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## REVISIÓN DE LIBROS

# Biology of Caviomorph Rodents: Diversity and evolution

Aldo I. Vassallo & Daniel Antenucci (eds.). 2015. Series A: Mammalogical Research, vol. 1. Sociedad Argentina para el Estudio de los Mamíferos, Mendoza, ix + 329 pp.

Against all odds, rodents won the sweepstakes and crossed the Atlantic Ocean from Africa to enter South America for the first time in the Eocene, ca. 40 million years ago. These gnawing pilgrims gave rise to one of the most spectacular monophyletic groups of mammals: the caviomorphs. This name is an allusion to one of its prominent members, the guinea pig (genus *Cavia*), but most caviomorphs do not look like guinea pigs. Actually, this is the most diverse group of rodents in terms of body plan, showing a great disparity of body sizes and shapes, locomotion modes, social and mating systems. Upon arrival, the newcomers evolved, diversified, and occupied a wide range of environments, from rainforests to deserts, from sea level to the Andean altiplanos, and from Tierra del Fuego to Central America, the Antilles, and even North America. How has this diversity evolved through space and time? What are the key biological aspects of caviomorph rodents that allowed such diversity? These are the main questions addressed in the excellent book edited by Vassallo and Antenucci, and published by the Sociedad Argentina para el Estudio de los Mamíferos (SAREM).

This book is the first product of a new editorial project SAREM established in 2013, with the goal of disseminating scientific works on Neotropical mammals. The result is a combination of original research and thorough reviews aiming at the international scientific community. To reach this goal, all chapters have been written in English, which was a smart and bold move. Each chapter also has an extended abstract in Spanish, which is appealing to Latin American undergraduate students who are starting their scientific careers. Most chapters also have excellent explanatory boxes, with instructive notes for those who are not familiar with the terms, methods or structures cited in the text.

Thirty-two scientists from seven countries contributed this the book; 20 authors are from Argentina, SAREM's home. The 10 chapters vary in length, most of them reaching 30 pages or less, with the exception of chapters 1 and 2, which go beyond 50 pages. The book is focused on a particular taxonomic group, but the approach is multidisciplinary, covering a wide range of fields, such as paleontology, ecology, genetics, evolution, functional morphology, behavior, and physiology. In the introduction, the editors set the stage by presenting the aims and scope of the book, and by characterizing rodents as a whole and caviomorphs in particular. Then they give a brief overview of the contents of the book, citing every chapter, but two. Surprisingly, chapters 1 and 2 were left out of the introduction—the latter was cited in a figure caption only. This omission has a cost: the lack of an introduction to the four main lineages within caviomorphs, recognized as superfamilies (Erethizontoidea, Cavioidea, Chichilloidea, and Octodontoidea). This phylogenetic and taxonomic introduction could have included color plates illustrating representatives of each superfamily. This strategy would have been more effective than placing the plates at the end in gray scale.

Chapters 1 and 2 stand out as the two most comprehensive texts. In Chapter 1, Vucetich et al. offer an impressive review of the evolutionary history of caviomorphs based on 260 references—both classic and modern—encompassing the rich fossil record of this group since the Eocene. In addition, the authors evaluated the evolution of gigantism based on original estimates of body sizes. The only shortcoming of this chapter is the way Appendix 1 is presented: a hard to read 8-page long table. A modified diagram with horizontal and vertical lines would have worked better. Chapter 2 is a remarkable original research paper by Upham & Patterson, focusing on a genus-level molecular phylogeny of extant caviomorphs. It is based on a data matrix of 199 species and DNA sequences from five genes, covering all 54 living genera in this group. In addition to a very careful molecular clock analysis including, for example, a detailed justification of the 22 fossil calibration

points, the authors discuss the environmental context for caviomorph diversification.

In Chapter 3, Ojeda et al. provided a nice synthesis of the ecological biogeography of caviomorphs in general and octodontids in particular. Their most important novel findings are a strong association of species richness with area and productivity; the Amazon as the ancestral area of diversification from a saxicolous grazer ancestor; and the arid lands of the proto-Monte region as the ancestral macrohabitat of octodontids. Their character state reconstructions should serve as a hypothetical framework for future studies, despite some odd assignments, such as *Proechimys* and *Thrichomys* as semifossorial taxa, since they are both terrestrial.

Chapters 4, 5, and 6 deal with functional morphology and adaptation: the first focusing on locomotion, the second on the post-cranial skeleton, and the third on the skull. Rocha-Barbosa et al. (chapter 4) examined the postcranial features of caviomorphs, especially cavioids. They found out that most caviomorph species are cursorial, and pacing is disadvantageous for most species, which are short-legged, but advantageous for long-legged ones, like *Dolichotis*. In chapter 5, Morgan explores patterns of morphological evolution of the shoulder girdle and forelimb skeleton using geometric morphometrics in a comparative phylogenetic framework. Her results show that distantly related taxa with digging habits share autopodial (carpal-metacarpal) specializations that provide stability and better distribution of forces, thus resulting in a higher adaptive value. Also, the fossil record shows that skeletal adaptations were acquired early in the history of the major caviomorph lineages. Álvarez et al. (chapter 6) examined the macroevolutionary and functional patterns responsible for the diversity of craniomandibular morphology in caviomorphs. They used geometric morphometric techniques to study skull size and shape, analyzed the functional morphology of the masticatory apparatus, and compared biomechanics and enamel microstructure of incisors and cheek teeth. They found strong phylogenetic signal of morphological variation, but proximate causes, such as body size, habitat, diet, habits, and life history, also played an important role.

Chapters 7 to 10 review behavioral, physiological, genetic, and ecological aspects of caviomorphs. Herrera (chapter 7) reviews mating systems, sexual selection, and sperm competition in caviomorphs and provides case studies from different families, especially Caviidae, in which we find almost every kind of social and mating systems described for mammals. In chapter 8, Luna et al. examined the effect of body mass and environmental factors (latitude, elevation, temperature, and precipitation) on caviomorph comparative energetic diversity, and discuss possible effects due to global warming. MacManes et al. (chapter 9) explore the potential for high throughput sequencing to studies of caviomorph biology, especially considering the evolution of insulin genes and the roles of social demography and social structure on immunogenetic variation. In chapter 10, Zapata et al. reviewed 127 dietary studies of mammalian carnivores from South America and found caviomoprhs in 76% of the diet samples. In addition, caviomorph rodents played a fundamental role in structuring raptor communities at an ecological scale in a case study in Patagonia.

The main shortcomings of the book in my opinion are the small size of some figures and the lack of taxonomic and subject indices. There are also some typos, especially in the foreword, where several spaces between words are missing. But none of these problems overshadow the quality of the science behind this most welcome volume. This is a first-class product, worth the cost, and will hopefully stimulate research on this neglected taxonomic group. A search in a public database (Google Scholar) for published papers using the word "caviomorph*" returned less than 3 000 results, while "sigmodontinae" returned more than 5 000, "phyllostomidae" returned almost 9 000, and "didelphidae" returned more than 11 000. This book is therefore a mandatory reading for any researcher or student interested in this amazing group of rodents.

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