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SHORT COMMUNICATION

New records of giant armadillo *Priodontes maximus* (Cingulata: Dasypodidae) at Serra do Amolar, Pantanal of Brazil

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Abstract The giant armadillo is one of the least studied South American mammals. It is classified as Vulnerable due to habitat loss and subsistence hunting. This species has been recorded at several sites within the Pantanal biome of Brazil. We aimed to confirm the species presence in Serra do Amolar, in the western border of the Pantanal. Using camera traps and burrow censuses we confirmed its presence in an area with no previous information. Nevertheless, it is necessary to assess the population status and to gather more information about its ecology in order to contribute to its regional conservation.

Keywords: camera trap, conservation, giant armadillo, *Priodontes maximus*, Serra do Amolar

Novos registros do tatu-canastra *Priodontes maximus* (Cingulata: Dasypodidae) na Serra do Amolar, Pantanal do Brasil

Resumo O tatu-canastra é um dos mamíferos sul-americanos menos estudados, e, atualmente, classificado como Vulnerável devido à perda de habitat e à caça de subsistência. A espécie foi registrada em vários locais dentro do bioma Pantanal, Brasil. Nosso objetivo foi confirmar a presença do tatu-canastra na Serra do Amolar, na fronteira oeste do Pantanal. Através de armadilhas fotográficas e censo de tocas pudemos confirmar a presença da espécie em uma área onde não havia informação. No entanto, é necessário avaliar o estado da população e obter mais informações sobre sua ecologia, a fim de contribuir para sua conservação a nível regional.

Palavras-chave: armadilhas fotográficas, conservação, Pantanal, *Priodontes maximus*, Serra do Amolar, tatu-canastra

The giant armadillo, *Priodontes maximus* (Kerr, 1792), is the largest armadillo among the 21 extant species (Abba & Superina, 2010), and is classified by the IUCN Red List of Threatened Species as Vulnerable with a decreasing population trend (IUCN, 2012). Major threats include habitat loss,

subsistence hunting, and illegal capture for animal collectors (Fonseca & Aguiar, 2004; Abba & Superina, 2010).

Although widely distributed in South America, the giant armadillo seems to occur at low population densities, with a patchy distribution (Aguiar &

Fonseca, 2008). It is solitary, nocturnal or crepuscular, highly fossorial, and rarely observed (Eisenberg & Redford, 1999). Due to its cryptic nature, it is also one of the least studied mammals (Silveira *et al.*, 2009).

According to Silveira *et al.* (2009) the information on giant armadillo ecology has mainly been obtained from indirect signs, sporadic sightings, or dead animals, including in some areas of Pantanal (Schaller, 1983; Alho *et al.*, 1987; Coutinho *et al.*, 1997; Schneider, 2000). In the past few years, the increasing use of camera-trapping provided new evidence of its presence, for example in Chiquitano and Chaco forests of Bolivia (Noss *et al.*, 2004), the grassland-savannahs of central Brazil (Silveira *et al.*, 2009), the Atlantic forest (Srbek-Araujo *et al.*, 2009), and again in Pantanal (Trolle, 2003; Trolle & Kéry, 2005). Despite the increasing data on its distribution some aspects of its ecology remain poorly understood.

In this study we report the first record from camera trapping of the giant armadillo in the region of Serra do Amolar in the western Pantanal, a biome known for its unique abundance of wildlife (Trolle, 2003) that preserves more than 80% of its original vegetation coverage (Sollmann *et al.*, 2008). Although its presence in the area was already confirmed since the 1970s (Schaller, 1983), we obtained the first record from camera traps for Serra do Amolar.

The study was carried out in the 200 km² Engenheiro Eliezer Batista Private Natural Heritage Reserve (RPPN EEB), located on the western border of Pantanal, between the Paraguay river and lake Mandioré on the Bolivian border, 180 km north of Corumbá (18°05'26"S, 57°18'29"W). The area consists of several rocky peaks (highest altitude of 870 m asl) and flooded plains, and contains a mixture of plant communities, such as moist tropical rainforest plants, semi-arid woodlands, Brazilian Cerrado, and grasslands. Here the ecosystem suffers drastic alterations during the year with an inundation and a desiccation phase, which can alter the spatial ecology of most animal species. Average yearly rainfall is 1,000–1,400 mm, with most precipitation occurring between November and March. Mean temperature is 25 °C but temperatures can fluctuate from 0 to 40 °C. During the rainy season the water level can rise between two and five meters, which isolates most of the peaks. Human presence is low with sparse fishermen settlements along the Paraguay river. The predominant soil in the area is sandy.

The PNHR EEB was created in 2008 by private initiative in order to enhance the conservation efforts of Pantanal Matogrossense National Park. In partnership with other private institutions the PNHR EEB also takes part of Rede de Proteção e Conservação da Serra do Amolar (RPCSA), a multi-organizational conservation framework for Serra do Amolar that legally protects 209,000 ha of Pantanal

biome (Bertassoni *et al.*, 2012), since the Brazilian Environment Ministry classifies Serra do Amolar as an area of extremely high importance and priority for biodiversity conservation (MMA, 2007).

We undertook transects along the main roads from March until September 2011 in order to identify potential signs of presence, such as tracks, scats, and burrows. We conducted daily surveys once a month over a period that ranged from two to four days. To complement data collection, we also conducted a camera trapping survey between August and September 2011 in order to assess mammal biodiversity. The rapid expansion of camera trap surveys for detecting elusive species has led to the extensive application of this technique as camera technology has improved and equipment costs decreased (Kelly & Holub, 2008). Twenty-three camera traps (12 Bushnell Trophycam® digital cameras and 11 Tigrinus 6.0 C® analog cameras) were installed along the main dirt roads and in the hills in a trapping grid arrangement with an average of 400 m between cameras. All cameras were programmed to operate continuously (24 h/day) and to take pictures with a minimum interval of 30 s for the digital models, and 5 min for the analog models. The geographic coordinates of camera traps, photographic captures, and presence signs were recorded in a GPS navigator and exported to ArcGis 10 (ESRI®). Sampling effort and sampling success were calculated following Srbek-Araujo & Chiarello (2005).

With an effort of 550 trap-days we obtained two captures of giant armadillo (0.36 captures per 100 camera-days) from camera traps installed on one of the roads and in the valley (**Fig. 1**). The animals were registered at night, and because of their position we were not able to determine their sex. The giant armadillo was the only *Xenarthra* species recorded on this camera trapping effort but other species have been detected by camera traps previously installed in the protected area, such as the nine-banded armadillo (*Dasypus novemcinctus*), six-banded armadillo (*Euphractus sexcinctus*), and giant anteater (*Myrmecophaga tridactyla*) (Instituto Homem Pantaneiro, unpublished data). Although further studies are planned to gather information about the ecology and conservation status of these *Xenarthra* species, they seem to occur at low densities at the PNHR EEB, since the area has large flooded fields in proportion to the dry lands.

Our census effort comprised approximately 40 hours, and we identified three distinct burrows along two main roads of the RPPN EEB. The first burrow was located under an anthill, and there were three entrances around the mound. The second burrow was found on the road, under a fallen trunk, and the third burrow was found beside the dirt road, in a sand bank formed due to the accumulation of soil taken to open the road (**Fig. 1**). The point where this

hole was dug was covered by vegetation, and there were no signs of ant or termite mounds.

Although in recent years new information has been obtained about giant armadillos, this species is still poorly known. Most of this knowledge has been obtained by the use of camera trapping methodology. In this context, camera traps have been shown to be an efficient and non-invasive tool to study important ecological aspects of the species such as activity patterns, density estimates, habitat use, home range, and interaction with other species (Noss *et al.*, 2004; Silveira *et al.*, 2009; Srbek-Araujo *et al.*, 2009).

In a study conducted in the upper Rio Negro Basin, Trolle (2003) concluded that camera trapping allows analyzing the field biology of many species to a degree of precision that had not been published before in the region of the study area. Yet, he found only one old burrow of a giant armadillo in Acuri (*Attalea phalerata*) forest, and the species was never recorded by camera trapping, seeming to be rare.

In a review, Rodrigues *et al.* (2002) detailed other areas within the Pantanal where giant armadillo presence was confirmed such as the upper Paraguai river basin, in the region of Manso river hydro-electric power plant (Schneider, 2000), Serra do Amolar, in Acurizal ranch (Schaller, 1983), Chapada

dos Guimarães (Cope, 1889), and Nhumirim ranch (Alho *et al.*, 1987). Also, a giant armadillo was photographed with a conventional camera at Fazenda 4 Cantos, in the Pantanal of Nhecolândia (18°36'54"S, 56°16'59"W), in 2011. The picture was taken by Mr. Pablo Lima, one of the farm owners, and shown to one of the authors (GEOP). The species was also registered by Trolle (2003) in the upper Rio Negro basin, and in the northern Pantanal by Trolle & Kéry (2005) (FIG. 2).

The most recent previous sign of giant armadillos in Serra do Amolar dates back to the late 1970s, at the Acurizal ranch, 30 km north of our study area. At that time, Schaller (1983) concluded that this species was very rare or recently extinct on the ranch, and only a few abandoned burrows were found in Cerrado and gallery forest.

Our research confirms the species' presence in Serra do Amolar both by signs and by photos. Nevertheless, it is necessary to gather information on habitat use, population density, interactions, and feeding ecology, as well as to assess its population status at Serra do Amolar in order to fill gaps in scientific knowledge and to strategically contribute to conservation planning.

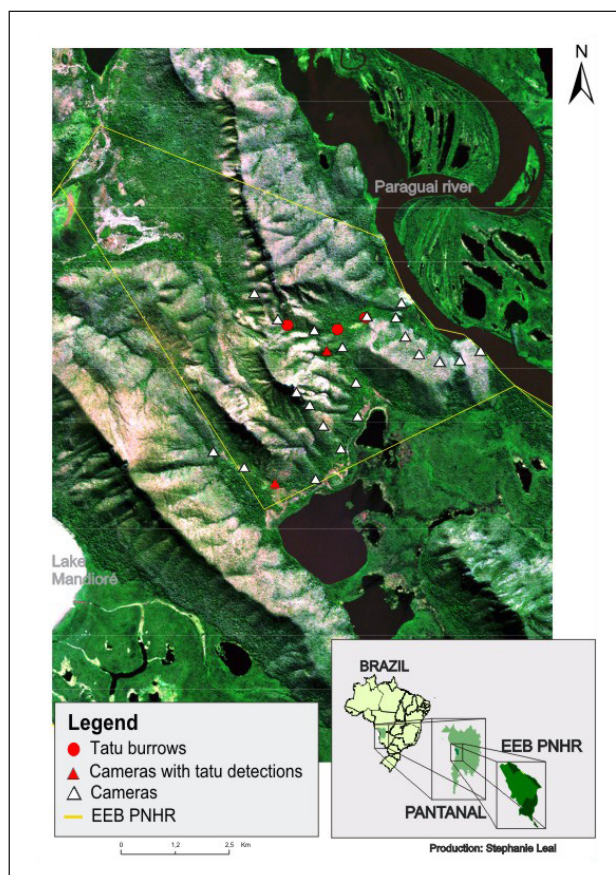


FIGURE 1. Location of Engenheiro Eliezer Batista Protected Area (EEB PNHR), and locations of giant armadillo captures and signs.



FIGURE 2. Giant armadillo detections in the Brazilian Pantanal. 1: Schneider (2000); 2: Cope (1889); 3: Trolle & Kéry (2005); 4: Schaller (1983); 5: this study; 6: P. Lima, pers. comm.; 7: Alho *et al.* (1987); 8: Trolle (2003).

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