

## *Bradypus torquatus* (Pilosa: Bradypodidae)

VIRGINIA HAYSSEN

Department of Biology, Smith College, Northampton, MA 01063, USA; vhayssen@email.smith.edu

**Abstract:** *Bradypus torquatus* Illiger, 1811 is a three-toed sloth commonly called the maned three-toed sloth. It is endemic to the Atlantic coastal forests of southeastern Brazil. Occasionally placed in its own genus (*Scaeopus*), the black mane of this three-toed sloth is distinctive. Like other sloths, *B. torquatus* is a high-canopy folivore with a commensal relationship with algae and invertebrates that live in its abundant pelage. *B. torquatus* is an endangered species that does not adapt to captive zoo settings. DOI: 10.1644/829.1

**Key words:** Brazil, commensal, Edentata, edentate, folivory, *Scaeopus*, sloth, Xenarthra

Published 31 March 2009 by the American Society of Mammalogists  
Synonymy completed 15 February 2008

www.mammalogy.org



### *Bradypus torquatus* Illiger, 1811 Maned Three-toed Sloth

*Bradypus didactylus* Linnaeus, 1758:34. Part.

*Br[adypus]. torquatus* Illiger, 1811:109. No type locality, restricted to “the Atlantic drainage of Bahia, Espírito Santo, and Rio de Janeiro,” Brazil (Wetzel and Avila-Pires 1980:834); further restricted to “aos arredores de Salvador, Estado da Bahia, Brasil” (Vaz 2003:3). First use of current name combination.

*Ch[oloepus]. torquatus*: Illiger, 1811:110. Name combination.

*Bradypus* [(*Choloepus*)] *torquatus*: Desmarest, 1816:327. Name combination.

[*Bradypus*] *cristatus* Hamilton-Smith, 1827:278 in Griffith, Hamilton-Smith, and Pidgeon (1827). No type locality; identified as Brazil (Swainson 1835:207).

[*Bradypus*] *melanotis* Swainson, 1835:207. Type locality “Brasil.”

[*Bradypus* [(*Acheus*)]] *Acheus torquatus*: Lesson, 1840:270. Name combination.

*Bradypus crinitus* Gray, 1850:67. Type locality “British Guiana,” now Guyana.

*Bradypus affinis* Gray, 1850:68. Type locality “Tropical America.”

*Hemibradypus mareyi* Anthony, 1907:220. No type locality.

*Hemibradypus torquatus*: Menegaux, 1908:702. Name combination.

*Bradypus* (*Scaeopus*) *torquatus*: Menegaux, 1909:27. Name combination.

*Scaeopus torquatus*: Poche, 1908:569. Name combination.

CONTEXT AND CONTENT. Order Pilosa, suborder Folivora, family Bradypodidae, genus *Bradypus*, subgenus *Scaeopus*. Synonymy is modified from Gardner (2005, 2008). Gray’s



**Fig. 1.**—Mane of an adult male *Bradypus torquatus* from Santa Teresa municipality, state of Espírito Santo, Brazil. Used with permission of the photographer A. Chiarello, who retains the copyright.

(1850) type locality for *Bradypus crinitus* is far north of the current distribution of *B. torquatus* and is probably an error due to incomplete knowledge of the distribution of *B. torquatus* in the mid-1800s (Gardner 2008). *B. torquatus* is monotypic.

**NOMENCLATURAL NOTES.** The generic name, *Bradypus*, is from the Greek for slow-footed. The species name, *torquatus*, is from the Latin for collared (Borrer 1960). Other common names are maned sloth, Atlantic forest maned sloth (Lara-Ruiz and Chiarello 2005), preguiça de coleira, ai-pixuna (Wetzel and de Avila-Pires 1980), par-esseux à collier (Anthony 1953), and bicho preguiça (Oliver and Santos 1991).

### DIAGNOSIS

Male *Bradypus torquatus* lack the middorsal speculum present in male *B. variegatus* (Wetzel 1985). Adults of *B. variegatus* lack the black mane present on adults of *B. torquatus* (Wetzel 1985; Fig. 1). Skulls of *B. torquatus* have inflated pterygoid sinuses (Fig. 2), whereas pterygoids of *B. variegatus* are not inflated (Wetzel 1985).

### GENERAL CHARACTERS

Pelage is uniformly pale brown over body and head except for long, black hairs (the mane) on base of neck that project over the shoulders (Wetzel 1985). Males do not have a speculum. Pterygoid sinuses are inflated (Wetzel 1985). In 2 samples, females were larger than males (mm or g; mean, *SE*, range, *n* [Lara-Ruiz and Chiarello 2005]; total length; mean, *SD*, range, *n* [Pinder 1993], separate tail and head-body length, respectively): females: length of head and body, 680, 1.051, 590–752, 21; 629.8, 31.75, 590–672, 5; length of tail, 47.6, 5.03, 40–52, 5; mass, 6,900, 343, 5,100–10,100, 21; 5,281.7, 655.76, 4,500–6,200, 5; males: length of head and body, 646, 0.776, 620–720, 15; 550.4, 0.89, 550–552, 2; length of tail, 50.8, 1.79, 50–54, 2; mass, 6,150, 274, 4,600–7,500, 15; 4,428, 327.06, 4,050–4,900, 2. Measurements of 2 adults (mm or g) were total length, 500, 540; length of tail, 48, 50; length of hind foot, 100, 115; mass, 3,600, 4,150 (Wetzel 1985).

Greatest length of skull of 10 adults was 77.2 mm (*SD* = 3.2 mm; range = 73.5–84.3 mm; *n* = 10) and length of mandibular spout was 6.1 mm (*SD* = 0.8 mm; range = 4.8–7.1 mm; *n* = 8—Wetzel 1985). Cranial measurements (mm, as illustrated by Anderson and Handley [2001]) of 1 adult female (United States National Museum [USNM] 259473; Fig. 2) were: greatest length of skull, 78.35; posterior zygomatic breadth, 40.83; postorbital breadth, 24.22; length of squamosal process, 27.16; breadth of squamosal process, 4.67; length of maxillary toothrow, 23.43; postpalatal length, 36.49; palatal breadth, 17.34; depth of braincase, 32.51; breadth of antorbital bar, 3.93; length of descending jugal



**Fig. 2.**—Dorsal, ventral, and lateral views of cranium and lateral view of mandible of an adult female *Bradypus torquatus* (United States National Museum 259473). Greatest length of cranium is 78.35 mm.

process, 14.59; diameter of external auditory meatus, 4.98; breadth of ascending mandibular ramus, 19.39. A detailed comparison of a skull of *B. torquatus* with 3 skulls of *Bradypus* (but not *torquatus*) is available (Santos 1977).

Both males and females have a black mane, but those of males are usually larger and darker, especially in the



**Fig. 3.**—Current distribution (brown with hatching) of *Bradypus torquatus* along the southeastern Atlantic coastal area of Brazil (Lara-Ruiz et al. 2008). Historic distribution extends further up the northeastern coast and is not disjunct (Gardner 2008).

middorsum. The mane of females can appear as 2 discontinuous lateral tufts (Lara-Ruiz and Chiarello 2005). Neonates lack the mane of adults (Pinder 1993).

### DISTRIBUTION

*Bradypus torquatus* has a disjunct distribution (Fig. 3) in the Atlantic coastal forests of southeastern Brazil (Lara-Ruiz et al. 2008). The historic distribution extended further north along the coast (from Rio Grande do Norte to Rio de Janeiro) and was not disjunct (Gardner 2008; Wetzel and Avila-Pires 1980). No fossils are known (Patterson and Pascual 1968).

### FORM AND FUNCTION

Hairs of *Bradypus torquatus* have neither a medulla nor pigment granules (Aiello 1985). Individual hairs have transverse cracking that increases with age (Aiello 1985). Algae occur in the transverse cracks of young and middle-aged hair (Aiello 1985). The central portion of teeth of *B. variegatus* is a modified orthodontine with numerous vascular canals and few or no dentinal tubules (Ferigolo 1985). Illustrations of the telencephalon are available (Anthony 1953). Testes are within the abdomen (Lara-Ruiz

and Chiarello 2005). The clitoris resembles a small undeveloped penis (Lara-Ruiz and Chiarello 2005).

### ONTOGENY AND REPRODUCTION

Litter size is 1. The smallest infant captured had remnants of the umbilical cord and weighed 300 g (Lara-Ruiz and Chiarello 2005). Another small infant was 365 g (7% of maternal mass) when captured (Pinder 1993). The heaviest suckling infant was 800 g (Lara-Ruiz and Chiarello 2005). The heaviest juvenile being carried was 1,600 g (Pinder 1993). Infants do not have black manes, and determination of sex for both infants and juveniles by external features is not possible (Lara-Ruiz and Chiarello 2005). Neonates without manes are more camouflaged in their mother's fur (Fig. 4) than are juveniles with developing manes (Pinder 1993).

One copulation was observed in September (Dias et al. 2008). Births may occur year-round (Pinder 1993), but 15 of 20 births were estimated to occur between February and April (Dias et al. 2008), including a female that gave birth in February–March in 5 successive years (Lara-Ruiz and Chiarello 2005). Small neonates have been found with their mothers in April, May, and July (Lara-Ruiz and Chiarello 2005; Pinder 1993). A juvenile was caught in November, and 2 juveniles near weaning were caught in August and December (Pinder 1993).

Neonates eat their 1st solid food at 2 weeks, but suckling continues until 2–4 months; young become independent at 9–11 months (Lara-Ruiz and Chiarello 2005). Growth does not stop at sexual maturity (Lara-Ruiz and Chiarello 2005).

### ECOLOGY AND BEHAVIOR

*Bradypus torquatus* is an arboreal folivore endemic to the Atlantic coastal forests of Brazil (Lara-Ruiz and Chiarello 2005). It is sympatric with *B. variegatus* in the eastern coastal areas of Brazil below 1,500 m in elevation (Oliver and Santos 1991).

Home ranges of 3 animals were 0.5–6 ha (Chiarello 1998a). Mean home-range size is 5.4–5.6 ha (Chiarello 2008). Examination of these data estimates population density at 0.09–1.25 individuals/ha (Chiarello 2008). Distance traveled on average was 24 m over 24 h, 5 m at night and 17 m during the day (Chiarello 1998a).

Percentages of daylight behaviors for 3 animals (observed for 66 days over 14 months) were resting, 60–80%; feeding, 7–17%; moving, 6–17%; and grooming, 1–6% (Chiarello 1998a). Percentage of time feeding was 2 times higher in the dry (19%) than the wet season (9%—Chiarello 1998a). In the Poço das Antas Biological Reserve in Rio de Janeiro, Brazil, *B. torquatus* is nocturnal (Gilmore et al. 2001).



**Fig. 4.**—Face of adult female *Bradypus torquatus* (top) and adult female with infant (bottom), both from Santa Teresa municipality, state of Espírito Santo, Brazil. Used with permission of the photographer A. Chiarello, who retains the copyright.

Leaves from 21 species (16 trees and 5 lianas; 12 families, 15 genera) formed 99% of the diet of 3 animals (Chiarello 1998b), measured as time spent feeding. Single animals ate leaves from 7–12 species, and young leaves were preferred over mature leaves (Chiarello 1998b). Foraging on *Ficus* (Moraceae), *Mandevilla* (Apocynaceae), *Micropholis venulosa* (Sapotaceae), and *Prunus* (Rosaceae) constituted 56% of feeding time (Chiarello 1998b). Individuals are specialist folivores, but *B. torquatus* as a species is a generalist folivore (Chiarello 2008). Diets of individual animals are composed of few plant species, but populations of individuals forage on many species.

Ectoparasites from the pelage of 28 *B. torquatus* included *Cryptosis* (Lepidoptera, a sloth moth) in the

underfur, ticks *Amblyomma varium* and *Boophilus* underneath the thighs, and the coleopteran *Trichilium* in the lower back and thighs (Pinder 1993). Most (83%) of the ticks were male (Pinder 1993).

*Bradypus torquatus* has been successfully translocated (Chiarello et al. 2004). A wild male *B. torquatus* lived at least 12 years (Lara-Ruiz and Chiarello 2005). *B. torquatus* can be tranquilized with a mixture of 1.3 mg/kg ketamine with 0.1 mg/kg acepromazine (Pinder 1993).

## GENETICS

*Bradypus torquatus* has a diploid number ( $2n$ ) of 50 chromosomes and a fundamental number (FN) of 64 with 8 submetacentric or metacentric and 32 acrocentric autosomal pairs. The X chromosome is submetacentric, and the Y chromosome is metacentric (Jorge and Pinder 1990; Pinder 1993). For 19 individuals from 2 regions, a 332-base pair (bp) mitochondrial DNA fragment of the control region yielded 9 haplotypes with 16 polymorphic sites (Moraes-Barros et al. 2006). For 70 animals from 9 regions, a 370-bp mitochondrial DNA fragment from the control region yielded 6 haplotypes with 21 variable sites, and a 632-bp fragment of the cytochrome oxidase subunit yielded 5 haplotypes with 48 variable sites (Lara-Ruiz et al. 2008). Divergent genetic clusters were specific to different geographic regions (Lara-Ruiz et al. 2008). The 16S mitochondrial DNA from 3 *B. variegatus* and 2 *B. torquatus* estimates a split between the lineages 7.7 million years ago (Barros et al. 2003).

## CONSERVATION

*Bradypus torquatus* is listed as endangered by the International Union for the Conservation of Nature (Chiarello et al. 2006) and vulnerable by the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Costa et al. 2005). The main threats are habitat loss, continued population decline (Oliver and Santos 1991), a small geographic range, and the fragmented nature of its habitat (Aguar and Fonseca 2008). Examination of genetic data suggests that the northern and southern distributions should be managed as separate species (Lara-Ruiz et al. 2008).

## ACKNOWLEDGMENTS

A. Keller provided bibliographic support for this account. Photographs of the animal are by A. G. Chiarello. Skull photograph is by D. Fish and T. J. Leach. Map was created by A. Ward. A. G. Chiarello graciously reviewed a draft of the manuscript. Funding was from the Blakeslee Grant for Genetics Research at Smith College.

## LITERATURE CITED

- AGUIAR, J. M., AND G. A. B. FONSECA. 2008. Conservation status of the Xenarthra. Pp. 215–231 in *The biology of the Xenarthra* (S. F. Vizcaino and W. J. Loughry, eds.). University Press of Florida, Gainesville.
- AIELLO, A. 1985. Sloth hair: unanswered questions. Pp. 213–218 in *The evolution and ecology of armadillos, sloths, and vermilinguas* (G. G. Montgomery, ed.). Smithsonian Institution Press, Washington, D.C.
- ANDERSON, R. P., AND C. O. HANDLEY, JR. 2001. A new species of three-toed sloth (Mammalia: Xenarthra) from Panamá, with a review of *Bradypus*. *Proceedings of the Biological Society of Washington* 114:1–33.
- ANTHONY, J. 1953. Morphologie externe du télécéphale dans le genre *Bradypus* L. (Edentata). *Mammalia* 17:149–163.
- ANTHONY, R. 1907. Les affinités des Bradypodidae (Paresseux) et, en particulier, de l'*Hemibradypus Mareyi* Anth. avec les Hapalopsidae du Santacruzien de l'Amérique de Sud. *Comptes Rendus, Academie Sciences, Paris* 144:219–221.
- BARROS, M. C., I. SAMPAIO, AND H. SCHNEIDER. 2003. Phylogenetic analysis of 16S mitochondrial DNA data in sloths and anteaters. *Genetics and Molecular Biology* 26:5–11.
- BORROR, D. J. 1960. *Dictionary of word roots and combining forms*. Mayfield Publishing Company, Mountain View, California.
- CHIARELLO, A. G. 1998a. Activity budgets and ranging patterns of the Atlantic forest maned sloth. *Journal of Zoology (London)* 246:1–10.
- CHIARELLO, A. G. 1998b. Diet of the Atlantic forest maned sloth *Bradypus torquatus* (Xenarthra: Bradypodidae). *Journal of Zoology (London)* 246:11–19.
- CHIARELLO, A. G. 2008. Sloth ecology. An overview of field studies. Pp. 269–280 in *The biology of the Xenarthra* (S. F. Vizcaino and W. J. Loughry, eds.). University Press of Florida, Gainesville.
- CHIARELLO, A. G., D. J. CHIVERS, C. BASSI, M. A. F. MACIEL, L. S. MOREIRA, AND M. BAZZALO. 2004. A translocation experiment for the conservation of maned sloths, *Bradypus torquatus* (Xenarthra, Bradypodidae). *Biological Conservation* 118:421–430.
- CHIARELLO, A. [G.], P. LARA-RUIZ, AND MEMBERS OF THE EDENTATA SPECIALIST GROUP. 2006. *Bradypus torquatus*. 2006 IUCN Red List of threatened species. [www.iucnredlist.org](http://www.iucnredlist.org). (12 March 2007).
- COSTA, L. P., Y. L. R. LEITE, S. L. MENDES, AND A. D. DITCHFIELD. 2005. Mammal conservation in Brazil. *Conservation Biology* 19:672–679.
- DESMAREST, M. A. G. 1816. Bradype, *Bradypus*, Linn.; Erxleben; Cuv.; Illiger, etc.; *Tardigradus*, Brisson; *Choloepus* et *Prochilus*, Illiger. Pp. 319–328 in *Nouveau dictionnaire d'histoire naturelle, appliquée aux arts, à l'agriculture, à l'économie rurale et domestique, à la médecine, etc.* Par une société de naturalistes et d'agriculteurs. Vol. 4. Nouvelle édition. Deterville, Paris, France.
- DIAS, B. B., L. A. D. SANTOS, P. LARA-RUIZ, C. R. CASSANO, L. PINDER, AND A. G. CHIARELLO. 2009. First observation on mating and reproductive seasonality in maned sloths *Bradypus torquatus* (Pilosa: Bradypodidae). *Journal of Ethology* 27:97–103.
- FERIGOLO, J. 1985. Evolutionary trends of the histological pattern in the teeth of Edentata (Xenarthra). *Archives of Oral Biology* 30:71–82.
- GARDNER, A. L. 2005. Order Pilosa. Pp. 100–103 in *Mammal species of the world: a taxonomic and geographic reference* (D. E. Wilson and D. M. Reeder, eds.). 3rd ed. Johns Hopkins University Press, Baltimore, Maryland.
- GARDNER, A. L. 2008. 157–164 in *Mammals of South America*. Vol. 1. Marsupials, xenarthrans, shrews, and bats (A. L. Gardner, ed.). University of Chicago Press, Chicago, Illinois.
- GILMORE, D. P., C. P. DA-COSTA, AND D. P. F. DUARTE. 2001. Sloth biology: an update on their physiological ecology, behavior and role as vectors of arthropods and arboviruses. *Brazilian Journal of Medical and Biological Research* 34:9–25.
- GRAY, J. E. 1850. On the genus *Bradypus* of Linnaeus. *Proceedings of the Zoological Society of London* 17(194):65–73.
- GRIFFITH, E., C. HAMILTON-SMITH, AND E. PIDGEON. 1827. The animal kingdom arranged in conformity with its organization, by the Baron Cuvier, member of the Institute of France, with additional descriptions of all the species hitherto named, and of many not before noticed. The class Mammalia arranged by the Baron Cuvier with specific descriptions. Vol. 3. G. B. Whittaker, London, United Kingdom.
- ILLIGER, J. K. W. 1811. *Prodromus systematis mammalium et avium additis terminis zoographicis utriusque classis, eorumque versione germanica*. C. Salfield, Berlin, Germany.
- JORGE, W., AND L. PINDER. 1990. Chromosome study on the maned sloth *Bradypus torquatus* (Bradypodidae, Xenarthra). *Cytobios* 62:21–25.
- LARA-RUIZ, P., AND A. G. CHIARELLO. 2005. Life-history traits and sexual dimorphism of the Atlantic forest maned sloth *Bradypus torquatus* (Xenarthra: Bradypodidae). *Journal of Zoology (London)* 267:63–73.
- LARA-RUIZ, P., A. G. CHIARELLO, AND F. R. SANTOS. 2008. Extreme population divergence and conservation implications for the rare endangered Atlantic forest sloth, *Bradypus torquatus* (Pilosa: Bradypodidae). *Biological Conservation* 141:1332–1342.
- LESSON, R. P. 1840. *Species des mammifères bimanés et quadrumanes; suite d'un mémoire sur les oryctérotes*. J. B. Baillière, Paris, France.
- LINNAEUS, C. 1758. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. Editio decima, reformata. Vol. 1. Laurentii Salvii, Stockholm, Sweden.
- MENEGAUX, A. 1908. Les genres actuels de la famille des bradypodidés. *Comptes Rendus, Academie Sciences, Paris* 147:701–703.
- MENEGAUX, A. 1909. A propos d'*Hemibradypus mareyi* Anth. = *Bradypus (Scaeoopus) torquatus* (Ill.). *Bulletin de la Societe Zoologique de France* 34:27–32.
- MORAES-BARROS, N., J. A. B. SILVA, C. Y. MIYAKI, AND J. S. MORGANTE. 2006. Comparative phylogeography of the Atlantic forest endemic sloth (*Bradypus torquatus*) and the widespread three-toed sloth (*Bradypus variegatus*) (Bradypodidae, Xenarthra). *Genetica* 126:189–198.
- OLIVER, W. L. R., AND I. B. SANTOS. 1991. Threatened endemic mammals of the Atlantic forest region of south-eastern Brazil. *Special Science Report 4*. Wildlife Preservation Trust, Trinity, Jersey, Channel Islands, British Isles, United Kingdom.
- PATTERSON, B., AND R. PASCUAL. 1968. The fossil mammal fauna of South America. *Quarterly Review of Biology* 43:409–451.
- PINDER, L. 1993. Body measurements, karyotype, and birth frequencies of maned sloth (*Bradypus torquatus*). *Mammalia* 57:43–48.
- POCHE, F. 1908. Über die Anatomie und die systematische Stellung von *Bradypus torquatus* (Ill.). *Zoologischer Anzeiger* 33:567–580.
- SANTOS, T. M. S. 1977. Osteologia craniana de *Bradypus* Linnaeus, 1758 e revalidação do gênero *Scaeoopus* Peters, 1865 (Edentata—Bradypodidae). M.S. thesis, Universidade Federal do Rio Grande do Sul, Porto Alegre City, Brazil.
- SWAINSON, W. 1835. On the natural history and classification of quadrupeds. Longman, Rees, Orme, Brown, Green, and Longman; and John Taylor, London, United Kingdom.
- VAZ, S. M. 2003. A localidade tipo da preguiça-de-coleira, *Bradypus torquatus* Illiger, 1811 (Xenarthra, Bradypodidae). *Edentata* 5:1–4.
- WETZEL, R. M. 1985. The identification and distribution of recent Xenarthra (= Edentata). Pp. 5–21 in *The evolution and ecology of armadillos, sloths, and vermilinguas* (G. G. Montgomery, ed.). Smithsonian Institution Press, Washington, D.C.
- WETZEL, R. M., AND R. D. DE AVILA-PIRES. 1980. Identification and distribution of the Recent sloths of Brazil (Edentata). *Revista Brasileira de Biologia* 40:831–836.

Associate editors of this account were DAVID M. LESLIE, JR., and PAMELA OWEN. Editor was MEREDITH J. HAMILTON.