

SHORT COMMUNICATION

Size and orientation of giant armadillo burrow entrances (*Priodontes maximus*) in western Formosa province, Argentina

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Abstract Giant armadillos (*Priodontes maximus*) are one of the most endangered mammals in the Gran Chaco. They are largely nocturnal, highly fossorial and solitary, characteristics that have limited the understanding of their behavior and ecology. We report on the results of a study of the structure of 32 giant armadillo burrows in 25,000 ha of semi-arid forest owned by Toba aborigines of Formosa, Argentina. Burrow entrances were on average 43 cm wide and 36 cm high and more likely to be facing west (24) than east (8).

Keywords: Argentinean Chaco, giant armadillo burrows, *Priodontes maximus*

Tamaño y orientación de cuevas de tatú carreta (*Priodontes maximus*) en el oeste de la provincia de Formosa, Argentina

Resumen Los tatú carreta (*Priodontes maximus*) son uno de los mamíferos en mayor peligro de extinción del Gran Chaco. Son animales principalmente nocturnos, fosoriales y solitarios, características que han limitado el conocimiento sobre su comportamiento y ecología. Presentamos en este trabajo los resultados de un estudio para caracterizar la estructura de 32 cuevas de tatú carreta en 25,000 ha de bosques semi-áridos propiedad de comunidades Toba de Formosa, Argentina. Las entradas de las cuevas eran, en promedio, de 43 cm de ancho y 36 cm de alto, y estaban más frecuentemente orientadas hacia el oeste (24) que hacia el este (8).

Palabras clave: Chaco argentino, cuevas del armadillo gigante, *Priodontes maximus*, tatú carreta

Giant armadillos are the largest of the armadillos, with a head-to-body length of approximately 89 cm and an average adult body mass of 30–40 kg (Redford & Eisenberg, 1992; Meritt, 2008). They range over most of South America, from Colombia and northern Venezuela to Paraguay and northern Argentina (Silveira *et al.*, 2009; Srbeke-Araujo *et al.*, 2009; Abba & Superina, 2010; Torres & Jayat, 2010). They are found in the tropical forests of Amazonia, as well as in the open savannas of the Cerrado and Gran Chaco. The species has been classified as Vulnerable at the global level by the IUCN Red List of Threatened Species (Superina & Abba, 2010) and in Argentina its populations are threatened with extinction due to hunting and habitat destruction (Porini, 2001).

Giant armadillos are rarely seen because they are largely nocturnal, highly fossorial and solitary animals (Carter, 1983; Carter & Encarnaç o, 1983; Redford & Eisenberg, 1992; Vizca no & Milne, 2002; Cu ellar & Noss, 2003; Noss *et al.*, 2004). They are extremely powerful diggers that dig for food (mainly ants and termites) and refuge (Carter & Encarnaç o, 1983; Redford & Eisenberg, 1992).

We report here information on the size and orientation of giant armadillo burrow entrances found in 25,000 ha of semi-arid forest owned by 12 Toba communities in Formosa Province, Argentina. The area is part of the semiarid Argentinean Chaco (61°–62°W, 23.5°–23.7°S), which is characterized by low xeric vegetation, patches of thorny

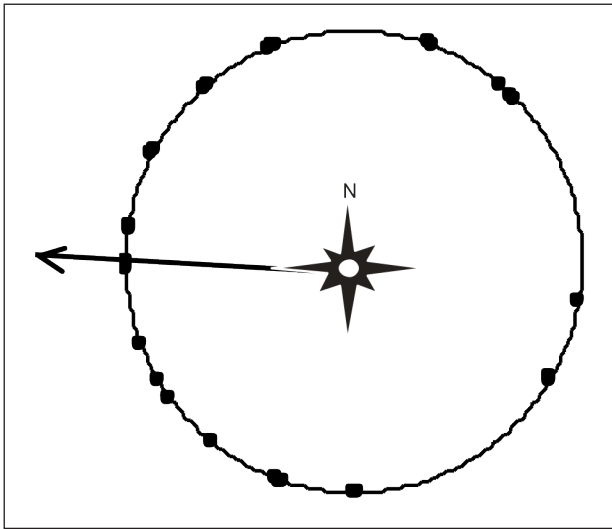


FIGURE 1. Compass orientation of 32 giant armadillo burrows. The average orientation is indicated with a black solid arrow.

bushes, bromeliads, and cacti (Morello & Horts, 1987; Adámoli *et al.*, 1990).

After signing an agreement between the Toba civil association and Fundación ECO of Formosa, a group of 12 Toba men volunteered to report to us the burrows they found while actively searching for them or during their daily activities. One of us (NC) traveled to the field site monthly to visit the burrows that had been found. For each burrow, we measured the length and the width at the entrance of the burrows using a measuring tape, and the slope of the entrance with a clinometer. We recorded the compass orientation of the burrow's entrance from inside the burrow. The statistical significance of the variation in the compass orientation of the burrow's entrance was tested with the Rayleigh's test for circular uniformity (Zar, 1999). The sample sizes for the different results varied because not all measurements were possible in all burrows.

The Toba volunteers found 32 burrows between January and December 2003. The majority of burrows (94%) were located on ant mounds and the remaining ones ($n=2$) on the ground. Although these data may suggest a strong preference for digging the burrows in ant mounds, it is possible that the results were influenced by biases in the searches conducted by the Toba. The Toba, given the conspicuousness of ant mounds in the landscape, and aware of the association between ant mounds and burrows, may have been visually searching for ant mounds instead of giant armadillo burrows.

Burrows were more frequently facing west ($n=24$) than east ($n=8$, **FIG. 1**). The difference between the number of burrows facing west or east was statistically significant as indicated by the Rayleigh's

test for circular uniformity ($R_{0.05, 32}$: 9.87, $z=3.04$, mean angle: 273.3°).

Given that a western orientation maximizes the amount of heat reaching the entrance to the burrow, this orientation may be an adaptive response to handle the relatively cold days of the Chaco, as it seems to be the case with other armadillo taxa (Carter, 1983; González *et al.*, 2001; Abba *et al.*, 2005).

The average length of the burrows was 36 ± 7 cm, whereas the average width of the entrance was 43 ± 9 cm ($n=27$). The average entrance slope was $26\pm 7^\circ$ ($n=23$). These results are in general good agreement with the existing data on the structure of giant armadillo burrows. The average length and the average width were a little larger than the burrows measured by Carter (1983) in Serra da Canastra National Park, Brazil (30.8 cm and 41.3 cm, respectively), but the slope of the entrance was similar.

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REFERENCES

- Abba, A. M. & M. Superina. 2010. The 2009/2010 armadillo Red List assessment. *Edentata* 11: 135–184.
- Abba, A. M., D. E. Udrizar Sauthier & S. F. Vizcaíno. 2005. Distribution and use of burrows and tunnels of *Chaetophractus villosus* (Mammalia, Xenarthra) in the eastern Argentinean pampas. *Acta Theriologica* 50: 115–124.
- Adámoli, J., E. Sennhauser, J. M. Acero & A. Rescia. 1990. Stress and disturbance: vegetation dynamics in the dry Chaco region of Argentina. *Journal of Biogeography* 17: 491–500.
- Carter, T. S. 1983. The burrows of giant armadillos, *Priodontes maximus* (Edentata: Dasypodidae). *Säugetierkundliche Mitteilungen* 31: 47–53.
- Carter, T. S. & C. D. Encarnação. 1983. Characteristics and use of burrows by four species of armadillos in Brazil. *Journal of Mammalogy* 64: 103–108.
- Cuéllar, E. & A. Noss. 2003. *Mamíferos del Chaco y de la Chiquitania de Santa Cruz, Bolivia*. Editorial Fan, Santa Cruz, Bolivia. 202 pp.
- González, E. M., A. Soutullo & C. A. Altuna. 2001. The burrow of *Dasypus hybridus* (Cingulata: Dasypodidae). *Acta Theriologica* 46: 53–59.

- Meritt, D. A. Jr. 2008. Xenarthrans of the Paraguayan Chaco. Pp. 294–299 in: *The biology of the Xenarthra* (S. F. Vizcaíno & W. J. Loughry, eds.). University Press of Florida, Gainesville.
- Morello, J. & G. Hortt. 1987. La naturaleza y la frontera agropecuaria en el Gran Chaco sudamericano. *Pensamiento Iberoamericano* 12: 109–137.
- Noss, A., R. Peña & D. I. Rumiz. 2004. Camera trapping *Priodontes maximus* in the dry forests of Santa Cruz, Bolivia. *Endangered Species Update* 21: 43–52.
- Porini, G. 2001. Tatú carreta (*Priodontes maximus*) en Argentina. *Edentata* 4: 9–14.
- Redford, K. H. & J. F. Eisenberg. 1992. *Mammals of the Neotropics, Volume 2. The Southern Cone: Chile, Argentina, Uruguay, Paraguay*. The University of Chicago Press, Chicago. 430 pp.
- Silveira, L., A. T. A. Jácomo, M. M. Furtado, N. M. Torres, R. Sollmann & C. Vynne. 2009. Ecology of the giant armadillo (*Priodontes maximus*) in the grasslands of central Brazil. *Edentata* 8–10: 25–34.
- Srbek-Araujo, A. C., L. M. Scoss, A. A. Hirsch & A. G. Chiarello. 2009. Records of the giant-armadillo *Priodontes maximus* (Cingulata: Dasypodidae) in the Atlantic Forest: are Minas Gerais and Espírito Santo the last strongholds of the species? *Zoologia* 26: 461–468.
- Superina, M. & A. M. Abba. 2010. *Priodontes maximus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <<http://www.iucnredlist.org>>. Downloaded on 10 August 2012.
- Torres, R. & J. P. Jayat. 2010. Modelos predictivos de distribución para cuatro especies de mamíferos (Cingulata, Artiodactyla y Rodentia) típicas del Chaco en Argentina. *Mastozoología Neotropical* 17: 335–352.
- Vizcaíno, S. F. & N. Milne. 2002. Structure and function in armadillo limbs (Mammalia: Xenarthra: Dasypodidae). *Journal of Zoology, London* 257: 117–127.
- Zar, J. H. 1999. *Biostatistical analysis*. Prentice-Hall, New Jersey. 663 pp.

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