News

Source: Edentata, 14(1) : 90-93

Published By: IUCN/SSC Anteater, Sloth and Armadillo Specialist Group

URL: https://doi.org/10.5537/020.014.0114

Edentata 14 (2013): **87-89**
Electronic version: ISSN 1852-9208
Print version: ISSN 1413-4411
http://www.xenarthrans.org

FIELD NOTE

Mating behavior of the six-banded armadillo *Euphractus sexcinctus* in the Pantanal wetland, Brazil

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Abstract Little is known about the reproductive behavior of *Euphractus sexcinctus*, but the chasing behavior of several individuals behind one another has been reported. We describe two observations of chasing behavior in the Pantanal, Brazil, which included a clear mating event. On these two occasions, a presumed adult male mounted another individual, presumed to be an adult female, during and after the chase, clearly indicating reproductive behavior. Our occasional records of chasing behavior, eventually including mounting, suggest a fairly defined mating period from the mid-dry season to the onset of the raining season in the Pantanal wetland.

***Keywords*:** behavior, *Euphractus sexcinctus*, mating, Pantanal, yellow armadillo

Comportamento reprodutivo em tatu-peba *Euphractus sexcinctus* no Pantanal, Brasil

Resumo O comportamento reprodutivo de *Euphractus sexcinctus* ainda é pouco conhecido, mas a perseguição de um indivíduo por vários outros já foi reportada. Nós relatamos a observação, em duas ocasiões, de comportamento de perseguição que incluiu evento de cópula. Nas duas ocasiões, um indivíduo presumidamente macho montou em outro indivíduo, presumidamente fêmea, durante e após a perseguição, no Pantanal, Brasil, indicando claramente um comportamento reprodutivo. Nossos registros ocasionais sugerem um período de reprodução relativamente bem definido, que vai de meados da estação seca ao início da estação de chuvas no Pantanal.

***Palavras-chave*:** acasalamento, comportamento, *Euphractus sexcinctus*, Pantanal, tatu-peba

The ecology and natural history of the six-banded or yellow armadillo (*Euphractus sexcinctus* Linnaeus, 1758) is still largely unknown (Medri, 2008). This includes a lack of understanding of mating and pre-mating behavior. Published reports on the chasing behavior among armadillos have been considered as an indication of reproductive competition among male six-banded armadillos (Desbiez *et al*., 2006), or as an aggressive display of adult male nine-banded armadillos (*Dasypus novemcinctus*) towards juveniles (Breece & Dusi, 1985) and one- to two-year-old males (McDonough, 1994). These chasing events have also been reported for the Brazilian three-banded armadillo (*Tolypeutes tricinctus*) (Marinho-Filho *apud* Guimarães, 1997).

On two occasions we recorded in digital video a group of adult six-banded armadillos, presumably males ('males'), chasing another adult presumed as female ('female') in the southern Pantanal wetland, Brazil. The first observation occurred in July 2006 (19°02'06"S, 56°46'04"W) at approximately 17:00 hr,

Figure 1. A presumably female six-banded armadillo (*Euphractus sexcinctus*) mounted by a presumed male during a collective race, chased by another presumed male, in the Pantanal wetland, Brazil, July 2006. Photo: Walfrido Tomas.

when we witnessed a successful attempt of one of the 'males' in mounting the 'female'. Five 'males' were in a line running after one 'female', and one of the 'males' mounted the 'female' in a quick movement when it briefly stopped during the chase. After being mounted successfully the 'female' quickly resumed running, with the 'male' still attached (**Fig. 1**). The remaining 'males' started chasing the couple. The mounted running was as fast as when individuals were running alone and occurred for nearly 20 m, without release by the 'male'.

The mounted run finished when the 'female' entered a burrow, with the 'male' being left outside. While mounting, both 'male' and 'female' were running coordinately in a wandering line until the 'female' found the burrow hidden in a bunch grass bush (the video is available at http://www.cpap.embrapa.br/imagens_documentais/euphractus_mating_walfrido_tomas_jul_2006.avi).

The second observation occurred on 16 October 2012 around 17:00 hr (19°08'36"S, 56°50'50"W). A pair of armadillos (presumably a female mounted by a male) crossed in front of our vehicle, chased by three other adults, presumably males. Again, the 'female' entered a burrow, with the 'male' being detached from the 'female's' back, and started digging and filling the entrance with sand. The 'male' that had mounted the 'female', as well as the other 'males' involved in the chasing event, started to dig vigorously at the burrow entrance and the surrounding substrate in an attempt to reach the 'female'. The shoot was stopped around 18:00 hr due to the lack of light conditions to continue.

These two observations indicate that the chasing behavior reported by Desbiez *et al*. (2006) is a pre-mating behavior, or at least one of the mating repertories of six-banded armadillos. The unusually long penis of six-banded armadillo males, which can reach about 33% of its body length (McDonough & Loughry, 2001), may represent an adaptation to ensure fertilization during these mounted runs, if the reported events represent a pre-mating or even mating behavior. However, it is unclear if complete copulation is achieved during the mounted run or if *E. sexcinctus* females would accept another male afterwards. While a published description of a male mounting a female *T. tricinctus* while moving slowly (Marini-Filho & Guimarães, 2010) may be similar, it contrasts with the fast locomotion we witnessed.

The behavior we witnessed during the mounted runs differs substantially from the agonistic interaction between individuals reported for *D. novemcinctus* (Breece & Dusi, 1985; McDonough, 1994). Additionally, we found the observed behavior of *E. sexcinctus* to be different from the described attempt to prevent the access of a male competitor to a female in *T. tricinctus* (Marinho-Filho *apud* Guimarães, 1997; Marini-Filho & Guimarães, 2010). In both occasions the *E. sexcinctus* 'males' involved in the chase did not interact directly with one another. Several additional, anecdotal observations in the Pantanal involving two to six males also did not include any type of direct interactions among the males. Therefore, the competition for mating in *E. sexcinctus* seems to be based on the ability to be the first to reach and mount the female rather than any aggressive behaviors between males.

The frantic excavation by several males when a female is inside a burrow, such as described here, may explain the concentration of burrows in certain areas, often observed in the Pantanal. It has also been observed that the males may continue the chase inside the burrows, emerging at other openings in search of the female.

Our records help to clarify at least one of the questions raised by Desbiez *et al*. (2006). These authors were not certain whether the chasing behavior they reported had a reproductive function or rather represented a strategy to defend territories or food resources. Although no specimen was captured or sex-discriminated, some of the photos we have taken showed the erect penis of the mounting armadillo (**Fig. 2**), indicating that the chasing and mounting behaviors represent a reproductive event.

Figure 2. A male six-banded armadillo (*Euphractus sexcinctus*) mounting a female during a chase event in the Pantanal wetland, Brazil. Photo: The Pantanal Giant Armadillo Project.

Finally, we recorded 11 events of chasing behavior by *E. sexcinctus* from 2006 to 2013 in the Pantanal (three in July, two in August, one in September, three in October, and two in November), and no records in other periods of the year. Mountings were observed three times, always associated with runs or chasings. These occasional records of chasing behavior from July to November in the Pantanal suggest a slightly defined mating period lasting from the mid-dry season to the onset of the raining season, which is in agreement with the records of pregnant females found in Central Brazil (September and October) and in Uruguay (January) (Bralow, 1965), as gestation lasts 60 to 64 days (Redford, 1985).

Acknowledgements

We thank Embrapa Pantanal for the logistic support during field work in which observations were made. We are also thankful to the Royal Zoological Society of Scotland for the support given to the Giant Armadillo Project.

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Received: 19 November 2013; Accepted: 24 December 2013

Edentata 14 (2013): **90-92**
Electronic version: ISSN 1852-9208
Print version: ISSN 1413-4411
http://www.xenarthrans.org

NEWS

Bradypus pygmaeus is now listed in CITES Appendix II

On November 20, 2013, the Convention on International Trade in Endangered Species of Wild Fauna and Flora included the pygmy sloth *Bradypus pygmaeus* Anderson and Handley, 2001 in CITES Appendix II. As specified in the Notification to the Parties No. 2013/052, the species *Bradypus boliviensis* (brown-throated sloth) had been included in Appendix II when the Convention was signed on 3 March 1973. The scientific name of this species was changed to *Bradypus variegatus* when *Mammal species of the world: a taxonomic and geographic reference* was adpoted as the standard nomenclatural reference for mammals in 1983. In the 2007 update of the Appendices, CITES adopted the third version of the abovementioned book as standard reference. The latter recognized the species *Bradypus pygmaeus*, without comment, in addition to the species *B. variegatus.* As the original description of *B. pygmaeus* indicates that it was split from *B. variegatus*, the pygmy sloth should have been included automatically in CITES Appendix II during the 2007 update. This omission was now recognized as an oversight, and the CITES Secretariat thus corrected the CITES Appendices to include *B. pygmaeus.* This will provide this Critically Endangered species increased protection from illegal trade.

The Second International Sloth Meeting was held in Suriname

Organized by Green Heritage Fund Suriname and IUCN/SSC Anteater, Sloth and Armadillo Specialist Group

Bergendal (Suriname), 13–14 April 2013

The Green Heritage Fund Suriname (GHFS) and the IUCN/SSC Anteater, Sloth and Armadillo Specialist Group (ASASG) organized the International Meeting on Xenarthra Conservation and the 2nd International Sloth Meeting, held at Bergendal, Suriname from 13 to 14 April 2013. The meeting was financially supported by the Global Environment Facility Small Grants Programme, WWF Guianas and Bergendal Adventure Centre.

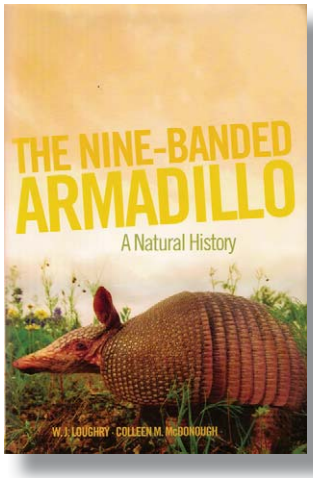
The main objective of the meeting was to share research results and protocols among wildlife biology professionals to improve the scientific body of knowledge about xenarthrans in South America, and the Guianas in particular. A total of 20 scientists, students, veterinarians and other professionals from Suriname, Guyana, Panama, Colombia, Brazil, Argentina, Portugal, and Germany gathered at the Bergendal Adventure Centre in Bergendal, Suriname to discuss different aspects of the current knowledge on Xenarthra, mostly those related and applied to their conservation. The program included talks on the situation of the Xenarthra in Guyana, Suriname, Colombia, and in European zoos; the conservation program for pygmy sloths in Panama; evolutionary biology and conservation genetics of sloths; the sloth rescue performed by GHFS in Paramaribo in 2012; and sloth medicine. Furthermore, the range maps for all xenarthrans were discussed and corrected by the participants. The meeting was an excellent opportunity for our Specialist Group to learn about the situation of the Xenarthra in the Guianas, to consolidate research projects and establish new cooperative protocols among reasearchers, and to get to know Xenarthra researchers and enthusiasts from the Guianas, an area from which we still lack scientific information.

The meeting was followed by a Course on Diversity, Conservation and Research of Xenarthra, held at the University Guesthouse in Paramaribo. The main goal of the course was to educate students about the basics of Xenarthra biology, habitat and conservation issues in South America, and the Guianas in particular. It was very well attended, and it was a pleasure to see so many students and rangers interested in learning more about xenarthrans!

Detailed proceedings will soon be made available at the GHFS website (http://www.greenfund.sr.org/) and the ASASG website (http://www.xenarthrans.org).

The ultimate book on nine-banded armadillos is now available!

The nine-banded armadillo: a natural history by Jim Loughry and Colleen McDonough aims at describing the current knowledge on the biology of nine-banded armadillos. In a logical sequence of 11 chapters, it provides a thorough review of the research that has been done on this species and highlights the gaps that remain to be explored. Although focusing on nine-banded armadillos, this wonderful book also includes data on the other 20 species of armadillos and thus gives an excellent overview over the state of the art of armadillo research.



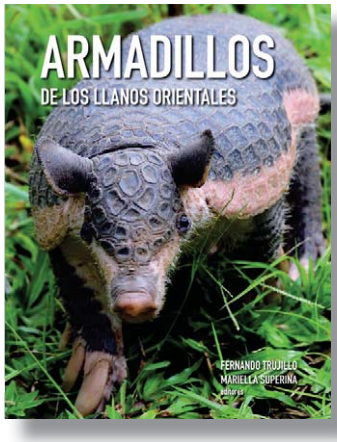
The nine-banded armadillo: a natural history is a major contribution to the field of armadillo research. The usual thinking is that armadillos are poorly known mammals, but this book proves us wrong – at least for the case of the nine-banded armadillo. By compiling all available scientific data on nine-banded armadillos and interpreting them in a broader context, the authors show us that, in fact, we know quite a bit about the biology of this strange mammal, in spite of the limited number of researchers dedicated to exploring the wonders of this odd creature. But, of course, there are still quite a few unknowns about its biology. The authors also stress the gaps in our knowledge and highlight some areas that deserve more attention from the scientific community. Among others, this book provides an extremely useful description on the methodology of doing fieldwork on armadillos. We wish someone had published a chapter like Methods and Madness years ago – it would certainly have saved many of us quite a lot of headache, and its reading should be mandatory for anyone thinking about working with armadillos.

The nine-banded armadillo: a natural history includes abundant scientific data, which has been translated by the authors into a language that is easy to understand, but without losing scientific accuracy. The information is presented in a way that is appealing to scientists and armadillo enthusiasts alike. It is a pleasure to read it, as the style is entertaining and stimulating. It makes you want to continue reading and learning more about these odd-looking mammals. We highly recommend it!
Loughry, W. J. & C. M. McDonough. 2013. The nine-banded armadillo: a natural history. University of Oklahoma Press, Norman, OK. 323 pp. Hardcover, ISBN 978-0-8061-4310-1

Available at http://www.oupress.com/ECommerce/Book/Detail/1748/the%20nine%20banded%20armadillo

Nuevo libro de divulgación sobre los armadillos de los Llanos Orientales

Armadillos de los Llanos Orientales es un libro muy atractivo de divulgación, editado por Fernando Trujillo y Mariella Superina, que aborda uno de los problemas fundamentales que están sufriendo los armadillos: el desconocimiento. En un lenguaje claro, sencillo y con abundantes ilustraciones, a lo largo de 176 páginas introduce al lector al fascinante mundo de los armadillos. El texto empieza con una descripción de las 21 especies de armadillos existentes en el mundo revelando su amplia diversidad morfológica y ecológica, poniendo especial énfasis en las cinco especies presentes en los Llanos Orientales de Colombia. Le sigue un capítulo sobre los armadillos en el mundo indígena y llanero que no solo describe el uso tradicional de estos mamíferos acorazados, sino también incluye muy interesantes creencias y leyendas recabadas de pobladores indígenas. Las características anatómicas, biológicas y ecológicas más sobresalientes de los armadillos son el enfoque de otro capítulo que sin lugar a dudas despertará el interés de los lectores. Las amenazas que enfrentan estos "arquitectos de la naturaleza" en los Llanos Orientales cierran la parte general de este libro para dar lugar a una descripción del Programa de Conservación y Manejo de los Armadillos de los Llanos Orientales. Este último capítulo incluye una presentación de los principales logros de las evaluaciones biológicas, sociales, genéticas, de manejo *ex situ* y de educación ambiental obtenidos en el transcurso del primer año de vida de esta interesante iniciativa. El libro concluye con un capítulo llamado Armadillos: El Futuro, que insiste en la importancia de dar continuidad y de sumar otros actores al Programa de Conservación y Manejo de los Armadillos de los Llanos Orientales, y da recomendaciones para el largo camino que tiene por delante esta iniciativa.



Armadillos de los Llanos Orientales es parte de la estrategia educativa del Programa de Conservación y Manejo de los Armadillos de los Llanos Orientales. Este Programa, el primero no solo a nivel nacional, sino uno de los más promisorios en América, nació en el año 2012 como un esfuerzo conjunto entre empresa privada, academia, gobierno y comunidad. Actualmente está integrado por la empresa Oleoducto de los Llanos Orientales (ODL), la Fundación Omacha, el Bioparque Los Ocarros

y las Corporaciones Ambientales Cormacarena y Corporinoquia. El Programa busca hacer un aporte importante y sostenible a la fauna, al preservar una especie insigne de los Llanos a través, entre otras acciones, de la educación y generación de conciencia en sus habitantes y muy especialmente, en diez mil niños y niñas que serán abanderados de su cuidado y conservación desde ahora y en el futuro.

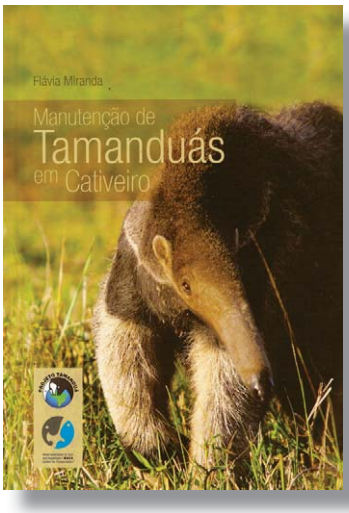
Los editores mencionan que es su anhelo que esta publicación despierte el interés y la curiosidad de los lectores por estos fascinantes animales y motive su investigación y su cuidado para que no los vean desaparecer de Colombia. Sin lugar a dudas, este fascinante libro logrará su objetivo.

Para mayor información contactarse con Mariella Superina, E-mail <mariella@superina.ch> o Fernando Trujillo, E-mail <fernando@omacha.org>.

Trujillo, F. y M. Superina (eds.). 2013. Armadillos de los Llanos Orientales. ODL, Fundación Omacha, Cormacarena, Corporinoquia, Bioparque Los Ocarros. Bogotá. 176 pp. ISBN 978-958-8554-31-0

Novo livro sobre manutenção de tamanduás em cativeiro!

Manutenção de tamanduás em cativeiro, cuidadosamente produzido e editado é um guia completo, didático, atualizado e útil a respeito destas famílias de animais, com esperança de alcançar o máximo de impacto acerca dos tamanduás em cativeiro e beneficiar aqueles que persistem em estado selvagem, apesar das pressões que exercem a perda de habitat, os efeitos das estradas, incêndios e a caça ilegal na sua população geral. Através deste volume, tem-se conseguido elaborar um verdadeiro resumo e guia de um grupo de animais tão interessantes como desafiadores... Não há melhor maneira de dizê-lo: este livro é essencial para qualquer pessoa que lide, trate, estude ou tenha interesse nestes animais fascinantes.



Para maior informação, contatar a <contato@tamandua.org>.

Miranda, F. (ed.) 2012. Manutenção de tamanduás em cativeiro. Editora Cubo, São Carlos, Brazil. ISBN 978-85-60064-27-4

Edentata 14 (2013): **93**
Electronic version: ISSN 1852-9208
Print version: ISSN 1413-4411
http://www.xenarthrans.org

NOTES TO CONTRIBUTORS

Edentata is the official, peer-reviewed, annual publication of the IUCN/SSC Anteater, Sloth and Armadillo Specialist Group. It aims to publish information that contributes to the conservation of xenarthrans.

A broad range of topics is welcomed and encouraged, including taxonomy, systematics, genetics, biogeography, ecology, conservation, behavior, and health. Manuscripts must describe original research findings that have not been published or submitted simultaneously to other journals. Any overlap of contents with already published papers should be minimal.

Edentata accepts manuscripts of original research findings related to any aspect of xenarthran conservation. It also encourages submission of short communications, field notes, thesis abstracts, news items, recent events, book reviews, congress announcements, and the like.

Manuscripts may be written in English, Portuguese or Spanish. Authors whose first language is not English should please have their texts *carefully reviewed* by a native English speaker.

Once the manuscript has been received, the editors will perform a first evaluation. Manuscripts not satisfying the editorial instructions will be returned to the author without review.

Detailed instructions to authors are available on the Specialist Group's website <http://www.xenarthrans.org/bibliography/edentata>.

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Edentata es la publicación oficial del grupo de especialistas en osos hormigueros, perezosos y armadillos de la UICN/SSC (IUCN/SSC Anteater, Sloth and Armadillo Specialist Group). Es publicada en forma anual y está dedicada a la difusión de información que contribuya a la conservación de los xenartros.

Todos los manuscritos son sometidos a revisión por pares. Se aceptan manuscritos que se encuentren dentro de una amplia variedad de temáticas, incluyendo: taxonomía, sistemática, genética, biogeografía, ecología, conservación, comportamiento y salud. Los manuscritos deben ser trabajos originales y no haber sido publicados ni enviados simultáneamente a otros medios de publicación. La superposición de contenidos con artículos relacionados ya publicados debe ser mínima.

Edentata acepta artículos sobre investigaciones originales relacionadas con cualquier aspecto de la conservación de xenartros. También se alienta el envío de comunicaciones breves, notas de campo, resúmenes de tesis, noticias, información sobre eventos, revisiones de libros, avisos de congresos, etc.

Los manuscritos pueden estar redactados en inglés, portugués o español. En el caso de autores cuya lengua materna no sea el inglés y envíen manuscritos en ese idioma, deberán someter el texto a una revisión detallada por una persona angloparlante nativa o traductor profesional para garantizar el uso correcto del inglés.

Una vez recibido el manuscrito, el Comité editorial realizará una primera evaluación y los manuscritos que no cumplan con las normas establecidas serán devueltos a los autores sin pasar al proceso de revisión por pares.

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INSTRUÇÕES AOS COLABORADORES

Edentata é a publicação oficial do grupo de especialistas em tamanduás, preguiças e tatus da UICN/SSC (IUCN/SSC Anteater, Sloth and Armadillo Specialist Group). É publicada anualmente e tem como finalidade a difusão de informações que possam vir a contribuir para a conservação dos xenartros.

Todos os manuscritos são submetidos a revisão por pares. Serão aceitos manuscritos que se encontrem dentro da ampla variedade temática, incluindo-se taxonomia, sistemática, genética, biogeografia, ecologia, conservação, comportamento e saúde. Os trabalhos devem ser originais, não publicados ou enviados simultaneamente a outros meios de publicação. A superposição dos conteúdos com artigos relacionados e já publicados, deve ser mínima.

Edentata aceita artigos sobre investigações originais relacionadas com qualquer aspecto de conservação de xenartros. Comporta ainda comunicações breves, notas de campo, resumos de teses, informações sobre eventos, revisões de livros, avisos de congressos, entre outros.

Serão publicados artigos em inglês, português ou espanhol. Aos autores cuja língua materna não seja o inglês, e que optem por enviar manuscritos nesse idioma, solicita-se uma revisão detalhada por pessoa nativa ou tradutor profissional, a fim de garantir a correção idiomática.

Os manuscritos serão submetidos a uma avaliação inicial pelo Comitê Editorial, sendo procedida a devolução aos autores, sem revisão, dos que não estiverem dentro das normas pré-estabelecidas.

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