



Nota

NEW RECORDS OF THE ELUSIVE MARSUPIAL *Gracilinanus emiliae* (DIDELPHIMORPHIA, DIDELPHIDAE) FROM THE BRAZILIAN AMAZON BASIN AND A RANGE EXTENSION FOR THE SPECIES

Marcus V. Brandão O.¹, Patrício A. da Rocha², Sillionamã P. Dantas^{3,4},
and Wanieuilli Pascoal^{3,5}

¹ Universidade Federal de São Carlos, Campus Sorocaba, Departamento de Biologia, Laboratório de Diversidade Animal, Rod. João Leme dos Santos (SP-264), km 110, Bairro Itinga, 18052-78, Sorocaba, São Paulo, Brazil [correspondence: Marcus V. Brandão O. <puerabio@gmail.com>].

² Universidade Federal da Paraíba, Departamento de Sistemática e Ecologia, Programa de Pós-Graduação em Zoologia, CEP 58059-900, João Pessoa, Paraíba, Brazil.

³ Ciências Biológicas pela Universidade Federal do Tocantins, Tocantins, Brazil.

⁴ Campus de Araguaína, R. Paraguai s/n (esquina com Urixamas), 77838-824, Araguaína, Brazil.

⁵ Campus de Porto Nacional, Rua 03, Quadra 17, Lote 11, s/n, Setor Jardim dos Ipês, 77500-000, Porto Nacional, Brazil.

ABSTRACT. While described in the early twentieth century, *Gracilinanus emiliae* is still one of the least known taxa of its genus, with fewer than 20 specimens in scientific collections. In Brazil, only 2 specimens are known from the vicinity of Belém, Pará, and 2 specimens were recently reported from Amapá. We report here 2 new localities records for this country, which represent a significant range extension in the distribution of this marsupial. The new records corroborate the fact that *G. emiliae* inhabit primary lowland rain forest and it is present in great portion of the Amazonian border.

RESUMO. Novos registros do elusivo marsupial *Gracilinanus emiliae* (Didelphimorphia, Didelphidae) da Bacia Amazônica Brasileira e uma extensão de distribuição para a espécie. Embora descrito no início do século XX, *Gracilinanus emiliae* ainda é um dos táxons menos conhecidos de seu gênero, com menos de 20 espécimes em coleções científicas. No Brasil, apenas 2 espécimes são conhecidos das proximidades de Belém, Pará, e dois espécimes recentemente relatados do Amapá. Relatamos aqui 2 novos registros em localidades deste país, o que representa um aumento significativo na distribuição deste marsupial. Os novos registros corroboram o fato de que *G. emiliae* habita terras baixas da floresta tropical primária e está presente em grande parte da fronteira amazônica.

Key words: Amazonia. Brazil. Distribution extension. Rare marsupial.

Palavras chave: Amazônia. Brasil. Extensão de distribuição. Marsupial raro

Marsupials are a diversified group of Neotropical mammals that encompasses almost a hundred species (Voss and Jansa, 2009). For several of these species, however, geographic range limits are still poorly known, even for taxa described in the early 20th century. This includes most species of the genus *Gracilinanus*, which is currently divided into 6 valid taxon: *aceramarcae* (Tate, 1931), *agilis* (Burmeister, 1854), *dryas* (Thomas, 1898), *emiliae* (Thomas, 1909), *marica* (Thomas, 1898), and *microtarsus* (Wagner, 1842).

These small opossums are arboreal animals restricted to forested habitats in South America, including Brazil, where 3 species are known to occur: *G. agilis* in the moist and dry forests of central Brazil, *G. microtarsus* in the Atlantic Forest, and *G. emiliae* in lowland Amazon rainforest (Creighton and Gardner, 2008). The former 2 species are relatively common in museum collections (Voss and Jansa, 2009) and their geographic ranges, as well as their taxonomic status, have received considerable attention in recent years (Costa et al., 2003; Geise and Astua, 2009; Loss et al., 2011; Faria et al., 2013), whereas *G. emiliae* has been largely overlooked (but see Voss et al., 2009).

While it was described more than 100 years ago, *G. emiliae* is currently one of the least known species of the genus, with fewer than 20 specimens housed in scientific collections, and “data deficient” status in the IUCN Red List (Brito et al., 2008) and the Brazilian list of threatened species (Chiarello et al., 2008). Until recently, the species was known from only the northern Amazon basin (Voss et al., 2001); however, Voss et al. (2009) reported a record for Nuevo San Juan, Peru, extending its known geographic range by 950 km and indicating that it may be more widely distributed than was originally thought.

In Brazil, some of the records of *G. emiliae* from the Amazon region were derived from the erroneous identification of juvenile specimens of *Marmosa lepida* and from *Hyladelphus kalinowskii* (for details see Voss et al., 2001, 2009, respectively). Two cytogenetic studies reported the occurrence of *G. emiliae* in the Cerrado savanna of Goiás state, Brazil (Carvalho et al., 2002; Pereira et al., 2008). However,

most specimens reported by Carvalho et al. (2002)—deposited in the Museu Nacional, Rio de Janeiro—actually belong to the genus *Cryptonanus* (A. P. Carmignotto, pers. comm.), while the single specimen analyzed by Pereira et al. (2008) is probably lost and, as the authors did not provide any morphological description, this record is doubtful and probably the reason why either record from Goiás are currently not included at the known distribution range of this species (see Creighton and Gardner, 2008; Voss et al., 2009). Finally, the specimen from Parque Nacional de Ubajara, Ceará—deposited in the Universidade Federal do Ceará, Ceará—, reported by Guedes et al. (2005) would need to be reevaluated. However, this individual is lost as there is no *G. emiliae* specimen at the referred collection (Gurgel Filho and Langguth, in press). This specimen might be referent to “*Marmosa agricolai* Moojen 1943, a typical taxon from the Caatinga biome and that was considered a junior synonym of *G. emiliae* by Gardner and Creighton (1989) but now is referred to the recently described genus *Cryptonanus* (Voss et al., 2005).

Given these considerations, the only reliable records of *G. emiliae* from Brazil are 2 specimens from the vicinity of Belém, in Pará state, and 2 recently reported from Amapá (Silva et al., 2013). The present study reports on material from 2 new Brazilian localities, which represent a significant extension of the known distribution of the species in this country.

One record is derived from a specimen deposited in the Museu de Zoologia da Universidade de São Paulo (MZUSP), and the other is from a live caught specimen. Measurements of the specimens are based on Voss et al. (2009). The museum specimen, MZUSP 11780, comprises a skin and skull (Fig. 1) from Fordlândia (3°50’S, 55°30’W) on the Tapajós River in Pará. This individual, a subadult male collected by A. M. Olalla in March, 1965, presents erupted, but unaligned third and fourth upper molars, consistent with Tribe’s (1990) age class 5. While treated with caution, given the position of Voss et al. (2001, 2009) with regard to juveniles, this specimen is undoubtedly *G. emiliae* due to the presence of all the diagnostic characters of the species: reddish-brown dorsal fur, pure



Fig. 1. Dorsal (top, left), ventral (top, right), and lateral (bottom, middle) views of the skull and lateral view (bottom) of the mandible of a male *Gracilinanus emiliae* specimen (MZUSP 11780) from Tapajós River, Fordlândia, Pará, northern Brazil. Scale bar = 5 mm.

white-colored ventral fur, tail (LT) much longer than body (HBL) with LT/HBL ratio of 1.77 (Table 1), the presence of an anteromedial alisphenoid process on the auditory bullae, interorbital region with beaded supraorbital margins, and the absence of a maxillary fenestra (Fig. 1). The cranial measurements are also highly similar to those of the holotype, which we examined through photographs, and only slightly below the range of values recorded for adult *G. emiliae* specimens (Table 1).

The second studied specimen was captured in Araguaína (7°11'S, 48°12'W), Tocantins state, which refers to an animal captured in a 20-liter pitfall trap during a herpetological survey in a lowland gallery forest in

Table 1

Age, sex, weight (in g) and selected measurements (in mm) of the specimen (MZUSP 11780) of *Gracilinanus emiliae* recorded in Tapajós River, Fordlandia, Para, northern Brazil, and its comparison with the holotype (BMNH 93910) of the species and the range of 3 animals reported by Voss et al. (2009).

	MZUSP 11780	BMNH 93910	Voss et al. (2009)
Age	subadult	subadult	adult
Sex	male	male	2 males; 1 female
Weight	-	-	10
Head-and-body length (HBL)	72	75	77-87
Length of tail (LT)	128	142	142-151
Hind foot length	14	13	14-16
Ear	-	16	15-17
Condylal-basal length	21.36	22	23.2-23.8
Length of upper molars (M1-M4)	4.6	4.9	4.8-5.1
Length of M1-M3	4.1	4.2	4.2-4.4
Palatal breadth	7.1	7.0	6.9-7.7
Palatal length	11.7	11.9	12.6-12.9
Least interorbital breadth	4.2	4.2	4.2- 4.2
Zygomatic breadth	12.7	12.8	13.4-14.0
HBL/LT	1.77	1.89	1.64-1.87

Fig. 2. Live-caught *Gracilinanus emiliae* specimen from Araguaina, Tocantins, Brazil.



August, 2013. This is an adult individual (third upper premolar fully erupted) and was released, although its description refers clearly to *G. emiliae*: a very small murine opossum with smooth adult pelage; a narrow midrostral streak of pure orange fur contrasting with a unruffled reddish brown dorsal fur, and a tail distinctly much longer than the head-and-body (Fig. 2).

This record from Tocantins represents the southeastern limit of the geographic range of *G. emiliae* (Fig. 3), an extension of approximately 610 km toward the southeastern limit of Amazonia, near a transitional area between Amazonia and Cerrado. Additionally, the record from Fordlândia further reinforce

the apparent presence of *G. emiliae* at primary lowland rainforest, and its probably occurrence throughout most of the Amazon basin. Patton and Costa (2003) have suggested that *Gracilinanus* is absent from the Central Ama-

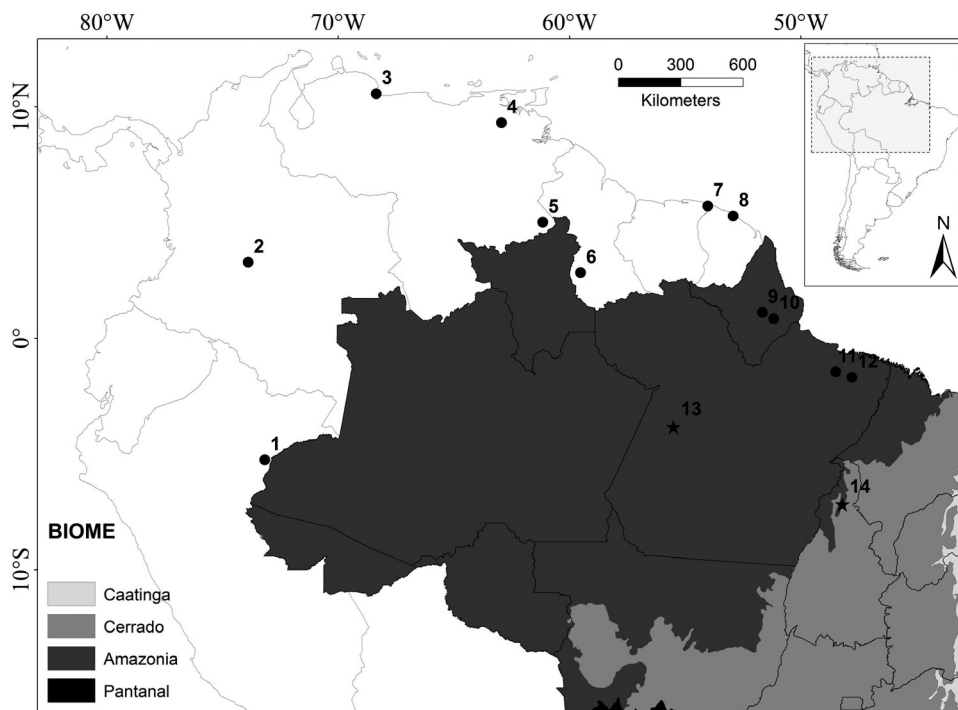


Fig. 3. Recording localities for *Gracilinanus emiliae*: (1) Nuevo San Juan, Loreto, Peru; (2) Los Micos, Meta, Colombia; (3) Falcón, Venezuela; (4) Hato Mata de Bejuco, Monagas, Venezuela; (5) San Ignacio de Yuruaní, Bolívar, Venezuela; (6) Dadanawa, Upper Takutu-Upper Essequibo, Guyana; (7) Langamankondre, Marowijne, Suriname; (8) Paracou, French Guiana; (9) Igarape do Braço, FLONA Amapá, Amapá, Brazil; (10) Araguari River, Ferreira Gomes, Amapá, Brazil; (11) Belém, Para, Brazil (type locality); (12) Capim, Para, Brazil; (13) Fordlândia, Pará, Brazil; (14) Araguaina, Tocantins, Brazil. Compiled from Voss et al. (2009) and Silva et al. (2013); the stars indicate the new localities reported in this study.

zon basin, and while none of the new records presented here contradicted this hypothesis, the record from Fordlândia does represent an approximation to the central basin. In addition, the spatial distribution of the known records, which stretch from Peru in the west to French Guiana in the northeast and Tocantins in the southeast, suggests that *G. emiliae* is widely dispersed throughout the basin.

Overall, the distribution pattern of *Gracilinanus* species indicates that the radiation of the genus was closely related to the distribution of forest formations in South America. Based on our current knowledge of the geographic range of *G. emiliae*, we believe that this and other *Gracilinanus* species may prove to occur not only in the central Amazon basin, but also in other poorly investigated forest areas of South America. The results of the present study further reinforce the paucity of our current knowledge on the diversity of Neotropical marsupials, and highlight the need for new inventories, especially in the central and western Amazon basin.

Acknowledgments. The authors thank the curator, Mario de Vivo, and staff member, Juliana Gualda-Barros, for access to the specimens of the MZUSP Mammal Collection; to Stephen Francis Ferrari for the careful review of the manuscript; to Sergio Solari and one anonymous reviewer for advices on a previous version of the manuscript and to Ana Paula Carmignotto for advices and unpublished *Cryptonanus* information. Part of this work was supported through grants from Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP – 2010/03969-4). PAR thanks CNPq for research stipends (501701/2013-3).

LITERATURE CITED

- BRITO D, D ASTUA, D LEW, P SORIANO, and L MMONS. 2008. *Gracilinanus emiliae*, in: IUCN 2013 IUCN Red List of Threatened Species Version 2013.2 <www.iucnredlist.org> Downloaded on 02 April 2014.
- CARVALHO BA, LFB OLIVEIRA, AP NUNES, and MS MATTEVI. 2002. Karyotypes of nineteen marsupial species from Brazil. *Journal of Mammalogy* 83:58-70.
- CHIARELLO AG, LMS AGUIAR, R CERQUEIRA, FR MELO, FHG RODRIGUES, and VMF SILVA. 2008. Mamíferos Ameaçados de Extinção no Brasil. Pp. 680-880, in: Livro Vermelho da Fauna Brasileira Ameaçada de Extinção (ABM Machado, GM Drummond, and AP Paglia, eds.). MMA, Brasília, Fundação Biodiversitas, Belo Horizonte, Biodiversidade.
- COSTA LP, YLR LEITE, and JL PATTON. 2003. Phylogeography and systematic notes on two species of gracile mouse opossums, genus *Gracilinanus* (Marsupialia, Didelphidae). *Proceedings of the Biological Society of Washington* 116:275-292.
- CREIGHTON GK and AL GARDNER. 2008. Genus *Gracilinanus* Gardner and Creighton, 1989. Pp. 43-50, in: *Mammals of South America, Volume 1: Marsupials, Xenarthrans, Shrews and Bats* (AL Gardner, ed.). The University of Chicago Press, Chicago.
- FARIA MB, FF NASCIMENTO, JA OLIVEIRA, and CR BONVICINO. 2013. Biogeographic determinants of genetic diversification in the mouse opossum *Gracilinanus agilis* (Didelphimorphia: Didelphidae). *Journal of Heredity* 104:613-626.
- GEISE L and D ASTUA. 2009. Distribution extension and sympatric occurrence of *Gracilinanus agilis* and *G. microtarsus* (Didelphimorphia, Didelphidae), with cytogenetic notes. *Biota Neotropica* (Online Edição em Inglês) 9:269-276.
- GUÉDES, PG, SSP DA SILVA, AR CAMARDELLA, MFG DE ABREU, DM BORGES-NOJOSA, JAG DA SILVA, and AA SILVA. 2000. Diversidade de mamíferos do Parque Nacional de Ubajara (Ceará, Brasil). *Mastozoologia Neotropical* 7:95-100.
- GURGEL FILHO NM and A LANGGUTH. In press. Pequenos Mamíferos do Ceará (Didelphimorphia, Chiroptera e Rodentia). *Revista Nordestina de Biologia*.
- LOSS A, LP COSTA, and YRL LEITE. 2011. Geographic variation, phylogeny and systematic status of *Gracilinanus microtarsus* (Mammalia: Didelphimorphia: Didelphidae). *Zootaxa* 2761:1-33.
- PATTON JL and LP COSTA. 2003. Molecular phylogeography and species limits in rainforest didelphid marsupials of South America. Pp. 63-81, in: *Predators with pouches: The biology of carnivorous marsupials* (ME Jones, CR Dickman, and M Archer, eds.). CSIRO Press, Melbourne.
- PEREIRA NP, K VENTURA, MCS JÚNIOR, DM SILVA, Y YONENAGA-YASSUDA, and KCM PELLEGRINO. 2008. Karyotype characterization and nucleolar organizer regions of marsupial species (Didelphidae) from areas of Cerrado and Atlantic Forest in Brazil. *Genetics and Molecular Biology* 31:887-892.
- SILVA CR, ACM MARTINS, IJ CASTRO, E BERNARD, EM CARDOSO, D SANTOS LIMA, R GREGORIN, RV ROSSI, AR PERCEQUILLO, and KC CASTRO. 2013. *Mammals of Amapá State, Eastern Brazilian Amazonia: A revised taxonomic list with comments on species distributions*. *Mammalia* 77:1-16.
- VOSS RS and SA JANSÁ. 2009. Phylogenetic relationships and classification of didelphid marsupials, an extant radiation of New World metatherian mammals. *Bulletin of the American Museum of Natural History* 322:1-177.
- VOSS RS, DW FLECK, and SA JANSÁ. 2009. On the diagnostic characters, ecogeographic distribution, and phylogenetic relationships of *Gracilinanus emiliae* (Didelphimorphia: Didelphidae: Thylamyini). *Mastozoologia Neotropical* 16:433-443.

VOSS RS, DP LUNDE, and SA JANSA. 2005. On the contents of *Gracilinanus* Gardner and Creighton, 1989, with the description of a previously unrecognized clade of small didelphid marsupials. American Museum Novitates 3482:1-34.

VOSS RS, DP LUNDE and NB SIMMONS 2001 The mammals of Paracou, French Guiana: a Neotropical rainforest fauna Part 1 Nonvolant species. Bulletin of the American Museum of Natural History 263:1-236.