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Tamandua mexicana (Pilosa: Myrmecophagidae)

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Abstract: *Tamandua mexicana* (Saussure, 1860) is a medium-sized anteater commonly known as the northern tamandua or oso hormiguero. It has an elongated head and is toothless, with a slender and sticky tongue and a prehensile tail. Its fur has a black patch across the back like a vest worn backward against a pale yellow background. It is present from southern Mexico to the northwest Andes in South America; it also lives in many different forested ecosystems including transformed areas. The International Union for Conservation of Nature and Natural Resources classifies *T. mexicana* as "Least Concern" because it has a wide distribution, presumably large population, and because it is represented in protected areas, as well as anthropogenic ecosystems. In some areas local laws protect *T. mexicana* from exploitation and habitat destruction.

Key words: anteater, northern tamandua, prehensile tail, sticky tongue, toothlessness

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Tamandua mexicana (Saussure, 1860)
Northern Tamandua

Myrmecophaga tamandua var. *Mexicana* Saussure, 1860:9. Type locality: "Tabasco," México.

[*Tamandua bivittata*] var. 3. *Opistholeuca* Gray, 1873a:27. Several localities listed, type locality restricted to "Colombia (New Grenada of Gray 1873a)" by Wetzel (1975:104) based on selection as lectotype from the 1st (not 2nd as stated by Wetzel 1975) of the several syntypes listed.

Tamandua tetradactyla var. *leucopygia* Gray, 1873b:469. Nomen nudum.

Myrmecophaga quadridactyla True, 1884:588. Incorrect subsequent spelling (*lapsus*) of *M. tetradactyla*; not *Myremcophaga tetradactyla* Linnaeus, 1758.

Myrmecophaga sellata Cope, 1889:133. Type locality: "Honduras."

T[*amandua*] *sellata*: Trouessart 1898:1121. Name combination.

Tamandua tetradactyla instabilis J. A. Allen, 1904:392. Type locality "Bonda," Magdalena, Colombia.

Tamandua tetradactyla tenuirostris J. A. Allen, 1904:394. Type locality "Passa Nueva, State of Vera Cruz, México."

Tamandua tetradactyla chiriquensis J. A. Allen, 1904:395. Type locality: "Boqueron, Chiriqui, Panamá."

Tamandua tetradactyla mexicana: J. A. Allen, 1906:200. Name combination.

Tamandua tetradactyla punensis J. A. Allen, 1916:85. Type locality: "Puna Island," Guayas, Ecuador.

Tamandua tetradactyla sellata: Goldman, 1920:63, footnote. Name combination.

Tamandua tetradactyla tambensis Lönnberg, 1937:25. Type locality "El Tambo, Cauca, Colombia."

T[*amandua*]. *t*[*etradactyla*]. *Tetradactyla*: Reeve, 1942:300. Part, not *Myrmecophaga tetradactyla* Linnaeus, 1758.

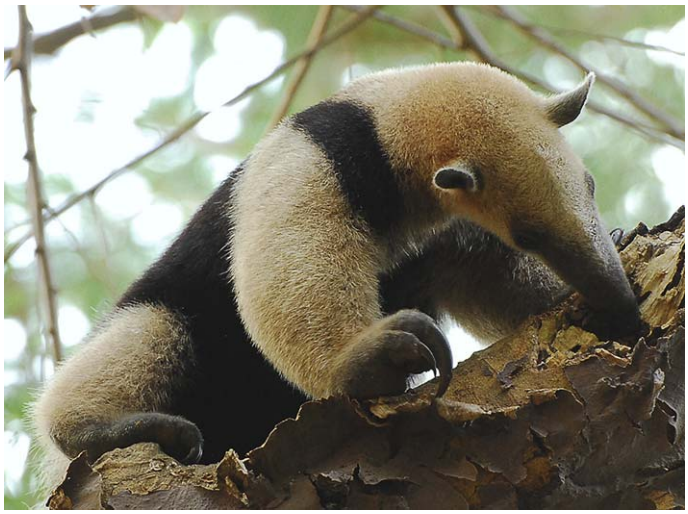

Fig. 1.—An adult male *Tamandua mexicana* from La Ensenada, Costa Rica, 080222. Photograph by Jerry R. Oldenettel used with permission.

Tamandua tetradactyla hesperia Davis, 1955:558. Type locality: "near Acahuizotla, 2800 feet elevation, Guerrero, México."
Tamandua mexicana: Wetzel, 1975:104. First use of current name combination.
T[*amandua*]. *m*[*exicana*]. *chiriquensis*: Wetzel, 1982:350. Name combination.
T[*amandua*]. *m*[*exicana*]. *punensis*: Wetzel, 1982:350. Name combination

Context and Content. Order Pilosa, suborder Vermilingua, family Myrmecophagidae. Synonymy is modified from Gardner (2005) and Gardner and Naples (2007). The genus *Tamandua* includes 2 living species, *T. mexicana* and *T. tetradactyla*, and the following 4 subspecies of *T. mexicana* are recognized (Gardner 2005):

T. m. instabilis J. A. Allen, 1904. See above.
T. m. mexicana (Saussure, 1860). See above; *hesperia* Davis and *tenuirostris* J. A. Allen are synonyms.
T. m. opistholeuca Gray, 1873. See above; *chiriquensis* J. A. Allen, *sellata* Cope, and *tambensis* Lönnberg are synonyms.
T. m. punensis J. A. Allen, 1916. See above.

Nomenclatural Notes. *Tamandua* is from the Brazilian Portuguese term tamandúa that is derived from the yupitaa language and means ants; mundeu means trap, which is an allusion to its feeding habits (Cervantes and Villa 2003). Other vernacular names are (language, country): banded anteater (English, Belize); hormiguero arborícola (Spanish, Central America); oso amarillo, susurete, tamanduá (Spanish, Colombia); oso mielero, perico ligero (Spanish, Honduras); brazo fuerte, oso hormiguero común (Spanish, Mexico); osito hormiguero norteño (Spanish, Peru); osito melero zuliano (Spanish, Venezuela); baakakai, kajkai (Barí, Colombia); sugachu (Kuna, Panama); chab (Mayan, Central America); wingku (Miskito, Nicaragua); kárquin (Tawahka, Honduras): tamanduá-mirim (Portuguese); Nördlicher Tamandua (German); and tamandua mexicain (French—Superina and Aguiar 2006). The molecular clock analyses presented by Delsuc et al. (2004) indicated that within anteaters, the lineages leading to the pygmy anteater (*Cyclopes*) emerged in the middle Eocene around 40 million years ago, whereas *Tamandua* and *Myrmecophaga* lineages diverged 30 million years ago in the late Miocene. Phylogenetic relationships within Xenarthra were established by using Bayesian approaches to DNA sequences. The separation between the 2 genera of anteaters (*Myrmecophaga* and *Tamandua*) was estimated at 10 ± 2 million years ago (Delsuc et al. 2004).

DIAGNOSIS

Tamandua mexicana (Fig. 1) can be distinguished from the southern tamandua (*T. tetradactyla*) by the presence of a large patch across the back, like a vest worn backward, against a pale yellow background, whereas *T. tetradactyla* has fur that varies from uniformly golden, brown or black, to partially or completely black vested (Eisenberg 1989; Eisenberg and Redford 1989; Linares 1998; Lubin 1983; Wetzel 1975). In addition, *T. mexicana* is slightly smaller than *T. tetradactyla*; head and body lengths are approximately 563 mm and 593 mm, and body masses are 3.2–5.4 kg and 3.4–7.0 kg, respectively (Eisenberg 1989; Eisenberg and Redford 1989; Wetzel 1975). Differentiation also can be made based on skull morphology: *T. mexicana* has 4 pairs of orbital foramina and the posterior border of the infraorbital foramen is distinctly crescent shaped; *T. tetradactyla* has 3 pairs of orbital foramina and the posterior border of the infraorbital foramen has an incomplete crescent, with a lateral border distinctly posterior to the medial border (Wetzel 1985). The caudal vertebrae are composed of 40–42 bones in *T. mexicana*, whereas in *T. tetradactyla* the tail has 31–39 bones (Wetzel 1975).

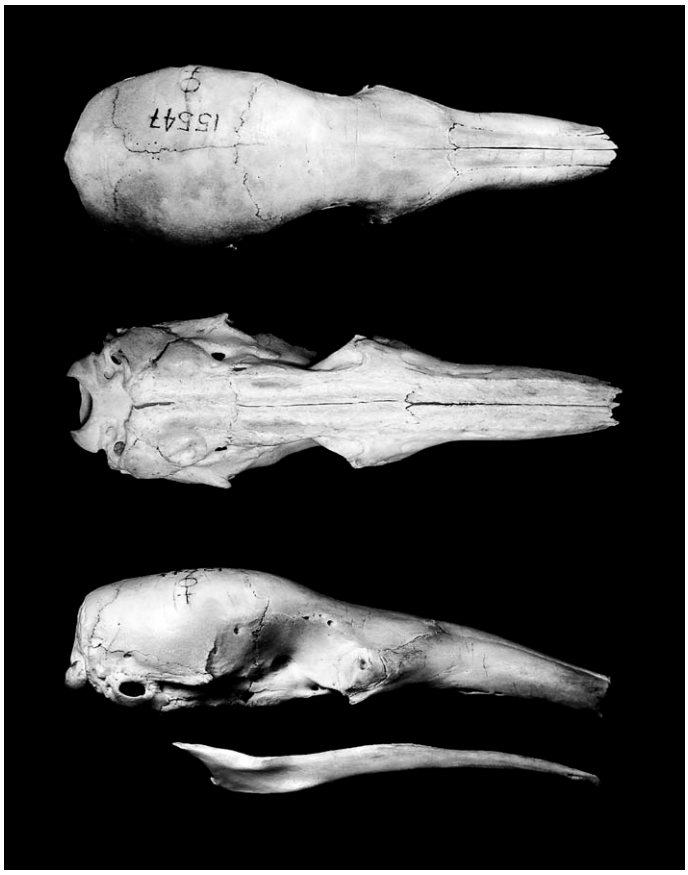

Fig. 2.—Dorsal, ventral, and lateral views of the skull and lateral view of mandible of an adult female *Tamandua mexicana* (OSUFW [Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Nacional Mammalogical Collection] 15547). Greatest length of skull is 127.3 mm.

GENERAL CHARACTERS

Tamandua mexicana is a medium-sized anteater with an elongated and tubular head, is toothless, and has a long, slender and sticky tongue, small eyes, and short, rounded ears. The tail is prehensile, nearly longer than the head and body, furred dorsally for about one-third of its length, but naked and with dark irregular spots on the distal two-thirds (Eisenberg 1989). The fur of *T. mexicana* is invariably black vested, covered with a short, dense, slightly rigid, and bright coat (Eisenberg 1989; Linares 1998; Lubin 1983; Wetzel 1985); there is no difference in color pattern between males and females (Linares 1998). Young tamanduas, however, have dorsal fur longer than that of adults, and golden hair mixed within the black coat (Wetzel 1975). *T. mexicana* has 5 conspicuous digits on the hind foot and 4 digits on the forefoot; the middle digit of the forefoot has an extremely large claw (Wetzel 1985).

External measurements (mm) for adults are as follows (*n*, range): total length, 1,111 (60, 1,020–1,300); length of tail, 544 (59, 400–675); length of hind foot, 98 (56, 80–110); length of ear, 44 (42, 35–51); and body mass, 4.3 kg (15, 3.2–5.4 kg—Genoways and Timm 2003; Wetzel 1985). Cranial measurements (range in mm), only for adults (Cervantes and Villa 2003; Genoways and Timm 2003; Reeve 1942; Wetzel 1975, 1985; $n = 98$), are: total length, 114.8–138.9; occipitonasal length, 124.9–128.5; postorbital breadth, 23.9–24.0; breadth of braincase, 39.8–41.6; mastoid breadth, 34.1–35.1; palatal length, 96.3–102.8; rostral length, 59.3–60.7; length of mandible, 101.9–107.4; condylobasal length, 117.7–131.1; nasal length, 46–50; cranial box breadth, 39.0–42.4; and interorbital constriction, 23.0–24.6 (Fig. 2). *T. mexicana opistholeuca* from Nicaragua is sexually dimorphic in size (based on a sample of 3 males and 6 females—Genoways and Timm 2003). Males were larger for breadth of braincase, mastoid breadth, and rostral length (females were larger for 5 of the 9 cranial measurements—occipitonasal length, condylobasal length, length of nasals, palatal length, and length of mandible); females were on average larger for total length, length of tail, length of hind foot, and length of ear.

DISTRIBUTION

Tamandua mexicana is present from southern Mexico through all of Central America to the western Andes in South America (Fig. 3). *T. mexicana mexicana* is distributed along the Pacific coast of Mexico, the coast of the Mexican Gulf, and the Peninsula of Yucatan to Honduras; *T. m. opistholeuca* ranges throughout Central America to almost the entirety of Colombia; *T. m. instabilis* occurs in the western part of Venezuela to the border with Colombia; and *T. m. punensis* is located along the west coast of Ecuador and in Peru (Fig. 3). In general, the species' range includes northern and western Colombia, northwestern Venezuela, western Ecuador, and northwestern Peru (Eisenberg 1989; Emmons 1997; Hall 1981; Reid 1997; Tirira 2007; Wetzel 1985). A specimen of *T. mexicana* is reported from the northern portion of French Guiana (Voss et al. 2001), but not from the intermediary northeast area (eastern Venezuela, Suriname, and Guyana). In Mexico, it has been reported from Colima southward on the Pacific Coast and from Veracruz on the Mexican Gulf Coast, south through Chiapas and the Yucatan Peninsula (Burton and Ceballos 2006; Cuarón 2005). The species also has been reported from Barro Colorado Island, Panama (Reid 1997). The elevational range is 0–2,000 m, but most records are from below 1,000 m (Cuarón 2005; Cuervo-Díaz et al. 1986; Eisenberg 1989; Tirira 2007). In some areas of its distribution *T. mexicana* occurs in sympatry with *T. tetradactyla* (Eisenberg 1989; Linares 1998; Wetzel 1985).

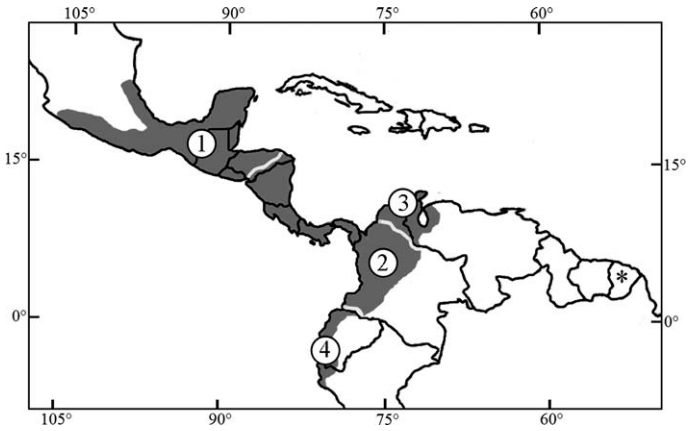

Fig. 3.—Geographic distribution of *Tamandua mexicana*. Subspecies are: 1, *T. m. mexicana*; 2, *T. m. opistholeuca*; 3, *T. m. instabilis*; and 4, *T. m. punensis.* Map is modified from Cervantes and Villa (2003); Hall (1981); and Wetzel (1985). An asterisk (*) indicates a report of *T. mexicana* in the northern portion of French Guiana (Voss et al. 2001).

FOSSIL RECORD

The oldest fossil record for an anteater was collected from the Colhuehuapian age (in South America, about 20 million years ago). Anteaters are well known since the Santacrucian South American Land Mammal Age (in South America, approximately 16 million years ago—Delsuc et al. 2004). The fossil record for *Tamandua* is known from the Pleistocene and Recent (McDonald et al. 2008; McKenna and Bell 1997; Simpson 1945); however, not for *Tamandua mexicana* specifically (Siriano 1996). *Neotamandua* is considered a parallel ancestral form for the 2 species of small anteaters (McDonald et al. 2008).

FORM AND FUNCTION

Anatomical modifications of anteaters are associated with an ability to capture insects and to climb. Modifications

of the skull of *Tamandua mexicana* allow the use of its slender, elongated tongue (McDonald et al. 2008). The skull is tubular and elongate, the zygomatic arch is incomplete, and the dentary bone is toothless, elongate, curved, and fragile. Pterygoids are long and the hard palate is extended back to the caudal tympanic region (McDonald et al. 2008; Reiss 1997). In the otic region, mastoid exposure is minimal and the styloid and paraoccipital processes are not pronounced. The oral cavity of *T. mexicana* is separated from the nasal cavity by the hard palate and contains the free portion of the tongue. Jaw musculature is reduced but the musculature of the tongue is greatly developed and it originates in the posterior end of the sternum (Naples 1985; Reiss 1997).

The tongue of *T. mexicana* is long, slender, protrusible, and is covered with sticky saliva secreted by the enlarged and fused submaxillary and parotid salivary glands (Reiss 1997). The hyoid apparatus is robust and well ossified, where the corpus hyoideum and the posterior cornu form a single fused element (Reiss 1997). The pharynx is divided by the soft palate into the oropharynx and the nasopharynx. The soft palate is extremely long extending from the caudal pterygoid shelves to the 5th cervical vertebra. The floor of the nasopharynx is composed of a facial muscle, containing the levator veli palatini, medialis veli palatini, mylohyoideus, stylopharyngeus, and palatopharyngeous (Reiss 1997). The lateral walls of the oropharynx contain the cervical portion of the mylohyoideus; inserted in the lateral muscle, there is a well-developed double salivary duct. The floor of the oropharynx consists of a mucosa with a poorly developed hyoglossus muscle. The laryngopharynx is formed by fibers of the palatopharyngeus. The sternoglossal space is well defined and lies ventral to the oropharynx and hyoid apparatus; the lateral and ventral boundaries of this space are muscular rostrally and consist of the mylohyoideus, interhyoideus, and geniohyoideus; finally the ventral boundary of the space is formed by an aponeurosis (Reiss 1997). Naples (1985) presents a detailed description of the facial musculature and Reiss (1997) describes the feeding apparatus musculature.

A variable number of vertebrae have been reported for *T. mexicana*. Gaudin (1999) reports on 2 specimens of *T. mexicana*, 1 with 17 thoracic and the other with 18 thoracic vertebrae. Both specimens had 2 lumbar vertebrae. Flower (1885) reports 1 thoracic and 3 lumbar vertebrae in specimens of *Tamandua*. Compared with other cingulates, *T. mexicana* has less-modified thoracic vertebrae; the neural spines are uniform in height, robust, and elongated anteroposteriorly; the zygapophyseal articular facets are widely separated from the midline of the vertebral lamina; and the zygapophyseal facets are wide mediolaterally. In juvenile individuals, the neural arches of the sacral vertebrae are unfused (Gaudin 1999).

Morphology of the tympanic region of *Tamandua* and other myrmecophagids is unique among members of the Pilosa. The alterations in morphology are most likely the result of the feeding style associated with their almost exclusive diet of termintes and ants (Patterson et al. 1992). Placement of the eustachian tube is unusual in *T. mexicana*, in that it is displaced from the more common anterointernal portion to the posterointernal portion of the bulla. This displacement is associated with an elongation of the hard palate and a posterior shift of the internal naria. The bony opening is always oval in shape in *T. mexicana*, whereas in *T. tetradactyla* it is variable (round to oval) in shape (Patterson et al. 1992). The sulcus tympanicus and the crista tympanica are prominent; also the sulcus maleolaris is always present. As in other Myrmecophagidae, the basioccipital bone (forms the posterointernal portion) and the pterygoid bone (forms the anterointernal portion) have a major role in formation of the bulla. A detailed description of the ear region is available (Patterson et al. 1992).

The placenta of *Tamandua* is always implanted at the fundus, and in advancing gestation, the uterine wall becomes very thin in the region of nidation. In the fundus a vascular network developed in the musculature is visible. The maternal surface of the placenta had a finely lobulated appearance (Benirschke 2008).

Tamandua mexicana has an extremely large and powerful claw on digit III of the forelimb, approximately twice as long as its corresponding metacarpal (Taylor 1985). This allows the animal to concentrate all the force of the limb at a single point. The principal modification of the forelimb of *T. mexicana* is related to the flexion as well as the power and rotation abilities that permit it to break hard materials such as wood with its claws; this modification allows the animal to attack a nest with its limb fully extended, preventing ants and termites from attacking the main part of the body. The palm of the forefoot has a large, thickened pad formed of fibrous connective tissues and fat. Its principal functions are to provide a weight-bearing surface during walking and a somewhat resilient surface against which the tips of the claws may be opposed, giving to the animal a prehensile organ with the capacity of manipulation even with its large claws (Taylor 1985).

ONTOGENY AND REPRODUCTION

Reproduction of *Tamandua mexicana* is aseasonal (Lubin 1983). In Mexico, births, neonates, and lactating females can be found in March, May, and December, respectively (Cuarón 2005). For Venezuela, Linares (1998) reports that reproduction occurred during the dry season. In Nicaragua, a lactating female was captured in April and 2 newborns were captured in June and July (Genoways and Timm 2003). Vaginal bleeding has been observed in a female aged 6 months (Cuarón 2005). Estrous cycles have not been reported for *T. mexicana*. The gestation period has been reported as between 130 and 150 days (Matlaga 2006;

Nowak and Paradiso 1983; Silveira 1968) and between 160 and 190 days (Nowak 1999). *T. mexicana* usually gives birth to a single young that remains with the mother until it is about a year old (Lubin 1983; Nowak 1999).

ECOLOGY

Tamandua mexicana has been documented in a variety of habitats—evergreen, deciduous tropical forest, mangroves, second-growth forest, savannah, gallery forest, mist forest, and transformed areas (Cuarón 2005; Eisenberg 1989; Linares 1998; Reid 1997; Tirira 2007). *T. mexicana* can move, feed, and rest on the ground and trees (Lubin and Montgomery 1981; Montgomery 1985a, 1985b), and generally uses its large limbs and lianas for movements between arboreal environments. *T. mexicana* passes 40% of its activity period up in the trees (Eisenberg 1989; Montgomery 1985a). During 23 observational periods (each $>$ 20 min), *T. mexicana* moved a total of 3,397 m (mean per period = 148 m, *SD* = 96 m), at an average rate of 132 m/h in the Panama tropical rain forest (Montgomery 1985a). In forested areas, it frequently shelters in hollow trees (Eisenberg 1989). *T. mexicana* was reported as abundant in Soberanía National Park, Panama, and Rara Avis, a private rain-forest preserve bordering Braulio Carrillo National Park, Costa Rica (Reid 1997).

Home-range area estimates are 25 ha for Central America and Ecuador (Montgomery 1985a; Tirira 2007) and 70 ha for Panama (Eisenberg 1989). In Panama, the population density was estimated at about 0.13 individuals/ha (Montgomery 1985b), and in La Selva, Costa Rica, the relative abundance estimate was 0.06 individuals/ha (Guariguata et al. 2002). Home ranges may overlap between adults, and females tend to be more spaced out than males but the pattern is not clear (Eisenberg 1989; Lubin 1983; Montgomery 1985b).

Ants and termites are both consumed by *T. mexicana*, but one-third of its diet is restricted to ants. *T. mexicana* consumes about 9,000 ants per day, in a proportion of 1 larva per 9 adults (Álvarez del Toro 1991; Mongomery 1985a). The diet consists of 2.3 times as many worker ants compared with soldier ants (Lubin and Mongomery 1981; Montgomery 1985b). *T. mexicana* feeds mainly on the ant genera *Camponotus*, *Azteca*, and *Crematogaster*, and on the termite genera *Armitermes*, *Calcaritermes*, *Coptotermes*, *Leucotermes*, *Microcerotermes*, and *Nasutitermes* (Montgomery 1985b). During the wet season, in Barro Colorado Island, Panama, termites are consumed more frequently than are ants (Montgomery 1985a, 1985b). *T. mexicana* locates its prey by scent; it subsequently digs the nests of its prey with its powerful claws, capturing the ants or termites with its long and sticky tongue (Rodrigues et al. 2008). *T. mexicana* visits 50–80 different colonies of termites or ants each day; however, it eats relatively few insects from each colony; usually feeding for $<$1 min at each colony (Lubin and Mongomery 1981; Montgomery 1985b). The predatory behavior of *T. mexicana* on colonies of termites and ants does not cause severe damage to the nest, primarily because the duration of feeding is minimized by the defensive behaviors of the prey species (Lubin et al. 1977). Ants $>$ 4 mm in length are the principal diet of *T. mexicana*, but the pulp of some fruits also is consumed (Cuarón 2005).

The silky anteater (*Cyclopes didactylus*) is sympatric with *T. mexicana*, but they share consumption of only 20% of the genera of ants and termites available to both species (Montgomery 1985a). *C. didactylus* is completely arboreal and nocturnal; *T. mexicana* can be diurnal and moves between trees and the ground (Montgomery 1985a; Rodrigues et al. 2008). Occasionally *T. mexicana* is predated by the jaguar (*Panthera onca*—Aranda 1994; Rabinowitz and Nottingham 1986), and the harpy eagle (*Harpia harpyja*—Izor 1985).

Tamandua mexicana is considered a reservoir of *Leishmania mexicana* (Stephens et al. 2009). *Trypanosoma legery* was reported in 5 individuals from Belize and Panama (out of 17 individuals—Shaw 1985). *Trypanosoma cruzy* was found in 3 anteaters of Panama (Shaw 1985). The specialized diet of *T. mexicana* reduces its exposure to these hemoflagellates compared with other Pilosa; however, *T. mexicana* has an infection rate of 22% of *Trypanosoma rangeli* and is considered as a secondary reservoir of this parasite (Shaw 1985; Walton and Sousa 1967). Eight individuals tested positive for leptospirosis disease (Clark et al. 1966). The fleas *Echidnophaga gallinácea* and *Rhopalopsyllus australis* are common ectoparasites of *T. mexicana* (Ayala-Barajas et al. 1988; Tipton and Machado-Allison 1972).

HUSBANDRY

Álvarez del Toro (1991) consider it very difficult to maintain *Tamandua mexicana* in captivity because of its specialized diet. However, a diet designed by Pérez Jimeno and González González (2004), containing banana, apple, egg yolk, horse meat, baby formula, milk without lactose, vitamins, minerals, and water was used successfully. The life span of a captive individual was 9.5 years (Nowak and Paradiso 1983).

BEHAVIOR

Individual *Tamandua mexicana* are solitary and territorial. *T. mexicana* has been observed drag-marking, apparently with anal scent glands; it has an offensive odor detectable from several meters away (Montgomery 1985b; Rodrigues et al. 2008). The reproductive behavior of *T. mexicana* is not well comprehended but Matlaga (2006) describes the mating behavior of *T. mexicana* in Costa Rica.

In this observed behavior, the male located the female by odor; once he approached her he smelled her rump then followed her while she searched for food. The male swatted her rump with his forelimbs several times, and on several occasions he straddled the female and climbed over her back. Several times, both individuals stopped to sniff each other for 5–10 s. The female attempted to flee on several occasions and the male finally restrained her with his forearms. The male mounted the female dorsally and copulated for 10–30 s with approximately 2 min of rest between copulations (Matlaga 2006). These observations of *T. mexicana* suggest that the strong forelimbs and tail may assist males in copulating with indisposed females, and that scent may be also important during mating, perhaps to identify potential mates and assess their receptivity. *T. mexicana* usually produces a single young at time, the young is placed in a nest or den area, usually in a hollow tree while the mother goes off to feed. Newborns have been observed riding on the mother's back (Lubin 1983).

Adult *T. mexicana* rarely perform calls, but juveniles frequently emit sounds (Álvarez del Toro 1991; Cuarón 2005; Emmons 1997). Temperature and the incidence of direct sunlight have a strong effect on daily movements of *T. mexicana*, individuals can be active during the day and the night, but generally rest at noon (Álvarez del Toro 1991; Eisenberg 1989; Eisenberg and Thorington 1973). *T. mexicana* has a daily period of activity of about 8 h that can begin at any time of day or night, with 1 or 3 resting times of 30 or more minutes (Montgomery 1985b; Rodrigues et al. 2008).

When attacked, *T. mexicana* defends itself by assuming a tripod position against a tree or a rock, and then attacking its opponent with its powerful claws (Álvarez del Toro 1991; Nowak and Paradiso 1983).

GENETICS

The diploid number (2n) for *Tamandua mexicana* is 54 chromosomes, and the fundamental number (FN) is 104 (Hsu and Benirschke 1969; Jorge and Pereira 2008). The X chromosome is submetracentric and Y chromosome is acrocentric, or a small submetacentric (Jorge and Pereira 2008; Pereira et al. 2004; Wilham et al. 1985). Data from the α-crystallin A-chain of *T. mexicana* has been used in phylogenic analyses (de Jong et al. 1985).

CONSERVATION

The pelage of *Tamandua mexicana* is rough and the skin has no commercial value (Álvarez del Toro 1991). *T. mexicana* has been kept as a pet in south Mexico (Lira Torres 2006); in some regions the meat is consumed by indigenous people (Espinoza et al. 2003; Méndez-Cabrera and Montiel 2007); or its skin is used for ornamentation. It is considered a species with a restricted distribution and low density that needs special attention for conservation, especially because of habitat destruction (Arita et al. 1990; Cuarón 2005; Linares 1998). Nonetheless, *T. mexicana* can live in disturbed habitats, including agricultural croplands such as coffee fields (Cuarón 2005; Linares 1998; Moguel and Toledo 1999; Reid 1997).

In Mexico, *T. mexicana* is considered a threatened species and protected by national laws (Ceballos et al. 2002; Secretaría de Medio Ambiente y Recursos Naturales 2002). The International Union for Conservation of Nature and Natural Resources classifies *T. mexicana* as "Least Concern" because it has a wide distribution, presumably large population, and because it is represented in protected areas, as well as anthropogenic ecosystems (International Union for Conservation of Nature and Natural Resources 2009). *T. mexicana* is listed in the Appendix III of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (2009). In Guatemala, populations of *T. mexicana* also are protected by federal laws (Convention on International Trade in Endangered Species of Wild Fauna and Flora 2009). In Peru, *T. mexicana* is considered vulnerable (Pacheco 2002).

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LITERATURE CITED

Allen, J. A. 1904. The *Tamandua* anteaters. Bulletin of the American Museum of Natural History 20:385–398.

Allen, J. A. 1906. The proper name of the Mexican tamandua. Proceedings of the Biological Society of Washington 19:200.

Allen, J. A. 1916. New South American mammals. Bulletin of the American Museum of Natural History 35:83–87.

Alston, E. R. 1880. Biologia Centrali-Americana: Mammalia. R. H. Porter, London, United Kingdom.

Álvarez del Toro, M. 1991. Los mamíferos de Chiapas. Gobierno del Estado de Chiapas, Consejo Estatal de a la Investigación y Difusión de la Cultura, Tuxtla Gutiérrez, Chiapas, México.

Anonymous [= Allen, J. A] 1906. [Notice on Batty specimens received at AMNH.] Auk 23:128.

Aranda, M. 1994. Importancia de los pecaries (*Tayassu* spp.) en la alimentación del jaguar (*Panthera onca*). Acta Zoológica Mexicana 62:11–22.

Arita, H. T., J. G. Robinson, and K. H. Redford. 1990. Rarity in Neotropical forest mammals and its ecological correlates. Conservation Biology 4:181–192.

Ayala-Barajas, R., J. C. Morales-Muciño, N. Wilson, J. E. Llorente-Bousquets, and H. E. Ponce-Ulloa. 1988. Catálogo de las pulgas (Insecta; Siphonaptera) en el Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autónoma e México 1: Colección Alfredo Barrera. Serie Catálogos del Museo de Zoología "Alfonso L. Herrera" Catálogo 1:1–102.

Benirschke, K. 2008. Reproductive parameters and placentation in anteaters and sloths. Pp. 160–171 in The biology of the Xenarthra

(S. F. Vizcaíno and W. J. Loughry, eds.). University Press of Florida, Gainesville.

Burton, A. M., and G. C. Ceballos. 2006. Northern-most record of the collared anteater (*Tamandua mexicana*) from the Pacific slope of Mexico. Revista Mexicana de Mastozoología 10:67–70.

Ceballos, G. C., J. Arroyo-Cabrales, and R. A. Medellín. 2002. The mammals of México: composition, distribution, and conservation status. Occasional Papers, Museum of Texas Tech University 218: 1–28.

Cervantes, F. A., and B. R. Villa. 2003. Los mamíferos de México. Grupo Editorial Iberoamérica, México.

Clark, L. G., V. M. Varela-Díaz, C. R. Sulzer, R. R. Marshak, and C. J. Hollister. 1966. Leptospirosis in Nicaragua: preliminary report on the first year of study. American Journal of Tropical Medicine and Hygiene 15:735–742.

Convention on International Trade in Endangered Species of Wild Fauna and Flora. 2009. 2009 Convention on International Trade in Endangered Species of Wild Fauna and Flora species data base. http://www.cites.org/esp/resources/species.html, accessed 7 September 2009.

Cope, E. D. 1889. On the Mammalia obtained by the naturalist exploring expedition to southern Brazil. American Naturalist 23(266):128–150.

Cuarón, A. D. 2005. *Tamandua mexicana* (Saussure, 1860) oso hormiguero. Pp. 121–123 in Los mamíferos silvestres de México (G. Ceballos and G. Oliva, eds.). Comisión Nacional Para el Conocimiento y Uso de la Biodiversidad and Fondo de Cultura Económica, México City, México.

Cuervo-Díaz, A., J. Hernández-Camacho, and A. Cadena G. 1986. Lista actualizada de los mamíferos de Colombia: anotaciones sobre su distribución. Caldasia 15:471–502.

Davis, W. B. 1955. A new four-toed anteater from Mexico. Journal of Mammalogy 36:557–559.

de Jong, W. W., A. Zweers, K. A. Joysey, J. T. Gleaves, and D. Boulter. 1985. Protein sequence analysis applied to xenarthran and pholiodote phylogeny. Pp. 65–76 in The evolution and ecology of armadillos, sloths, and vermilinguas (G. G. Montgomery, ed.). Smithsonian Institution Press, Washington, D.C.

Delsuc, F., S. F. Vizcaíno, and E. J. P. Douzery. 2004. Influence of tertiary paleoenvironmental changes on the diversification of South American mammals: a relaxed molecular clock study within xenarthrans. BMC Evolutionary Biology 4:11.

Eisenberg, J. F. 1989. Mammals of the Neotropics, the northern Neotropics. Vol. 1. Panamá, Colombia, Venezuela, Guyana, Suriname and French Guiana. University of Chicago Press, Chicago, Illinois.

Eisenberg, J. F., and K. H. Redford. 1989. Mammals of the Neotropics, the central Neotropics. Vol. 3. Ecuador, Peru, Bolivia and Brazil. University of Chicago Press, Chicago, Illinois.

Eisenberg, J. F., and R. W. Thorington, Jr. 1973. A preliminary analysis of a Neotropical mammal fauna. Biotropica 5:150–161.

Emmons, L. H. 1997. Neotropical rainforest mammals: a field guide. 2nd ed. The University of Chicago Press, Chicago, Illinois.

Espinoza, E., E. Cruz, H. Kramsky, and I. Sánchez. 2003. Mastofauna de la Reserva de la Biósfera "La Encrucijada," Chiapas. Revista Mexicana de Mastozoología 7:5–19.

Flower, W. H. 1885. An introduction to the osteology of the mammals. Macmillan and Co., London, United Kingdom.

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., and V. L. Naples. 2007. Genus Tamandua Gray, 1825. Pp. 173–177 in Mammals of South America. Vol. 1. Marsupials, xenarthrans, shrews, and bats (A. L. Gardner, ed.). University of Chicago Press, Chicago, Illinois. (Dated 2007, but published 2008.)

Gaudin, T. J. 1999. The morphology of xenarthrans vertebrae (Mammalia: Xenarthra). Fieldiana: Geology (New Series) 41: 1–38.

Genoways, H. H., and R. M. Timm. 2003. The xenarthrans of Nicaragua. Mastozoología Neotropical/Journal of Neotropical Mammalogy 10:231–253.

Goldman, E. A. 1920. Mammals of Panama. Smithsonian Miscellaneous Collections 69:1–309.

Gray, J. E. 1873a. Hand list of the edentate, thick-skinned, and ruminant mammals in the British Museum. British Museum (Natural History), London, United Kingdom.

Gray, J. E. 1873b. On Mammalia from the neighbourhood of Concordia, New Granada. Annals and Magazine of Natural History, Series 4 11:468–469.

Guariguata, M. R., H. Arias-Le Claire, and G. Jones. 2002. Tree seed fate in a logged and fragmented forest landscape, northeastern Costa Rica. Biotropica 34:405–415.

Hall, E. R. 1981. The mammals of North America. 2nd ed. John Wiley & Sons, Inc., New York.

Hsu, T. C., and K. Benirschke. 1969. *Cabassous centralis* (Central American soft-tailed armadillo). P. 107 in An atlas of mammalian chromosomes. Vol. 3. Springer-Verlag, New York.

International Union for Conservation of Nature and Natural Resources. 2009. 2009 International Union for Conservation of Nature and Natural Resources Red list of threatened species. http://www.iucnredlist.org/, accessed 7 September 2009.

Izor, R. J. 1985. Sloths and other mammalian prey of the harpy eagle. Pp. 343–346 in The evolution and ecology of armadillos, sloths, and vermilinguas (G. G. Montgomery, ed.). Smithsonian Institution Press, Washington, D.C.

Jorge, W., and H. R. J. Pererira, Jr. 2008. Chromosomal studies in the Xenarthra. Pp. 196–204 in The biology of the Xenarthra (S. F. Vizcaíno and W. J. Loughry, eds.). University Press of Florida, Gainesville.

Linares, O. J. 1998. Mamíferos de Venezuela. Sociedad Conservacionista Audubon de Venezuela, Caracas, Venezuela.

Linnaeus, C. 1758. Systema Naturae per regna tria naturae, secundum classis, ordines, genera, species cum characteribus, differentiis, synonymis, locis. Vol. 1. 10th ed. Laurentii Salvii, Stockholm, Sweden.

Lira Torres, I. 2006. Abundancia, densidad, preferencia de hábitat y uso local de los vertebrados en La Tuza de Monroy, Santiago Jamiltepec, Oaxaca. Revista Mexicana de Mastozoología 10: 41–66.

Lönnberg, E. 1937. Notes on some South-American mammals. Arkiv für Zoologi 29A:1–29.

Lubin, Y. D. 1983. *Tamandua mexicana* (oso jaceta, hormiguero, tamandúa, banded anteater, lesser anteater). Pp. 44–495 in Costa Rican natural history (D. H. Janzen, ed.). University of Chicago Press, Chicago, Illinois.

Lubin, Y. D., and G. G. Montgomery. 1981. Defenses of *Nasutitermes* termites (Isoptera, Termitidae) against *Tamandua* anteaters (Edentata, Myrmecophagidae). Biotropica 13:66–76.

Lubin, Y. D., G. G. Montgomery, and O. P. Young. 1977. Food resources of anteaters (Edentata, Myrmecophagidae) I. A year's census of arboreal nests of ants and termites on Barro Colorado Island, Panama Canal Zone. Biotropica 9:26–34.

Matlaga, D. 2006. Mating behavior of the northern tamandua (*Tamandua mexicana*) in Costa Rica. Edentata 7:46–48.

McDonald, H. G., S. F. Vizcaíno, and M. S. Bargo. 2008. Skeletal anatomy and the fossil history of the Vermilingua. Pp. 64–78 in The biology of the Xenarthra (S. F. Vizcaíno and W. J. Loughry, eds.). University Press of Florida, Gainesville.

McKenna, M. C., and S. K. Bell. 1997. Classification of mammals above the species level. Columbia University Press, New York.

Méndez-Cabrera, F., and S. Montiel. 2007. Diagnóstico preliminar de la fauna y flora silvestre utilizada por la población maya de dos comunidades costeras de Campeche, México. Universidad y Ciencia, Trópico Húmedo 23:127–139.

Moguel, P., and V. M. Toledo. 1999. Biodiversity conservation in traditional coffee systems of Mexico. Conservation Biology 13: 11–21.

Montgomery, G. G. 1985a. Impact of vermilinguas (*Cyclopes*, *Tamandua*: Xenarthra = Edentata) on arboreal ant populations. Pp. 351–363 in The evolution and ecology of armadillos, sloths, and vermilinguas (G. G. Montgomery, ed.). Smithsonian Institution Press, Washington, D.C.

Montgomery, G. G. 1985b. Movements, foraging and food habits of the four extant species of Neotropical vermilinguas (Mammalia;

Myrmecophagidae). Pp. 365–377 in The evolution and ecology of armadillos, sloths, and vermilinguas (G. G. Montgomery, ed.). Smithsonian Institution Press, Washington, D.C.

Naples, V. L. 1985. The superficial facial musculature in sloths and vermilinguas (anteaters). Pp. 173–189 in The Evolution and ecology of armadillos, sloths, and vermilinguas (G. G. Montgomery, ed.). Smithsonian Institution Press, Washington, D.C.

Nowak, R. M. 1999. Walker's mammals of the world. 6th ed. Johns Hopkins University Press, Baltimore, Maryland.

Nowak, R. M., and J. L. Paradiso. 1983. Walker's mammals of the world. 4th ed. Johns Hopkins University Press, Baltimore, Maryland.

Pacheco, V. 2002. Mamíferos del Perú. Pp. 503–549 in Diversidad y conservación de los mamíferos neotropicales (G. Ceballos and J. A. Simonetti, eds.). Comisión Nacional para la Biodiversidad-Universidad Nacional Autónoma de México, México, Distrito Federal, México.

Patterson, B., W. Segall, W. D. Turnbull, and T. J. Gaudin. 1992. The ear region in Xenarthrans (= Edentata: Mammalia) part II: Pilosa (sloths, anteaters), palaeanodonts, and a miscellany. Fieldiana: Geology (New Series) 24:1–79.

Pereira, H. R. J., J. Wilham, and M. E. Loyola. 2004. Chromosome study of anteaters (Myrmecophagidae, Xenarthra)—a preliminary report. Genetics and Molecular Biology 27(3):391–394.

Pérez Jimeno, G., and G. González González. 2004. Evaluación de una dieta para tamanduás (*Tamandua* spp.) utilizada en el Jardín Zoológico de Rosario, Argentina y el Zoológico La Aurora, Guatemala. Edentata 6:43–50.

Rabinowitz, A. R., and B. C. Nottingham, Jr. 1986. Ecology and behaviour of the jaguar (*Panthera onca*) in Belize, Central America. Journal of the Zoological Society of London 210: 149–159.

Reeve, E. C. R. 1942. A statistical analysis of taxonomic differences within the genus *Tamandua* Gray (Xenarthra). Proceedings of the Zoological Society of London 111A:279–302.

Reid, F. A. 1997. A field guide to the mammals of Central America and southeast Mexico. Oxford University Press, New York.

Reiss, K. Z. 1997. Myology of the feeding apparatus of myrmecophagid anteaters (Xenarthra: Myrmecophagidae). Journal of Mammalian Evolution 4:87–117.

Rodrigues, F. H. G., I. M. Medri, G. H. B. de Miranda, C. Camilo-Alves, and G. Mourão. 2008. Anteater behavior and ecology. Pp. 257–268 in The biology of the Xenarthra (S. F. Vizcaíno and W. J. Loughry, eds.). University Press of Florida, Gainesville.

Saussure, H. 1860. Note sur quelques mammiferes du Mexique. Revue et Magasin de Zoologie Pure et Appliquée, Serie 2 12:3–11.

Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT). 2002. Norma Oficial Mexicana NOM-059-ECOL-2001. Distrito Federal, 6 de marzo de 2002:1–56.

Shaw, J. K. 1985. The hemoflagellates of sloths, vermilinguas (anteaters), and armadillos. Pp. 279–292 in The evolution and ecology of armadillos, sloths, and vermilinguas (G. G. Montgomery, ed.). Smithsonian Institution Press, Washington, D.C.

Silveira, E. K. P. da. 1968. Notas sobre a historia natural do tamandua mirim (*Tamandua tetradactyla chiriquensis* J. A. Allen, 1904, Myrmecophagidae), com referencias a fauna do istmo do Panama. Vellozia, Rio de Janeiro 6:9–31.

Simpson, G. G. 1945. The principles of classification and a classification of mammals. Bulletin of the American Museum of Natural History 85:1–350.

Siriano, M. R. C. 1996. A la filogenia de *Tamandua* (Myrmecophagidae: Xenarthra). Maestría en Ciencias Biológicas, Facultad de Ciencias, Universidad Nacional Autónoma de México, México.

Stephens, C. R., J. G. Heau, C. González, C. N. Ibarra-Cerdeña, V. Sánchez-Cordero, and C. González-Salazar. 2009. Using biotic interaction networks for prediction in biodiversity and emerging diseases. PLoS ONE 4:e5725.

Superina, M., and J. M. Aguiar. 2006. A reference list of common names for the edentates. Edentata 7:33–44.

Taylor, B. K. 1985. Functional anatomy of the forelimb in vermilinguas (anteaters). Pp. 163–171 in The evolution and ecology of armadillos, sloths, and vermilinguas (G. G. Montgomery, ed.). Smithsonian Institution Press, Washington, D.C.

Tipton, V. J., and C. E. Machado-Allison. 1972. Fleas of Venezuela. Brigham Young University Science Bulletin, Biological Series 17: 1–115.

Tirira, D. 2007. Mamíferos del Ecuador. Guía de Campo. Publicación Especial 6. Ediciones Murciélago Blanco, Quito, Ecuador.

Trouessart, E.-L. 1898. Catalogous mammalium tam viventium quam fossilium. Fasciculus V. Sirenia, Cetacea, Edentata, Marsupialia, Allotheria, Monotremata. R. Friedländer & Sohn, Berolini, Germany 2:999–1264.

True, F. W. 1884. A provisional list of the mammals of the North and Central America, and the West Indian Islands. Proceedings of the United States National Museum 78:587–611.

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 263:3–236.

Walton, B. C., and O. E. Sousa. 1967. Trypanosomes of the lesser anteater, *Tamandua tetradactyla*, from Panama. Journal of Parasitology 53:956–961.

Wetzel, R. M. 1975. The species of *Tamandua* Gray (Edentata, Myrmecophagidae). Proceedings of Biological Society of Washington 88(11):95–112.

Wetzel, R. M. 1982. Systematics, distribution, ecology, and conservation of South American Edentates. Pp. 345–375 in Mammalian biology in South America (M. A. Mares and H. H. Genoways, eds.). Special Publication Series, Pymatuning Laboratory of Ecology, University of Pittsburgh, Pittsburgh, Pennsylvania.

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.

Wilham, J., A. T. Orsi-Souza, and R. Best. 1985. The somatic chromosomes of Xenarthra. Pp. 121–129 in The evolution and ecology of armadillos, sloths, and vermilinguas (G. G. Montgomery, ed.). Smithsonian Institution Press, Washington, D.C.

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