

Dexter Chan

David Stokes

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Conservation of the Giant Armadillo (*Priodontes maximus*)

Description

The largest armadillo in the world, *P. maximus*, can be distinguished by its large flat carapace, if not for its size. The carapace is hairless and covered with rows of rectangular scales and has a buffy border. It is composed of 11 to 13 movable dorsal bands and 3 to 4 moveable neck bands allowing a great degree of movement from within the protective structure. They can grow up to 89 cm in head-to-body length and 30-40 kg in Argentina (Ceresoli and Fernandez-Duque 2012). Records in Paraguay note that the giant armadillo is more than twice as large and five times heavier than the next largest species of armadillo with wild specimens weighing up to 45kg and as much as 80 kg in captivity (Smith 2007). They have oval heads with blunt muzzles and a tail covered in pale pentagonal scales and tapers toward the tip. The ventral side is uncovered by armor, pinkish-brown, and hairless (Smith 2007). Individuals can be identified by the unique scale patterns most notably by the dividing line between dark and lights scales and the “number of light scales per row from the lower edge of the carapace up to the dividing line” (Smith 2007). They walk on the soles of their hind feet and tips of the claws of their forefeet and are able to swim rather well. If threatened, giant armadillos rise up on their hind legs much like anteaters and can strike out with their hooked claws. Giant armadillo have poor eyesight, but a keen sense of smell (Smith 2007).

Ecology

The minimum home range for a giant armadillo has been estimated to be averaged at 425.5 hectares with individuals roaming up to 3 kilometers per night (Smith 2007). *P. maximus* is not territorial and home ranges of males have been observed to overlap. A separate study estimated a home range of 10.05 km² leading to a population density estimate of 1.27 to 5.55 individuals per 100 km² in Emas National Park of Brazil (Smith 2007).

Giant armadillos like all armadillos lack true teeth, but possess molariform teeth which are squarish for grinding food. These molariform teeth shed with age and because of this the number of teeth in each armadillo is highly variable (Smith 2007). Their diet consists solely of termites and ants and they often destroy the mound upon which they are feeding (Redford 1994). Based on their restrictive diet, the habitats of giant armadillos are limited to areas where termites and ants can be found as well as proximity to water. They become locally extinct near human inhabited areas quickly and as such their main habitat is undisturbed tropical rainforest, grasslands, and scrub (Superina 2010).

Their forefeet are equipped with large curved claws with the third generally being the largest and attaining lengths up to 20.3 cm (Smith 2007). The large claws are typically used in defensive behavior to flee and quickly dig into the soil and lodge themselves securely. The long claws are also utilized when digging large burrows where they spend most of the daylight hours. As nocturnal animals, they are most active from 10pm to 6am in Santa Cruz, Boliva and peak activity was recorded to be from 2am to 4am in Brazil (Smith 2007). The burrows in which they spend most of the day are often constructed into sandbanks or termite mounds and inhabited for at least 24 hours and up to 17 days. Some specimens have been noted to remain in their burrows for up to three consecutive days without leaving (Smith 2007).

A study in of armadillos located in the Pantanal - Brazil's large, tropical wetland - reveals that giant armadillos are physical ecosystem engineers due to their widespread burrows that alter the environment and creating new habitats for other organisms. This study distinguished new burrows from the old with evidence of tracks, fresh sand, and tail prints while older burrows tended to have flattened front mounds and entrances littered with leaves (Desbiez and Kluyber 2013). By mounting cameras in front of these burrows, the researchers were able to record the interactions of other animals with the burrows. A total of 57 species visited the burrows, though a number of rodents were grouped as one species and birds and domestic animals were not included (Desbiez and Kluyber 2013). Of these 57 visiting species, at least 24 vertebrate species used and interacted with the burrows and sand mounds (Desbiez and Kluyber 2013). In the Pantanal region, yearly flooding and sandy soils prevent many animals from creating long lasting holes and burrows making the giant armadillo the only species capable of digging large and deep burrows in such a terrain (Desbiez and Kluyber 2013). These burrows seem to have similar temperatures to the outside, but actually fluctuate less making them desirable habitats for passing animals. Newer burrows tend to be interacted with more often and even though there are few giant armadillos, they change burrows frequently and will on average dig a new burrow every two days providing a steady source of habitats (Desbiez and Kluyber 2013).

A study in the western Formosa province of Argentina on the size and orientation of the burrows of the giant armadillo found a total of 32 burrows with 94% of them located on ant mounds and were frequently facing west (Ceresoli and Fernandez-Duque 2012). Researchers hypothesized that the western orientation maximizes the "amount of heat reaching the entrance to the burrow" and "may be an adaptive response to handle the relatively cold days of the Chaco" (Ceresoli and Fernandez-Duque 2012).

An ethnobiologist who has studied the Wayapi people in the Troi-Sauts in the headwaters of the Oyapok River in French Guiana has reported that armadillos are rarely hunted by the Wayapi people (Catzfelis and Thoisy 2012). Only the elderly are allowed to eat them and in particular, the giant armadillo benefits from a strict culinary interdict and consequently, is never hunted (Catzfelis and Thoisy 2012). The Wayapi believe that the diet of earthworms and other invertebrates of armadillos introduces the chance of consuming cadavers indirectly as well as the consideration that the blood of armadillos is a health-risk for women of childbearing age (Catzfelis and Thoisy 2012). All armadillos are culturally valued for their extraordinary strength and the names of several people include the local name for various species of armadillo “tatu” (Catzfelis and Thoisy 2012). The armadillos along with sloths and anteaters “evoke empathy, if not fondness” from most city dwellers and are featured in childrens’ books as well as the parade of Carnival in Cayenne where a local band creates a large armadillo float (Catzfelis and Thoisy 2012).

Population

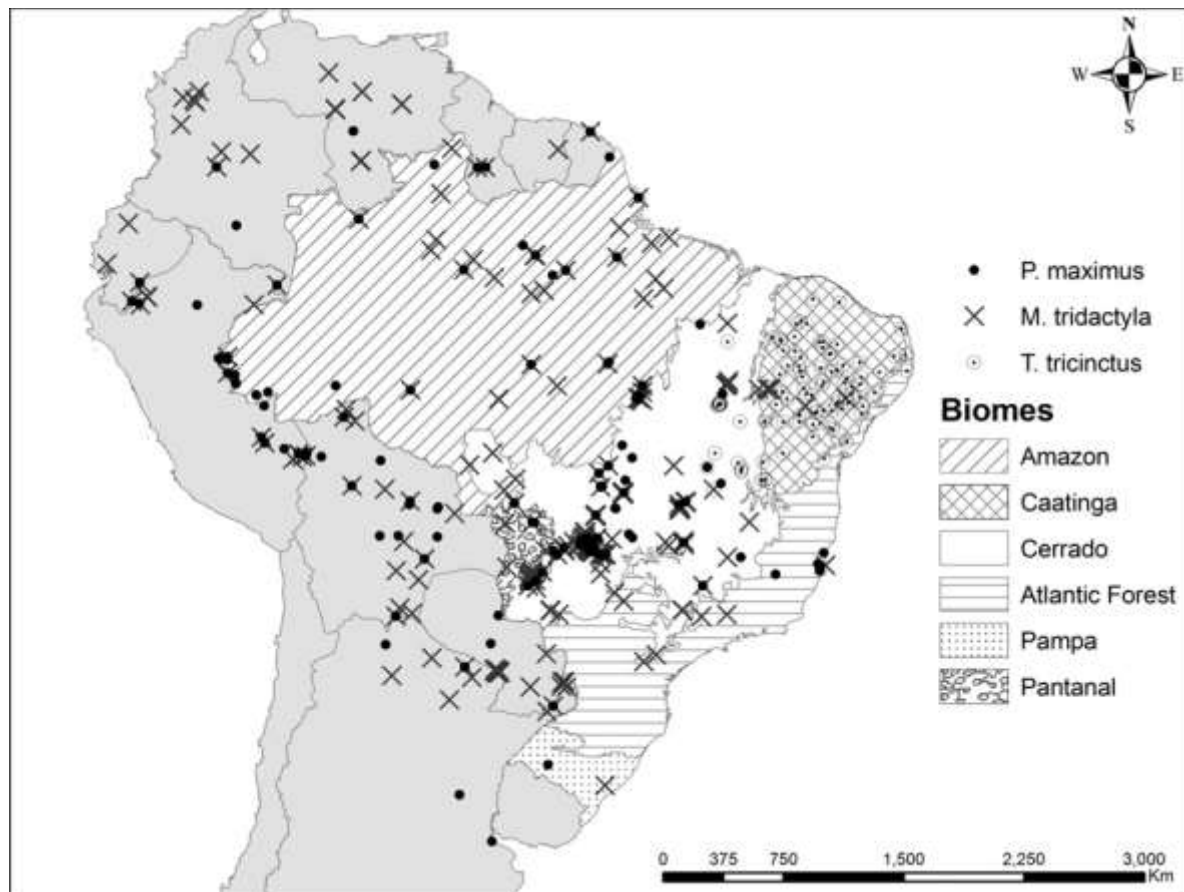
There are no population figures for large areas of habitat, but over its entire range the IUCN estimates that there has been a 30% decline in the last 20 to 30 years and a more recent figure for estimation has been a 50% decline just in the last decade (Smith 2007). The giant armadillo has a low reproduction rate and adults are targeted by hunters for their meat. The population in Chaco was previously healthy and well protected because it is isolated, but deforestation since 2010 has created ranches from its natural habitat as well as desertification in areas of extensive deforestation (Smith 2007). These factors will increase the Gran Chaco

region's armadillo's contact with humans and is predicted to reduce their population greatly (Smith 2007).

Current and Historic Range

The historic range of the giant armadillo probably occurred as far south as 31°S in Argentina (Smith 2007). A study of records of giant armadillo in the Atlantic Forest concludes that the giant-armadillo was never abundant in the Atlantic Forest due to the scarcity of historical and recent records as well as evidence that most of its current distribution lies in the Cerrado and Amazon (A. C. Srбек-Araujo *et al.* 2009). Sightings have been made in southeast Venezuela, the Amazon Basin of Columbia, Ecuador, Brazil, Peru and Bolivia, Paraguay, and northern Argentina (Smith 2007). Today, the species is still widely distributed, though scarcely populated, in South America and east of the Andes in Formosa, Chaco, Salta, and northern Santiago del Estero (Smith 2007).

The giant armadillo has become locally extinct in much of its historical range in Paraguay and large portions of the Orient (Smith 2007). Small populations exist in the Itaipú Reserves in Departamento Alto Paraná, in the Mbaracayú Forest Reserve in Departamento Candindeyú and in Departamento Concepción of Paraguay (Smith 2007). There is only one record in Itaipú and the species is now extinct there and in the rest of eastern Paraguay (Smith 2007). It is still widespread in the Chaco region but is becoming locally extinct where human populations become established in the Nueva Asunción and Tte Enciso National Park, northern Departamento Boquerón (Smith 2007).



Total occurrence points compiled for *Myrmecophaga tridactyla*, *Priodontes maximus* and *Tolypeutes tricinctus* based on from projects conducted by the Universidade de Brasília, by the Jaguar Conservation Fund (JCF), and local researchers' personal observations. Amazon Biome refers to a moist broadleaf rainforest. Caatinga Biome refers to a semi-arid region populated by thorny desert vegetation. Cerrado Biome refers to a tropical savanna. Atlantic Forest Biome refers to a varied region consisting of tropical and subtropical moist and dry broadleaf forests, tropical and subtropical grasslands, savannas, and shrublands, and Mangrove forests. Pampa refers to vast fertile plains. Pantanal refers to one of the world's largest wetland area.

Legal Status

The giant armadillo is classified as Vulnerable by the IUCN/ SSC Red List of Threatened Species, listed on Appendix I of CITES, and listed as 'Critically Endangered' in Brazil (Desbiez and Kluyber 2013). Paraguay's Centro de Datos de Conservacion judges the species to be in imminent danger of extinction (Smith 2007). Some states' of the Atlantic Forest red lists the giant-armadillo as Regionally Extinct in São Paulo, Critically Endangered in Espírito Santo and in Rio de Janeiro, and as Endangered in Minas Gerais (A. C. Srbek-Araujo *et al.* 2009).

Threats to species existence

The biggest threats to giant armadillos in the Atlantic Forest are habitat destruction from deforestation, hunting for subsistence and the souvenir market, and capture of live specimens (A. C. Srbek-Araujo *et al.* 2009). Since 1970, a total of 755, 000 km² had been cleared from the Amazon Rainforest mainly for cattle farming (Butler 2014). Natural fires are also a threat to its conservation, but regular burning may be less damaging than infrequent severe fires brought on by more frequent dry seasons from El Niño (Smith 2007). The meat is considered to be invigorating and the fat is used to treat asthma and bronchitis (Smith 2007). Due to its rarity and size, giant armadillos are also trophy hunted. In the Pantanal region, some rancher workers will kill them on sight as they are believed to bring bad luck (Desbiez and Kluyber 2013). Intensive pesticide use in agricultural areas removes food sources for the giant armadillo (Smith 2007). Due to the armadillo's rarity and the unreported nature of illegal hunting, there are no estimates on mortality from anthropogenic interactions other than a 50% decline in the last decade.

Conservation

A study was done in the Brazilian Cerrado on the effects of fragmentation on the ecology of xenarthrans (placental mammals including anteaters, sloths, and armadillos) and found that the absence of an observed effect of fragmentation on the occupancy probabilities for these species might suggest that these species do not suffer from the impact of habitat fragmentation due to range shift predictions from climate change models (Zimbres *et al.* 2013). However, they caution the interpretation of this statement as part of the study area was a Permanently Protected Area and as it was surrounded by fragmented patches of habitat, may have served as a refuge experiencing overcrowding (Zimbres *et al.* 2013). Another point to consider for land managers is that future range shifts of *P. maximus* will push it out of the reach of the 10% threshold for

adequate protection under both Brazilian reserve systems of integral protection as well as sustainable use and indigenous reserves (Zimbres *et al.* 2013). There is a captive breeding program in Argentina aiming to reintroduce the species and augment the wild population, but is suggested that “any conservation strategy should be accompanied [by] an educational element in which local people are taught to admire and respect the species and myths about its supposed great value on the black market are dispelled (Smith 2007).



Giant Armadillo (*Priodontes maximus*) – Vulnerable © Carly Vynne

Literature Cited

Butler, R. 2014. "Calculating Deforestation Figures for the Amazon." Mongabay. Available from http://rainforests.mongabay.com/amazon/deforestation_calculations.html

Catzfelis, F. and Thoisy, B. D. 2013. "Xenarthrans in French Guiana: a brief overview of their distribution and conservation status." *Edentata* 13: 29-37.

Desbiez, A. L. J. and Kluyber, D. 2013. "The Role of Giant Armadillos (*Priodontes maximus*) as Physical Ecosystem Engineers." *Biotropica* 45. 5: 537 –540.

Redford, K. H. 1994. "The Edentates of the Cerrado." *Edentata*. 1: 4 -10

Smith P 2007 - FAUNA Paraguay Handbook of the Mammals of Paraguay Number 6
Priodontes maximus - www.faunaparaguay.com/priodontesmaximus.html.

Srbek-Araujo, A. C., Scross, L. M., Hirsch, Andre, and Chiarello, Adriono G. 2009. "Records of the giant armadillo *Priodontes maximus* (Cingulata: Dasypodidae) in the Atlantic Forest: are Minas Gerais and Espirito Santo the last strongholds of the species?" *Zoologia* 26. 3:461-468.

Superina, M. & Abba, A.M. 2010. *Priodontes maximus*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 20 March 2014.

Vynne, C. 2010. Giant Armadillo (*Priodontes maximus*) – Vulnerable. Fighting for Survival - The IUCN Red List update, October 2010 [Internet] [Cited 2014 Mar 20]. Available from <http://www.flickr.com/photos/iucnweb/sets/72157625247699054/detail/>

Zimbres, B., Furtado, M. M., Jacomo, A. T. A., Silveira, L., Sollmann, L., Torres, N. M., Machado, R. B., Marinho-Fillho, J. 2013. “The impact of habitat fragmentation on the ecology of xenarthrans (Mammalia) in the Brazillian Cerrado.” *Landscape Ecol* 28: 259-269.

Zimbres B., Aquino, P., Machado, R., Silveira, L., Jacomo, A., Sollman, R., Torres, N., Furtado, M., Marinho-Filho, J. 2012. “Range shifts under climate change and the role of protected areas for armadillos and anteaters.” *Biological Conservacion* 152: 53 – 61.