The rediscovery of the Brazilian three banded armadillo and notes on its conservation status

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Abstract

A recent survey in the northern part of Bahia state, Brazil, has revealed the presence of Brazilian three banded armadillos *Tolypeutes tricinctus*, a species that had not been seen alive by the scientific community for at least 20 years. The factors that led to the decline of the species continue to operate, and three-banded armadillos face an uncertain future. Intensive surveys in the presumed area of distribution of the species are urgently needed so that a management plan for this endemic Brazilian edentate can be developed.

Introduction

The Brazilian three-banded armadillo *Tolypeutes tricinctus* is the rarest of the edentates, not having been seen by scientists for at least 20 years. The only other species in the genus is *T. matacus*, which occurs from Bolivia and the Mato Grosso region of Brazil to southern Argentina (Wetzel, 1981). *T. tricinctus* is confined to north-eastern Brazil, inhabiting the semi-arid *caatingas* (communities of drought-adapted plants). It is the only endemic Brazilian armadillo and one of two edentates restricted to Brazil (the other being the maned sloth *Bradypus torquatus*). *T. matacus* is still relatively common, although heavily hunted in some parts of its range (Wetzel, 1981). *T. tricinctus*, on the other hand, has not been seen, collected or reported for at least 20 years. Carvalho (1969) observed wild individuals and also burned shells in the São Francisco river region of Bahia state. Before this the most recent observations were from Coimbra-Filho and Moojen in 1958 (Coimbra-Filho, 1972), in the Alto Jaguaribe region (state of Ceará) and Barreiras (state of Bahia). As far back as 1964-68 a questionnaire used in the state of Bahia revealed that *T. tricinctus* was already extremely rare because of overhunting (Paiva, 1972).

Only six specimens with complete collecting information are known from the world's museums and recent studies throughout its distribution range failed to locate wild populations (Mares et al., Wetzel, 1981; A. Langguth, pers. comm.). To our knowledge, only one individual has been recorded in zoological collections (Olney, 1980). T. *tricinctus* is categorized by the IUCN "indeterminate" (Thornback and Jenkins, 1982). The Brazilian Institute of Environment and Renewable Resources (IBAMA) lists the Brazilian three-banded armadillo as "endangered".

This paper reports on the finding in 1988 that *T. tricinctus* still lives in the wild in Canudos county, in the northernmost part of the state of Bahia, close to the border of the state of Pernambuco (approximately 10°S 39°W) (see Figure 1).

Description of locality

The range of *Tolypeutes tricinctus* is confined to the semi-arid vegetation formations, known collectively as caatinga, which extend inland

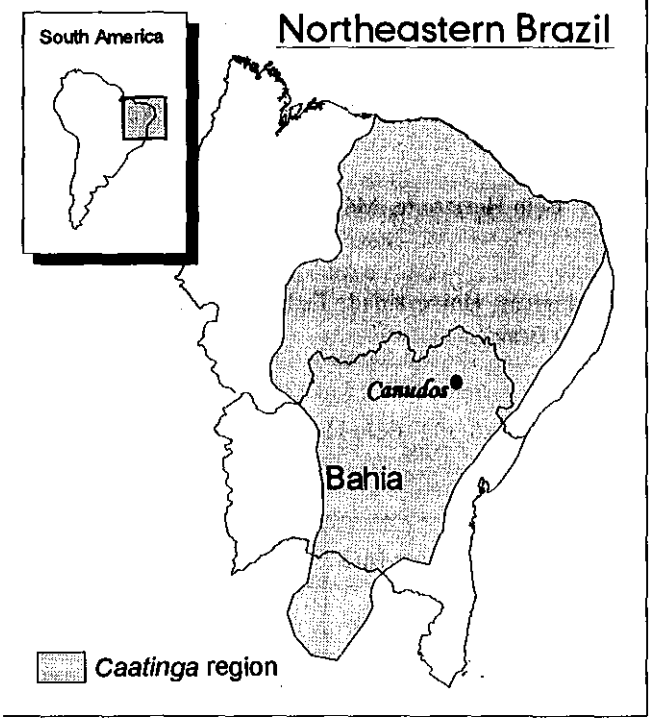

Figure 1. Map showing the area of Caatinga region in Northeastern Brazil and the location of Canudos in the Bahia state.

diagonally from the north-east corner of Brazil for 800,000 sq km (Figure 1). The vegetation communities of the region we visited can be broadly divided into "arboreal caatinga" and "scrub caatinga" (Hueck, 1972). The locality surveyed in this study dominated by scrub caatinga, characterized by low-growing xerophytic woody plants, cacti and terrestrial bromeliads. Average annual precipitation is usually below 500 mm, and the rainfall can be unpredictable (Hueck, 1972; Sick *et al.*, 1987). The area where *T. tricinctus* was observed has been termed "Raso da Catarina Ecosystem"(Sick *et al.*, 1987) and one of the most remote and unpopulated sections of north-eastern Brazil. The Raso is characterized by flat terrain cut by canyons carved by seasonal rivers. The central human settlement of this region is the town of Canudos (county of Canudos). The whole county has approximately 13,794 inhabitants, 4,762 of which live in towns.

Observations on *Tolypeutes tricinctus*

T. tricinctus can be distinguished from *T. matacus* in that the former species has five clawed digits on the forefeet, while the latter has only four (Nowak and Paradiso, 1983). These two species are the poorest diggers of the armadillos and roll up when disturbed, making them very vulnerable to hunters. Although *T. matacus* id frequently seen and hunted in parts of its range (Wetzel, 1981), it was described as being the second most abundant armadillo species in south-western Mato Grosso, Brazil (Schaller, 1983),

The first indications of the presence of *T. tricinctus* in the area were given by R. B. Machado and A. Brandt, directors of the Lear's Macaw Conservation Programme under the auspices of WWF-US and Fundação Biodiversitas. During a survey in late 1988 they discovered two burned shells of the species at houses in the towns of Canudos and Rosário. According to information from local people, these two specimens had been bought at the popular market that serves the whole country and takes place every Sunday in the town of Canudos. Machado and Brandt took the shells to the Federal University of Minas Gerais (Belo Horizonte, Brazil), and an expedition was then sent out to locate live individuals.

Although no individuals were seen in the wild, the authors bought five live adults (three males and two females), and took them to the federal University of Minas Gerais. The three males, which had multiple injuries, died upon arrival, and one of the females gave birth. As is observed with *T. matacus* (Meritt, 1971), newborn *T. tricinctus* resemble the adults in general morphology, possessing hardened claws, but with the eyes and ear pinnae closed. Attempts are under way to keep the two surviving females in captivity. They are apparently healthy, and at the time of writing have been in captivity for 20 weeks, being fed on a diet of fruit, mealworms, boiled eggs and a special jelly developed for captive marmosets. The individuals purchased at the market were reported to be caught, two days before, in the vicinity of Canudos. According to information from local people, *T. tricinctus* is relatively common in the market, although the least abundant of the armadillo species sold locally. In addition to the five *Tolypeutes*, we found at the same market, in one single day, 11 common armadillos *Dasypus novemcinctus* (sold at US$ 3.00 each), eight six-banded armadillos *Euphractus sexcinctus* (sold at US$ 3.50 each), and one naked-tailed armadillo *Cabassous tatouay* (sold for US$ 3.00). *Euphractus*

is the species preferred by consumers of the region, followed by *Dasypus*. The cheapest species is *Tolypeutes* (sold for US$ 0.80 each), and apparently the pries are set proportionally to the weight of each species and individual. Individuals of all ages are sold, but immature. *T. tricinctus* fetch very low prices. Local people say that three-banded armadillos do not thrive in captivity, and therefore cannot be fattened for later consumption. *Euphractus, Cabassous* and *Dasypus*, on the other hand, are said to be suitable for fattening and thrive on a very broad diet. Therefore, even young individuals are sold for a fairly good price.

According to personal observations and information by local people, peccaries, *Tayassu pecari* and *T. tajacu*, brocket deer *Mazama gouazoubira*, lesser anteaters *Tamandua tetradactyla*, mocos or rock cavies *Kerodon rupestris and* cavies *Cavia aperea* are also frequently sold at the Canudos market.

Tolypeutes is considered by hunters to be the species that is most easily caught, and this may account for its current rarity. R. Machado has visited three previous markets at Canudos and had reported that the three other armadillo species were present, but that *Tolypeutes* was absent. This may reflect overhunting.

Conservation status and prospects for action

The survey described in the present study is preliminary and a larger project on the conservation and biology of *T. tricinctus* is being developed. The ease with which *T. matacus* is observed in areas where it is not hunted, associated with the fact the previous attempts failed to locate *T. tricinctus* in the caatinga region, indicate that the species is under severe hunting pressure. Anecdotal information obtained locally seems to suggest that the species was much more common in the past, sharply declining during the past 10 years. Local people gave the impression that three-banded armadillos were once so abundant that armadillo hunting dogs were trained not to pursue them. Nonetheless, the area is important in that it is the only site where *T. tricinctus* has been described alive during the past 20 years. The low human population density may account for the persistence of the species, but the threat is certainly increasing.

The standard of living of Brazilian northeastern populations is among the lowest in Brazil. Long and unpredictable droughts make agriculture and the keeping of livestock highly risky. Agriculture is mostly limited to the production of sisal. It is probable that a large fraction of the human population relies on bush meat for its protein requirements. Game in the area under study has been progressively declining, and it is reported that an area of a few kilometers radius around the town of Canudos is now almost free of game species. Because living conditions are below the poverty level, and domestic sources of protein are anyway not easily available, the demand for bush meat is not likely to decrease. Education campaigns designed to curb hunting are therefore unlikely to succeed in the short term.

The only protected area in the Canudos region is the Raso da Catarina Ecological Station (997 sq km), established in January 1984, which now belongs to the IBAMA. The reserve protects a fairly large portion of pristine caatinga habitat. A major problem with the reserve is its loosely defined boundaries, and the fact that local people generally ignore its reserve status. *T. tricinctus* has been reported in the Raso da Catarina Ecological Station, but the "reserve" status does not guarantee protection; hunters have been seen frequently within its boundaries. Since the area has only two permanent guards, law enforcement is highly unlikely to improve in the short term.

Within the distribution range of *T. tricinctus*, there are other established protected areas that belongs to IBAMA, such as, Aiuaba Ecological Station, National Park of Ubajara, and National Forest of Araripe-Apodi (state of Ceará), National Park of Serra da Capivara and Sete Cidades, and Urucuí-Una Ecological Station (state of Piauí), National Park of Chapada Diamantina (state of Bahia), Itabaianas Ecological Station (state of Sergipe), Serra Negra Ecological Station (state of Pernambuco), Ecological Station of Seridó (state of Rio Grande do Norte). The total area currently under protection in the presumed original geographical range of the Brazilian three-banded armadillo is approximately 558,433 ha. None of these protected areas has been surveyed for the species.

Given these conditions, and anticipating that in the short term the Brazilian federal and state wildlife agencies will still continue to be financially and politically weak, we see only a limited number of options that could succeed in improving the conservation status of *T. tricinctus*. We have listed below some of the most obvious suggestions that we feel have a fair probability of success.

1. At the international level, we suggest that the IUCN transfers the species from the "indeterminate" category to, at least, "vulnerable". It is our belief, however, that *T. tricinctus* merits "endangered" status, for the following reasons : (a) this is the first report of live individuals in the least 20 years; (b) a number of intensive field studies conducted within its distribution range (Mares *et al.*, 1981; A. Langguth, pers comm.; see also Wetzel, 1981) failed to detect the species; (c) the species is endemic to the poorest region of Brazil. The population reported in this study, in spite of inhabiting a fairly remote area, is under heavy hunting pressure, which is likely to be kept constant or increase in subsequent years. Evidence (a) and (b) suggest that most other populations within the range of the distribution of the species are likely to have disappeared or fallen below critical density. Furthermore, it may be possible that the original distribution of *T. tricinctus* was more restricted or less uniform than previously suspected. The existence of only a limited number of museum specimens with known locality makes the determination of the geographical range of the species difficult (see Wetzel, 1981 for distribution map); (d) the only reserve in the region (Raso da Catarina) lacks any formal protection, and hunters use it freely. Furthermore, previous owners of the land now covered by the reserve have not yet been compensated for their properties, which makes the reserve's future uncertain; (e) the paving of highway BR116, which is soon to be completed, will improve access to the region, thus increasing hunting pressure on game species (Sick *et al.*, 1987). Furthermore, international conservation organizations should promote fund-raising to support field studies, to improve established reserves and to secure additional protected areas.

2. At the national, state and local levels, efforts should be channelled towards providing funding for the study of the biology of the species in the region. General surveys should be made in order to search for other potential populations of *T. tricinctus*, especially within the protected areas already established by IBAMA. The government agencies should try to secure better protection for the Raso da Catarina Ecological Station, and conduct or fund education and public awareness campaigns to inform local people of the presence and importance of this protected area. With its relatively large area, the Raso da Catarina Ecological Station represents an important conservation unit within the caatinga ecosystem, and may be crucial to the survival of endangered species such as Lear's macaw *Anodorhynchus leari*, Spix's macaw *Cyanospitta spixii* and the Brazilian three-banded armadillo.

3. With information on the general biology of *T. tricinctus*, especially diet and reproductive behaviour, funds should be made available for the development of captive-breeding programmes. Although three-banded armadillos are known to be keep in captivity, there is no information available demonstrating the impossibility of such a programme. Coimbra-Filho (1972) states that both *T. matacus* and *T. tricinctus* were kept in captivity with good results, although no breeding was attempted. The experience of keeping *T. tricinctus* at the Federal University of Minas Gerais suggests that captive breeding may constitute a viable method of improving the conservation status of the species.

Acknowledgments

Kent Redford stimulated us in writing this note and developing a larger project. Ana Maria P. Fonseca obtained demographic and socioeconomic data on Canudos. World Wildlife Fund-US financed this work. The Fundação Biodiversitas and the Department of Zoology of the Federal University of Minas Gerais provided technical and logistical support.

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News

GIANT ANTEATERS, *MYRMECOPHAGA TRIDACTYLA*: FEEDING BEHAVIOR AND FIRES

One of the most important protected areas in the *cerrado* (bush savanna) of central Brazil is the Serra da Canastra National Park (71,525 ha), in the west of the state of Minas Gerais. It is an extensive plateau, largely composed of open grassland, with altitudes averaging 1,300 m and reaching 1,496 m above sea level. Perhaps one of the most significant features of the park is the community of edentates it protects, including six species of Dasypodidae (*Dasypus novemcinctus*, *D. septemcinctus*, *Cabassous tatouay*, *C. unicinctus*, *Euphractus sexcinctus*, and *Priodontes maximus*) along with the southern tamandua, *Tamandua tetradactyla* and the giant-anteater, *Myrmecophaga tridactyla*. Field research on the armadillos was carried out by Encarnação and Carter (Carter; 1983; Carter and Encarnação, 1983; Encarnação, 1986), and population densities and the feeding behavior of the park's giant anteaters were studied for two months in 1978 by Shaw, Carter and Machado-Neto (1985).

The Park suffers annually from grass fires, and in 1990/91 a study was made of the feeding behavior and diet of the giant anteater during 11 months (March 1990 to May 1991), in order to obtain a better understanding of their diet (including seasonal variation), and also investigate the possible effects of fires on their foraging behavior (Drumond, 1992). Quantitative data were obtained on dietary items, time spent attacking each nest, and food availability, and these parameters were compared for anteaters foraging in unburnt and recently burnt areas. Censuses were carried out to investigate possible effects of burning on the anteater's foraging. The giant anteater's diet showed seasonal variation in prey selection, and was also evidently determined by different defence mechanisms of the ants (notably *Solenopsis*, *Camponotus* and *Crematogaster*) and termites (mainly Apicotermitinae, Nasutitermitinae and Termitinae) predated. The seasonal effect showed that although Shaw *et al.* (1985) recorded a diet of 88% ants and 12% termites during two months at the end of the wet season (February and March), at other times of the year (for example, April, August and October) termites can make up the majority of their diet. Attacks on nests and galleries were always of very short duration, very rarely lasting more than a minute.

Short term effects of fires were investigated by censuses and observations of foraging behavior in burnt and unburnt areas. They did not avoid recently burnt areas, and there was no evident difference in diet nor prey availability from that observed for intact grassland. The short term effects of, at least light, grass fires would appear to be negligible, probably due to the nests acting as refuges. The anteaters had no problem in finding refuges for themselves during a fire, in swampy areas or forest patches. The effect of fires on the termite and ant communities is undoubtedly, however, complex and significant, and one important factor is the amount of dry biomass available. One would predict that infrequent burns of a larger accumulated biomass may be more damaging than the frequent and light fires typical of most years in the Park.

The study formed part of a Master's degree for the course in Ecology, Conservation and Wildlife Management of the Biological Sciences Institute of the Federal University of Minas Gerais (UFMG), Belo Horizonte. It was supervised by Anthony B.Rylands, Zoology Department, UFMG, supported by the Brazilian Institute for the Environment (Ibama) responsible for the administration of the Park, and financed by Conservation International (CI) - Brazil Program, Belo Horizonte; U.S.Fish and Wildlife Service, Washington, D.C., Fundação Biodiversitas, Belo Horizonte, and the Higher