

# New records of *Marmosops noctivagus* (Tschudi, 1845) (Didelphimorphia: Didelphidae) and first record of *Marmosops bishopi* (Pine, 1981) for Colombia

Juan F. Díaz-N

University of Minnesota, Department of Ecology, Evolution and Behavior; and J.F. Bell Museum of Natural History. 100 Ecology Building, 1987 Upper Buford Circle. St. Paul, MN 55108, USA.  
Universidad de Antioquia, Instituto de Biología, Colección Teriológica – CTUA, AA1226. Medellín, Colombia.  
E-mail: [diaz0154@umn.edu](mailto:diaz0154@umn.edu)

**ABSTRACT:** Based on newly material from the Department of Putumayo and material collected in 1951 by Phillip Hershkovitz, the presence of *Marmosops noctivagus* is confirmed in at least three localities for Colombia. Additionally, the first record of *M. bishopi* is presented for Colombia extending its distribution by 750 Km northward.

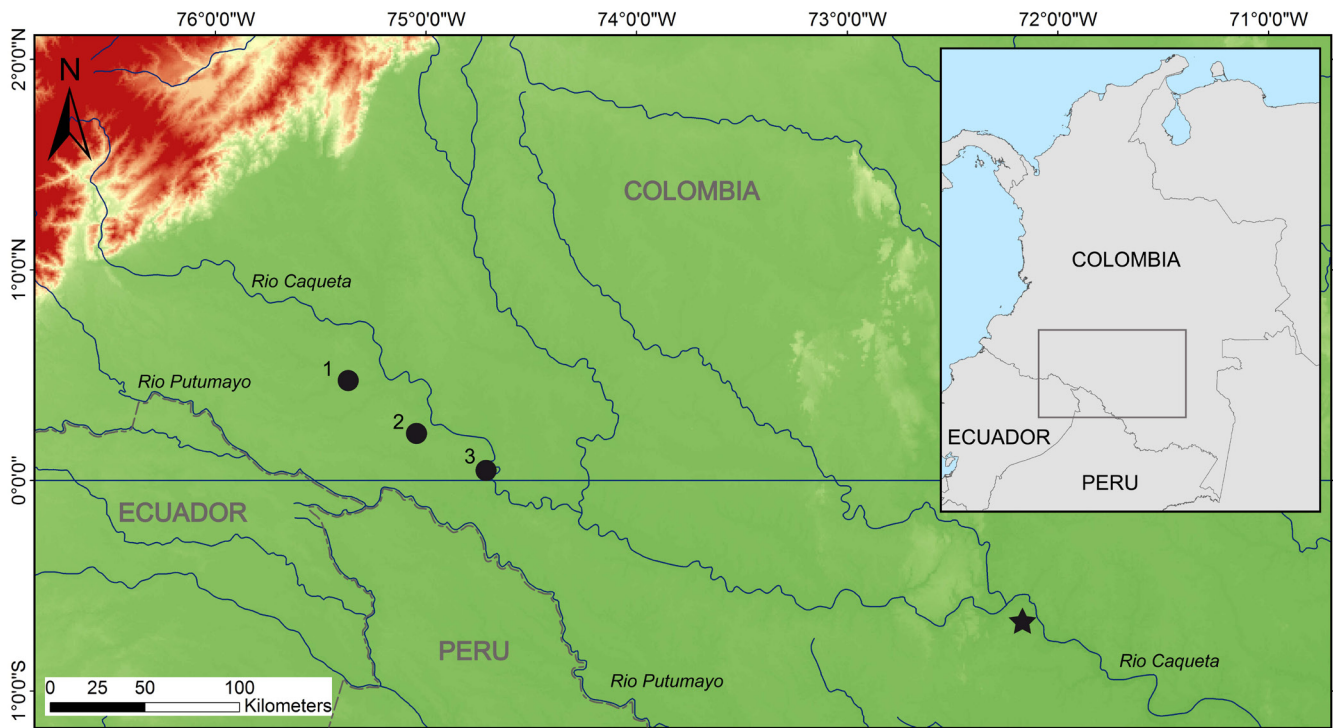
The genus *Marmosops* is comprised of small-bodied marsupials of the family Didelphidae widely distributed in the humid forests of the Neotropics ranging from Panama to south of Brazil and Bolivia (Emmons and Feer 1997; Gardner and Creighton 2008). Several revisionary studies using molecular and morphological data have been recently developed to clarify the species limits within different genera of didelphid marsupials (*e.g.* Giarla *et al.* 2010; Gutiérrez *et al.* 2010; Rossi *et al.* 2010); nonetheless, the genus *Marmosops* has been absent from such revisions and remains taxonomically problematic. As a consequence, a significant fraction of the specimens deposited in scientific collections are either misidentified as species of other genera or lumped into polytypic species with suspiciously large distributions. Herein, new records of *Marmosops noctivagus* for Colombia are presented based on both misidentified material and positively identified material vaguely mentioned in the literature. Additionally, the first record of *Marmosops bishopi* for Colombia is presented based on a misidentified museum specimen.

The following morphological descriptions are based on adult specimens (*sensu* Voss *et al.* 2001) and follow the terminology described by Voss and Jansa (2003; 2009), Rossi *et al.* (2010) and Díaz-N *et al.* (2011). Measurements were taken with a digital caliper to the nearest 0.01 mm following Voss *et al.* (2004). The specimens herein described are deposited at the Field Museum of Natural History, Chicago (FMNH), and the Instituto de Ciencias Naturales, Bogotá (ICN). Identification of the material at the genus-level follows Voss and Jansa (2009). Due to the old and vague original description of the species (Tschudi 1845) and the apparent absence of a type specimen (Tate 1933), the species-level identification of *Marmosops noctivagus* can be contentious. Consequently, for the purposes of this note I will follow the description of *M. noctivagus* given by Voss *et al.* (2004) and Voss and Jansa (2009). The identification of material herein referred to as *M. bishopi* follows the descriptions of Pine (1981) and Voss

*et al.* (2001; 2004).

***Marmosops noctivagus.*** Phillip Hershkovitz (1992) published a taxonomic revision of Neotropical marsupials of the genus *Gracilinanus*, where he included—for comparison purposes—information of other genera of small opossums (Hershkovitz 1992; table 4). Among the species he used for comparison was *Marmosops noctivagus*, with reference to 15 individuals he collected in 1951 in the Southern lowlands of Colombia (Hershkovitz's field notes). These specimens were deposited at the Field Museum of Natural History, Chicago (FMNH). Prior to his publication (Hershkovitz 1992) all known records of *M. noctivagus* were from south of Río Putumayo; therefore, the species was presumably absent from Colombia (Tate 1933; Cabrera 1958; Eisenberg 1989; but see Cuervo-Díaz *et al.* 1986). Despite Hershkovitz' collections, all subsequent works dealing with the distribution of *M. noctivagus* did not consider the Colombian specimens (*e.g.* Gardner 1993; Emmons and Feer 1997; Alberico *et al.* 2000; Brown 2004; Gardner 2005; Gardner and Creighton 2008). The present records—based on Hershkovitz' s material and on two specimens deposited at the ICN misidentified as *Marmosa murina* (see Polanco-Ochoa *et al.*, 1999)—corroborate the presence of *M. noctivagus* in Colombian territory in at least three localities (Figure 1).

**Description of Colombian material** (Figure 2): As for the species, these are large specimens in external and cranio-dental measurements (Table 1). Dorsally, these specimens are covered by chestnut-brown to dark chestnut-brown hairs. The ocular mask is black and contrast with the dorsal coloration. Lateral hairs are lighter, marking a transition between the dark dorsum and the white venter. The venter is entirely covered by a continuous band—from chin to anus—of self-colored white or buff hairs that extend to the anterior and posterior limbs. No trace of a band of gray-based hairs bordering the self-colored hairs is present. Only one female (FMNH 70961) from Putumayo shows a yellowish (not reddish or rusty as other *Marmosops*



**FIGURE 1.** Localities of the material on which the present report is based. Circles represent *Marmosops noctivagus* localities as follows: Río Mesay (1), La Paya (2), and Tres Troncos (3). The star corresponds to *M. bishopi* locality at Vereda Peña Roja. Dashed line demarks country boundaries. For complete locality data see material examined in the text.

species) coloration in the mammary area, and all other females—which are old enough to have pigmented mammary areas—do not present any distinctive coloration (FMNH 70957, 70959, 70960). Testes in males are unpigmented and covered by white hairs. A stripe of brown hairs extend to the dorsal surface of the manus, which is otherwise mainly covered by white self-colored hairs; pes are completely covered by self-colored white hairs that do not contrast with the digits. The forearm has single ulnar antebrachial vibrissae. Tail is long, bicolored (darker dorsally, paler ventrally), but never parti-colored (although some *M. noctivagus* specimens may exhibit parti-colored tails, as observed by Voss *et al.* 2004). Males have robust blade-like lateral carpal tubercles, females do not have lateral carpal tubercles, and both sexes consistently lack medial carpal tubercles.

The skull has a particularly long rostrum. Nasals are expanded at the maxillo-frontal suture. Frontals have well-developed supraorbital ridges, but there is no trace of laterally projecting postorbital processes. The supraorbital ridges extend posteriorly into the braincase to form well-developed temporal crests that connect (in some specimens more conspicuously than in others) with the lamboidal crest. Both the supraorbital ridges and temporal crests are more-or-less subparallel; however, some old male specimens have supraorbital ridges that tend to converge posteriorly (*e.g.* ICN14466, FMNH70946). As in most small didelphids, the degree of ossification of the supraorbital ridges and temporal crests is correlated with age and sex, old males having the highest ossification and females with the lowest. The palate has incisive foramina, maxillopalatine fenestrae, palatine fenestrae, and posterolateral palatal vacuities but lacks maxillary fenestrae. The palatine fenestrae are small and there are usually two on each side (but more can

be found). The posterolateral palatal foramina are small, oval and usually do not reach M4. The fenestrae between squamosal and parietal can be either present or absent (as described by Voss and Jansa 2009). Subsquamosal fenestrae are small and rounded; therefore, the only visible area of the petrosal bone is the sulcus of prootic sinus. The auditory bullae are small, conical, and laterally compressed. Dentally, upper canines are robust, large (3 to 4 times longer than P1), and lack accessory cusps. The size of C1 is also correlated with age and sex (adult males have the largest canines and females have the smallest). Upper third molar (M3) consistently lacks anterior cingulum. In the lower tooth row c1, p2 and p3 are almost subequal in height (the canine can be slightly taller) and p1 is half (or a third) the size of c1. Lower canines are large and without posterior cusp in males; females have smaller canines and tend to develop small posterior cusps.

**Material examined:** COLOMBIA. Departamento Putumayo, La Tagua, Tres Troncos, Río Caquetá (0°08' N, 74°41' W; ca.150 m) (geographic coordinates from Instituto Geográfico Agustín Codazzi 2002): FMNH70946 (Adult male), FMNH70947 (Adult male), FMNH70948 (Juvenile male), FMNH70949 (Adult male), FMNH70950 (Juvenile male), FMNH70951 (Subadult male), FMNH70952 (Adult male), FMNH70957 (Adult female), FMNH70958 (Adult female), FMNH70959 (Adult female), FMNH70960 (Adult female). Departamento Putumayo, San Antonio, Río Mecaya (0°28' N, 75°20' W; 185 m) (geographic coordinates from Paynter 1997): FMNH70953 (Juvenile male), FMNH70954 (Adult male), FMNH70955 (Juvenile male). Departamento Putumayo, Puerto Leguizamo, Vereda El Guadual, Finca de Pablo Aguirre, Lomas 1, Vega Río Caucaýá, PNN La Paya (0°16' N, 75°1.2' W; ca. 200m) (geographic coordinates from Instituto Geográfico Agustín Codazzi 2002): ICN14465 (Adult male), ICN14466 (Adult male).

**TABLE 1.** Measurements (average and range) of Colombian material of *Marmosops noctivagus* and *M. bishopi*. Description of measurements and abbreviations follow Voss *et al.* (2004).

	<i>Marmosops noctivagus</i>				<i>Marmosops bishopi</i>
	Males (N=7)		Females (N=5)		Male (N=1)
HBL	148.00	(140 - 170)	138.80	(130 - 145)	93.00
LT	177.60	(148 - 200)	175.40	(170 - 186)	148.00
HF	19.40	(16 - 21)	19.40	(18 - 20)	19.00
Ear	22.75	(21 - 25)	22.20	(21 - 24)	18.00
CBL	39.02	(35.57 - 42.57)	37.41	(37.17 - 37.64)	-
NB	4.84	(4.60 - 5.25)	4.37	(4.27 - 4.50)	3.71
LIB	6.59	(6.16 - 7.51)	6.29	(6.11 - 6.43)	5.77
ZB	19.58	(18.53 - 21.95)	18.85	(18.20 - 19.24)	14.37
PL	22.54	(20.36 - 24.59)	20.86	(19.83 - 21.85)	15.74
PB	11.63	(10.32 - 12.19)	11.56	(11.18 - 11.86)	8.39
MTR	15.94	(13.85 - 16.67)	15.24	(14.85 - 15.79)	11.33
LM	7.85	(6.64 - 8.15)	7.65	(7.57 - 7.76)	5.63
M1-M3	6.88	(5.83 - 6.96)	6.62	(6.54 - 6.80)	5.08
WM4	2.73	(2.31 - 2.88)	2.73	(2.54 - 3.05)	1.93
Weight	66.50	(48 - 85)	-	-	24.10

**FIGURE 2.** Skull and mandible of adult male *Marmosops noctivagus* (ICN14466) from Departamento Putumayo, Colombia. Scale bar = 10 mm.

***Marmosops bishopi*.** The species is known to occur in western Brazilian Amazon, lowlands and eastern slopes of the Andes of Peru and Bolivia (Gardner and Creighton 2008). The northernmost published record of the species is for Barro Vermelho, Brazil (Patton *et al.* 2000; Gardner and Creighton 2008). The present description—based on a single adult male (ICN18338) erroneously labeled as *Marmosops parvidens* from the Colombian Amazon—extends the known distribution of the species by ca. 750 Km northward.

**Description of Colombian material** (Figure 3): Although some external and cranio-dental measurements of ICN18338 (Table 1) can be larger than those of Bolivian populations (see Voss *et al.* 2004) the morphology corresponds otherwise to what is described for the species. The specimen has chestnut brown dorsal hairs, darker in the midline of the dorsum, paler on the sides and on the head between the black ocular masks. There is a continuous broad band—almost, but not as wide as the venter—of self-colored white hairs extending from chin to anus bordered by a narrow band of gray-based hairs. Self-colored white hairs are also present around the lips, ventrally on the fore and hind limbs, and cover the white scrotal epithelium. Manus and pes are dorsally covered by self-colored white hairs that do not contrast with the digits. The forearm has two ulnar antebrachial vibrissae (distal and proximal). The tail is dark and sharply bicolored. Blade-like lateral carpal tubercles are present, and medial carpal tubercles are absent.

The skull has nasals that expand at the maxillo-frontal suture. Frontals and parietals tend to be rounded (no trace of laterally projecting postorbital processes) with only a faint development of suborbital ridges and temporal crests. The palate has short and narrow maxillopalatine fenestrae (only extending from mid-P3 to M2 metacone), lacks palatine and maxillary fenestrae, and the posterolateral palatal foramina are small, ovale, slightly visible in ventral view, and do not reach M4. Subsquamosal fenestrae are anteroposteriorly elongated exposing a large area of the petrosal bone that includes the sulcus of prootic sinus (Díaz-N *et al.* 2011, Figure 6B). The auditory



bullae have some degree of lateral constriction. Dentally, the upper canines have posterior accessory cusps, and the third upper molar (M3) has a narrow, but nonetheless present, anterior cingulum. The lower canine (c1) has a small posterior cusp and is subequal in height to p1. Lower second premolar (p2) can be twice as high as p1.



**FIGURE 3.** Skull and mandible of adult male *Marmosops bishopi* (ICN18338) from Departamento Amazonas, Colombia. Scale bar = 10 mm.

Material of *Marmosops bishopi* is often misidentified as *M. parvidens*, a species mainly distributed in French Guiana, Guyana, Surinam, northern Brazil, and some isolated populations on the North of the Andes (Gardner and Creighton 2008). Given that useful characters for identifying these species might be sexually dimorphic and because the present report is based on a male *M. bishopi*, the characters presented for distinguishing these two species are only based on male specimens. The following characters of *M. parvidens* are based on what is reported for material mainly from the Guiana (Voss et al. 2001). Male *M. bishopi* can be easily distinguished from males of

*M. parvidens* by the presence of blade-like lateral carpal tubercles and a single posterior accessory cusp in the upper canines; by contrast, *M. parvidens* has spoon-shaped lateral carpal tubercles and both anterior and posterior accessory cusps in the upper canines (Voss et al. 2001).

**Material examined:** COLOMBIA. Departamento Amazonas, Leticia, Vereda Peña Roja (0°41.3' S, 72°08' W; 300m) (geographic coordinates from Instituto Geográfico Agustín Codazzi 2002): ICN18338 (Adult male).

Before the present records, Río Putumayo could have been hypothesized as a barrier to the northward dispersion of the two species included in this report. Although large rivers can be notorious barriers for the dispersion of some mammal species in the Amazon (Wallace 1852; Hershkovitz 1977), and some might even prevent genetic flow promoting diversification (Ayers and Clutton-Brock 1992; da Silva and Patton 1998), Río Putumayo does not seem to have such properties. For instance, recent work has shown that populations of other small opossums occur north and south of Putumayo River (Rossi et al. 2010; Voss et al. 2009) and that some Amazonian tributaries do not appear to be important barriers as initially hypothesized (Gascon et al. 2000; Patton et al. 2000). The scarcity of records of these species (and almost certainly many others) in the Colombian Amazon is more likely to be related to a lack of sampling in this region. As shown by other authors (Voss and Emmons 1996) the northwestern quadrant of the Amazon is the least explored area within the Amazon basin and is therefore in urgent need of sampling.

**ACKNOWLEDGMENTS:** I extend my gratitude to the curators and staff who allowed me access to museum facilities and specimens under their care: Bruce D. Patterson and William T. Stanley at FMNH, and Hugo López-Arevalo, Miguel Rodríguez-López, and Catalina Cárdenas at ICN. I also want to thank Rogério Vieira Rossi for his helpful comments that improved the quality of this manuscript, and to the subject Editor for his help during this process. Carolina Rivera Alvarez provided assistance with image digitalization of Figures 2 and 3.

#### LITERATURE CITED

- Alberico, M., A. Cadena, J. Hernández-Camacho, Y. Muñoz-Saba. 2000. Mamíferos (Synapsida: Theria) de Colombia. *Biota Colombiana* 1: 43–75.
- Brown, B.E. 2004. *Atlas of new world marsupials*. Fieldiana Zoology. New Series 102.
- Cabrera, A. 1958 [Dated 1957]. Catálogo de los mamíferos de América del Sur [parte 1]. *Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia"* (Ciencias Zoológicas) 4: 1–307.
- Cuervo-Díaz, A., J. Hernández-Camacho, A. Cadena-C. 1986. Lista actualizada de los mamíferos de Colombia: anotaciones sobre su distribución. *Caldasia* 15: 471–501.
- Díaz-N, J.F., M. Gómez-Laverde, C. Sánchez-Giraldo. 2011. Rediscovery and redescription of *Marmosops handleyi* (Pine, 1981) (Didelphimorphia: Didelphidae), the least known Andean Slender Mouse Opossum. *Mastozoología Neotropical* 18(1): 45–61.
- Eisenberg, J.F. 1989. *Mammals of the Neotropics, volume 1: Panama, Colombia, Venezuela, Guyana, Suriname, French Guiana*. Chicago: University of Chicago Press.
- Emmons, L.H. and Feer. 1997. *Neotropical rainforest mammals, second edition*. Chicago: University of Chicago Press.
- Gardner, A.L. 1993. Order Didelphimorphia; p. 15–23 In D.E. Wilson and D.M. Reeder (ed.). *Mammal species of the world*. Second edition. Washington DC: Smithsonian Institution Press.
- Gardner, A.L. 2005. Order Didelphimorphia; p. 3–18 In D.E. Wilson and D.M. Reeder (ed.). *Mammal species of the world*. Third edition. Washington DC: Smithsonian Institution Press.
- Gardner, A.L. and G.K. Creighton. 2008. Genus *Marmosops*; p. 61–74 In A.L. Gardner (ed.). *Mammals of South America. Volume 1: Marsupials, xenarthrans, shrews, and bats*. Chicago: University of Chicago Press.

- Gascon, C., J.R. Malcolm, J.L. Patton, M.N. F. da Silva, J.P. Bogart, S.C. Lougheed, C.A. Peres, S. Neckel and P.T. Boag. 2000. Riverine barriers and the geographic distribution of Amazonian species. *Proceedings of the National Academy of Sciences of the United States of America* 97(25): 13672–13677.
- Giarla, T.C., R.S. Voss and S.A. Jansa. 2010. Species limits and phylogenetic relationships in the didelphid marsupial genus *Thylamys* based on mitochondrial DNA sequences and morphology. *Bulletin of the American Museum of Natural History* 346: 1–67.
- Gutiérrez, E.E., S.A. Jansa and R.S. Voss. 2010. Molecular Systematics of Mouse Opossums (Didelphidae: *Marmosa*): Assessing Species Limits using Mitochondrial DNA Sequences, with Comments on Phylogenetic Relationships and Biogeography. *American Museum Novitates* 3692: 1–22.
- Hershkovitz, P. 1977. *Living New World Monkeys (Platyrrhini) with an Introduction to Primates*. Volume 1. Chicago: University of Chicago Press.
- Hershkovitz, P. 1992. The South American gracile mouse opossums, genus *Gracilinanus* Gardner and Creighton, 1989 Marmosidae, Marsupialia): a taxonomic review with notes on general morphology and relationships. *Fieldiana Zoology. New series* 39: 1–56.
- Instituto Geográfico Agustín Codazzi. 2002. *Atlas de Colombia*. Quinta Ed. Rev. Bogotá: Imprenta Nacional de Colombia.
- Patton, J.L., M.N.F. Da Silva and J.R. Malcolm. 2000. Mammals of the rio Juruá and the evolutionary and ecological diversification of Amazonia. *Bulletin of the American Museum of Natural History* 244: 1–172.
- Pine, R.H. 1981. Reviews of the mouse opossums *Marmosa parvidens* Tate and *Marmosa invicta* Goldman (Mammalia: Marsupialia: Didelphidae) with description of a new species. *Mammalia* 45: 55–70.
- Polanco-Ochoa, R.P., Jaimes V. and W. Piragua. 1999. Los mamíferos del Parque Nacional Natural La Paya, amazonia colombiana. *Revista de la Academia Colombiana de Ciencias* 23 (Suplemento especial): 671–682.
- Rossi, R.V., R.S. Voss and D.P. Lunde. 2010. A revision of the didelphid marsupial genus *Marmosa*. Part 1. The species in Tate's 'mexicana' and 'mitis' sections and other closely related forms. *Bulletin of the American Museum of Natural History* 334: 1–83.
- Sherborn, C.D. 1922. *Index animalium*. London: British Museum (Natural History). [section 2, part 1].
- Tate, G.H.H. 1933. A systematic revision of the marsupial genus *Marmosa*, with a discussion of the adaptive radiation of the murine opossums (*Marmosa*). *Bulletin of the American Museum of Natural History* 66: 1–250 + 26 láminas.
- Tribe, C.J. 1990. Dental age classes in *Marmosa incana* and other didelphoids. *Journal of Mammalogy* 71: 566–569.
- Tschudi, J.J. von. 1845. *Untersuchungen über die Fauna Peruana*. St. Gallen: Scheitlin und Zollikofer. [see Sherborn, 1922: cxxiv for publication dates]
- Voss, R.S. and L.E. Emmons. 1996. Mammalian diversity in neotropical lowland rainforests: a preliminary assessment. *Bulletin of the American Museum of Natural History* 230: 1–115.
- Voss, R.S., D.P. Lunde and N.B. Simmons. 2001. The mammals of Paracou, French Guiana: a neotropical lowland rainforest fauna, part 2. Nonvolant species. *Bulletin of the American Museum of Natural History* 263: 1–236.
- Voss, R.S. and S.A. Jansa. 2003. Phylogenetic studies on didelphid marsupials II. Nonmolecular data and new IRBP sequences: separate and combined analyses of didelphine relationships with denser taxon sampling. *Bulletin of the American Museum of Natural History* 276: 1–82.
- Voss, R.S., T. Tarifa and E. Yensen. 2004. An introduction to *Marmosops* (Marsupialia: Didelphidae), with the description of a new species from Bolivia and notes on the taxonomy and distribution of other Bolivian forms. *American Museum Novitates* 3466: 1–40.
- Voss, R.S. and S.A. Jansa. 2009. Phylogenetic relationship 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, R.S., D.W. Fleck and S.A. Jansa. 2009. On the diagnostic characters, ecogeographic distribution, and phylogenetic relationships of *Gracilinanus emiliae* (Didelphimorphia: Didelphidae: Thylamyini). *Mastozoología Neotropical* 16(2): 433–443.
- Wallace, A.R. 1852. On the Monkeys of the Amazon. *Proceedings of the Zoological Society of London* 20: 107–110.

RECEIVED: May 2012

ACCEPTED: July 2012

PUBLISHED ONLINE: August 2012

EDITORIAL RESPONSIBILITY: Fabio Oliveira do Nascimento