics. CG-rich regions were observed in all chromosomes. Moreover, chromosome pairs 2, 3 and 4 present additional telomeric AT-rich blocks. Our results do not support the notion of chromosomal fusions to account for the 14-chromosome karyotype of *D. gliroides*. Therefore, its karyotype does not represent a derived condition associated to the South American radiation. The suggestion is made that not all American marsupials are derived from a single 22-chromosome ancestral lineage. Partially funded by Fondecyt 1070217

139 DETERMINANTS OF POPULATION GENETIC STRUCTURE IN BATS: A META-ANALYSIS

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Studies of population genetic structure are fundamental to evolutionary biology and our knowledge of the speciation process in mammals. However, our understanding of how different life-history traits, ecologies, behaviors, and morphologies shape population structure among related species is lacking, as most published studies are taxon-specific. Here I use a comparative, meta-analysis approach to examine patterns and potential determinants of population genetic structure for 60 species (9 families) in the order Chiroptera. I use a common statistical measure of population genetic subdivision, F_{ST} , to test against morphological, ecological, and behavioral variables for each bat species. In bivariate analyses, wing aspect ratio – a measure of wing shape relating to flight efficiency – was the most significant variable correlated with F_{ST} across all taxa, explaining up to 30% of total variation (r^2). This relationship remained significant in analyses controlling for phylogeny, and supports the hypothesis that long narrow wings, more efficient for long-distance dispersal, will facilitate increased gene flow between bat populations. In comparisons of fruit bats (Family Pteropodidae) alone, wing aspect ratio was an even better predictor of F_{ST} and wingspan, body mass, and dispersal estimates from previous studies were also significantly correlated. In addition, categorical variables related to a species' food resource, roost type, geographic distribution, seasonal migration, mating system, and IUCN threatened status were included and tested using a general linear model and controls for phylogenetic dependence. Results from this comparative analysis significantly expand our understanding of how life-history traits and a species' ecology may determine population genetic structure mammals, and specifically may allow us to predict levels of population subdivision in the majority of bat species not-yet-examined with genetic tools.

140 EFFECT OF RIVERS AS GEOGRAPHIC BARRIER TO DIFFERENT KARYOTYPIC POPULATIONS OF *CTENOMYS TORQUATUS*

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Ctenomys torquatus is one of the several species described for this chromosomally variable genus. Despite its wide geographic distribution (south of Rio Grande do Sul State – Brazil and north of Uruguay), this species shows $2n=44$ as predominant karyotype. Some diploid number variations are associated with the presence of a great river, such as the $2n=46$ from collection sites in Rio Grande and Taim (eastern side of the São Gonçalo Channel) and the $2n=40$ karyotypic form from Itaqui (northern side of the Ibicui River), all in Rio Grande do Sul. In both situations, on the other side of those rivers, populations show $2n=44$. A phylogeographic approach using mitochondrial DNA (D-loop) found closely related haplotypes for distinct chromosomal forms near São Gonçalo Channel, whilst the same haplotype was shared between the $2n=44$ and $2n=40$ populations separated by the Ibicui River. To further investigate these scenarios, we used ten microsatellite loci in a sample of 116 *C. torquatus* specimens from the five distinct chromosomal populations previously cited, and four $2n=44$ karyotype populations, split up by the Jacui River. Nine populations were successfully inferred solely on the basis of microsatellite genotypes using Bayesian MCMC approach (higher probability $\Pr(k=9) = -900.8$). F_{ST} values (0.43 to 0.85) indicate high differentiation among populations pair by pair, and AMOVA tests showed higher percentage of variation among all populations (70.04%) rather than considering groups by distinct karyotype or sides of a river. Mantel test comparing

genetic and geographic distances revealed no significant association ($r=0.28$; $p=0.05$). Monmonier's algorithm detected a barrier between populations near the three rivers. To corroborate this analysis, we will include new collection sites from both sides of the rivers that split chromosomal distinct populations, and study Cytochrome Oxidase I (COI) gene sequences.

141 GENETIC DIVERSITY OF THE MOUNTAIN LION (*PUMA CONCOLOR*) IN SOUTHERN BRAZIL

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Genetic variations in the mountain lion wild population in southern Brazil were evaluated in this study. Mountain lions samples from tissue or blood were collected and genotyped at 13 microsatellite loci originally designed in North American mountain lions. We use the program CERVUS 3.0.3 for data analysis and compare our results with those found in literature for North American individuals. A total of 81 alleles were identified from the 13 microsatellite loci in Brazilian mountain lions and 80 alleles in North Americans when the same loci are compared. The mean observed and expected heterozygosity and average number of alleles was 0.70, 0.73 and 6.23 respectively for Brazilian and 0.63, 0.69 and 6.15 for North American mountain lions. The Brazilian mountain lions have highest genetic variability for these microsatellite markers. Molecular analyses of genetic variability integrate with biological and ecological studies are important information for threatened species conservation and management. This research was financially supported by Conselho Nacional de Pesquisa (CNPq).

142 GENETIC VARIATION IN SPACE AND TIME: THE POPULATION GENETICS OF THE ENDEMIC FLORIDA MOUSE (*PODOMYS FLORIDANUS*)

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Habitat fragmentation is one of the most important threats to global biodiversity. Although, some of Florida's ecosystems are naturally fragmented, human development has greatly increased this fragmentation and reduced the habitat for many species. In the last 50 years Florida became the seventh-fastest growing state in The United States. Such rapid growth places unusual stress on the environment. Moreover, habitat conversion and fire suppression have greatly reduced and altered Florida's vegetation, resulting in threats to the persistence of its unique flora and fauna. In many species habitat fragmentation may have significant consequences for population genetic structure because geographic distance and physical barriers may impede gene flow between adjacent populations. The Florida Mouse (*Podomys floridanus*) is considered a vulnerable species by IUCN and is a species of special concern because of habitat loss. Its habitat is scrub, pineland and sandhill associations and is in high demand for human development because of its well-drained soils. Here we determine whether there has been a change in genetic diversity in populations of *P. floridanus* over the last 50 years. We examined allele variation in 15 microsatellite loci genotyped from museum and recently caught specimens of *P. floridanus* from The Florida Museum of Natural History. Historical samples from 1957 in two counties (Highlands and Alachua) were chosen to represent historical genetic diversity, and we compared them with samples collected since the year 2000 from the same regions. Understanding how much genetic variation has been lost over time as this area has become more developed will be useful for inferring possible loss of genetic variation in other areas with similar biologic and anthropogenic characteristics.

143 GENETIC, MORPHOLOGICAL AND ECOLOGICAL DIFFERENTIATION BETWEEN *LEOPARDUS TIGRINUS* AND *L. GEOFFROYI* AT THEIR CONTACT ZONE IN SOUTHERN BRAZIL

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The detection of hybridization events between *Leopardus tigrinus* and *L. geoffroyi* at their geographic contact zone in Rio Grande do Sul (RS) state, southern Brazil, has raised interesting questions about the genetic, morphological and ecological relationships between these species. In this study we have analyzed multiple molecular markers along with morphological characters and ecological aspects of the two species to investigate their degree of genetic, morphological and ecological differentiation. For the genetic analysis we characterized samples of *L. tigrinus* and *L. geoffroyi* from RS state and also from control (more distant) populations observed to be less influenced by the hybridization process. For the morphological analysis a sub-sample from RS was evaluated for 25 body measurements. Ecological differences were assessed by the compilation of geographic records of both species in RS to evaluate their spatial distribution and to test for differences in habitat association. The genetic analysis showed a reduced level of genetic differentiation between these two cats at the contact zone in comparison to the control populations, probably due to an extensive rate of hybridization and introgression in RS. However the morphological and ecological analyses revealed a significant differentiation between *L. tigrinus* and *L. geoffroyi*, with the former being defined as a smaller species associated to more forested environments in the northern portion of RS, and the latter as a bigger cat more associated with open vegetation in the southern part of the state. Despite the incomplete reproductive isolation detected between the two felid species, reflected by the high rates of hybridization/introgression that might lead to rapid homogenization around their geographic contact zone, the morphological and ecological data suggest that different selective pressures may play an important role in maintaining the phenotypic and ecological integrity of both parental species.

144 LOSS OF GENETIC DIVERSITY AND DIFFERENTIATION AMONG REMNANT *PANTHERA ONCA* POPULATIONS OF THE ATLANTIC FOREST

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In the Upper Paraná Atlantic Forest (UPAF), spanning southwestern Brazil, northeastern Argentina and eastern Paraguay, jaguars are essentially restricted to semiconnected protected areas each containing a small number of individuals. Field projects have been conducted in this region to investigate the ecology of this felid and to provide relevant information for the development of conservation and management plans on behalf of this species. This field-based information must be complemented by genetic analyses that shed light onto the population dynamics of jaguars in the face of rampant habitat fragmentation. In this study we have characterized the patterns genetic diversity present in remnant jaguar populations of the UPAF. Fifty-nine individuals (23 from the area influenced by the Porto Primavera dam - SP/MS states; 10 from Ivinhema Park - MS; eight from Morro do Diabo Park - SP and 18 from the 'Green Corridor' - Argentina/Paraguay/Brazil) were studied using 13 microsatellite loci. We observed evidence of recent allelic loss in local areas and marked genetic differentiation among fragments which were very likely connected until 30-40 years ago. The highest differentiation was between the Green Corridor and Morro do Diabo ($F_{ST} = 0.198$; $P = 0.000$) and the lowest was between Porto Primavera and Green Corridor ($F_{ST} = 0.048$; $P = 0.000$). The results suggest strong effects of genetic drift induced by the small effective size in each area, ranging from 51.4 in the Green Corridor to 4.6 in Morro do Diabo, and increasing isolation among them. Assignment test showed evidence of recent demographic connectivity between areas (two migrants and five admixed individuals), which should be maintained or restored to ensure the long term viability of these populations. These results will be integrated into the management plan for this felid developed as part of the efforts to promote its persistence in this ecoregion.

145 MTDNA EVIDENCE OF DIVERGENCE OF PUDU (*PUDU PUDA*) BETWEEN CONTINENTAL AND CHILOÉ ISLAND, CHILE

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Pleistocene climatic and glacial cycles had modified several species distribution. During the late period of the last glaciations (29,400 - 14,450 AP) South America's temperate rain forests were completely covered with glaciers, from Coastal Cordillera to Andean Cordillera, but coastal areas north to 41° S and northwest area of Chiloe Island were practically intact, representing the principal refuge during glaciations. This forest represents the current distribution of Pudu puda, one of the smallest deer species divided into continental and insular populations. In order to evaluate the genetic structure and divergence between continental and insular (Chiloe Island) individuals, a total of 654 bp mitochondrial DNA control region were sequenced from 32 samples collected at different locations of southern Chile. We found a significantly high population genetic structure ($F_{ST}=0.68$) between continental and insular individuals. Maximum likelihood and Bayesian analysis tree concluded two well supported clades, continental and insular, with a sequence divergence of 2.2%, probably due to the colonization from different glacial refuges after retreat of glaciers. Our results suggest that no recent gene flow between these two locations occurred, because the presence of the Chacao channel between continent and Chiloe Island formed by the retreat of glaciers. Thus, we propose that continental and insular populations represent two different Evolutionary Significant Units (ESU), and should be considered for future conservation programs.

146 PORTUGUESE PINE VOLES (GENUS *MICROTUS*): WHEN CAN WE SAY THAT WE HAVE TWO SPECIES?

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The genus *Microtus* represents one of the best-known cases of rapid mammalian radiation and offers a huge potential for evolutionary research, particularly with regard to speciation. In Portugal, two pine voles of the genus *Microtus* with a fossorial way of life are known to occur, the Lusitanian pine vole (*Microtus lusitanicus*) in the northern part of the country, and the Mediterranean pine vole (*M. duodecimcostatus*) in the south, being both species sympatric over a restricted area of central Portugal. Although morphologically similar, *M. lusitanicus* and *M. duodecimcostatus* differ in the type of inhabited soils and in their commitment to an underground way of life, being the later considered the most fossorial of the Iberian voles and the most tolerant to high temperatures and drought. Even widely accepted these species are of difficult taxonomic discrimination with diagnostic characteristics mainly based on the larger size of *M. duodecimcostatus*. We generated cyt-b data with the aim to overcome difficulties in the taxonomic assignment of some individuals from the sympatric area. Our data are surprising as neither *M. lusitanicus* individuals captured in the allopatric, nor in the sympatric areas showed an agreement with the putative molecular species differences. These findings raise questions regarding the actual allopatric area of each species, possible ongoing hybridization and introgression, as well as the need of a species status review. We will present data on morphology, mtDNA and microsatellite in an attempt to uncover the evolutionary history of these two sister species and their phylogeographic patterns throughout their Portuguese range.

PALEONTOLOGY

147 **EARLY MIOCENE BATS (PHYLLOSTOMIDAE AND MOLOSSIDAE) FROM GRAN BARRANCA, CHUBUT PROVINCE, ARGENTINA**

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Bats are extremely rare as fossils in Argentina, where they are known only from the early Eocene and Pleistocene-Holocene. Bat specimens recently were found in the middle of the Upper Puesto Almendra Member of the Sarmiento Formation (type section of the Colhuehuapian South American Land Mammal Age (SALMA); early Miocene) at the Gran Barranca, south of Lago Colhué-Huapí, Argentina. An isolated m3 represents an unidentified large leaf-nosed bat (Phyllostomidae, Phyllostominae) and is the oldest record of this family in South America. A partial dentary with p3-m2 and an isolated m2 are most similar to those in the genera *Mormopterus* and *Tomopeas*, and represent a new species of *Mormopterus*. The new species has myotodont molars, an advanced p4 and a moderately shortened anterior portion of the jaw, with lower premolars more crowded than in the Deseadan species *Mormopterus faustoi* and less crowded than in the early Miocene European species *M. stehlini*. An isolated m2 probably represents a second, unidentified species of *Mormopterus*, 20%-30% smaller than *Mormopterus* sp. nov. The presence of the phyllostomine suggests a warm moist climate and the availability of lowland forest habitat in the Gran Barranca area about 20 million years ago, much different from the cool dry temperate climate of this area today and consistent in part with paleohabitats inferred from early Miocene rodents and primates.

148 **EUCHOLAEOPS (XENARTHRA, TARDIGRADA) REMAINS FROM THE SANTA CRUZ FORMATION (EARLY MIOCENE), PATAGONIA, ARGENTINA**

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Santacrucian (early Miocene) sloths have been known at least since the 1880s, but understanding of their systematics has not changed since the first decade of the 20th century. The plethora of genera and species erected by earlier workers were based in large part on fragmentary remains and, almost certainly, there are many more taxa named that can be justified on the available material. This situation is particularly acute for, among others, *Eucholaeops* Ameghino, 1887, for which 15 species have been named in the literature. A revision of the Santacrucian sloths has not been attempted so far, mainly because of the imposing nature of the material itself. However, new specimens recovered between 2003 and 2009 by a team from the Museo de La Plata and Duke University, provide a basis for beginning to unravel the chaotic taxonomy of some of these sloths. The remains of *Eucholaeops* suggest that there are two morphotypes present. The main distinction between the two morphotypes is the size of the caniniforms. This pattern was recognized by W.B. Scott, who suggested these differences were sex related, with males having the larger caniniforms, but other features suggest that these morphotypes do represent distinct species. Review of the type material available in the Museo de La Plata (MLP) and Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN) suggests that most named species are likely invalid. Which of the proposed names might apply to the two *Eucholaeops* morphotypes is still under consideration.

149 **FIRST SMALL MAMMALS ASSEMBLAGE (DIDELPHIMORPHIA AND RODENTIA) FROM UPPER PLIOCENE IN NORTHWESTERN ARGENTINA**

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Small mammals record for Pliocene in Northwestern Argentina is scarce. In this region, the period is mainly represented by the Uquía Formation, mostly characterized by medium and large mammals (e.g., Gomphotheriidae, Equidae, Tayassuidae, Megatheriidae, Glyptodontidae, Dasypodidae) that document the GABI. We describe the first fossil assemblage of small mammals for Pliocene times in Northwestern Argentina. The remains were found in the middle unit of Uquía Formation (ca. between 3.0 and 2.5 Ma), corresponding to the Marplatán stage, in San Roque, near Humahuaca, Jujuy province. The assemblage is constituted by 32 individuals belonging to 9 species: didelphimorph marsupials (*Thylamys* sp. and *Didelphimorphia* indet.), sigmodontine rodents (*Akodon* cf. *A. albiventer*, *Necromys* cf. *N. amoenus*, *Auliscomys* cf. *A. sublimis*, *Auliscomys* sp.), and an innominate Phyllotini, and caviomorph rodents (*Octodontidae* indet. and *Ctenomys* sp.). The sample is dominated by the undescribed phyllotine, represented by many mandibles and fragments of maxillae with molar series, constituting more than 90% of the recorded specimens. These specimens show morphological affinities with the nowadays widespread *Calomys* and *Eligmodontia*, but some cranial (short incisive foramina), mandibular (short masseteric crest) and dental characters (conspicuous second minor fold in M1-M2) indicate that they pertain to a new genus. *Akodon albiventer*, *Necromys amoenus* and *Auliscomys sublimis* are today conspicuous elements of the small mammals communities in high altitude Andean region of northwestern Argentina and southwestern Bolivia. These species characterize open environments with rocky outcrops in Puna and High Andean eco-regions. Moreover, the record of the *Octodontidae* indet. supports the idea of an arid or semiarid environment. This report constitutes the first mention in the fossil record for taxa assignable to *N. amoenus*, and the oldest record for specimens that can be referred to *A. sublimis* and *A. albiventer*.

150 LATE-QUATERNARY EXTINCTIONS OF SOUTH AMERICAN MEGAMAMMALS IN RELATION TO HUMAN DISPERSAL AND CLIMATE CHANGE

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Research suggests that the late-Quaternary megafaunal extinctions were most rapid and severe in times and areas where climate changes intersected with human pressures (including hunting, fire and habitat fragmentation, and introduced species and diseases) on a naïve fauna. We tested this hypothesis on a local scale in South America by comparing last appearance dates (LADs) of extinct megafauna with first appearance dates (FADs) of humans and type and timing of environmental changes across the continent. We assembled and evaluated 132 published radiocarbon dates on extinct South American megamammal taxa, 401 dates for early (> 8000 BP) South American archaeological sites, and records of paleoclimate and vegetation changes from English-, Spanish- and Portuguese-language publications. Youngest reliable (95% c.i.) dates for megafauna differ by region: Venezuela, 26,800 years ago; Ecuador, 14,800 years ago; southern Chile, 12,900 years ago; Brazil, 10,700 years ago; Peruvian coast, 10,500 years ago; Uruguay, 10,200 years ago; and central Argentina, 8000 years ago. First solid appearance dates of human occupation are in coastal Chile before 14,200 years ago; in southern Chile, northern Brazil and central Argentina before 12,800 years ago; on the south coast of Peru before 12,400; in Colombia before 11,200; and in Uruguay before 9,900. Nearly all regions showed a cooling effect 11,000-13,000 years ago, after which areas in northern Amazonia and Patagonia became warmer and wetter; the Peruvian Andes and the Atacama Desert became warmer and drier; and most regions experienced marked changes in vegetation. While the majority of Pleistocene megamammal LADs fall during these climatic changes, 1,000 – 4,000 years after humans appear on the continent, many regions still lack evidence of temporal overlap between humans and extinct mammals on a local scale. Additional sampling, especially in northern South America, will be necessary to better resolve these patterns.

151 MICROMAMMALS AND GASTROPODS: CLIMATIC CHANGE AND PALEOECOLOGY EVIDENCE IN THE EARLY HOLOCENE ARCHAEOLOGICAL SITE CAMPO LABORDE, ARGENTINA

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The diversity of micromammals and gastropods in archaeological and paleontological sites are strongly associated with change in environmental conditions. In addition, micromammals record is frequently modified by other factors such as human exploitation as nutritional resource or natural predators (small mammals carnivores or prey birds). For this reason their analysis with other indicators, such as the microinvertebrate, is crucial to analyze the environmental dynamics. The objectives of this work are: 1) Recognize the paleoenvironmental patterns during Pleistocene - Holocene transition (~12 - 8 kys BP) on the southwest of Interserrana area; 2) Identify the micromammals species introduced by humans and those that bring information about the ecological relations; 3) Evaluate the ecological characteristics of faunal assemblages recovered from the Campo Laborde and the Tapalqué streams profiles in relation to environmental changes. The malacological evidence indicates arid conditions during Late Pleistocene, and an increase of humidity on the beginning of Early Holocene that was reflected on marshy (paludal) habitat on Campo Laborde site. The local evidence of stratigraphy, sediments and pollen confirm these conclusions. The micromammals record shows the predominance of arid conditions on the Late Pleistocene and Early Holocene. The species identified are caviomorph rodents (*Ctenomys* sp.) and cricetid (*Reithrodon auritus*). Also the presence of armadillos like *Zaedyus pichiy* and *Chaetophractus villosus* confirm the arid conditions. In the transition between the Late Pleistocene - Early Holocene we recognize differences in environmental variations according to the record of micromammals and microvertebrates of southwest of Interserrana area. Some of the bones of rodents in Campo Laborde present evidences of predation. For this reason, these environmental markers would be cautiously evaluated considering the predators and preys ecological relations. The present work presents a synthesis of paleoenvironmental and paleoecological information for the area using alternative ways of analysis.

152 MULTIVARIATE ANALYSIS OF SKULL, MANDIBLE AND TEETH OF ARGENTINEAN PROCYONIDS (CARNIVORA, MAMMALIA)

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Five extant genera of Procyonidae are recognized in South America: *Bassaricyon*, *Nasuella*, *Potos*, *Procyon* and *Nasua*. Only *Procyon* and *Nasua* have been recorded at various localities from outcrops in Brazil, Uruguay and Bolivia (late Pleistocene-Holocene). Taxonomic and phylogenetic relationships of South American Procyonidae are controversial due to the following problems: 1- many taxa were described and based on fragmentary remains; 2- different diagnostic characters were used by various authors; and 3- there is not a recent revision of fossil taxa. There are five extinct genera formally nominated in South America: *Cyonasua*, *Oligobunis*, *Pachynasua*, *Brachynasua* and *Chapalmalania*; from them only *Cyonasua* and *Chapalmalania* have broad consensus. The fossil taxa are recorded only in Argentina and mainly in late Miocene and Pliocene beds. Only one taxon (*Cyonasua meranii*) was reported for the Pleistocene. In front of that situation, we are studying the skull, mandibles and tooth rows of living (mainly *Procyon* and *Nasua*) and fossil taxa with the following objectives: 1- to make a data base considering morphometric characters for *Procyon* and *Nasua* and fossil taxa; 2- to determine the diagnostic value of such characters in order to clarify the taxonomic problems; 3- to evaluate if the specimens' geographic procedure could be predicted by morphometric characters; and 4- to create a comparative morphometric model. The specimens we are studying are deposited in Museo de La Plata, Museo Municipal de Mar del Plata and

Museo Argentino de Ciencias Naturales "Bernardino Rivadavia". A total of 43 cranial, mandibular and dental morphometric characters were measured on 93 specimens. A multivariate and a systematic analysis are currently developed.

153 XENARTHTRANS FROM THE QUATERNARY OF SERRA DA BODOQUENA (MATO GROSSO DO SUL, BRAZIL)

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As part of a research program focused on the Quaternary mammals from Brazil, a series of expeditions were carried out in order to explore underwater limestone caves at the Bodoquena's karst. Here we summarized the results of bone remains of xenarthrans so far sorted out from two caves, Japonês and Nascente do Formoso. In association with the xenarthrans there sampled, fragments of extinct and extant mammal species were recovered such as horses (*Equus*), tapirs (*Tapirus*), carnivores (*Panthera*, *Leopardus*, *Smilodon*, *Chrysocyon*, *Protocyon* and *Pteronura*), deers (*Mazama* e *Ozotoceros*), peccaries (*Tayassu*), llamas (*Paleolama*), mastodonts (*Haplomastodon*) and endemic South American ungulates (*Macrauchenia* e *Toxodon*). The xenarthrans are represented by all sources of cranial and potcranial bones identified as *Dasypus*, *Euphractus*, and *Propaopus* (*Dasypodidae*); *Pampatherium* (*Pampatheriidae*); *Gliptodon* (*Glyptodontidae*), *Glossotherium* and *Myloodonopsis* (*Myloodontidae*); and *Eremotherium* (*Megatheriidae*). With further investments we expect to enrich our understanding of the Holo-Pleistocene fauna of xenarthrans from the Bodoquena region.

SYSTEMATICS

154 GEOGRAPHIC VARIATION IN HAIRY DWARF PORCUPINES FROM EASTERN BRAZIL (MAMMALIA: ERETHIZONTIDAE: *SPHIGGURUS*)

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We evaluated the geographic variation in New World porcupines of the genus *Sphiggurus* (Erethizontidae) from eastern Brazil by analyzing morphological data from museum specimens. Our results indicated three spatially coherent, morphologically distinct groups, diagnosable using a combination of discrete morphological characters, and supported by univariate and multivariate statistical analyses. We classified members of the northern group as *S. insidiosus*, which usually have several pale to light-brown unicolor thin hairs covering dorsal and lateral quills. They are cranially and externally smaller than the other two groups and have shorter hairs and quills. Specimens from the central group are intermediate in terms of body size, and have many thick hairs covering dorsal and lateral quills. These hairs are dark-brown at the base, and grayish, orange, yellow or light brown at the tip. The southern group has the largest body size and conspicuous quills on the dorsal surface, which varies from yellowish or orangish to blackish. The specific identity of the central and southern groups is uncertain due to the taxonomic confusion surrounding type specimens and the early taxonomy Neotropical porcupines. Funding: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq).

155 GEOGRAPHIC VARIATION IN SKULL AND MANDIBLE SHAPE AND SIZE IN *CALUROMYS LANATUS* (DIDELPHIMORPHIA, DIDELPHIDAE)

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Caluromys lanatus is distributed in South America from Venezuela to southern Brazil, and presently includes four subspecies (*C.l.cicur*, *C.l.lanatus*, *C.l.ochropus* and *C.l.ornatus*). Here we analyzed geographic variation of skull size and shape in *Caluromys lanatus* using geometric morphometrics. A total of 134 specimens from 69 localities were examined, and 29, 36, 22 and 14 landmarks were set on digital images of the skull (in dorsal, ventral and lateral views) and the mandible, respectively for each specimen. Based on location and sample sizes, localities were grouped as follows: Venezuela-Ecuador (1), Left Amazonas (2), Peru-Acre (3), Right Amazonas (4) and Southern Brazil-Paraguay (5). Size and shape sexual dimorphism were tested for each view using centroid size and partial warps, respectively. No sexual dimorphism was observed and sexes were thus pooled for subsequent analyses. ANOVA was used to compare size variation between groups. *C. lanatus* can be divided in three groups: (1) northern South America (Venezuela, Colombia and Ecuador), corresponding to *C. l. cicur*, (2) right and left Amazonas margins (northern and northwestern Brazil, northern Bolivia and southern Venezuela) and specimens in Peru and western Brazil, grouping *C. l. ochropus* and *C. l. ornatus* and (3) central Brazil, southeastern Bolivia and Paraguay, corresponding to *C. l. lanatus*. Canonical Variates Analyses show a clear divergence in skull shape in specimens from Brazil-Paraguay from all other localities. No difference was found in mandible. These data confirm the morphometric distinctiveness of populations of *C. lanatus* from Colombia (*C. l. cicur*) and of those of Southern Brazil-Paraguay (*C. l. lanatus*), while *C. l. ochropus* and *C. l. ornatus* cannot be morphometrically distinguished based on skull and mandible size and shape. These data also suggest that the current taxonomy of *Caluromys lanatus* may need a reassessment.

156 HOMOLOGY ASSESSMENT OF RODENTS' CHEEK TEETH OCCLUSAL STRUCTURE, AND A NOMENCLATURE DERIVED FROM TRIBOSPHEMIC TERMS

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Rodents constitute the largest, most widely distributed, and arguably most successful group of mammals. The diversity of the order in terms of both extant and fossil forms is reflected by the variation found in the occlusal surface of rodents' cheek teeth. Ranging from strict brachydont and bunodont molars to extremely hypsodont and lophodont forms, this variation has enabled successful specializations for different diets. Recent advances provide the first glimpses of the genetic mechanisms that control the plasticity of this complex morphological system. Our knowledge of the evolutionary transitions, however, is still hampered by difficulty in the phylogenetic treatment of occlusal structures, especially in analyses with comprehensive sampling among and outside rodents. In order to incorporate the information of rodent teeth into a mammalian higher-level phylogenetic framework (AToL - Mammalia), we propose a set of primary homology hypotheses for rodent crown structures based on the comparative analyses of ca. 200 Simplicidentata taxa, including members from all extinct and living rodent families, as well as euryomyids. Most cusps, styles, cingula, ridges, lophs, valleys, folds, flexi, and fossettes can be correlated with tribosphenic features across different rodent groups, with the exception of a few highly modified teeth. Some neomorphic structures, however, are necessary to describe the observed variation. We contend that current rodent dental nomenclature, which has greatly expanded since the pivotal work of Wood and Wilson (1936), needs again to be unified and should incorporate an explicit reference to the tribosphenic condition.

157 MORPHOLOGICAL VARIATION IN FOUR SPECIES OF *MONODELPHIS*, WITH DESCRIPTION OF A NEW SPECIES FROM BRAZIL

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Monodelphis comprises the most diverse genus of didelphid marsupials, with at least 21 species currently recognized. The taxonomy of Monodelphis remained stable for the most part of the last three decades. Recent studies, however, have shown that this apparent stability is unreliable, and the need for revision of the genus has been claimed by several authors. Simultaneously, there has been an increase in museum specimen series, related to the recent usage of pitfall traps in small mammal inventories in the South America. Herein we present the results of a comparative morphological study on four species from the Atlantic Forest of southeastern Brazil, with the description of a new species. We examined a total of 241 specimens deposited in the Museu de Zoologia da Universidade de São Paulo, Brazil. Before external and cranial examination, the specimens were grouped in age classes based on tooth eruption and tooth wear. *M. americana*, *M. iheringi*, and *M. scalops* exhibit three dorsal longitudinal stripes, which differ in color and conspicuity through life in males of *M. americana*, and both males and females of *M. scalops*. *M. sorex* and *Monodelphis* sp. nov. have no dorsal stripes. The latter exhibits homogeneous light brown dorsal fur whereas the former exhibits reddish head and rump fur, and the remaining dorsal fur dark gray. *M. iheringi* and *Monodelphis* sp. nov. have substantially smaller craniodental dimensions than the other species. Among the cranial traits, the auditory region provides the greatest number of diagnostic features. Our results represent the first description of sexual dimorphism and ontogenetic variation in body pelage patterns in Monodelphis. Comparisons among specimens with the same sex and age were essential to comprehend the real nature of pelage variation observed in the species herein studied, and are essential steps to improve our knowledge on the diversity within the genus.

158 MORPHOLOGICAL DIVERGENCE IN CENTRAL AMERICAN POPULATIONS OF THE WATER OPOSSUM, *CHIRONECTES MINIMUS* (DIDELPHIMORPHIA, DIDELPHIDAE)

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The water opossum (*Chironectes minimus*) is the only semi-aquatic marsupial, and is widely distributed along the Neotropical region, associated with water courses. Two subspecies are described for Central America, *C. m. argyrodytes* (occurring in southern Mexico, Honduras and mountains of El Salvador) and *C. m. panamensis* (occurring in Nicaragua, Costa Rica and Panama). The purpose of this work was to analyze the morphological variation in Central American populations of *Chironectes minimus*. Traditional and geometric morphometrics and qualitative analyses of the skull were used to seek discontinuities between populations. We took 13 measurements of the skull, and inserted 37, 18, 25 and 23 landmarks on the dorsal, lateral, ventral and mandible views, respectively, on a sample of 121 specimens from 33 localities. MANOVAs and Canonical Variates Analyses were performed on these data. The populations from Belize, Guatemala, Honduras, El Salvador and Nicaragua differed from the other Central American populations (Costa Rica and Panama). This difference is inconsistent with the current proposed boundaries of the subspecies *C. m. argyrodytes* and *C. m. panamensis*, and these should thus be redefined accordingly. The results indicate a break on the morphological continuity in the same area where is placed the Nicaraguan depression. Evidence suggests that a marine gap existed between the Chortis and Lower Central American highlands during the Miocene/Pliocene (10 Myr ago). Because the *Chironectes* lineage appeared at around 38 to 48 Myr ago, this geographical barrier might explain the morphological differentiation between these populations, as the Nicaraguan Depression has been identified as a major phylogeographic break for many taxa, including frogs, salamanders, birds, plants, insects and fish. Dating the divergence of these populations using molecular markers will help clarify further its timing of occurrence and the proper taxonomic status of these populations.

159 MORPHOLOGICAL VARIATION IN OCELOT *LEOPARDUS PARDALIS* (LINNAEUS, 1758) (CARNIVORA, FELIDAE) FROM BRAZIL

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The ocelot, *Leopardus pardalis* (Linnaeus, 1758), is a medium-sized Neotropical cat found from north of Argentina to the southern extreme of United States. Ten subspecies are recognized along the ocelot geographic distribution, and two of them are recognized for Brazil: *L. p. melanurus* (Ball, 1844), with Amazonian distribution, and *L. p. mitis* (Cuvier, 1820), found in the eastern portion of Brazil. Nevertheless the limits for the distribution of these subspecies are unclear, as well as the individual and geographic variation of morphological characters. Pondering this problem I analyzed the Brazilian populations of *L. pardalis* including qualitative and quantitative characters of the skull and the pelage from 87 specimens, adult and subadult of both sexes, registered in the major Brazilian collections (Museu de Zoologia da Universidade de São Paulo – MZUSP; Museu Nacional da Universidade Federal do Rio de Janeiro – MN; and Museu Paraense Emílio Goeldi - MPEG). A total of 28 skull measurements were analyzed using univariate and multivariate statistics. In order to investigate the geographic variation among these characters, and due to the low number of individuals per locality, I assembled specimens of relatively nearby localities and with similar vegetational features into main groups. Then I compared these groups, disposed along transects, using univariate statistic tests of skull and external morphologic characters of adults and subadults specimens. I observed a great overlap in the skull size and a great variation in the pelage of the specimens examined, and did not detect any discontinuity in these characters along the different transects analyzed. These results do not support the separation of Brazilian ocelot populations in two subspecies. A deeper knowledge of the taxonomic diversity of *L. pardalis* in the Neotropics will become possible with the evaluation of geographic variation along the range of the other recognized subspecies not included here.

160 MULTIGENE PHYLOGENY AND SPECIES LIMITS IN THE ATLANTIC FOREST TREE RATS, GENUS *PHYLLOMYS* (RODENTIA, ECHIMYIDAE)

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There are 13 described species in the genus *Phyllomys*, all endemic to the Atlantic Forest of eastern Brazil. We analyzed the phylogenetic relationships among species of *Phyllomys* using sequences of two mitochondrial (cyt b and COI) and two nuclear (IRBP and vWF) genes. The mitochondrial phylogeny shows 7 well-supported (bootstrap>75%) interspecific clades while the nuclear tree shows only 4. The total evidence tree, resulting from a concatenated dataset of 3,876 base pairs of nuclear and mitochondrial sequences, shows 5 interspecific clades and a basal polytomy. These results are suggestive of a hard polytomy as the result of a rapid diversification from an adaptive radiation. The clades identified in the total evidence are geographically coherent: one is restricted to the northeast, another is widespread from the southeast toward the south, and the remaining 3 clades overlap in the southeast, two of them extending to the northeast, one along the coast and the other inland. Based on the DNA sequences, we identified highly divergent, and potentially new species among our samples, prompting a reevaluation of museum specimens. Funding: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Fundação de Apoio à Ciência e Tecnologia do Espírito Santo (FAPES), Critical Ecosystem Partnership Fund (CEPF).

161 PHENETIC AND GENETIC CONCORDANCE AMONG THREE SPECIES OF ENDEMIC *PEROMYSCUS* (RODENTIA) FROM MESOAMERICAN HIGHLANDS.

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There are complex levels of variation among species of the *Peromyscus mexicanus* group, distributed in Mesoamerica. Some of this species, are endemic to Central America, and are of special conservation concern. The core of the *P. mexicanus* group consists of six species, centered in Guatemala and southern Mexico, whose morphological recognition involves almost imperceptible size and color gradations. Three of these species, *P. grandis*, *P. guatemalensis*, and *P. zarhynchus*, distributed in the highlands, were characterized morphologically and genetically, in order to test hypotheses of species limits. In the genetic context, the aim was to estimate phylogenetic relationships of these species within the *P. mexicanus* group using mitochondrial DNA. Moreover, attempt to answer whether or not the phenetic relationships among these three taxa proposed previously are supported. The results included analyses of non-geographic and geographic variation for individuals from 36 localities in Guatemala and southeastern Mexico. In addition, phylogenetic analyses including Maximum Parsimony and Bayesian inference of 35 mitochondrial Cytochrome-b gene sequences were conducted to complement the morphometric analyses. This study found support for the presence of three morphologically and genetically cohesive units, which based on comparisons to type specimens do not support the phenetic hypothesis proposed previously. However, the data supports *P. grandis* and *P. guatemalensis* as being related to each other than either one are to *P. zarhynchus*. The results of this study, including relationships among members of the *P. mexicanus* group, patterns of speciation and historical biogeography, allow to the identification of regionally important phylogeographic units that will contribute to conservation actions in the region. Furthermore, this study is a contribution to the phylogenetic investigation of small mammals distributed over Mesoamerican mountain and addition to the knowledge of one of the world's biodiversity hotspots.

162 PHYLOGENY OF DIDELPHID MARSUPIALS (DIDELPHIMORPHIA, DIDELPHIDAE) USING POSTCRANIAL MORPHOLOGY

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A phylogenetic hypothesis for didelphid Marsupials including a suite of 114 postcranial characters is provided. The evidence was cladistically analyzed separately and concatenated with a published nonmolecular data set. The dataset includes 48 characters from the axial skeleton, 37 from the forelimb, and 29 from the hindlimb. Different hypotheses that are discussed as polymorphic characters are alternatively treated as composite entries (CO) and transformation series (TS) in morphological and combined analyses. Different codings of polymorphic postcranial characters produce topologies that in general are not contradictory. The principal difference is the loss of resolution of trees in TS analysis, compared to CO analysis in postcranial evidence, whereas the support were in general low in both codings. The topology in the postcranial evidence supported some already recovered relationships, such as the monophyly of the large opossums (*Didelphis*, *Philander*, *Chironectes*, *Lutreolina*, and *Metachirus*), and several polytypic groups such as *Didelphis*, *Monodelphis*, *Marmosops*, *Thylamys*, *Micoureus*, and *Philander*. The intermediate position of *Hyladelphys* between *caluromyines* and *didelphines* is kept in CO analysis. Some unusual clusterings are observed, resulting from convergences caused by functional demands. The inclusion of the postcranial data set to previous nonmolecular evidence causes little incongruence, although some modifications in the topology and support were detected. The effect of different codings of polymorphic characters was similar respect to the postcranial-only data set. In this case, the topology obtained with CO analysis was also better resolved than TS analysis. Similarly to the postcranial analysis, the topologies in the total morphological evidence applying the two kinds of codings are highly congruent, but the TS treatment seemed not to contribute to retention of more phylogenetic information, since the CO analysis was better resolved. Some relationships, formerly evidenced only with nuclear sequences, are now recovered with the addition of postcranial characters as well in a morphological framework.

163 PHYLOGEOGRAPHY OF *MICOUREUS* (DIDELPHIMORPHIA: DIDELPHIDAE) IN THE AMAZON

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In the Amazon, the genus *Micoureus* is widely distributed, and shows considerable morphological, morphometric and genetic variation. Molecular studies began when da Silva and Patton (1998) validated the species status of *M. regina* and demonstrated the existence of divergent clades of *M. demerarae* in the Amazon with respect to the Atlantic rainforest (Patton et al. 2000). Costa (2003) observed that the northeastern clade of the Atlantic rainforest is associated with the Amazonian clade, while the southern Atlantic rainforest clade is named *M. paraguayanus*. From 2004 until now, we have been conducting a morphometric study of 292 specimens of *Micoureus* from 46 Amazonian localities deposited in the mammalian collection at INPA. From these and other samples, we selected 123 tissue samples representing morphologically significantly divergent groups, and we sequenced approximately 1100 base pairs of the mitochondrial gene cytochrome b. Our analyses based on 187 sequences from 66 localities in South America resulted in distinct, highly divergent clades supported by high bootstrap values, demonstrating the existence of a geographic structure. Seven clades containing 21 morphological groups from the Amazon and recognized as *M. demerarae* are deeply divergent. Between 2 and 10% divergence is observed among groups inhabiting interfluviums of the Amazon and Negro Rivers, and interfluvial divergences of 8 to 11% are observed when *M. demerarae* clades from the region of Carajás, Pará are included in these comparisons. These values increase when comparisons are made with other South American groups. Intraspecific genetic variation in Amazonian groups varies from 0 to 1%, but increases to 3% in *M. paraguayanus*. Genetic divergence of the ingroup to the outgroup *Marmosa murina* resulted in 17 to 21% sequence divergence. These results reinforce the notion of existence of a complex of species and lineages within *M. demerarae* and the need for a major taxonomic revision of the genus.

164 SYSTEMATICS AND HISTORICAL BIOGEOGRAPHY OF *THYLAMYS*, THE FAT-TAILED MOUSE OPOSSUMS

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Opossums of the genus *Thylamys* are small-bodied, omnivorous marsupials distributed widely in central and southern South America, from Peru to Patagonia and high into the Andes. Most species within this genus live in semi-arid habitats and possess incassate tails that distinguish them morphologically from other didelphids. Previous molecular phylogenetic studies on *Thylamys* have utilized short fragments of mitochondrial DNA and featured restricted geographic sampling, factors that limited the scope of inference. Here, I sequenced the entire mitochondrial gene cytochrome-b (ca. 1150 bp) for over 130 individual *Thylamys* specimens representing all 10 currently recognized species. When possible, individuals from each recognized species were sampled across their range in order to detect cryptic diversity. The mitochondrial genes ND2 and COX2 were sequenced for a species-level subset of individuals and were used to rigorously define species-level relationships. In addition, DNA was extracted from the skins of several historic specimens in order to resolve key nomenclatural issues and to place rare taxa within the tree. Sequence data were analyzed using maximum parsimony, maximum likelihood, and Bayesian methods. Results indicate that several of the recognized species contain two or more reciprocally monophyletic clades: three within both of the taxa currently recognized as *T. venustus* and *T. pallidior* and two within *T. pusillus*. The Brazilian species *T. velutinus* was identified as the most basal species, and nearly all nodes have high support values. The resultant highly resolved phylogenetic tree is used to discuss historical biogeographic scenarios for *Thylamys*.

165 TAXONOMY AND SPECIES LIMITS IN THE BROWN FOUR-EYED OPOSSUM, GENUS *METACHIRUS* BURMEISTER, 1854 (DIDELPHIMORPHIA: DIDELPHIDAE)

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The brown four-eyed opossum, *Metachirus nudicaudatus* (É. Geoffroy, 1803) is currently recognized as monotypic. *Metachirus* is widely distributed throughout the neotropics and there are high levels of genetic divergence and abrupt discontinuities across its range. There are eleven names associated with *M. nudicaudatus*, four currently recognized as subspecies and seven as synonymies. Its wide geographic distribution, high levels of sequence divergence, and subspecies confirming morphological variation across geography suggest that what we recognize as *M. nudicaudatus* may represent more than one species. We analyzed museum specimens to verify if the patterns of morphological and morphometric variation are congruent with the genetic variation documented. A few discrete morphological characters are diagnostic for the clades recovered in previous phylogenetic analyses of DNA sequences, and discriminant function analysis of cranial measurements also support the recognition of such groups. The association between genetic clades and diagnostic morphological characters allowed the characterization and elevation of the following taxa from subspecies to the species level: *Metachirus nudicaudatus* (É. Geoffroy, 1803), *Metachirus colombianus* (J. A. Allen, 1900), *Metachirus tschudii* J. A. Allen, 1900, *Metachirus myosuros* (Temminck, 1824), and *Metachirus modestus* (Thomas, 1923).

166 TAXONOMY OF *BRUCEPATTERSONIUS* (RODENTIA, CRICETIDAE) IN THE SOUTHERNMOST ATLANTIC FOREST

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Elio Massoia in the 60th was the first in recognizing the existence of populations of *Bucepattersonius* (referred, at this time, as *Oxymycterus iheringi*) in the forest of Misiones province, Argentina. However, the specific assignment of these populations to *iheringi* was questioned by Hershkovitz when naming the new genus *Bucepattersonius*. In 2000 Mares and Braun described 3 putative new species of *Bucepattersonius* from a homogeneous forested area of about 10 km in length. During the last five years we have collected in Misiones and studied several individuals of this sylvan genus including topotypes of two of Mares and Braun nominal forms, *paradisus* and *guarani*. The evidence at hand reveals the occurrence of a single morph of *Bucepattersonius* in Misiones province with a moderate degree of morphological variation. The forms *paradisus* and *guarani* represent the same biological species, and are therefore synonyms; probably the same is true for *misionensis*, another taxon named by Mares and Braun. However, a more difficult task in this chaotic nominal scenario is clarifying which is the correct name to apply to the populations from Misiones. The form *iheringi* –with type locality in Rio Grande do Sul, Brazil– may prove the correct; if not, probably *paradisus*, the first of the names erected by Mares and Braun, might be applied. To solve this problem the study of topotypical specimens of *iheringi* is mandatory. Until this goal is accomplished, it is safe to state that only one species of *Bucepattersonius* inhabit the southernmost portion of the Atlantic Forest, in Misiones. The recently proposed synonymy between *albinasus* and *griserufescens* and that suggested here involving *paradisus*, *guarani*, and, probably, *misionensis* indicate that *Bucepattersonius* is much less diverse than currently envisioned [Funded by PIP CONICET 6179].

167 TRIGGERS OF DIVERSIFICATION IN MUROID RODENTS

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Muroid rodents are the most diverse family-level clade of mammals and provide an opportunity to identify mechanisms that increase rates of taxonomic and phenotypic diversification. We explore the issue of taxonomic diversification (net speciation) by estimating a 300-species phylogeny based on 6,000 nucleotides of mostly nuclear DNA. Branches are identified that are associated with significant changes on net diversification rates. We then test whether these branches are associated with events defined a priori, including several key dental traits and changes in geographic distribution. Geographic opportunity appears to be a key mechanism and the relative contributions of alternative mechanisms are discussed.

OTHERS

168 CHEMICAL IMMOBILIZATION OF WILD FOXES WITH 3 PROTOCOLS IN NORTH-CENTRAL CHILE

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The restraint and chemical immobilization of wild animals in the field has being a target for research in veterinary science. It is important to establish safe chemical immobilization procedures that minimize the stress, pain, and restraint time of captured animals. This study was aimed to compare the effects of ketamine hydrochloride (KH)-medetomidine (M), KH- xilazine hydrochloride (XH) and zolazepam hydrochloride (ZH)-tiletamine hydrochloride (TH) in free-ranging chilla foxes. Twenty eight chillas (thirteen males and fifteen females) were trapped and immobilized with: 1) KH-M, 2) KH-XH, and 3) ZH-TH. Cardiac and respiratory rate (HR and RR), oxygen haemoglobin saturation (SpO₂), rectal temperature and palpebral and anal reflexes were measured at 5-min intervals. Data were analyzed with Mann-Whitney-U test, ?2 test and General Lineal Model (GLM) analysis for comparing the effect of treatments.

Ten chillas were immobilized with 2.8 ± 0.3 mg kg⁻¹ of KH and 56 ± 5.8 ug kg⁻¹ of M, and reverted with 291 ± 58 ug kg⁻¹ of atipemazole (A), 13 were immobilized with 13.5 ± 4.2 mg kg⁻¹ of KH and 1.6 ± 0.4 mg kg⁻¹ of XH, and five with 4.8 ± 3.2 mg kg⁻¹ of ZH and 4.8 ± 3.2 mg kg⁻¹ TH. The induction time with KH-M treatment was shorter than the recorded with KH-XH but not with the obtained with ZH-TH. Palpebral and anal reflexes in foxes immobilized with KH-M were maintained in more animals than those treated with the KH-XH and ZH-TH. ZH-TH produced higher HR and RR than the other two treatments. Higher SpO₂ was found in KH-M. The KH-M level of anaesthesia was the most satisfactory, and it showed better response to that anaesthetized with KH-XH and ZH-TH and it is recommended to be used in this fox species.

169 CONSERVATION PERSPECTIVE ON MANED WOLF *CHRYSOCYON BRACHYURUS* IN ARGENTINA

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Between 1982 and 2008 the IUCN status of *Chrysocyon brachyurus* (MW) changed the category in 3 different opportunities (V-LR/NT-NT). Argentina added the MW to the Endangered Species list in 2006. The threats to the MW include habitat loss, inter-specific competition, illegal trade, mortality resulting from infectious diseases, road kills, and conflicts with humans and domestic pets. But what do we really know about the ecology of this carnivore and the specific threats facing MW in Argentina? We investigated available information about MW for the period 1990-2008 to assess the extent of current knowledge, determine where gaps exist and make recommendations for preserving the species and remaining habitat. Between 1990 and 2008, 11 projects were undertaken, of which 2 (18%) continue today. During that same period, 31 documents were produced: 30% were abstracts presented at scientific conferences, 32% were reports from workshops, conferences and popular journals and 29% were published in national and international journals; 23.3% of the documents considered captive individuals. Descriptions of species distribution was the topic most frequently published (32%), followed by health status of wildlife individuals (22.5%) and in captivity (22.5%). Conflicts and environmental issues were rarely addressed. Regarding the scope of the publications, 48% were regional, 32% local and the remainder had international impact. Priority issues that need to be addressed are: 1) accurate determination of the species' distribution, 2) human-MW conflicts, 3) increasing understanding of ecology and behavior, 4) examining population genetics, 5) health status and 6) developing conservation education programmes. It is imperative that the governments actively take part in future action plans, contributing both manpower and financial resources. WAZA project 06031; Supported by: Amneville Zoo, Doué la Fontaine Zoo, Abilene Zoo, John Ball Zoological Garden, Friends of Dickerson Park - SSPMW/IUCN, Brookfield Zoo, Idea Wild, WAZA and Safari de Peaugres. PGI 24/B123.

170 ETHNOZOOLOGICAL APPROACHES BETWEEN MAMMALS AND SNAKES INTO THE HUNTING PRACTICES AND ZOOTHERAPY OF CEARÁ, BRAZIL

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Currently, researches approaching ethnozoology are fundamental tools for the understanding of how human communities interact with wildlife. In order to contribute to the study of Ethnoscience of the state of Ceará, during the six months, ethnographic surveys about the snakes involved in legends, beliefs and hunting practices, were held at the municipalities of Aratuba, Pacoti and Mulungu (mountain region), Itapajé, Irauçuba and Tururu (caatinga region) and São Gonçalo do Amarante and Caucaia (coastal region), through hunts monitoring and semi-structured interviews with hunters selected through the indication of the local people of each region. The interaction between the use of snakes and mammals was cited several times, both in reports on the hunting of mammals, and on prevention and cure of snakebites. The rattle of *Crotalus durissus* (rattle-snake) is used to alert the sentinels of *Kerodon rupestris* (rock cavy), which, according to the hunters in the caatinga's region, leave their burrows, facilitating their slaughter and difficulting the organization of the colony. Hunters of the three regions usually carry with them, pieces of leather of *Procyon cancrivorus* (crab-eating raccoon) to drive off the snakes, natural prey of this mammal species, which may cross their path. The leather of this species, such as the one of *Galea spixii* (yellow-toothed cavy), is also used by healers to nullify the effect of the poison of venomous snakes in humans and livestock animals, when tied at the site of the bite. Moreover, the healers enchant individuals of *Cavia aperea* (brazilian guinea pig) or *G. spixii* to kill all the snakes that may bite them at the forest. Records as this one, enables the development of environmental impacts analysis and strategies for participatory management of the local fauna.

171 HISTORICAL AND CURRENT GEOGRAPHIC DISTRIBUTION OF *CHRYSOCYON BRACHYURUS* (CARNIVORA: CANIDAE)

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The maned wolf, *Chrysocyon brachyurus*, is a monotypic South American endemic canid chiefly found in grassland-dominated regions. We compare its current and historical distributions and propose causal hypotheses for observed changes. We compiled recent presence-absence data from reliable observations, interviews, field studies and museum specimens. Historical data was derived from the accounts of early naturalists and explorers and from paleontological records. Comparison of the two distribution maps shows recent range expansion only on the eastern side, in the Brazilian States of Minas Gerais, Espírito Santo, São Paulo y Rio de Janeiro. This expansion is associated with the deforestation of the Atlantic forests and conversion of habitat to grasslands for

cattle range. The northern, northeastern, and eastern sectors of the geographic range have not yet experienced significant modifications, and the species persists in central Brazil, northern and eastern Bolivia, and southeastern Peru. The largest range retractions have occurred on the southern limits. Maned wolves are still present in the Argentine provinces of Formosa, Chaco, Corrientes, the northern half of Santa Fe, northeastern Córdoba and southeastern Santiago del Estero, as well as two records from Uruguay and rare records from extreme NE and SE Rio Grande do Sul. Historically the species was present in nearly all of Rio Grande do Sul, Uruguay, and south to at least the 38th parallel of Argentina. The probable cause of the southern range restrictions is intense anthropic pressure coupled with limiting abiotic factors such as temperature and humidity. Our results show the need to revise our views of how habitat modifications are affecting the range distribution of *C. brachyurus*, so that range-wide conservation strategies can be improved and coordinated.

172 LABORATORY TECHNIQUES SET UP FOR ANTI-RABIES NEUTRALIZING ANTIBODIES DETECTION IN WILD FAUNA SERA IN URUGUAY

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Rabies is a viral disease that could affect to all mammal species. At regional and world level, wild reservoirs became more important as urban cycles are controlled and human impacts on natural environments increases. Epidemiologic surveillance is an important tool for disease control. Within laboratory techniques, serology is a suitable instrument for epidemiological research especially in wild fauna. In Uruguay, a rabies outbreak began late 2007, after more than 20 years of being a rabies-free country. The rabies surveillance since the outbreak begun is mostly based on direct immunofluorescence performed over *Desmodus rotundus* and livestock brain samples. This work attempted to tune-up and tests a modified qualitative RFFIT serological technique for viral circulation surveillance in wild fauna. The technique was modified to be adapted to a local laboratory, changing the viral strain and the cell line. The viral strain used was a PV growth in BHK suspension cells. The test was performed over a BHK monolayer cell line. As controls for the technique, guinea-pig sera were employed. A three doses vaccinated specimen was used as positive control, and a naïve specimen serum, was used as negative control. The vaccinated guinea-pig serum, showed good inhibition ability, while the naïve specimen's sera showed no inhibition. A low titer (1:5) was settled as cut-off to easily discard negative samples. The technique as adjusted in this work is a useful tool for epidemiological surveillance. The modifications made over the original technique proved to be efficient in detecting humoral immune response to rabies exposure. The sera utilized as control will be tested, and titrated against an international reference serum. Preliminary results of the wild fauna sera testing showed the presence of antibodies in three sera samples of *Desmodus rotundus* collected during the outbreak.

173 MESOHABITAT STRUCTURE AND THE COMPOSITION OF NON-VOLANT SMALL MAMMALS IN ATLANTIC FOREST REMNANTS

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Fragment size and isolation are still the most commonly studied variables in habitat fragmentation, but qualitative differences between fragments also may be important. Structural variables measured at a regional scale can be used to infer habitat quality, frequently denominated the mesohabitat scale. Our objective was to determine if mesohabitat structure affect the composition of non-volant small mammals in Atlantic Forest remnants.

Study sites were in the Macacu River watershed, Rio de Janeiro State, Brazil. Small mammals were surveyed in 26 remnants, and nine mesohabitat variables were measured in each trap-station: canopy cover, volume of understory, tree height, abundance of lianas, and presence of fallen logs, palm trees, grasses, *Cecropia*, and watercourses.

A total of 856 individuals of 17 species were captured, 8 marsupials and 9 rodents. The first three Canonical Correspondence Axes were interpretable. The first axis was a habitat degradation gradient of increasing open canopy, density of understory, and smaller trees. It was negatively associated with the rodents *Phyllomys nigrispinus* and *Oxymycterus dasytrichus*. The second axis represents another gradient of preservation, with increasing tree height, canopy cover and reduced grass cover. It was positively associated with the rodent *Rhiphidomys* sp. n., and negatively with the marsupial *Gracilinanus microtarsus*. The third axis represents the relationship between the presence of watercourses and the occurrence of the semi-aquatic *Nectomys squamipes*.

Apparently, *P. nigrispinus*, *O. dasytrichus*, and *Rhiphidomys* sp. n. are associated with more preserved remnants, and *G. microtarsus* with less preserved remnants. A previous study of the Macacu river watershed determined that small mammal composition in forest remnants is determined by fragment isolation and size. Mesohabitat structure clearly is associated with small mammal composition, but it remains to be determined the relationship between mesohabitat, fragment size and isolation.

174 POPULATION GENETICS OF THE SILKY ANTEATER (*CYCLOPES DIDACTYLUS*): GREAT DIVERGENCE BETWEEN AMAZONIC LINEAGES - PRELIMINARY RESULTS

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This work presents the first genetic study of the Silky Anteater, *Cyclopes didactylus* (Pilosa, Mammalia). The original distribution of the species included tropical forests of Central and South America. Sporadic records of *C. didactylus* in northeastern Brazil suggest the existence of an isolated population in the Atlantic forest. This species is hard to visualize in the field, which makes it difficult to

obtain material for genetic studies. Samples from animals representing the Amazon Forest population were collected at Rio Trombetas Biological Reserve (REBIO), Oriximiná, Pará (n=2) and São Luís do Maranhão, Maranhão (n=2). Samples representing the Atlantic Forest fragment population were collected in Recife, Pernambuco (n=2). Part of the D-loop region and part of the Cytochrome B gene (total: 790 bp) were analyzed. The results suggest three major lineages: one representing an ancient historical split between individuals of REBIO and the others, and two recent lineages in Pernambuco and Maranhão. The REBIO results suggest a strong barrier for gene flow, with nucleotide distances ranging from 40 to 43% with respect to Maranhão and Pernambuco individuals, respectively. One possible explanation for this pattern is the location of REBIO animals in pleistocenic forests. A different lineage indicates segregation between individuals of the Atlantic Forest in Pernambuco and others in Maranhão. This separation was expected, since the species suffers from an uneven distribution in this area. A Neighbour Joining phylogenetic tree shows separate clades, with high bootstrap support (66 and 90%) of these individuals. These preliminary results show the initial elucidation of the species phylogeography, and stress the value of broader studies about its evolutionary history. Collection data are currently being compiled and genetically analyzed. Financial support: Fundação O Boticário de Proteção à Natureza. Instituto de Pesquisa e Conservação de Tamanduás no Brasil, IUCN Edentate Conservation Fund and Wildlife Conservation Society.

175 RECORDS OF MAMMAL HUNTING ON CHAPADA DAS MESAS NATIONAL PARK

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Chapada das Mesas National Park (PNCM) is a conservation unit recently created (December, 2005) in the south of Maranhão – Brazil. This Park are now in implantation process, and some families are using the area, practicing, among others activities, the hunt. In this study, we investigate the effects of hunting on mammal populations of PNCM, recording levels, methods of hunt, and preferred species. From October to November 2008, we conducted 10 interviews with different families that live in the PNCM region. Interviews were aided by a list of mammals (with coloured pictures) that were used to record the abundance of each species in the area (personal observation of the families). The majority of listed species (77%) were indicated as present species in the region and 23% were not identified by any of the residents. A great number of species were classified as constant (73%; indicated in up to 50% of interviews), while the others species were classified as accessory (13%; indicated in 25-50% of interviews) and the same number were considered occasional species (13%; less than 25%). The residents preferred their own farms, or areas next to their property (33%), the nocturnal period (50%) and the summer (67%) to hunt. Most hunters used rifles (45%) as method of hunting. The six-banded armadillo (*Euphractus sexcinctus*) was the favorite animal to hunt and eat (all hunters interviewed). The paca (*Cuniculus paca*), azara's agouti (*Dasyprocta azarae*) and the gray brocket deer (*Mazama gouazoubira*), were also mentioned by 67% of the interviewed on their preference lists. More data will be added to this study and can to guide future actions for the conservation of the unit.

176 TRAPPING TO ERRADICATE AMERICAN MINK FROM THE WILD

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Invasive species are causing biodiversity loss. American mink, with feralised populations, is thought to be one of the most damaging mammals to the native European fauna, and one of the main factors related to the extinction process of the European mink. The problem has global magnitude since the species is widespread through most European countries due to mink farms escapes or deliberate releases. In 2004 we trapped mink for radiotagging in the Butron Basin (Spain). Once aspects about biology, ethology, and capturability were known, we designed a protocol to eradicate the invasive species. The main goal of this study is to prove an effective method of eradication testing its effectiveness. We carried out eradication campaigns in 2007 and 2008 so as to test the results. Trapping protocol attended to the spatial segregation in use and location of home ranges observed in previous studies, and tried to capture the maximum number of individuals, but mainly females. During 07/08 campaign, some fixed points were monitored with camera-traps, and field signs were evaluated daily. 2242 trap-nights were set in 232 sites, trapping 31 American and 3 European mink. We established a minimum population of 38 mink (31 American trapped + 4 in the cameras + 3 Europeans). Environment's carrying capacity calculated was 49 mink. 08/09 campaign will finish in March. 12 American mink and 2 European have been trapped. Captured individuals are result of reorganization of the remaining population, and the arrival of immigrants from other areas. Capture all the individuals in one basin is nearly impossible, and is vital to develop effective methods for eradication projects, avoiding time and money loss. Trapping effectiveness is related with varied considerations. It is clearly improbable to reach a complete eradication, but it is possible to control it in minimal influence levels with a systematic trapping.

177 HABITAT USE AND POBLATIONAL SIZE OF THREE TOED SLOTH (*BRADYPUS VARIEGATUS*) IN AN INSULAR ZONE OF BIOGEOGRAFIC COLOMBIAN CHOCÓ

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In order to evaluate and describe demographic and ecological characteristics of a population of tree toed sloths (*Bradypus variegatus*) in the Palma island (Colombian Pacific) five sampling campaigns were carried out, every two months between January and December 2008. In order to standardize the sampled area a lineal transect (100 m) technique was used. In total 16 transect were deployed in the sampled zone. An intensive search of *B. variegatus* was carried out from 07:00 – 10:00 and 16:00 – 18:00 along each transect. Sex, activity, high on the forest, and vegetation associated was established for each individual registered. Density of *B. variegatus*

was 13.11 ind ha⁻¹ (Shape Restricted estimator, CI: 8.65 – 21.53 ind ha⁻¹), prevailing females. Plant preferences were by Cecropiaceae, Fabaceae and Moraceae. Individuals spent the 12.87% of the time in alimentation, 18.81% to displacement and 11.88% in sprucing up. Moreover, females with neonates were registered in September and November. In conclusion, the *B. variegatus* population off Isla Palma could be classified as a stable and developed population.

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Zoos may play an important role in biodiversity conservation by keeping well-managed populations of threatened species, producing scientific knowledge and helping to improve public awareness through environmental education. Maintenance costs may compromise the capacity of a zoo to efficiently fulfill these tasks, especially in developing countries. Because visitation represents the most significant, sometimes the unique, income source for some zoos, visitor behavior may help administrators define species composition and enclosure location, design and improvement. In this study we test whether species or enclosure characteristics predict visitor attendance to mammals at the Parque Zoológico de Sapucaia do Sul, State of Rio Grande do Sul, Brazil. We conducted 30 censuses of visitor attendance to 40 mammal species from December 2008 to January 2009. Species popularity was calculated as the mean percentage of all visitors recorded in each census that was attending a given enclosure. Six variables (number of animals kept in the enclosure, infant presence and enclosure distance to zoo main entrance, the restaurant, parking lot 1 and parking lot 2) were not good predictors of popularity. On the other hand, three species traits (weight, origin and visibility) and two enclosure characteristics (size and type) were good predictors. Visitors preferred larger exotic species kept in larger and non-wired enclosures. Although at least some of these traits are interrelated, we suggest large exotic mammals are key species at the Sapucaia do Sul zoo. Their maintenance, however, is often much more expensive than that of smaller native species. Additionally, the replacement of large exotic species is far more unlikely. Therefore, the zoo administration will need to deal with a trade-off between costs and income in deciding in which set of species to focus in the future. 90619-900, Brazil; leodhrs@hotmail.com