

SHORT COMMUNICATION

When the giant rests: evidence of prolonged inactivity in the giant armadillo (*Priodontes maximus*) of the Pantanal

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Abstract We documented prolonged inactivity (12 consecutive days), an uncommon behavior, in a giant armadillo (*Priodontes maximus*) in the Pantanal. Unlike previous observations in the Amazon, there was no internal activity or alternative exits, suggesting prolonged inactivity. This behavior may be associated with the need for thermoregulation, although temperature variations or environmental factors (such as fires) were ruled out. This record raises questions about the species' energy conservation strategies, such as the causes and ecological consequences of this behavior. We recommend investigations of physiological mechanisms (body temperature, metabolism) and ecological implications, which could position the species as a model for studies of climate adaptation in tropical megafauna.

Keywords: burrows, sedentary behavior, thermoregulatory strategies, Xenarthra

Quando o gigante repousa: evidências de inatividade prolongada no tatu-canastra (*Priodontes maximus*) do Pantanal

Resumo Documentamos um período prolongado de inatividade (12 dias consecutivos), um comportamento incomum, em um tatu-canastra (*Priodontes maximus*) no Pantanal. Diferentemente de observações anteriores na Amazônia, não houve atividade interna ou saídas alternativas, sugerindo inatividade prolongada. Esse comportamento pode estar associado à necessidade de termorregulação, embora variações de temperatura ou fatores ambientais (como incêndios) tenham sido descartados. Esse registro levanta questões sobre as estratégias de conservação de energia da espécie, como as causas e consequências ecológicas desse comportamento. Recomendamos investigações sobre mecanismos fisiológicos (temperatura corporal, metabolismo) e implicações ecológicas, o que poderia posicionar a espécie como modelo para estudos de adaptação climática em megafauna tropical.

Palavras-chave: comportamento sedentário, estratégias de termorregulação, tocas, Xenarthra

The giant armadillo (*Priodontes maximus* [Kerr, 1792]) is considered the largest living representative of the order Cingulata, reaching up to 150 cm in total length (Desbiez *et al.*, 2021b). Individuals of this species are rarely seen due to their nocturnal and fossorial habits and low densities (Desbiez *et al.*, 2021a). Like some other Xenarthra species, the giant armadillo presents extreme specialization

in its diet, with a predominance of low-energy items, such as termites and ants (Valdes & Soto, 2012; Nascimento *et al.*, 2024). This trophic specialization may be associated with physiological characteristics of the group, which include low body temperature, low basal metabolic rates, and high thermal conductance (McNab, 1985; Valdes & Soto, 2012). In addition, low metabolic rates directly influence

reproductive and developmental traits such as long gestation periods, slow growth, and prolonged parental care (McNab, 1985).

As a burrowing animal, the giant armadillo performs three distinct types of excavations, as described by Desbiez & Kluyber (2013). The “feeding holes” are the shallowest, ranging from 60 cm to 1.2 m deep, and are used exclusively for searching for food. The “resting holes”, on the other hand, at 1.2 m to 3.7 m deep, are used for a single night, and are characterized by a small mound of earth at the entrance. Burrows, in turn, are the deepest structures and can exceed 4 m. In general, Mesias-Costa *et al.* (2001) describe burrows with multiple entrances and exits; however, studies carried out in the Pantanal, Cerrado, Atlantic Forest, and Chaco recorded structures with only one opening, observing the reuse of the same burrow for days in a row and even the reopening of old excavations (Desbiez & Kluyber, 2013; Desbiez *et al.*, 2022).

In the Pantanal, all giant armadillo burrows have a characteristic spatial distribution, being found: 1) in *murundus* (natural slightly elevated soil mounds found in the Pantanal's seasonally flooded areas, which have characteristic vegetation [Rosete *et al.*, 2012]), close to or associated with active

or inactive termite mounds; and 2) in the *cerradão*, under tree roots; there are no records in open field areas (Desbiez *et al.*, 2020a). The selection of forested environments for burrowing may be related to thermoregulation strategies, because the forest can buffer variations in air temperature, which may be important for basoendothermic individuals, such as *P. maximus*, with lower thermal inertia for thermoregulation and energy conservation (Desbiez *et al.*, 2020b). Normally, individuals can stay in these burrows for continuous periods of up to 20 hours, but they may remain in them for two to three nights during the winter season. Although they spend 75% to 80% of their time underground, accelerometer data confirm that the species does not remain active or feeds inside the burrows (Desbiez *et al.*, 2021a). In addition to the habitual use of burrows, female giant armadillos also use these excavations to give birth and protect their young from predators, remaining in them for longer periods than usual (Desbiez *et al.*, 2019).

In a study conducted in the Amazon by Pitman *et al.* (2004), an individual giant armadillo stayed in its burrow for 30 days, remaining active inside it, contrasting with the semi-hibernation hypothesis suggested by Funatura (1994). Encarnaç o (1987),



FIGURE 1. Giant armadillo entering and leaving the burrow. **A–B.** Individual entering the burrow on 11 November 2024 (28°C; 22:05:02 hr). **C–D.** Giant armadillo leaving on 23 November 2024 (23°C; 00:19:39 hr).

TABLE 1. Animals recorded during the period in which the giant armadillo (*P. maximus*) remained in its burrow (11 November 2024 to 23 November 2024).

Order	Species	Common name	Date	Time
Artiodactyla	<i>Sus scrofa</i>	Feral pig	22/11/2024	17:56:11
			11/11/2024	03:55:27
			14/11/2024	00:20:58
			15/11/2024	03:51:08
			15/11/2024	07:53:59
Cingulata	<i>Dasypus novemcinctus</i>	Nine-banded armadillo	19/11/2024	19:47:14
			20/11/2024	21:10:15
			22/11/2024	19:13:54
			22/11/2024	21:58:50
			23/11/2024	04:45:24
Rodentia	<i>Thrichomys fosteri</i>	Rodent	11/11/2024	02:37:00
			12/11/2024	19:20:16
			13/11/2024	04:30:10
			13/11/2024	19:43:47
			21/11/2024	23:40:42
Squamata	<i>Ameiva ameiva</i>	Lizard	14/11/2024	14:00:42

on the other hand, recorded an individual remaining in its burrow for 17 days but emerging occasionally. Over the course of 15 years of monitoring in the Pantanal, we have collected data from dozens of giant armadillos, generating essential information about the species, but we have never recorded animals staying in their burrows for more than a few days. Given the lack of records and information regarding prolonged inactivity for the species, this report documents an uncommon behavior in which an animal was recorded remaining in a burrow for a prolonged period without leaving even once.

This event was registered by camera traps used for a long-term study (2010–2025) conducted in the Nhecolândia subregion of the Pantanal (Desbiez *et al.*, 2020b). We installed a systematic grid of 75 camera traps where cameras were strategically positioned in front of *P. maximus* burrows and feeding areas. The records were obtained using *Reconyx* cameras (HF2 Pro Covert model; *Reconyx*, Holmen, USA) set to rapid-fire mode, capturing three consecutive photos without intervals. The monitoring station responsible for the recording is georeferenced at 19°16'36"S, 55°51'31"W. Individual identification of the giant armadillo strictly followed the criteria established by Massocato & Desbiez (2019), allowing the unequivocal recognition of the same individual in different sampling events.

The records were obtained on 11 November 2024 (28°C; 22:05:02 hr; entering the burrow) and

23 November 2024 (23°C; 00:19:39 hr; leaving the burrow), totaling 266 hours (FIG. 1A–1D). To ensure data reliability, we verified the proper functioning of the equipment, attested by the continuous capture of small, medium, and large species, including mammals and reptiles, during the 12-day interval between records (TABLE 1). After the event, we returned to the site and carried out inspections around the burrow, which did not reveal other openings or secondary burrows. As such, we ruled out possible sampling failures or undetected movements of the studied individual.

During the 12-day monitoring period (TABLE 1), the nine-banded armadillo (*Dasypus novemcinctus* Linnaeus, 1758) was the most frequently recorded species. It was observed at various times—including early morning (03:55:27 hr) and night (19:47:14 hr)—approaching the burrow, briefly entering, and then exiting. In contrast, the feral pig (*Sus scrofa* Linnaeus, 1758) was sighted only once (17:56:11 hr), passing quickly through the area, suggesting an occasional visit. The rodent *Thrichomys fosteri* Thomas, 1903, active at night and in the early morning, also entered the burrow for short periods, likely using it as temporary shelter or a feeding site. Meanwhile, the lizard *Ameiva ameiva* (Linnaeus, 1758) was observed exclusively during the day (14:00:42 hr) and exhibited similar behavior, entering and exiting the burrow rapidly—possibly seeking thermoregulation or protection, as it

showed signs of autotomy. This behavioral pattern—whether mere approach or brief burrow use—suggests that the presence of a giant armadillo inside may be influencing other species' interactions with the site. Nevertheless, the records highlight the giant armadillo's burrow as a key microhabitat, serving as a refuge, foraging area, and thermal regulator for multiple species (Desbiez & Kluyber, 2013).

This record documents a behavior of *P. maximus* not recorded in 15 years of monitoring in the area, which complements and contrasts with previous observations. While Encarnação (1987) recorded a giant armadillo staying in its burrow for 17 days, emerging occasionally, the individual we recorded in the Pantanal remained in its burrow for 12 consecutive days without leaving. Unlike observations by Pitman *et al.* (2004) in the Amazon, where the burrow had alternative exits and the individual emerged several times, the Pantanal burrow had no alternative exits, and we recorded no emergences. Through the use of an accelerometer Desbiez *et al.* (2021a) demonstrated that, while underground in the burrow, the giant armadillo is inactive. For this reason, it is assumed that the observed individual remained inactive throughout this period. In addition, records from the Cerrado (Parque Natural Municipal do Pombo) indicate that a giant armadillo that we monitored remained in its burrow for six consecutive nights (G.F. Massocato, pers. obs.).

In the Pantanal, individuals typically remain in their burrows for less than 20 hours, although they may extend their stay for two to three consecutive nights, especially on cold nights in the dry season (Desbiez *et al.*, 2022). Like other xenarthrans, some armadillo species adjust their activity patterns in response to temperature: they reduce daytime activity in hot periods and concentrate it earlier in the day during cold periods (Attias *et al.*, 2018; Desbiez *et al.*, 2022). A similar behavior has been observed in the giant anteater (*Myrmecophaga tridactyla* Linnaeus, 1758), which reduces its movement and seeks refuge in forests when temperatures drop, highlighting the importance of thermal shelters for thermoregulation in these animals (Giroux *et al.*, 2021). However, our study did not detect significant thermal variations capable of explaining the observed behavior (Max. 28°C; Min. 23°C). We also ruled out wildfires as a cause for the prolonged sheltering, as no fire events occurred in the region during the study period. While the individual remained in the burrow, other recorded animals (**TABLE 1**) merely passed by the entrance or briefly entered before leaving. Analysis of photographic records (**FIG. 1**) also revealed no: (1) signs of predator presence, (2) visible injuries on the individual, or (3) morphological or behavioral features suggestive of pathological conditions. It is worth highlighting that the observed individual, a subadult female (Luba *et al.*,

2020), did not have any young, as reproductive females normally remain longer in their burrows, leaving for short periods (Desbiez *et al.*, 2019).

The pichi (*Zaedyus pichii* [Desmarest, 1804]) is the only known cingulate that exhibits daily torpor outside hibernation season (Superina & Boily, 2007). In general, torpor is characterized by reduced body temperature, metabolism, and motor activity, helping mammals to conserve energy in adverse conditions (Superina & Jahn, 2013; Cerri, 2024). Although our records suggest the possibility of prolonged inactivity, the precise causes remain undetermined. Therefore, we recommend further research on the species, such as continuous physiological monitoring (heart rate and body temperature) via telemetry; assessment of ecological implications, including soil modification and predator-prey dynamics; and comparative analyses among populations to identify adaptive variations. Complementary studies could reveal whether this behavior affects its role as an ecosystem engineer, whether there is variation across habitats with different climatic and anthropogenic pressures, and whether it represents an energy conservation strategy among xenarthrans. In the future, the confirmation of these patterns might reposition the giant armadillo as a model for understanding tropical megafauna's energy conservation strategies and as an indicator of resilience to climate change.

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