

## OBSERVATIONS ON THE NATURAL HISTORY OF *Abrocoma* sp. (RODENTIA, ABROCOMIDAE) IN A *Polylepis* WOODLAND IN BOLIVIA

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**ABSTRACT:** We report four opportunistic field observations of a species of *Abrocoma* in *Polylepis besseri* woodlands in Cochabamba Department, Bolivia. These observations suggest four significant aspects of *Abrocoma* sp. natural history: 1) they have arboreal activity, 2) they may be specialized herbivores that feed on *Polylepis* leaves, 3) they have diurnal activity, and 4) they have docile behavior. These observations represent the first descriptions of aspects of the behavior and ecology of an abrocomid in Bolivia, and also suggest that *Polylepis* woodlands, a threatened Andean habitat, may provide an important habitat for specialized mammal herbivores such as *Abrocoma* sp.

**RESUMEN:** Observaciones sobre la historia natural de *Abrocoma* sp. (Rodentia, Abrocomidae) en un bosque de *Polylepis* en Bolivia. Reportamos cuatro observaciones de campo ocasionales de una especie de *Abrocoma* en un bosque de *Polylepis besseri* en el Departamento de Cochabamba, Bolivia. Estas observaciones sugieren cuatro aspectos significativos sobre la historia natural de *Abrocoma* sp.: 1) tienen actividad arbórea 2) podrían ser herbívoros especializados que se alimentan de hojas de *Polylepis*, 3) tienen actividad diurna y 4) tienen un comportamiento dócil. Estas observaciones son las primeras sobre el comportamiento y la ecología de un abrocómido en Bolivia y sugieren que los bosques de *Polylepis*, un hábitat amenazado, constituirían un importante hábitat para mamíferos herbívoros especializados como *Abrocoma* sp.

**Key words.** *Abrocoma*. Bolivia. Natural history. *Polylepis* woodlands.

**Palabras clave.** *Abrocoma*. Bolivia. Bosques de *Polylepis*. Historia natural.

Observations on the natural history of organisms are sometimes considered of little significance and a part of old-fashioned science. However, knowledge of natural history is at the core of science; it allows researchers in other branches of biology to develop novel and meaningful hypotheses, to design significant field experiments and observations, and to facilitate syntheses from organismal to eco-

system levels; it is also at the roots of modern evolutionary biology, ecology, wildlife management, conservation biology, and nature appreciation (Bartholomew, 1986; Wilson, 2000; Greene, 2005; Schmidly, 2005; Willson and Armesto, 2006).

We report here four opportunistic field observations of a possible new species of *Abrocoma* in *Polylepis besseri* woodlands in

Cochabamba Department, Bolivia. These observations represent the first descriptions of the behavior and ecology of an abrocomid in Bolivia, and they have four significant implications for the knowledge and understanding of the biology of this species and abrocomids in general: 1) arboreal activity, 2) specialized herbivory, 3) diurnal activity, and 4) docile behavior. These observations also suggest that *Polylepis* woodlands may provide an important habitat for specialized herbivorous mammals such as *Abrocoma* sp., adding to the importance of conserving this threatened habitat in Andean countries.

Abrocomid rodents are endemic to South America. With the exception of a few studies of *Abrocoma vaccarum* from Argentina and *Abrocoma bennetti* from Chile (Braun and Mares, 1996), the natural history of abrocomids is poorly known. Abrocomids are considered trap-shy and apparently disinterested in all types of baits (Braun and Mares, 1996). As a consequence, they continue to be poorly represented in museum collections and their ecology and behavior remain largely unknown.

Abrocomidae currently consists of two genera: *Abrocoma*, with eight recognized species (Braun and Mares, 2002; Woods and Kilpatrick, 2005), and the recently described *Cuscomys*, with two species: *C. ashaninka* (Emmons, 1999) and *C. oblativus* [= *Abrocoma oblativa*] long considered extinct (Eaton, 1916), but possibly still extant (Emmons, 1999). *Abrocoma boliviensis* was considered to be *Cuscomys* by Verzi and Quintana (2005); herein we have maintained it as *A. boliviensis* to be consistent with the current checklist (Woods and Kilpatrick, 2005). In Bolivia, Abrocomidae is currently represented by two species: *Abrocoma cinerea* and *A. boliviensis* (Anderson, 1997; Salazar-Bravo et al., 2003).

*Polylepis* woodlands are one of the most endangered habitats in Bolivia and other Andean countries (Fjelds , 2002; Ibsch et al., 2003; Kessler, 1995, 2002). Previous studies of mammals in *Polylepis* woodlands have reported that most species have wide distributions that are apparently not directly related to

the presence of *Polylepis* trees (Yensen and Tarifa, 1993; Tarifa and Yensen, 2001; Vargas, 2001; Yensen and Tarifa, 2002; Moya, 2003; Vargas, 2005; Tarifa et al., 2007). However, some species appear to use the woodlands as a refuge (e.g., *Hippocamelus antisensis*: Tarifa and Yensen, 2004).

Our observations occurred in *P. besseri* woodlands of Sach'a Loma [also spelled Sacha Loma] and Quturi [also spelled Cuturi] located ca. 12 km SW of Pocona, Mizque Province, Cochabamba Department, Bolivia (ca. 17° 44' S, 65° 34' W). Both sites were located between 3600 and 4000 m elevation in *Polylepis* woodlands on steep mountainsides in the Cordillera de Cochabamba. The average annual temperature at Sach'a Loma is ca. 8.7°C, with an average minimum temperature of 1.7°C and maximum of 19.3°C. The average annual precipitation is 721 mm (Fern ndez et al., 2001).

The woodland fragments where the observations occurred have abundant rocky outcrops of glacial origin locally called "salles." The woodlands have three clearly differentiated strata: trees from 2 to 6 m tall, shrubs 1 to 2 m high, and undergrowth up to 0.5 m. The latter consisted of forbs, ferns, and grasses. The arboreal stratum was completely dominated by *P. besseri besseri* (Fern ndez et al., 2001).

The small mammals of Sach'a Loma have been studied by Vargas (2001) and Moya (2003), and in both studies *Abrocoma* sp. was collected and voucher specimens deposited in the mammal collection at the Centro de Biodiversidad y Gen tica (CBG) at the Universidad Mayor de San Sim n. *Abrocoma* sp. was the largest of the 8 species of rodents reported from Sach'a Loma and was the only species of abrocomid. Voucher specimens of *Abrocoma* sp. from Sach'a Loma were compared to the holotype of *C. ashaninka* and specimens of *A. boliviensis*, *A. cinerea*, and *A. bennetti* and the descriptions of both genera in Emmons (1999), Glanz and Anderson (1990) and Verzi and Quintana (2005). The voucher specimens agreed with *Abrocoma* in 12 of 16 cranial characters compared.

In May 2000, a female *Abrocoma* was captured at Sach'a Loma in a Sherman trap baited with a mixture of oats, peanut butter, tuna, and vanilla scent. We kept the animal in captivity for three days before we liberated it. During the days in captivity the *Abrocoma* showed a very docile character. The first day the *Abrocoma* escaped from the bag where it was kept, and was standing up and looking around without fleeing. When we tried to catch the animal, it started to escape; however, the animal moved slowly, so it was easy to recapture by hand. The second day we took the *Abrocoma* out in order to clean the bag. The *Abrocoma* did not try to escape or bite us. The third day, because the animal had been in the bag for many hours, we decided to take it out for some sunlight. We put the *Abrocoma* on a big rock. It escaped but it did not go very fast, so we were able to catch it by hand again. We began to pet it, and the *Abrocoma* remained in CA's lap sunbathing and eating Brazil nuts and raisins for several minutes. Finally, we left the animal in the woodland where it remained for some minutes before taking refuge in a crevice in a pile of rocks nearby.

On 6 October 2002, at Sach'a Loma at 17:15 we observed an *Abrocoma* sitting on a thin branch at a height of 1.75 m in a young *P. besseri* tree 2 m tall. We saw the animal at some distance, and we decided to approach the tree very slowly trying not to scare it. The *Abrocoma* remained calm while we approached the tree. When we were close to the branch where the *Abrocoma* was sitting, we realized that it was not afraid of our presence and it continued calmly collecting young shoots with its hind foot and eating them. The animal repeated the same action several times while balancing on a thin branch. It used its rear feet and tail to support itself on the branch.

After 15 minutes of observation, we felt comfortable in offering young shoots to the *Abrocoma*. We placed the young shoots close to its muzzle. It smelled the shoots and grasped them with its forefeet, then ate them. We observed the *Abrocoma* foraging on *Polylepis* shoots for more than 30 minutes, after which

one of us reached out and touched the *Abrocoma* on its hind feet, dorsum and belly. When one of us tried to grasp the animal, it escaped and sought refuge within a pile of rocks nearby.

During October or November 2003, we observed an *Abrocoma* sp. at Quturi between 12:00 and 13:00. The animal was on a low branch in a small *P. besseri* tree ca. 1.5 m tall. The *Abrocoma* sp. was feeding on shoots and young leaves of *Polylepis*. It was rising up on two feet to reach its food. Moving slowly when it felt threatened, it just shrank and camouflaged itself in the foliage—making itself like a type of little ball—and it did not move until it was more tranquil.

During the period of observation, the *Abrocoma* moved slowly along the branches on the lower part of the tree while eating shoots and young leaves. We tried to feed the animal with bits of bread, which it did not eat. We touched the animal and petted it. After 30 minutes of observation, we tried to grasp the animal, but it escaped by jumping into some nearby rocks where it took refuge.

The last field observation occurred on 24 October 2004. At 14:00, an *Abrocoma* was observed in the interior of a *P. besseri* woodland fragment at Sach'a Loma. The individual emerged from a pasture of *Festuca* and *Stipa*, after which it jumped into a small cave in a nearby rock pile.

The lack of behavioral and ecological information about abrocomids was noted by Braun and Mares (1996), who mentioned that a specimen of *A. vaccarum* that they collected in Mendoza, Argentina was the only individual of this species encountered during their 5-year study of the mammals of the region. As a result, the observations presented here contribute not only to the knowledge of Bolivian abrocomids but also to an understanding of this family.

Anatomical characteristics such as a long tail, long hind feet, wide feet, well-developed abdominal musculature, well-developed plantar tubercles, and strong, hooked claws are considered to be adaptations of rodents for climbing (Dublin, 1903; Holbrook, 1979; Dewsbury et al., 1980; Packer and Layne,

1991; Rivas and Linares, 2006). The specimens of the putative undescribed species of *Abrocoma* from Cochabamba and *A. boliviensis* both have relatively long tails, long feet, and strong, curved claws. In describing the numerous small plantar tubercles of *Abrocoma*, Glanz and Anderson (1990) suggested they would function to increase traction on rocks or tree branches. We observed *Abrocoma* sp. use its long tail for balance, watched them climb, and saw them move easily but deliberately among the branches. Because of their similar anatomy, we suggest that both *Abrocoma* sp. and *A. boliviensis* may be suited for arboreal activity, although the degree of arboreality remains to be studied.

In contrast, *A. bennetti* and *A. cinerea* were characterized by Glanz and Anderson (1990) and Emmons (1999) as specialized for terrestrial life in open habitats and living in burrows among rocks; they have a short tail, reduced hallux, and inflated auditory bullae. We suggest that among the Abrocomidae there are those species that can be considered arboreally-adapted, *C. ashaninka* and *C. oblativa* (Emmons, 1999); species that are suited for arboreal activity, *Abrocoma* sp. and possibly *A. boliviensis*; and terrestrial species such as *A. vaccarum* (Braun and Mares, 1996) and *A. cinerea*.

Previous studies of small mammals in *Polylepis* woodlands at Sach'a Loma and other places in Bolivia were based on collecting efforts using traps placed at ground level (e.g., Yensen and Tarifa, 1993; Vargas, 2001; Yensen and Tarifa, 2002; Moya, 2003; Maradiegue 2006). Although for species lists there may not be much difference in the number of species captured in arboreal vs. ground level traps, for ecological studies the differences in habitat, available food resources, patterns of vertical stratification, and canopy utilization are among the most critical parameters that affect community composition of small mammals (Meserve, 1977; Laakkonen, 2003; Vieira and Monteiro-Fihlo, 2003; Wells et al., 2004). Therefore in ecological studies in *Polylepis* woodlands, it is important to consider species with arboreal activity, which uses

vertical structure. Trapping only at ground level will underestimate the abundance of species with arboreal activity and also misrepresent the composition of small mammal communities.

Diurnal activity in *Abrocoma* sp. at Sach'a Loma and Quturi was surprising, but almost nothing is known about the activity patterns of Bolivian abrocomids. Whether *Abrocoma* sp. is also active at night is not known, but these observations suggest that classical trapping techniques may have been unsuccessful for that reason. As a specialist herbivore, it may not be attracted to conventional baits, as is the case with other abrocomids (Glanz and Anderson, 1990; Braun and Mares, 1996).

It is also noteworthy that *Abrocoma* sp. was observed eating young shoots of *P. besseri*. Braun and Mares (1996) cited observations by Oliver Pearson in which he saw *A. cinerea* eating leaves of *Polylepis*, among other plants, in Peru. Taken together, these observations suggest that *Polylepis* woodlands may provide an important habitat for abrocomids.

Yensen and Tarifa (2002) noted a deficit of specialized herbivores in the small mammal guild in *Polylepis* woodlands, suggesting that a segment of the community has been lost at many sites, perhaps due to the degradation of those woodlands by human activity. The woodland fragments at Sach'a Loma and Quturi were well preserved. Consequently, these woodlands may give us insights into the original small mammal composition of *Polylepis* communities and serve as a useful baseline.

*Abrocoma* sp. was observed in the densest portions of the woodlands. This leads us to suspect that their docile behaviors of 1) shrinking the body into a ball and remaining still when threatened, and 2) relying on their grayish-brown color for camouflage among the *P. besseri* leaves was a cryptic antipredator behavior. Similar behavior was observed in *Ochrotomys nuttalli*, a rodent with arboreal activity (Layne 1960, cited in Packer and Layne, 1991) and an arboreal specialist, *Dactylomys dactylinus* (Emmons, 1981). This cryptic antipredator behavior was considered an adaptation to arboreal life (Layne 1960,

cited in Packer and Layne, 1991; Eisenberg 1978). This behavior also suggests that *Abrocoma* sp. is a species with regular arboreal activity.

The behavior that we observed in *Abrocoma* sp. of relying on its motionless behavior and grayish-brown color for camouflage in the vegetation could imply that a reduction in vegetation cover accompanying fragmentation would more readily expose them to view by predators. This might explain their apparent rarity because most remaining *Polylepis* woodlands are highly fragmented and disturbed.

The docile behavior of *Abrocoma* sp. may also make them vulnerable to invaders like *Rattus rattus* that are becoming increasingly common in *Polylepis* woodlands as human use increases. *R. rattus* has been observed preying on *A. bennetti* in Chile (Eduardo Valladares, pers. comm. 2006) and have been found in *Polylepis* woodlands adjacent to pine plantations in Tunari National Park, Cochabamba Department (Maradiegue, 2006). Finally, the docile character observed in *Abrocoma* sp. may have also been present in *C. oblativus* [= *A. oblativa*] and helps to understand why the Incas could keep them as pets, as suggested by evidence that these animals were buried with their owners in Inca burial caves (Eaton 1916).

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