Edentates of the Saracá-Taquera National Forest, Pará, Brazil

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ARTICLES

Situación de Los Edentados en Uruguay

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En el Uruguay hay reportados seis especies de edentados: mulita (*Dasypus hybridus*), tatú (*Dasypus novemcinctus novemcinctus*), tatú de rabo molle (*Cabassous tatouay*), peludo (*Euphractus sexcinctus flavimanus*), tamanduá (*Tamandua tetradactyla chapadensis*) y el oso hormiguero (*Myrmecophaga tridactyla tridactyla*) (González, 2001). Las especies de la Familia Dasypodidae son bastante comunes, exceptuando el *C. tatouay* del cual solo hay registros en los departamentos del noreste del país que limitan con Brasil, siendo esta zona el límite sur de su distribución (Tabla 1, Fig. 1). El *D. hybridus*, *D. novemcinctus* y el *E. sexcinctus* se encuentran en todo el país, principalmente en ambientes de monte y de praderas.

De la Familia Myrmecophagidae existe un solo registro de *M. tridactyla* asociado a yacimientos arqueológicos (González *et al.*, 2001). El tamanduá fue registrado por primera vez en Uruguay a fines de la década de los '90 cuando fue encontrado un ejemplar vivo en el departamento de Cerro Largo. A partir de ese hecho se han registrado más ejemplares en los departamentos vecinos de Rivera y Tacuarembó (Berrini, 1998). Cabe destacar que esta zona es el límite sur de distribución de la especie para Sudamérica (Fonseca y Aguiar, 2004).

Investigación
En Uruguay son casi nulos los estudios de edentados. El primer reporte sobre el tatú de rabo molle (Ximenez y Achaval, 1966) y estudios sobre la cavidad de la mulita (González *et al.*, 2001) son de las pocas publicaciones que existen. Los registros esencialmente se han realizado en salidas de colecta e inventarios que han realizado la Facultad de Ciencias y el Museo Nacional de Historia Natural, o por algún particular que ha donado especímenes.

FIGURA 1. Registros del *Cabassous tatouay* y *Tamandua t. chapadensis.*

Conservación
El creciente desarrollo agropecuario y forestal, junto a la disminución del monte indígena en las últimas décadas, trajo una importante pérdida del hábitat para todas las especies de edentados en nuestro territorio.

En Uruguay existen varios tamanduás y osos hormigueros provenientes de Argentina y Brasil que se encuentran en cautiverio en zoológicos y reservas de fauna. Los escasos registros de tamanduás en vida

TABLA 1. Situación de los edentados en Uruguay.

Nombre común	Distribución	Status nacional	Problemáticas
Mulita	Todo el país	Susceptible	Caza para alimentación y fabricación de artesanías
Tatú	Todo el país	Susceptible	Caza para alimentación y fabricación de artesanías
Tatú de rabo molle	Lavalleja, Cerro Largo y posibles registros para Rivera y Treinta y Tres	Amenazado e insuficientemente conocido	Pérdida de hábitat
Peludo	Todo el país	Susceptible	Caza para alimentación y fabricación de artesanías
Oso hormiguero	Rocha–un solo registro arqueológico	Extinguido	—
Tamanduá	Rivera, Cerro Largo y Tacuarembó	Amenazado e insuficientemente conocido	Pérdida de hábitat, caza deportiva

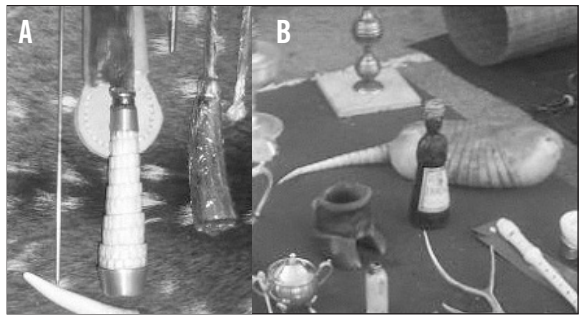

FIGURA 2. (A) Cuchillo artesanal con mango de mulita. **(B)** Venta de caparazón de tatú en feria de la capital, Montevideo. (A. Fallabrino.)

silvestre son principalmente de reportes de animales muertos por personas que ante lo desconocido prefieren cazarlos.

En Uruguay las especies de la Familia Dasypodidae han sido utilizadas para consumo humano y artesanal desde la época prehispánica. Pero es en el siglo XX que se comienza a ejercer una presión sobre estas especies debido al crecimiento demográfico en zonas rurales.

Existe un tradicional consumo de carne de armadillos, siendo denominada por algunos como un manjar. Si bien en algunas zonas rurales la gente más vieja realiza un consumo racional, existe una depredación por parte de personas de las grandes ciudades. Esto se puede observar en las salidas de cacería que organizan los citadinos, donde llegan a capturar decenas de individuos. La venta ilegal de carne se da principalmente en el medio rural, en comercios establecidos y en casas de particulares. También la carne es enviada a familiares y amigos a través de los buses de larga distancia, sin que exista ningún control sobre el mismo.

El caparazón y la cola son utilizados para la creación de artesanías (adornos, mangos, etc.) que se venden con total impunidad en ferias y comercios del país (Fig. 2). Otra problemática es el atropellamiento en rutas nacionales donde una gran cantidad de mulitas y tatúes aparecen muertos.

Todas las especies de edentados se encuentran en la Nómina Oficial de Especies de la Fauna Silvestre (Decreto N° 514/001) y están protegidas a nivel nacional por la Ley de Fauna (9.481) y por el decreto que la reglamenta (164/996), el cual establece la prohibición de caza, transporte, tenencia, comercialización e industrialización de las especies de la fauna silvestre. A nivel internacional Uruguay es parte de la Convención Internacional para el Tráfico de Especies Amenazadas (CITES) desde el año 1975 por lo que está totalmente prohibida la exportación e importación de cualquier producto o subproducto de estas especies.

A pesar de poseer legislación que las protege, la misma no es muy efectiva debido a que no existe un control permanente sobre la presión de caza y el comercio de las mismas.

Status y futuro

Si bien González (2001) y Achaval *et al.* (2004) designaron un status nacional a los edentados en Uruguay (Tabla 1), debido a los pocos estudios, es importante también tomar como referencia el status regional (Argentina y Brasil) y de la UICN (Unión Internacional para la Conservación de la Naturaleza) hasta que no exista una investigación profunda sobre la situación actual de estas especies.

Es necesario generar estudios a largo plazo, constantes y con fondos que permitan saber más sobre la distribución, biología y ecología de los edentados en Uruguay. Todo esto acompañado de actividades de conservación y educación localizadas principalmente en el medio rural, fomentando la valoración y protección de los mismos. A su vez con los tamanduás y osos hormigueros en cautiverio sería interesante poder generar intercambios y estudios en conjunto con Argentina y Brasil y así poder apoyar a los proyectos de reintroducción.

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Edentates of the Saracá-Taquera National Forest, Pará, Brazil

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Introduction

The order Xenarthra contains 31 living species distributed in 13 genera, all but one of which are restricted to the Neotropics (Wetzel, 1982; Fonseca and Aguiar, 2004). Nineteen of these species, distributed in ten genera and four families, can be found in Brazil (Fonseca *et al.*, 1996). This order embodies a substantial amount of the evolutionary history of mammals (Fonseca, 2001) and is potentially a basal offshoot of the earliest placental mammals (Murphy *et al.*, 2001). Despite their ecological importance and the need to highlight them in conservation programs, xenarthrans are virtually unstudied when compared with other, better-known mammals (Fonseca, 2001).

At least 13 species of xenarthrans are found in the rainforests of Amazonia, four of which are endemic (Fonseca *et al.*, 1996); another two are on the Brazilian Red List of threatened species (Fonseca and Chiarello, 2003). Although the Xenarthra include few species compared with other orders of Brazilian mammals, only a handful of field studies have focused on them, and their geographic distributions are still poorly known. Here we present data on the occurrence of xenarthrans in the Saracá-Taquera National Forest (STNF) in northwestern Pará, Brazil.

Field Site and Methods

The Saracá-Taquera National Forest (429,600 ha) is a bauxite-rich area immediately south of the village of Porto Trombetas (01°40′S, 56°00′W), in the municipality of Oriximiná in western Pará. Our study site in the STNF is about 100 km west of the confluence of the Rios Trombetas and Amazonas. The bauxite is mined by the Rio do Norte Mining Company (Mineração Rio do Norte — MRN). The deposits are associated with a series of Tertiary boundaries, occurring in small plateaus at altitudes between 150–200 m. Mining bauxite on these plateaus involves the wholesale removal of the rainforest along with the first 4–15 m of soil. Heavy machinery works around the clock to extract the ore, which is the raw material for the production of aluminum. After an area has been mined out, the pits are filled with a mixture of soil and vegetative debris, and the area is replanted with native seedlings by the mining company.

Our fieldwork for this study focused on three regions: the Almeidas plateau, which has been undergoing stepwise deforestation since 2002; in areas on the Saracá plateau, which was mined out and reforested during the 1980s and 1990s; and on sightings and road kills along a 30-km stretch of road between Porto de Trombetas and the Almeidas plateau (Fig. 1). From April 2002 to December 2004, a small team of three carried out ten field trips of 15 days each. On each field trip, the team was composed of two researchers (L. C. Oliveira and either S. M. Mendel or D. M. Loretto) plus a field assistant. Edentates were recorded whenever they were seen on trails in both mature forest and reforested areas.

Additional records on the occurrence of edentates in the region were gathered from publications (Wetzel, 1982, 1985a, 1985b; Emmons and Feer, 1997; Eisenberg and Redford, 1999; Silva Júnior and Nunes, 2001; Silva Júnior *et al.*, 2001) as well as two technical reports: the Saracá-Taquera National Forest Management Plan (STCP, 2001) and an environmental impact study (Brandt Meio Ambiente, 2001), as well as from specimens in the Museu Paraense Emílio Goeldi (MPEG), Belém. During our fieldwork in STNF we found 11 dead animals, which we compared directly with museum specimens at MPEG. We deposited tissue samples from the animals at the PUCMinas Natural History Museum, and also took reference photographs of live animals in the field.

We interviewed four technicians from the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA) who were working in the region, and also ten of our local field assistants. We presented each interviewee with the illustrations of the Xenarthra from Emmons and Feer (1997), and asked them to identify those which they had seen in the region. For each sighting they reported, we noted the species, the type of record, and the location and estimated date of the sighting. We also asked to see any remains, such as the skulls and carapaces of animals which were either hunted or found dead.

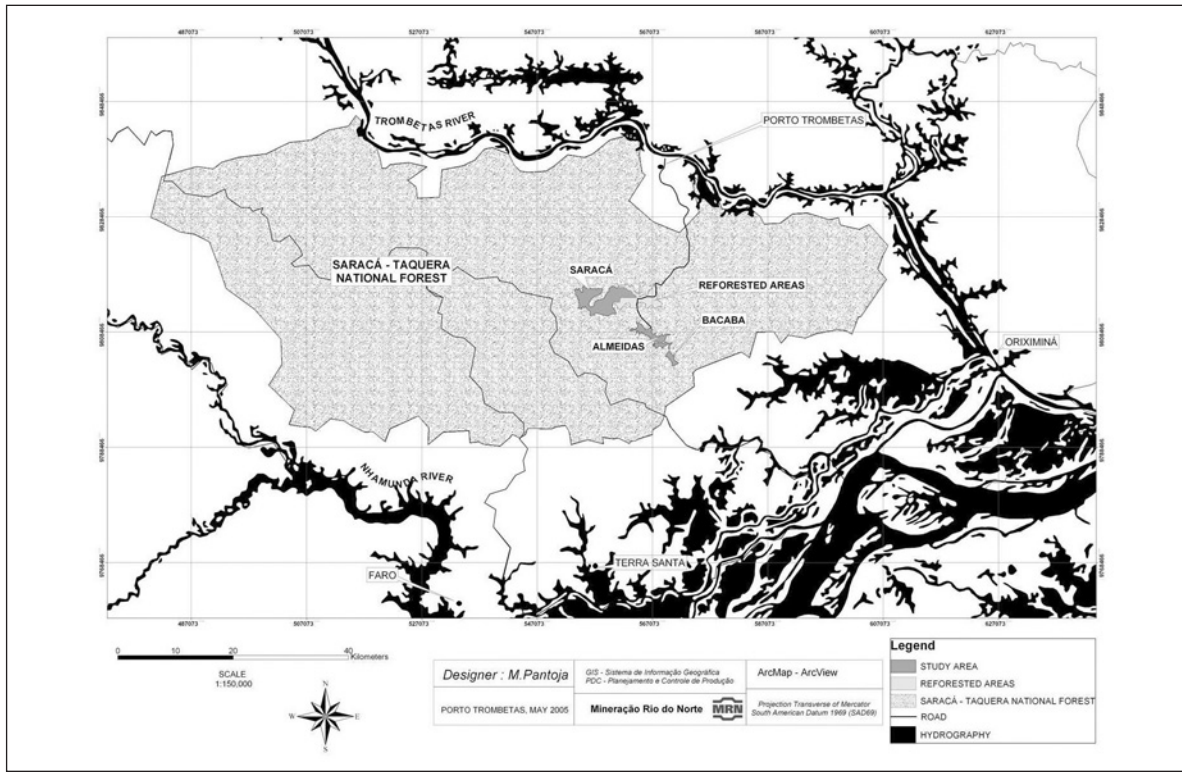

FIGURE 1. Map of the Saracá-Taquera National Forest with the study areas represented.

Results

Based on information compiled from our fieldwork, the scientific literature, technical reports, museum collections and interviews, we found evidence for up to 13 xenarthran species occurring in the STNF (Table 1). The geographic distribution of ten of them suggests their occurrence in the study area. The other three were mentioned only in the two technical reports; they have yet to be confirmed, and may be erroneous.

Fieldwork

We found six xenarthran species in our field surveys, three of them in reforested areas (Table 1). We recorded three of the four known species of anteaters in the study area. Three giant anteaters (*Myrmecophaga tridactyla*) were seen in the reforested areas, twice in plots reforested in the 1980s and once in a plot from the 1990s. The southern tamandua (*Tamandua tetradactyla*) was seen on six occasions, four of which were in the remaining forest of the Almeidas plateau. We found a fifth individual dead in the 1990s reforested plot, showing unmistakable signs of predation—broken bones, bite marks on the head, and large parts of the body missing. The sixth was found dead on the road between Porto de Trombetas and the Almeidas plateau, probably killed by a vehicle. We also found a pygmy anteater (*Cyclopes didactylus*) killed on the same road.

There are two species of sloth in the STNF: the pale-throated three-toed sloth (*Bradypus tridactylus*: Bradypodidae) and the two-toed sloth (*Choloepus didactylus*: Megalonychidae). A three-toed sloth was found dead on the road, and an IBAMA technician observed another crossing the road at Porto de Trombetas. *Choloepus didactylus* was the most frequently sighted of the xenarthrans during our field study, with a total of ten records for this species—six of which were dead specimens found on the road.

We recorded just one species of armadillo, the common long-nosed armadillo (*Dasypus novemcinctus*). We saw one in the Almeidas forest, and a second in the 1980s reforested zone at Saracá; a third was found dead on the road to Porto de Trombetas.

Museum collections

There are specimens of two xenarthran species from the STNF in the mammal collection of the Museu Paraense Emílio Goeldi: two of *Bradypus variegatus* (Faro and headwaters of the Rio Paru do Oeste), and one of the greater long-nosed armadillo, *Dasypus kappleri*, collected from the Rio Saracazinho, Porto Trombetas (Table 1).

Interviews and published literature

The presence of the giant armadillo (*Priodontes maximus*) was inferred by its burrows (recorded by an IBAMA technician, Antônio de Almeida Correia) and it was also listed during inventories for an environmental impact statement (Brandt Meio Ambiente, 2001) and for the preparation of a management plan for the national forest (STCP, 2001). The Brazilian lesser long-nosed armadillo (*Dasypus septemcinctus*) may also be present, as one of the technicians we interviewed described two different species of armadillos, one with nine bands in the carapace and the other with seven. The technician was unable to identify the exact species from the illustrations we provided, however, and this record is provisional. The southern naked-tail armadillo (*Cabassous unicinctus*), the Brazilian three-banded armadillo (*Tolypeutes tricinctus*) and the yellow armadillo (*Euphractus sexcinctus*) were only recorded in some publications and technical reports (Table 1).

Discussion

Although our study registered a potential total of 13 xenarthran species in the Saracá-Taquera National Forest, not all have been verified. The Brazilian three-banded armadillo (*Tolypeutes tricinctus*), although listed in a technical report (STCP, 2001) is unlikely to occur in the study area. It has never been recorded in Amazonia, and occurs mainly in the Cerrado biome (Wetzel, 1982, 1985a; Fonseca *et al.*, 1996; Eisenberg and Redford, 1999).

The presence of the yellow armadillo (*Euphractus sexcinctus*) also remains to be confirmed. According to Wetzel (1985a), this species occurs in northeastern, middle-western, southeastern, and southern Brazil, but Silva Júnior and Nunes (2001) and Silva Júnior *et al.* (2001) have found it in the eastern Amazon, and proposed that its disjunct range is an artifact of sampling. Our records for this species are based only on interviews and technical reports.

TABLE 1. Edentate fauna reported from the Saracá-Taquera National Forest, Pará, Brazil, from scientific collections, published reports and fieldwork. The number of individuals observed is given in parentheses.

Order Edentata	Museum	Literature		Fieldwork		
	MPEG	Technical reports	Scientific papers	Mature forest	Reforested area	Road
Myrmecophagidae						
Myrmecophaga tridactyla		1, 2	1, 3, 4, 5		Obs. (3)	
Tamandua tetradactyla		1, 2	1, 3, 4, 5	Obs. (4)	Obs. (1)	Obs.(1)
Cyclopes didactylus		1, 2	1, 3, 4, 5			Obs. (1)
Bradypodidae						
Bradypus tridactylus			1, 3, 4, 5			Obs.(2)
*Bradypus variegatus**	304; 1743	1, 2	1, 3, 5			
Megalonychidae						
Choloepus didactylus		1, 2	1, 3, 4, 5	Obs. (4)		Obs.(6)
Dasypodidae						
Priodontes maximus		1, 2	1, 2, 3, 4, 5	Int.		
Cabassous unicinctus		1, 2	1, 2, 3, 4, 5			
*Tolypeutes tricinctus***		1				
*Dasypus kappleri****	12592		1, 2, 3, 4, 5			
Dasypus novemcinctus			1, 2, 3, 4, 5	Obs (1)	Obs. (1)	Obs. (1)
*Dasypus septemcinctus*****				Int.		
Euphractus sexcinctus		1, 2				

Literature: 1 Wetzel, 1982; **2** Wetzel, 1985a; **3** Wetzel, 1985b; **4** Emmons and Feer, 1997; **5** Eisenberg and Redford, 1999.

Technical reports: 1. STCP, 2001; **2**. Brandt Meio Ambiente, 2001.

* **MPEG 304:** Faro and **MPEG 1743:** Cabeceiras do Rio Paru de Oeste.

** Improbable occurrence due to a geographic range restricted to other biomes.

*** **MPEG 12592:** Rio Saracazinho, Porto Trombetas.

**** Species recorded by interview and recorded in the Porto Trombetas Biological Reserve.

Obs. = Direct observation of the species.

Int. = Interview.

Dasypus septemcinctus has yet to be confirmed for the STNF. It has a broad range, from the mouth of the Amazon to the Gran Chaco in Argentina (Wetzel, 1985b), but none have been recorded from the central Amazon. As mentioned above, the presence of this species was suggested by one of the technicians we interviewed, and *D. septemcinctus* was listed in the management plan for the Rio Trombetas Biological Reserve, on the east side of the Rio Trombetas (Antônio de Almeida Correia, pers. comm.). Thus, we consider its occurrence possible for the STNF, but we have no concrete evidence of it having been seen or collected there.

Three of the six species recorded in our fieldwork — two anteaters (*Myrmecophaga tridactyla* and *Tamandua tetradactyla*) and an armadillo (*Dasypus novemcinctus*) — were seen in reforested areas. These areas appear to be important for the xenarthran fauna at Porto de Trombetas; the giant anteater (*M. tridactyla*), for instance, was only recorded in these areas. This may have been due to easier visibility in those areas; but field studies will be necessary to determine how these reforested areas support the local xenarthran fauna, and how xenarthrans colonize reforested patches.

The principal threats facing the xenarthran fauna of this region are hunting and roads. Road mortality has been considered one of the worst dangers to terrestrial fauna (Forman and Alexander, 1998), and all six of the species that we directly observed were found dead on the road. Xenarthrans are more vulnerable to highway traffic than most other mammals, as many of them have poor vision and are not equipped for a fast escape.

Edentates are a favored source of meat throughout the Neotropics (Redford, 1992; Leeuwenberg, 1997; Cullen *et al.*, 2000; Peres, 2000; Valsecchi, 2005), and many people in the STNF hunt wild game for food. Interviews with our field assistants indicated a strong preference for the armadillos, and our assistants showed us the carapaces of some recent kills.

Despite the road casualties and local hunting, the Saracá-Taquera National Forest has a remarkable richness of xenarthran species. This gives it a special importance as a protected area, and makes it an excellent location to study the dynamics of mammal recolonization in regenerating tropical forest.

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A Southern Extension of the Geographic Distribution of the Two-Toed Sloth, *Choloepus didactylus* (Xenarthra, Megalonychidae)

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The two species of two-toed sloths, *Choloepus didactylus* and *C. hoffmanni*, are the only extant representatives of the Megalonychidae (Adam, 1999), occurring in partial sympatry in the Andean regions and western Amazonia (Le Pont and Desjeux, 1992; Emmons and Feer, 1997; Adam, 1999; Eisenberg and Redford, 1999). Although their distributions are reasonably well-understood on a broad scale, the precise boundaries of their ranges are still unresolved. According to Wetzel and Ávila-Pires (1980), Wetzel (1985), Adam (1999) and Eisenberg and Redford (1999), *C. didactylus* occurs across all of northern Amazonia, from the eastern Andes to northeastern Surinam, reaching the northern coast of Brazil in the states of Amapá, Pará and Maranhão. The maps presented by Wetzel (1985), Emmons and Feer (1997) and Eisenberg and Redford (1999) all suggest that in Western Amazonia, this distribution extends southward to 10°S latitude. In central and eastern Amazonia, however, their maps show *Choloepus didactylus* as being restricted to a narrow belt along the southern edge of the Amazon River — although there is no ecological reason why the species might not occur further to the south. Wetzel and Ávila-Pires (1980) reported the only records for this region available at the time, referring to specimens from Santarém, Taperinha and Rio Barcarena in Pará, as well as Humberto de Campos in Maranhão. Specimens in the mammal collection of the Museu Paraense Emílio Goeldi (MPEG) confirm this distribution, including those from the following localities in eastern Pará: Marituba (MPEG 22070), Paragominas (MPEG 30677), Fazenda Cauaxi, municipality of Paragominas (MPEG 26315, 26316, 26317), and Rodovia Belém-Brasília, Km-75 (MPEG 2385, 2391, 2394). With the exception of the last three individuals, all these specimens were collected after 1980 and were thus not available to Wetzel and Ávila-Pires.

Mascarenhas and Puorto (1988) reported *C. didactylus* from the middle-lower Rio Tocantins, south of the range indicated by other authors. The specimens which Mascarenhas and Puorto collected are now in the MPEG collection (Tucuruí, Base 5: MPEG 12597; Jacundá: MPEG 11884), and these localities were included in the more recent range maps of Adam (1999) and Eisenberg and Redford (1999). Soon thereafter, Toledo *et al.* (1999) extended the distribution of *C. didactylus* to the region of Carajás in southern Pará, approximately 06°S, 50°W. Here we demonstrate that the eastern part of the distribution of this species extends further south than previously known.

While one of us was conducting fieldwork in a settlement in northern Mato Grosso (Trinca, 2004), a local man found a skull of *C. didactylus* in the nearby plantation of Fazenda do Tenente, Japuranã district (10°03′56.6″S, 58°00′02.3″W), municipality of Nova Bandeirantes (Fig. 1). This area is located in the Juruena interfluve between the Rios Juruena and Teles Pires.

The specimen, an adult skull without the mandible, is now in the MPEG mammal collection (MPEG 36871). We identified the specimen based on the diagnostic characters provided by Wetzel (1985) and by direct comparison with specimens of *Choloepus* in the MPEG collection. The skull fits the description of *C. didactylus*, possessing a large anterior and small posterior inter-pterygoid space, large pterygoid expansions, absence of a posterior pair of foramina in the inter-pterygoid space, pterygoid sinuses broadly inflated and broad contact of maxilla with frontal bone, not interrupted by lacrimals.

The original vegetation of the Juruena basin was mainly dense rainforest, interspersed with open rainforest and transitional areas (Dinerstein *et al.*, 1995; Miranda and Amorim, 2000). Within the past 30 years, these forests have been destroyed by the expansion of agriculture and pastures, and the increase in cattle-ranching and soybean farming may have extirpated *C. didactylus* from many areas in east-central Mato Grosso.

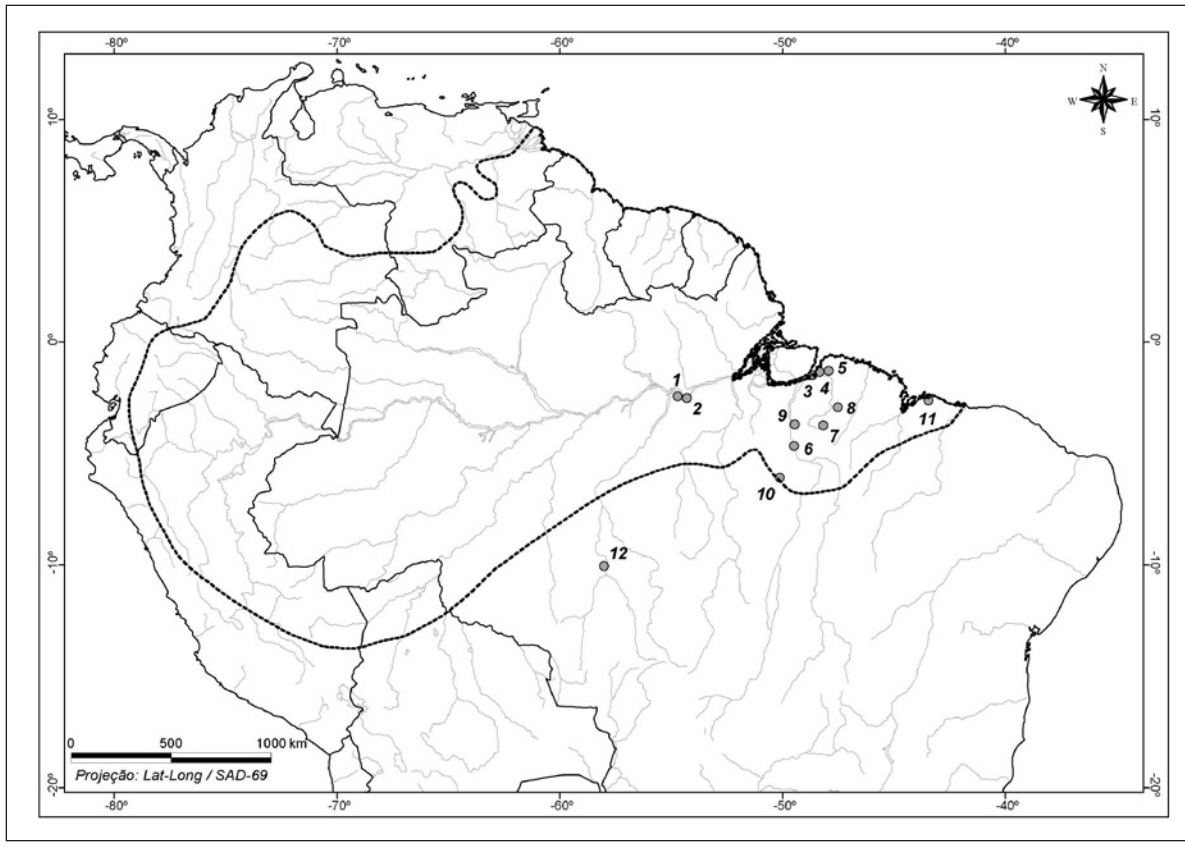

FIGURE 1. Location of the southern records of *C. didactylus*, based on the distributions presented in Eisenberg (1989) and Eisenberg and Redford (1999): 1. Pará, Santarém (02°26′S, 54°42′W); 2. Pará, Taperinha (02°31′S, 54°17′W); 3. Pará, Rio Barcarena (01°30′S, 48°39′W); 4. Pará, Marituba (01°22′S, 48°20′W); 5. Pará, Rodovia Belém-Brasília, Km 75 (01°19′S, 47°55′W); 6. Pará, Jacundá (04°39′S, 49°29′W); 7. Pará, Fazenda Cauaxi (03°45′S, 48°10′W); 8. Pará, Paragominas (02°56′S, 47°31′W); 9. Pará, Tucuruí, Base 5 (approx. 03°42′S, 49°27′W); 10. Pará, Carajás (06°05′S, 50°07′W); 11. Maranhão, Humberto de Campos (02°37′S, 43°27′W); 12. Mato Grosso, Fazenda do Tenente, Japuranã (10°03′S, 58°00′W).

This new record suggests that the presumed absence of this species in south-central and eastern Amazonia may be an artifact of undersampling, which has long been an impediment to understanding the diversity and biogeography of Neotropical fauna (Vivo, 1996; Silva Júnior, 1998; Silva *et al.*, 2001). Surveys covering this entire region would most likely indicate that *C. didactylus* has a wider geographic distribution within the forests of Amazonia than now understood.

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