

**Case Study: Environmental enrichment practices applied to a lesser anteater (*Tamandua tetradactyla*- Linnaeus, 1758), at the Mantenedor de Fauna Fazenda Palmares 1875 - IBIMM**

**Estudio de Caso: Prácticas de enriquecimiento ambiental aplicadas a un oso hormiguero menor (*Tamandua tetradactyla*- Linnaeus, 1758), en el Mantenedor de Fauna Fazenda Palmares 1875 – IBIMM**

DOI: 10.53499/sfjeasv4n2-003

Received in: May 1st, 2024  
Accepted in: Jun 30th, 2024

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## ABSTRACT

Environmental enrichment in public and/or private institutions is extremely important, as it provides quality of life and well-being to the animals covered, when as close as possible to their natural environment. We can carry out enrichment in numerous animal groups, whether vertebrates or invertebrates present in captivity such as: zoos, keepers, refuges, farms, laboratories and others. This study focuses on the introduction of environmental enrichment for a species of Little Anteater (*Tamandua tetradactyla*) kept in captivity, which is part of the living collection of the wildlife maintainer at Fazenda Palmares IBIMM. The main objective was to observe and monitor the animal's behavior when introduced into an environment different from its captive enclosure and observe the changes generated over three distinct phases (over a period of 18 hours and divided into 06 hours): pre-enrichment, during which observations were recorded and data collected on the animal's behavior in its enclosure; enrichment, which covers the entire quality of life process, which includes the movement of the animal, its behavior, the obstacles encountered in the process, interactions with the area, and the methods used; and finally, post-enrichment, when the results obtained in this study were evaluated. The methodology adopted to conduct this study was carried out through the collection and recording of data, observation of the animal, interpretation and validation of the results obtained. These were very positive and the animal's physical conditioning can be stimulated naturally and sustainably. It was possible to adapt the test enclosure to the animal's needs, but it was not entirely feasible, as it required a lot of time, resources and labor. It would be necessary for all this demand to be met by implementing enrichment management into the animal's routine twice a week. If this enrichment management was implemented, following the standard already established by this study and based on the information collected by it, it would be possible to promote a significant increase in the quality of life and physical, psychological and cognitive well-being of the specimen, in addition to maintaining its physiology and general health, by natural means, without the need for aggressive and/or invasive mechanical and anthropomorphic interventions. In general, we were very successful with the results that, once explored correctly, are capable of significantly changing the quality of life and general well-being of this species kept in captivity. It was concluded, therefore, that despite being an animal accustomed to captivity, its quality of life and well-being will be increased exponentially, if the study of this research is carried out at least twice a week, during the time already established and conditioned to the animal. Likewise, it was possible to identify preferences and interests expressed by the animal, never before documented, where the most evident were the interaction with natural climbing resources (trees and bushes) and the soil for digging.

**Keywords:** IBIMM – lesser anteater, environmental enrichment.

## RESUMEN

El enriquecimiento ambiental en instituciones públicas y/o privadas es de suma importancia, ya que proporciona calidad de vida y bienestar a los animales amparados, al aproximarse lo más posible a su entorno natural. Podemos llevar a cabo el enriquecimiento en numerosos grupos de animales, ya sean vertebrados o invertebrados presentes en cautividad como: zoológicos, cuidadores, refugios, granjas, laboratorios y otros. Este estudio se centra en la introducción del enriquecimiento ambiental para una especie de Oso Hormiguero Chico (*Tamandua tetradactyla*) mantenida en cautividad, que forma parte de la colección viva del mantenedor de fauna de la Fazenda Palmares IBIMM. O objetivo principal foi observar e monitorar o comportamento do animale quando introduzido num ambiente diferente do seu encerramento em cautiverio e observar as

alterações geradas ao longo de três fases distintas (ao longo de 18 horas e divididas em 06 horas): pre-enriquecimento, durante la cual se registraron las observaciones y se recogieron datos sobre el comportamiento del animal en su recinto; enriquecimento, que abarca todo el proceso de calidad de vida, que incluye el movimiento del animal, su comportamiento, los obstáculos encontrados en el proceso, las interacciones con el área y los métodos utilizados; y, por último, post-enriquecimento, cuando se evaluaron los resultados obtenidos en este estudio. La metodología adoptada para realizar este estudio se llevó a cabo mediante la recogida y registro de datos, la observación del animal, la interpretación y la validación de los resultados obtenidos. Éstos fueron muy positivos y el acondicionamiento físico del animal puede estimularse de forma natural y sostenible. Era posible adaptar el recinto de pruebas a las necesidades del animal, pero no era del todo factible, ya que exigía mucho tiempo, recursos y mano de obra. Sería necesario satisfacer toda esta demanda implementando la gestión del enriquecimento en la rutina del animal dos veces por semana. Si este manejo de enriquecimento fuera implementado, siguiendo el estándar ya establecido por este estudio y basado en la información recogida por el mismo, sería posible promover un aumento significativo en la calidad de vida y bienestar físico, psicológico y cognitivo del ejemplar, además de mantener su fisiología y salud general, por medios naturales, sin necesidad de intervenciones mecánicas y antropomórficas agresivas y/o invasivas. En general, tuvimos mucho éxito con los resultados que, una vez explorados correctamente, son capaces de cambiar significativamente la calidad de vida y el bienestar general de esta especie mantenida en cautividad. Se concluyó, por lo tanto, que a pesar de ser un animal acostumbrado al cautiverio, su calidad de vida y bienestar se incrementará exponencialmente, si el estudio de esta investigación se lleva a cabo al menos dos veces por semana, durante el tiempo ya establecido y condicionado al animal. Asimismo, fue posible identificar preferencias e intereses expresados por el animal, nunca antes documentados, donde los más evidentes fueron la interacción con los recursos naturales para trepar (árboles y arbustos) y el suelo para cavar.

**Palabras clave:** IBIMM - oso hormiguero menor, enriquecimento ambiental.

## 1 INTRODUCTION

Environmental enrichment in public and/or private institutions is extremely important, as it provides quality of life and well-being for the animals involved, as close as possible to their natural environment (Dias et al., 2010). Enrichment can be carried out on numerous animal groups, whether vertebrate or invertebrate (Eg. Carducci & Jakob 2000; Ilume et al., 2003), present in captivity (zoos, keepers, refuges, farms, laboratories, etc.) (Eg, Maple 2017), including anteaters (Vizcaino & Loughry 2008).

The giant anteater belongs to the suborder Xenarthra, the order Pilosa, the family Myrmecophagidae and the infraorder Vermilingua. The distinctive feature of these species is the complete absence of teeth and the presence of an elongated, conical snout, which houses a vermiform tongue, making it easier to grasp food. These creatures have predominantly nocturnal habits, a long gestation period, reach sexual maturity at around

2 years of age and generally behave solitarily. Their diet is essentially made up of termites and ants (Cubas et al., 2014), but there is little information about the nutrition of these animals when subjected to captivity. There are still many gaps in our knowledge of anteaters' biology and ecology, especially in terms of their ecological and, even more so, behavioral aspects (Redford, 1994) and much of what we know today comes from studies carried out on captive animals, bearing in mind that natural observation of these animals in their free-living environments is quite difficult and also very rare.

In the Myrmecophagidae family, infra-order Vermilingua (animals with thin, elongated tongues), we find *Tamandua tetradactyla*, known as the giant anteater or collared anteater (Engelman, 1985) due to its golden and black or brown vest-like coloration on its back (Superina, 2012), which can change according to its distribution and habitat (Gardner, 2008). They have an elongated snout, a prominent tongue (Cubas et al., 2014) and a prehensile tail with no hair at the lower end (Nowak, 1999). They have a solitary habit, except for parental care, and are practically nocturnal. In general, they feed on ants and termites (Montgomery and Lubin, 1977), but there are records of them attacking hives to feed on honey (Emmon and Feer, 1990). They have a long gestation period of approximately 150 days and parental care for up to a year (Montgomery and Lubin, 1977). Although they prefer forest areas, they can be found foraging in open areas of the caatinga and cerrado (Donnaruma et al., 2020).

In captivity, the diet of baby anteaters requires more nutritional components for survival and development, due to their gastrointestinal physiological particularities, which can be extracted from foods such as fruit, cat food, eggs and vegetables (Luppi et al., 2008). To compensate for the absence of teeth, food is crushed by rigid fibers in the stomach (Bloch et al., 1976).

When they are captive, when they reach a weight of 1.2kg to 1.4kg they are offered the termite at will in a single meal, and at 1.8kg to 2.0kg the animal begins to receive pasty food instead of milk (Cubas et al., 2014).

Because anteaters are predominantly solitary (Montgomery and Lubin, 1977) and, in captivity, there is little contact and social interaction between individuals (Capani, 2014), when paired together they show antagonistic behavior, in order to defend food, territory, shelter or sexual partners (Capani, 2014), and in the wild, to mediate these antagonistic interactions, individuals communicate with vocalization and postures (Koontz and Roush, 1996).

Currently, the presence of anteaters has become more frequent in urban areas, due to fires and areas of grassland and savannah becoming agroforestry, causing death by vehicles, domestic animals, capture in cities and trampling (Cubas et al., 2014).

The main objective was to observe and monitor the animal's behavior when it was introduced to an environment different from its captive enclosure and to observe the changes generated during three different phases (for a period of 18 hours and divided into 06 hours): These are pre-enrichment, during which observations were recorded and data collected on the animal's behavior in its enclosure; enrichment, which covers the entire quality of life process, including the animal's movement, behavior, obstacles encountered in the process, interactions with the area, and the methods used; and finally, post-enrichment.

## **2 MATERIALS AND METHODS**

This study was carried out with a specimen of an adult female Tamanduá-Mirim (Tamanduá tetradactyla) from the living biological collection of the Fazenda Palmares | IBIMM wildlife keeper and submitted to the BIOCEUA-IBIMM Ethics Committee on 02/05/2023 and approved at a meeting on 05/06/2023, under number 028/23.

The methodology adopted to conduct this study was through the collection and recording of data, from the observation of the animal, and the interpretation and validation of the results obtained. It was divided into three distinct phases of development.

The first phase, called pre-enrichment, was aimed at observing and getting the observers used to the behaviors shown by the animals before the enrichments were introduced. This phase lasted a total of 6 hours.

The second phase, known as enrichment, involved observing and recording the animals' behavior during the application of the enrichments. This phase lasted a total of 6 hours, during which the animals' responses to the enrichment interventions were recorded.

The third phase, called post-enrichment, focused on observing and recording the animals' behavior after the enrichments were removed, lasting 6 hours. This made it possible to assess possible residual effects of the interventions carried out during the enrichment phase.

These three phases together totaled 18 hours of observations, during which relevant data was collected for subsequent analysis.

### Description of the area used for environmental enrichment

The area used to develop the environmental enrichment activities for the Tamanduá-Mirim (*Tamandua tetradactyla*) animal, known as the permacasa, is a recently reclaimed cultivation area with some tree and shrub species: figure 1.

Figure 1- Vegetation used for environmental enrichment: 1- *Manihot esculenta* crantz (cassava); 2- Bambusoideae (bamboo); 3-*Eucalyptus cinerea* (eucalyptus); 4- *Musa* spp (banana tree); 5- Agave; 6- *Carica papaya* L. (papaya tree); 7- *Sansevieria* (St. George's sword); 8- *Pandanus amaryllifolius*; 9- *Sonchus oleraceus* (milkweed); 10- *Morus nigra* (blackberry tree); 11-*Artocarpus heterophyllus* (jackfruit); 12- *Erythrina verna* (mulungu); 13-*Cluzia*; 14-*Tradescantia zebrina* (lambari); 15-*Cycas revoluta*; 16 -*Cyca circinalis*; 17- *Justicia brandegeana* (red shrimp). Source: prepared by the authors (2023).



The total area of the permacasa was used in this study for the environmental enrichment of the Tamanduá-Mirim specimen, where the main means of enrichment used were: feeding, physical enrichment, given the number of ants present in the area, and the space available for active searching. The permacasa has an area of 0.25ha (hectares), corresponding to 2,500m<sup>2</sup>, surrounded by walls, with the necessary security so that the animal can move around freely, but not unaccompanied. The area has intense vegetation cover, where the only quadrants without grass distribution are the built and cultivated areas, as shown in figure 2.

Figure 2 - area used for the study. Source: prepared by the authors (2023).



### 3 RESULTS

The main results obtained during the research were characterized as:

The nocturnal observations of pre-enrichment (carried out inside the captive confinement enclosure), with the aim of determining what behaviors are expressed by the animal in the confinement environment and what impacts are generated by the environmental enrichments that already make up the enclosure. At the start of the study (day one) at 7pm, the animal became restless due to the presence of the team. This behavior continued for the first 20 minutes. After recognizing the team present, the Tamanduá-mirim quietened down and became more active in exploring its enclosure, adopting active search behavior. As it is a nocturnal, arboreal animal, its main activities during the observation were climbing (nets, ropes and bars) and foraging (hay). These activities were carried out within an hour, after which it returned to its burrow. Even though she was holed up, it was possible to hear her activity, after which she returned to the central area of the enclosure, looking for the termite mound (located in the center of the enclosure), where she remained for approximately 20 minutes, alternating her attention between the termite mound and the presence of the team. After that, it went back to its burrow and there was no more activity.

On the second day, we kept the time of 7 p.m. at the beginning of the observations, in order to fix our presence on the animal during this period of time. The specimen showed the same behaviors as the previous day, but during the second night of observations, we noticed that its attention was focused on the team present at the site. As a result, we moved away so that the animal could return to its normal routine activities. After approximately 40 minutes, the Tamanduá-Mirim turned its attention away from the team and began to move around the enclosure more naturally, repeating the behaviors it had exhibited the previous day.

When we arrived with the animal in the area duly prepared for environmental enrichment (Permacasa's delimited area), the study site, we noticed the behavior of

attention and later curiosity. Within the first 10 minutes of freely moving around the site, the female Tamanduá-Mirim showed some resistance to active searching and field reconnaissance, as well as inhibition when moving around the terrain. Even with some resistance, the animal was successfully introduced within the territorial limits established for the study, sniffing and foraging for the last 20 minutes and interacting with the anthills present at the site, where it showed interest in the area. One of the specimen's greatest interests in the delimited site was the trunks and branches present in the area, where it climbed and foraged for around 30 minutes. After it lost interest in the plants, it returned to the team present and began to interact with the researchers, at which point physical environmental enrichment began, where physical activity and natural behaviors regarding the species' biology and ecology were encouraged.

The specimen was closely monitored by the team, given the unpredictability of its behavior. On its own, the animal left the search area and indicated through physical patterns and behavioral indicators that it wanted to return to its transport box, where it was picked up and taken back to its captive enclosure. When it arrived at the enclosure, it showed excitement and anxiety about returning by urinating. Figure 3.

Figure 3: A - giant anteater in the transport box; Fig. B- first contact with the area; Fig. C- first contact with the area; Fig. D- interaction with mulungo; Fig. E- active search behavior. Source: Prepared by the authors (2023).



Following the same pattern, on the second day we carried out the same procedure, moving the animal to the study area and enriching it. We used a large transport box with pieces of termite mound inside to entertain the animal along the way.

When we arrived with the animal in the area duly prepared for enrichment, we noticed that the behavior of attention and later curiosity, shown the day before, was reduced to curiosity only, demonstrating a certain tranquility on the part of the animal in relation to the environment and the presence of the team on site, within the first 20 minutes. After this period, it began to show attention and then curiosity again, adopting a bipedal posture with its arms partially open (showing more curiosity than defense), where it remained for around 10 minutes sniffing the odors present in the area. Again, after returning to a state of natural comfort, she began to actively explore the entire environment prepared for her, but ignored the food enrichment with the anthills present in the area, just checking them out and leaving them to one side.

Something that drew attention was its interest in the Mulungo bush (see Description of the area used for environmental enrichment), where the animal stayed for more than 20 minutes, climbing up and down, as well as foraging and digging around, where it demonstrated, in addition to its intrinsic natural behavior, the need for environmental enrichment with a greater emphasis on tree climbing, since it is an arboreal animal. As on the previous day, the specimen was closely monitored by the team, given the unpredictability of its behavior.

After being collected from the transport box, even before we left the Permacasa area, it showed excitement and anxiety by urinating, but unlike the first day, this behavior was an indication that it didn't want to return to the enclosure. Having observed this, we kept the animal free for as long as it wanted (approximately 30 minutes) and as soon as it showed an interest in returning to the transport box again, it was collected and directed to its enclosure Figure 4.

Figure 4 - Anteater leaving transport box. Source: Prepared by the authors (2023).



On the third and final day, the same procedure of moving the animal to the study area and enrichment was carried out. We used a large transport box with pieces of termite mound inside to entertain them along the way.

However, this time we didn't take the transport box into the enclosure to collect it, we let the animal itself intend to enter the box and then move on to the study and enrichment area. Unlike the other days, as soon as we arrived at the Permacasa gate, the animal urinated out of excitement and anxiety, perhaps because of the activity that was going to be carried out again and demonstrated that all the work carried out was being of great importance in understanding animal behavior and the environmental enrichment that was developed over the three days in a practical way to carry out the activities.

There was more free movement and less light on this day. Thus, already familiar with the area and adapted to the conditions imposed, it showed behaviors intrinsic to the natural behavior of the species, through foraging, uninterrupted active search, attention and focus (ignoring human presence, but attentive to the sounds and vocalizations of other animals), climbing and feeding itself. So, on this last day of the case study, she showed total attention to the natural enclosure, as well as giving us the chance to be more assertive about her needs, interests and tastes. Figure 5.

Figure 05 - the animal's behavior in relation to activities in the permacasa's natural enclosure: 1 - natural predation; 2 - digging cassava; 3 and 4, active search. Source: Prepared by the authors (2023).



## 5 CONCLUSION

It was concluded that after the environmental enrichment carried out, it was important to define the needs and behaviors of the animal under study. The main aspect observed is related to the animal's conditioning due to the last few days, where we were always present at the same time to carry out the programmed activities, thus promoting the wait for enrichment on subsequent days, as in the case of this first day, where the specimen showed a more pronounced agitation over time to the detriment of not carrying out the enrichment activities carried out on previous days, thus generating the necessary

expectation to observe its intrinsic behavior and its ability to adapt to environments favorable to its ecology.

This demonstrates the importance of maintaining proper management and specific enrichment for each specimen according to their characteristics and conditions, favoring and stimulating their natural behaviors.

During the last day of behavioral observation, the Tamanduá-Mirim repeated the same behavioral pattern as the previous day, showing an interest in returning to the study area, but when it realized that the transport box was not present and that we had not entered the enclosure, just as on the previous day, we noticed a behavior that we can resemble frustration, where the animal showed a certain introversion and remained motionless for about 10 minutes in a contemplative way and then went to its shelter (burrow), where it remained until the end of the observation period.

Therefore, despite being an animal accustomed to captivity, its quality of life and well-being will increase exponentially if the work of this study is carried out at least twice a week, during pre-established hours and conditioned to the animal. It was also possible to identify preferences and interests expressed by the animal that had never been documented before, the most obvious of which were interaction with natural climbing resources (trees and shrubs) and the ground for digging.

If this enrichment management is implemented, following the pattern already established by this study and based on the information gathered by it, it will be possible to promote a significant increase in the specimen's quality of life and physical, psychological and cognitive well-being, as well as maintaining its physiology and general health, by natural means, without the need for aggressive and/or invasive mechanical and anthropomorphic interventions. Overall, we were very successful with the results, but there is still a need for more studies on animals kept in captivity, where, once properly exploited, they will be able to significantly change the quality of life and general well-being of these animals, in this case child anteaters.

## REFERENCES

- Altmann J. Observational study of behavior: Sampling methods. *Behaviour*, 49-227-267.1974.
- Carlstead K. (1996) Effects of captivity on the behavior of wild animals (p. 317-333). In Kleiman D.G. Allen ME, Thompson K.V., Lumpkin S. & Harris II. (Eds). *Wild Animals in Captivity: Principles and Techniques*. Chicago: The University of Chicago Press. 639 p.
- Carducci L.M. & Jakob E.M. (2000) Rearing environment affects behavior of jumping spiders. *Animal Behaviour*, 59: 39-46. DOI: 10.1006/anbe 1999
- Capani, ML, "Behavior of the giant anteater, *Tamandua tetradactyla* (Linnaeus, 1758) (Pilosa, Myrmecophagidae) under captive conditions: implications for welfare". Postgraduate Program in Ecology and Natural Resources, Federal University of São Carlos, 2014.
- Cubas, Zalmir Silvino, *Tratado de animais selvagens: medicina veterinária / Zalmir Silvino Cubas, Jean Carlos Ramos Silva, José Luiz Catão-Dias*. - 2. ed. São Paulo: Roca, 2014.
- Donnaruma TL, Et al, 2- Nutritional and behavioral management of *Tamandua tetradactyla* cubs kept for rehabilitation in captivity at Fazenda Palmares in the municipality of Santa Cruz das Palmeiras, SP, Brazil, - *Brazilian Journal of Animal and Environmental Research* DOI: 10.34188/bjaerv3n4-114- 2020.
- Emmons LH, Feer F. *Neotropical rainforest mammals: a field guide*. 1ed. University of Chicago Press, Chicago. 281p, 1990.
- Engelman GF, "The phylogeny of the Xenarthra. In: Montgomery GG (ed.) *The evolution and Ecology of Armadillos, Sloths and Vermilinguas*",. Smithsonian Institution Press, Washington, 1985.
- Francisco, A.R., Teixeira, P.S.T., "Biology and nutritional management of *Myrmecophaga tridactyla* and *Tamandua tetradactyla* anteaters kept in captivity: a review". *Journal of Veterinary Science and Public Health*, v. 5, n. 1, p. 085-096, 2018.
- Gardner AL, Order Pilosa. In: Wilson DE, Reeder DM (eds.) "Mammal species of the world: a taxonomic and geographic reference". 3 ed. Baltimore, The John Hopkins, 2005.
- Gardner, A L, "Mammals of South America" Vol 1., Baltimore, The John Hopkins University Press, 2008.
- Guimarães, E.; Carvalho, A.; Caetano, L.;. "Management, feeding and care of giant anteater (*Myrmecophaga tridactyla*) and giant anteater (*Tamandua tetradactyla*) cubs for conservation purposes." Kelps Publishing, 2020.
- Koontz, F.W and Roush RS. "Communication and social behavior" In: Kleiman DG, Allen ME, Thompson KV, Lumpkin S and Harris H (eds) *Wild Animals in Captivity: Principles and Techniques*, pp 334-343. University of Chicago Press: Chicago, USA, 1996.

Lima, F.C.S; Menezes, B.B. Princípios de alimentação, nutrição e fatores interferentes no consumo de dietas em animais silvestres captativos. Proceedings of the XI Amostra Científica Famez, UFMS, Campo Grande, 2018.

Lopes et al, Morphophysiological Analysis of Keratobranchial Bone II located in the Hyoid of the Green Turtle (*Chelonias mydas*) found in Peruibe, South Coast of Brazil, Mosaic of Conservation Units-Juréia-Itatins and APACIP. South Florida Journal of Environmental and Animal Science , v. 1, p. 120-130, 2021.

Luppi, M.M., “Taurine deficiency in Tamanduá-mirim (*Tamandua tetradactyla*) puppies fed milk substitutes for dogs and cats” *Ciência Animal Brasileira* , v. 9, n. 4, p. 1004-1009, 2008.

Montgomery GG & Lubin YD. “Prey influences on movements of neotropical anteaters.” In: Philips RL & Jonkel C (eds.) Proceedings of 1975 Predator Symposium. Missoula, University of Montana, 1997.

Morford, S., Meyers, M.A., “Research on the diet of the giant anteater (*Myrmecophaga tridactyla*)”. Edentata, 2003.

Nowak, R.M. Anteaters. In “Walker's mammals of the world” Pp: 154-156. The Johns Hopkins University Press, Baltimore, 1999.

Redford KH. “The Edentates of the Cerrado. Edentata” 1: 4-10. University Press, 1994.

Superina M. A walk through the biology of anteaters. In: Miranda F. Manutenção de tamanduás em captivity. São Carlos, Brazil: Editora Cubo, p.26-37, 2012.

Tavares, T.C.; Anacleto, T.C.S. Artificial feeding: an experience with an anteater (*Tamandua tetradactyla*). XI Congress of Ecology of Brazil, Porto Seguro - BA, 2013.

Federal University of São Carlos, São Carlos, São Paulo. Dias EL, Martins A.C., Fessuti C. & Barrella W. Environmental Enrichment in the Penguin Murum (*Crax fasciolata*) Enclosure at the “Quinzinho de Barros” Municipal Zoological Park, Sorocaba-SP. *Revista Eletronica de Biologia*, 3: 20-38 -2010.