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Edentata

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ASASG Chair: Mariella Superina
ASASG Deputy Chair: Flávia Miranda

IUCN/SSC
Anteater, Sloth
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Front Cover Photo
Maned sloth (*Bradypus torquatus*). Photo: Kevin Schafer, <http://www.kevinschafer.com>.

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IUCN/SSC Anteater, Sloth and Armadillo Specialist Group logo courtesy of Stephen D. Nash, 2009.

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Letter from the Editors

The IUCN/SSC Anteater, Sloth and Armadillo Specialist Group's primary responsibility is to keep the IUCN Red List of Threatened Species up to date. The conservation status of all xenarthrans needs to be assessed on a regular basis to ensure it accurately reflects the latest scientific knowledge on their range, population trends, and threats. The last evaluation had been performed in December 2004, during the Edentate Species Assessment Workshop in Belo Horizonte, Brazil (see Edentata 6). We therefore considered it necessary to re-assess all xenarthrans.

As a first step, we organized a meeting during the 10th International Mammalogical Congress (IMC10), which was held in August 2009 in Mendoza, Argentina. It was exciting to see that the group of Xenarthra researchers and enthusiasts is steadily growing! Over 30 researchers and graduate students from ten countries provided invaluable information that allowed us to update the range maps and carry out the re-assessment.

The conservation status of all 21 armadillo species was re-evaluated in December 2009. The anteaters and sloths followed in May and June 2010. The species descriptions were updated in IUCN's Species Information System (SIS), a new web-based application for managing species information that is at the core of the IUCN Red List of Threatened Species. This application allows swift updates, ensures consistent application of the Red List Categories and Criteria, and facilitates the evaluation process. Each assessment was then checked for consistency by two evaluators. The criteria, as well as the specific terminology used for the assessment, are explained in the glossary at the end of this special issue of *Edentata*.

Two sloths, one anteater and four armadillos are now listed in a threatened category. *Bradypus pygmaeus,* the most threatened xenarthran, has been categorized as Critically Endangered, while *B. torquatus* is classified as Vulnerable. Four armadillo species are listed as Near Threatened, while four are insufficiently known to be assessed and are therefore listed as Data Deficient. The isolated population of *Cyclopes didactylus* that inhabits the Atlantic forest of coastal northeastern Brazil was assessed separately and classified as Data Deficient. Fifty percent of all xenarthrans are considered Least Concern.

The updated armadillo assessments are available on the IUCN Red List of Threatened Species website (<http://www.iucnredlist.org>). The anteater and sloth assessments have been submitted to the IUCN/SSC and are currently being reviewed by the Red List authorities. They will be available online in May or June 2011.

We are very grateful to the 39 researchers who actively participated in the 2009/2010 Xenarthra assessment. This evaluation would not have been possible without their collaboration, and we hope that all Xenarthra researchers will continue sharing their field observations and publications with us to keep the Red List up to date.

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Flávia Miranda
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The 2010 Anteater Red List Assessment

Mariella Superina
Flávia Regina Miranda
Agustín Manuel Abba

Abstract

The IUCN/SSC Anteater, Sloth and Armadillo Specialist Group re-assessed the conservation status of the four extant anteater species in May 2010. Three species maintained their Least Concern status. *Myrmecophaga tridactyla* was listed as Vulnerable due to an estimated reduction in population size of at least 30%. The isolated population of *Cyclopes didactylus* that inhabits the Atlantic forest of coastal northeastern Brazil was assessed separately for the first time due to its separation from the main population by over 1000 km. Although its habitat has been severely reduced, it was classified as Data Deficient due to the lack of scientific data. The main threats to the long-term survival of anteaters is habitat degradation and fragmentation, wildfires, traffic accidents, hunting, and their capture for illegal trade and maintenance as pets. Education programs are in place for three species. Basic questions on the taxonomy, population dynamics, life history, and how hunting and extraction of wild individuals affects anteater populations still remain unresolved.

Keywords: Conservation status, threats, *Myrmecophaga*, *Tamandua*, *Cyclopes*, Pilosa, Xenarthra

The IUCN/SSC Anteater, Sloth and Armadillo Specialist Group re-assessed the conservation status of the four extant anteater species in May 2010. Version 3.1 of the IUCN Red List Categories and Criteria (IUCN, 2001) was used in all cases. A total of 13 researchers provided data on the geographic range, population size and status, habitat and ecology, threats, and existing conservation measures of anteaters. All evaluations were checked for consistency by at least two specialists.

The major change from the 2004 assessment (Fonseca and Aguiar, 2004) to the one presented here consists in the separate evaluation of the coastal northeastern Brazil population of *Cyclopes didactylus*. The latter is separated from the main population by over 1000 km, and may be sufficiently differentiated at the genetic level to represent a separate Evolutionary Significant Unit. Due to rapid deforestation in the area, we considered it appropriate to evaluate it apart from the main population. However, knowledge on the ecology and conservation status of the coastal Brazil population is virtually non-existent, and field research is urgently needed to correctly assess the long-term chances of survival of this smallest of all anteaters.

Three species maintained their Least Concern status (Table 1). The coastal northeastern Brazil subpopulation of *C. didactylus* was assessed for the first time and classified as Data Deficient due to the lack of data. Based on the observed habitat loss, it is inferred that its populations are declining (Table 1). *Myrmecophaga tridactyla* returned to its 1996 category (Vulnerable) due to an estimated reduction in population size of at least 30% and the fact that it is listed in a threat category in almost all regional and national Red Lists within its range. Sixty percent of the assessed anteater species and populations are now classified as Least Concern. However, it should be noted that their population trend is unknown (Table 1).

Giant anteaters, tamanduas, and silky anteaters are subjected to similar threats. Habitat degradation and fragmentation are affecting all assessed anteaters (Fig. 1). Similarly, all anteaters are hunted for food, persecuted as pest species, or captured for illegal trade or to maintain them as pets. Three out of five assessed anteaters are affected by wildfires and killed on roads (Fig. 1).

Basic questions on the taxonomy, population dynamics, life history, and how hunting and extraction of wild individuals affects anteater populations still remain unresolved (Fig. 2). It is interesting to note that education programs are in place for three out of five anteaters (Fig. 3) but only one out of 21 armadillo species (Abba and Superina, 2010). Similarly, *ex situ* conservation programs are proportionally more frequent for anteaters than for armadillos. Two species are included in the CITES Appendices: *Myrmecophaga tridactyla* is listed in Appendix II, and the Guatemalan populations of *Tamandua mexicana* are listed in Appendix III (CITES, 2009). No action recovery, harvest management or area-based management plans exist for any assessed anteater.

We thank all researchers, graduate students, rangers, and enthusiasts who participated in the 2010 Anteater Red List Assessment. Detailed species descriptions and updated range maps can be found on the following pages.

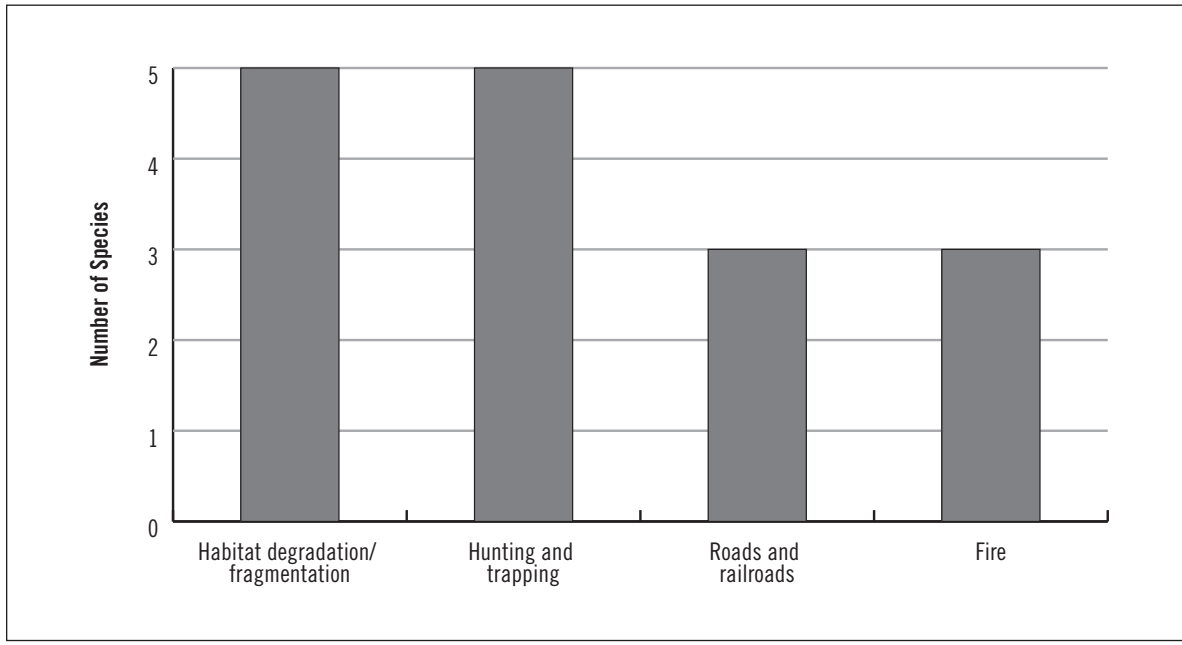


Figure 1. Main threats affecting wild anteaters. Note that the northeastern Brazil population of *C.didactylus* is counted as a species.

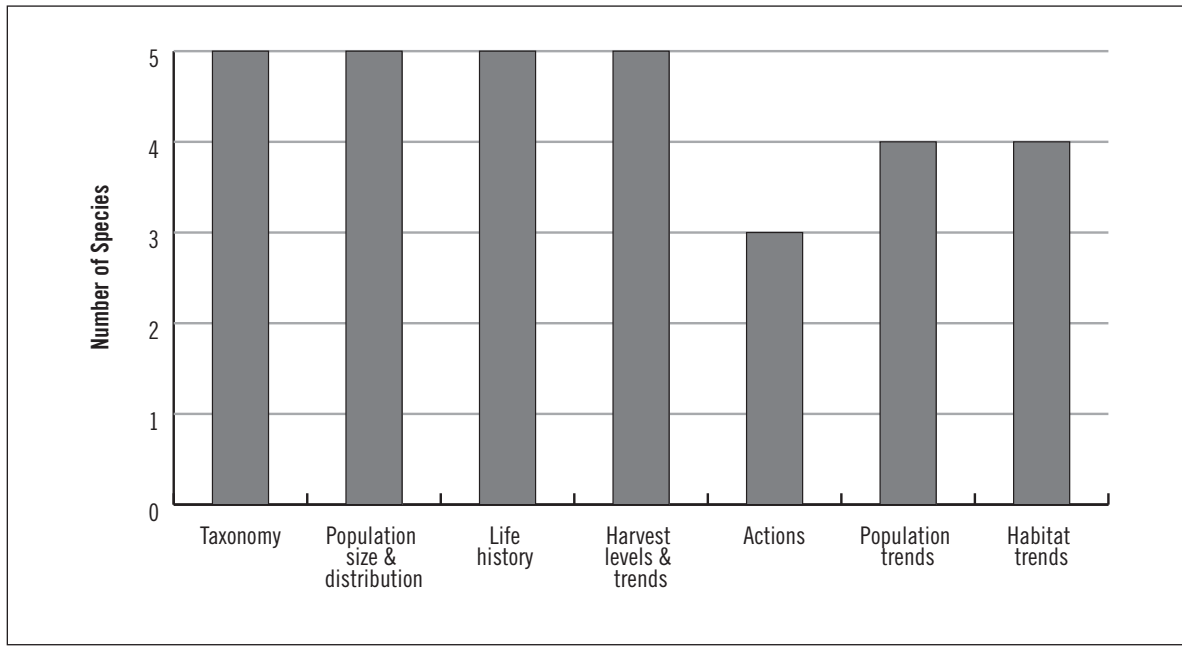


Figure 2. Research priorities for anteaters. Note that the northeastern Brazil population of *C.didactylus* is counted as a species.

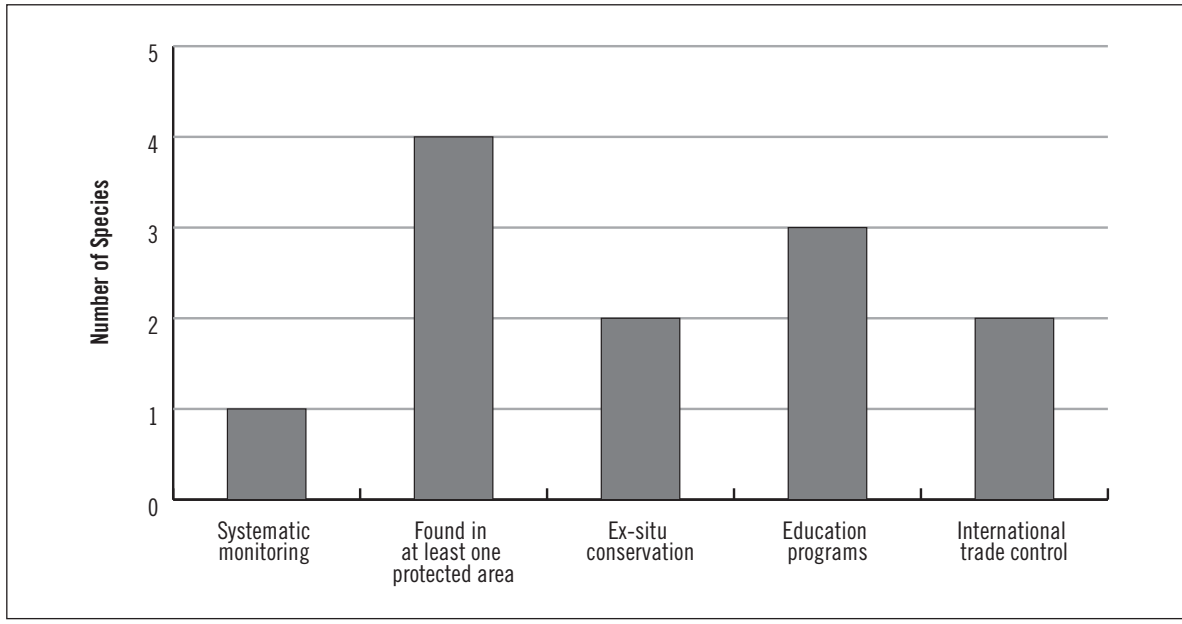


Figure 3. Existing conservation actions for anteaters. Note that the northeastern Brazil population of *C.didactylus* is counted as a species.

Table 1. Historical overview of the Red List categories and current population trends of the four anteater species. See glossary for definitions of the categories.

Species	1996	2004	2010	Population trend
Cyclopes didactylus	LR/lc	LC	LC	?
Cyclopes didactylus – northeastern Brazil subpopulation	--	--	DD	↓
Myrmecophaga tridactyla	VU	NT	VU A2c	↓
Tamandua mexicana	LR/lc	LC	LC	?
Tamandua tetradactyla	LR/lc	LC	LC	?

Cyclopes didactylus, main population

Least Concern (LC)

Photograph: Flávia Miranda

Common Names: Silky anteater (English), pygmy anteater (English), serafín (Spanish), serafín del platanar (Spanish), inti pelejo (Spanish), tamanduaí (Portuguese), tamandua-cigarra (Portuguese).

Assessment Rationale: *C. didactylus* is listed as Least Concern in view of its wide distribution, presumed large population, its occurrence in a number of protected areas, its tolerance of a degree of habitat modification, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category.

Taxonomic Note: There are seven subspecies of *C. didactylus* (Gardner, 2007).

Geographic Range: *C. didactylus* occurs from Mexico (Veracruz and Oaxaca) throughout Central America. West of the Andes, it occurs from Colombia to southern Ecuador. East of the Andes, it can be found in Venezuela, Trinidad Island, Guyana, Suriname, French Guiana, Brazil (Acre to western Maranhão), and as far south as Bolivia (La Paz and Santa Cruz; Fig. 4). The species has not been recorded from El Salvador and it is unclear if the species was ever present there. It has been recorded from sea level up to 1,500 m asl. There is a population of *C. didactylus* on the northeastern coast of Brazil; it is evaluated separately due to its isolation from the main population (see below). The extent of occurrence of the main population is approximately 7,600,000 km^2.

Population: Not much is known about the wild populations of *C. didactylus*.

Habitats and Ecology: This nocturnal and arboreal species occurs in semi-deciduous and evergreen tropical moist lowland forest, gallery forest, and mangrove forest. It can be found in secondary forest habitat. Adults are solitary; the home range of a male overlaps the home range of three females (Montgomery, 1983, 1985a). The females give birth to a single young once per year.

Threats: Although general deforestation is taking place over many parts of its range, *C. didactylus* remains widespread in the Amazon Basin and there are currently no major threats to the survival of this small anteater. In some areas it is captured and kept as a pet species, although it usually does not survive long in captivity.

Conservation: *C. didactylus* is present in a number of protected areas.

Assessors: Miranda, F. and Meritt Jr., D.A.

Evaluators: Superina, M. and Bermúdez Larrazabal, L.

Contributors: Tirira, D. and Arteaga, M.C.

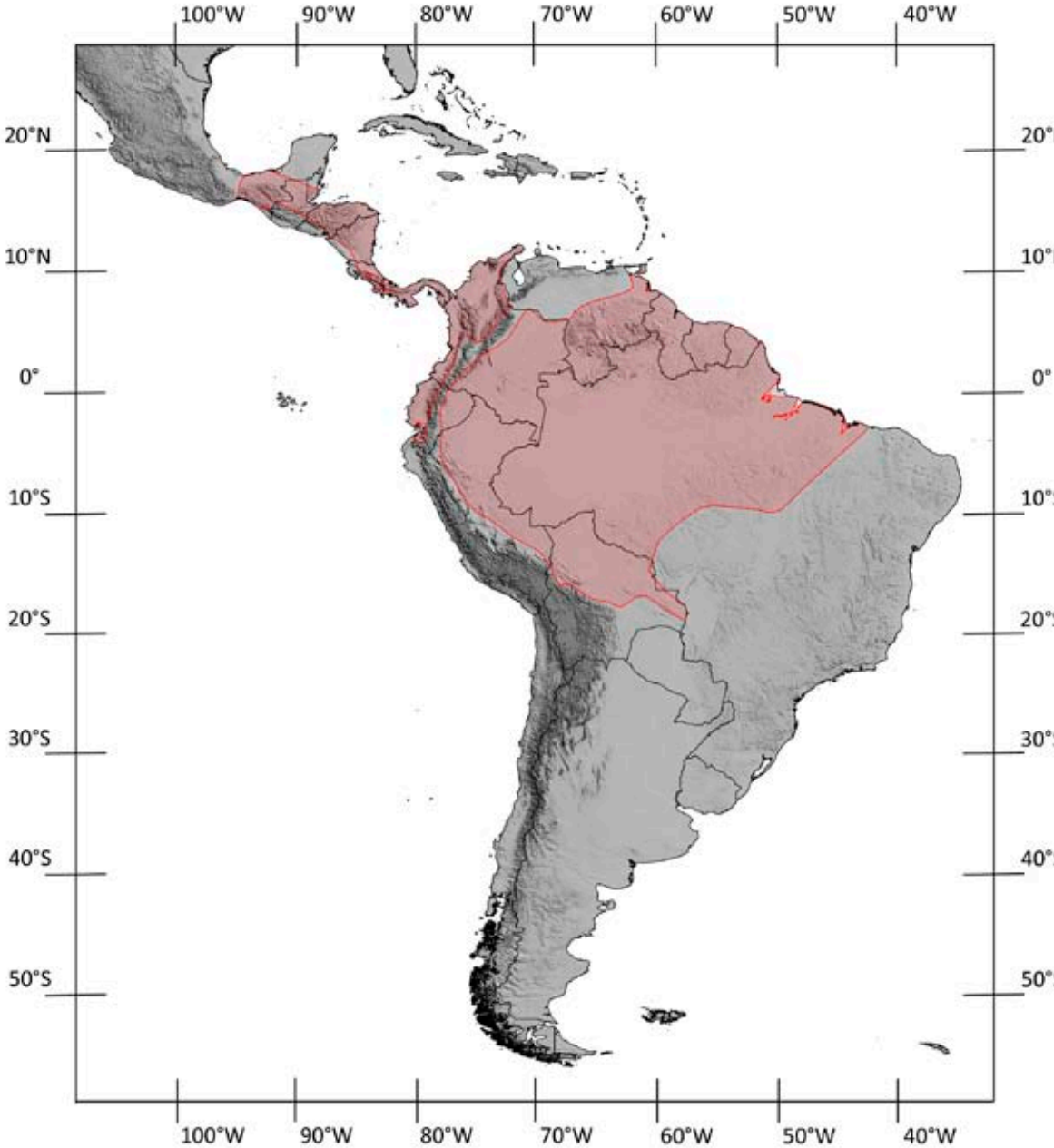


Figure 4. *Cyclopes didactylus*, main population. Based on Cabrera (1957); Hall (1981); Wetzel (1982); Eisenberg (1989); Nowak (1991); Pacheco *et al.* (1995); Anderson (1997); Emmons and Feer (1997); Reid (1997); Eisenberg and Redford (1999); Engstrom and Lim (2000); Lord (2000); Ceballos and Oliva (2005); Gardner (2007); Tirira (2007); Aguiar and Fonseca (2008); Reid (2009).

Cyclopes didactylus, Northeastern Brazil subpopulation

Data Deficient (DD)

Photograph: Flávia Miranda

Common Names: Silky anteater (English), pygmy anteater (English), tamanduaí (Portuguese), tamandua-cigarra (Portuguese).

Assessment Rationale: There is no doubt that rapid and ongoing deforestation of the Atlantic forest is negatively affecting the northeastern population of *C. didactylus*, as the species cannot survive in the sugar cane plantations that are replacing the native vegetation in this area and the remaining patches of suitable habitat are increasingly fragmented. It is therefore highly probable that this population requires listing in a threatened category. The lack of basic data on its ecology, population size and density, however, currently do not allow a realistic assessment of its conservation status. The northeastern population of *C. didactylus* is therefore classified as Data Deficient. Field studies are urgently needed to confirm the taxonomic status of this population and to obtain sufficient information for an appropriate assessment of its conservation status.

Taxonomic Note: The taxonomic status of this isolated population of *C. didactylus* needs to be confirmed.

Geographic Range: This subpopulation of the silky anteater occurs in coastal northeastern Brazil, in the states of Paraíba, Pernambuco, Alagoas and Rio Grande do Norte (Miranda and Superina, 2010; Fig. 5). It is isolated from the main silky anteater population by approximately 1,000 km. The extent of occurrence of this subpopulation is approximately 25,000 km^2.

Population: No data are available on the population size or density of this isolated population of *C. didactylus.* Ongoing deforestation is likely to further fragment the habitat and decimate the wild population of this smallest of all anteaters.

Habitats and Ecology: The northeastern subpopulation of *C. didactylus* is restricted to tropical moist lowland forests. Nothing is known about its biology or ecology.

Threats: This population of silky anteaters is threatened by rapid deforestation of its suitable habitat (Atlantic forest) due to the increase in sugar cane plantations, which, in addition to direct habitat loss, also leads to habitat fragmentation and degradation. Only five percent of the original extent of suitable habitat remain intact (Galindo-Leal and De Gusmão Câmara, 2003). The current area of Atlantic forest in the range states amounts to approximately 3,000 km^2 (Campanili and Prochnow, 2006). Furthermore, silky anteaters are captured for illegal trade (Miranda, pers. comm., 2010).

Conservation: There are no State or National parks within the range of the northeastern Brazil subpopulation of *C. didactylus.* Projeto Tamanduá (Brazil) is performing awareness programs in the area.

Assessors: Miranda, F. and Superina, M.

Evaluators: Bermúdez Larrazabal, L. and Meritt Jr., D.A.

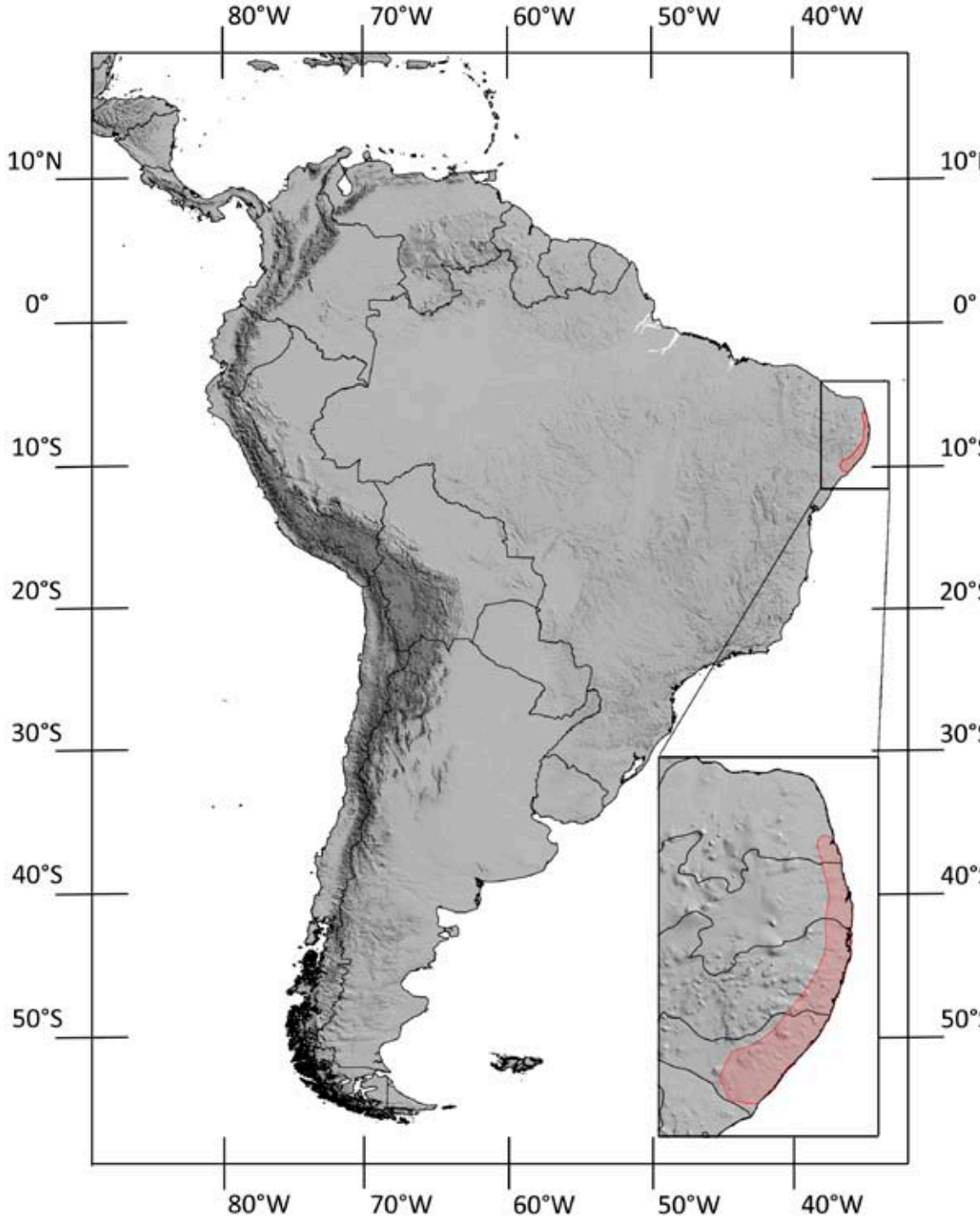


Figure 5. *Cyclopes didactylus*, northeastern Brazil subpopulation. Based on Wetzel (1982); Wetzel (1985); Fonseca *et al.* (1996); Gardner (2007); Aguiar and Fonseca (2008); Miranda and Superina (2010).

Myrmecophaga tridactyla

Vulnerable (VU A2c)

Photograph: Flávia Miranda

Common Names: Giant anteater (English), oso hormiguero (Spanish), oso palmero (Spanish), oso caballo (Spanish), hormiguero gigante (Spanish), banderón caballo (Spanish), tamanduá bandeira (Portuguese), grand fourmilier (French), tamanoir (French).

Assessment Rationale: *M. tridactyla* is geographically widespread, but there have been many records of population extirpation, especially in Central America (where it is considered the most threatened mammal) and the southern parts of its range. The dietary specificity, low reproductive rates, large body size, along with threats to habitat degradation in many parts of its range, have proved to be significant factors in its decline. The giant anteater is currently listed in a threatened category in virtually all regional and national Red Lists. A population loss of at least 30% over the past 10 years has been estimated based on local extinctions, habitat loss, and deaths caused by fires and roadkills. Because of the real threats to this species and the noticeable declines, a precautionary assessment of Vulnerable is given. More data and population monitoring is required for this species, and a re-assessment is recommended as soon as additional information becomes available.

Taxonomic Note: Three subspecies are recognized by Gardner (2007).

Geographic Range: *M. tridactyla* has been recorded from Honduras in Central America, south through South America to the Gran Chaco region of Bolivia, Paraguay and Argentina (Fig. 6). Within Central America, the species has disappeared from much of its range, with recent sightings generally confined to highland regions. Its presence in Ecuador west of the Andes needs to be confirmed. Its extent of occurrence is estimated at 12,500,000 km^2.

Population: *M. tridactyla* is locally uncommon to rare. Habitat loss, roadkills, and wildfires are substantially affecting the wild populations and have led to a continuing decline in mature individuals. A population reduction of 30% has been estimated based on criterion A2c (see glossary). The causes for this population reduction are understood and have not ceased; it is unknown whether they are reversible.

Habitats and Ecology: This terrestrial anteater is found in tropical moist forest, dry forest, savanna habitats and open grasslands; it has also been reported from the Gran Chaco (Meritt, 2008; Noss *et al.,* 2008). Conversion of suitable habitat to soybean and sugarcane plantations is affecting the Brazilian subpopulations. There is also habitat loss in other range countries. Animals are generally solitary. Males and females reach reproductive maturity at two years of age. Once per year, the female gives birth to a single young. Gestation length is about 190 days. The mother carries the offspring on its back for approximately six months. As it is not possible to determine their age once they reach adult size and long-term population studies on giant anteaters are lacking, there are no data on the longevity, survival rates, or reproductive rates of wild giant anteaters. The generation length is therefore unknown.

Threats: *M. tridactyla* is at risk from habitat loss in parts of its range, and this is a significant threat to Central American populations in particular. Where this species inhabits grassland habitats it is particularly susceptible to fires. Animals are sometimes killed on roads or by dogs. Giant anteaters are hunted for food throughout their distribution; this is especially true in the Caatinga area of Brazil. They are additionally hunted as a pest species, for pets or for illegal trade in some parts of their range. Their skin is sometimes used to manufacture harnesses and other leather products.

Conservation: *M. tridactyla* is listed on Appendix II of CITES. It has been recorded from many protected areas. It is listed on several national Red Lists, and is protected as a national heritage species in some provinces in Argentina. The giant anteater is considered the most threatened mammal of Central America; it seems to be extinct in Belize and Guatemala, and probably also in Costa Rica. In South America, this species is extinct in Uruguay (Fallabrino and Castiñeira, 2006) and in the state of Santa Catarina, Brazil (Cherem *et al.*, 2004). It is classified as Critically Endangered in Rio Grande do Sul, Brazil (Fontana *et al.*, 2003) but will be categorized as Extinct in the next update of this state's Red List (C. Kasper, pers. comm., 2009). There is a need to improve fire management practices, especially in sugarcane plantations and within the regions of grassland habitat occupied by this species. A Population Management Plan is in place in North American zoos and is being initiated in Brazil.

Assessors: Miranda, F. and Medri, I.M.

Evaluators: Superina, M. and Abba, A.M.

Contributor: Kasper, C.

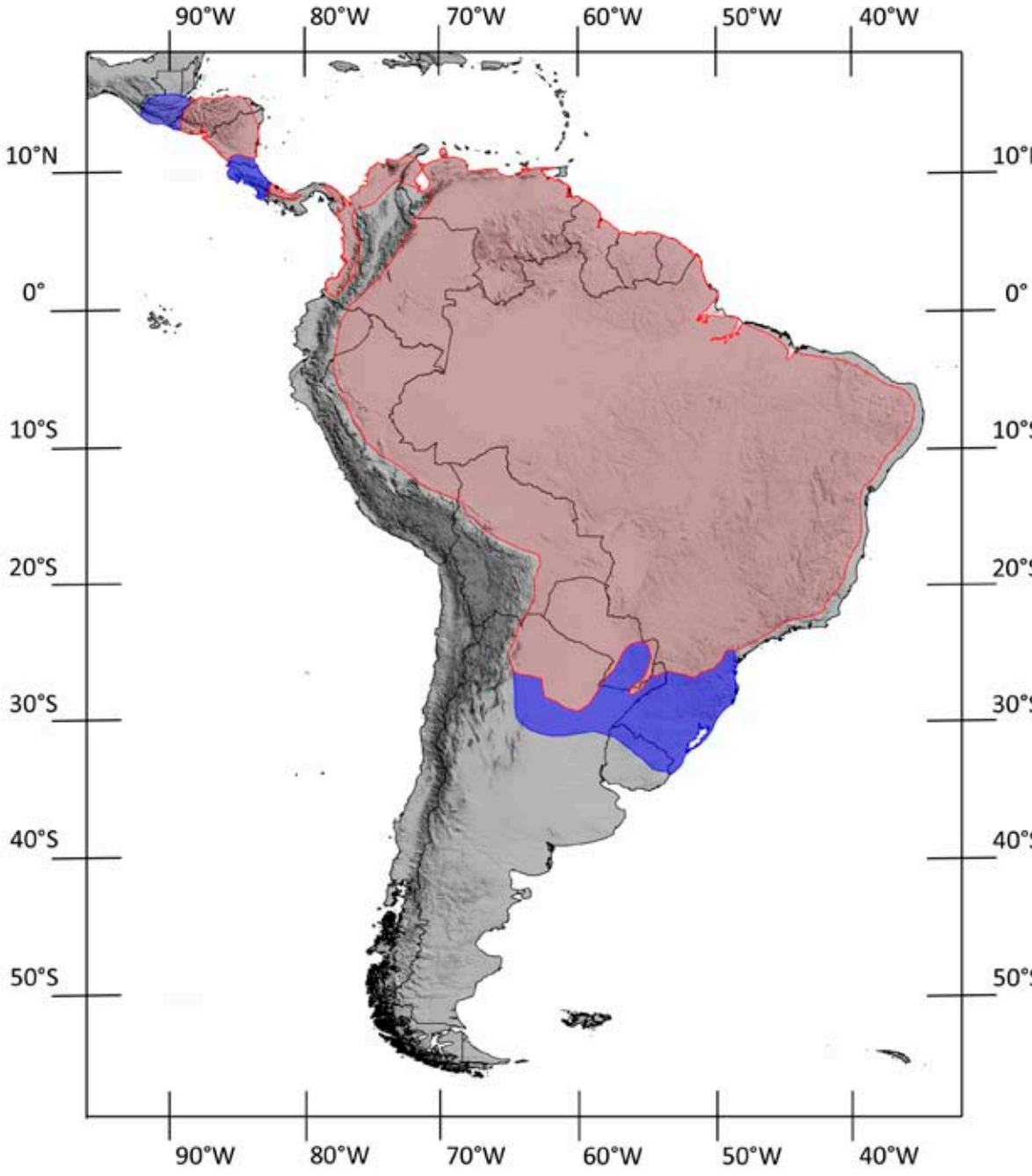
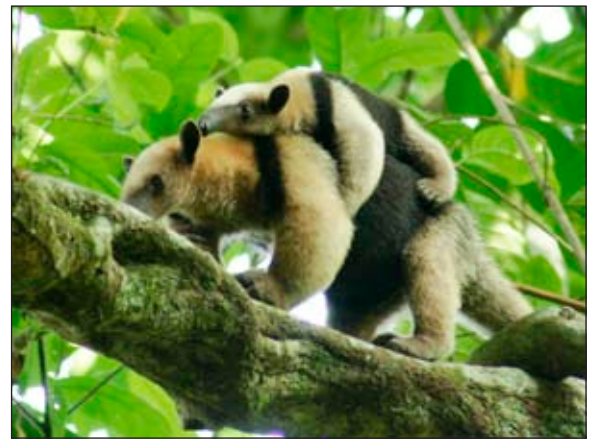


Figure 6. *Myrmecophaga tridactyla*. Blue: areas where the species is possibly extinct. Based on Sanborn (1953); Hall (1981); Wetzel (1982); Wetzel (1985); Eisenberg (1989); Anderson (1997); Emmons and Feer (1997); Reid (1997); Engstrom and Lim (2000); McCain (2002); Anonymous (2003); Fontana *et al.* (2003); INBio-SINAC (2003); INBio (2007); Cherem *et al.* (2004); Mikich and Bernils (2004); Fallabrino and Castiñeira (2006); Gardner (2007); Tirira (2007); Aguiar and Fonseca (2008); Koster (2008); Meritt (2008); Noss *et al.* (2008); Pérez-Jimeno and Llarín Amaya (2009); Smith (2009); Tarifa (2009). A. M. Abba, pers. comm. (2009); C. B. Kasper, pers. comm. (2009); N. Moraes-Barros, pers. comm. (2009); Í. M. Medri, pers. comm. (2009).

Tamandua mexicana

Least Concern (LC)



Photograph: Santiago Escobar

Common Names: Northern tamandua (English), tamandúa (Spanish), oso melero (Spanish), oso mielero (Spanish), oso hormiguero (Spanish).

Assessment Rationale: *T. mexicana* is listed as Least Concern in view of its wide distribution, presumed large population, its occurrence in a number of protected areas, its tolerance of a degree of habitat modification, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category.

Taxonomic Note: Wetzel (1982) recognizes five subspecies of *T. mexicana*. Further taxonomic work is needed for this species.

Geographic Range: *T. mexicana* ranges from southern Mexico in the north of its range, through Central America as far south as northwestern Peru and northwestern Venezuela (Fig. 7). It ranges from sea level to 2,000 m asl, although most sightings have been recorded from areas below 1,000 m asl (Cuervo-Díaz *et al.*, 1986; Eisenberg, 1989, Cuarón, 2005; Tirira, 2007). Its extent of occurrence is approximately 1,500,000 km^2.

Population: The northern tamandua is common in appropriate habitat. It is, however, considered uncommon in Ecuador (Tirira, 2007, 2008), where populations are highly fragmented. Population density estimates vary from 0.06 individuals per hectare in Costa Rica (Guariguata *et al.*, 2002) to 0.13 individuals per hectare in Panama (Montgomery, 1985a). Its home range has been estimated at 25 hectares in Central America and Ecuador (Montgomery, 1985a; Tirira, 2007) and 70 hectares in Panama (Eisenberg, 1989).

Habitats and Ecology: *T. mexicana* is found in tropical and subtropical dry and moist forest, including mixed deciduous and evergreen habitats. It can also be found in mangroves and grassland with some trees. It can survive in secondary forests and in disturbed habitats. The most common coloration is tan with a black vest on back and sides (Wetzel, 1985) but uniformly tan individuals without vest also occur. *T. mexicana* can move, feed and rest on the ground and trees (Lubin and Montgomery, 1981; Montgomery, 1985a, 1985b). It also swims (Esser *et al.*, 2010). The females give birth to one young at any time of the year (Reid, 1997). Gestation length estimates vary between 130 and 150 days (Silveira, 1969). The mating behavior has been described by Matlaga (2006).

Threats: Roadkills, wildfires and habitat change are affecting this arboreal anteater, but the scope of these threats is unknown. In rural Ecuador, *T. mexicana* is persecuted because it attacks domestic dogs when defending itself (Tirira, 2007). It is used as a pet species in southern Mexico (Lira-Torres, 2006), and

indigenous people may hunt it for food in some areas (Espinoza *et al*., 2003; Méndez-Cabrera and Montiel, 2007).

Conservation: The population of *T. mexicana* in Guatemala is listed on Appendix III of CITES. It has been recorded from several protected areas, among them Soberanía National Park (Panamá), Machalilla National Park, and the Ecological Reserves Arenillas, Cotacachi-Cayapas, Mache-Chindul and Manglares Churute (all in Ecuador; Tirira, 2007).

Assessors: Miranda, F. and Superina, M.

Evaluators: Tirira, D. and Ortega Reyes, J.

Contributors: Arteaga, M.C.

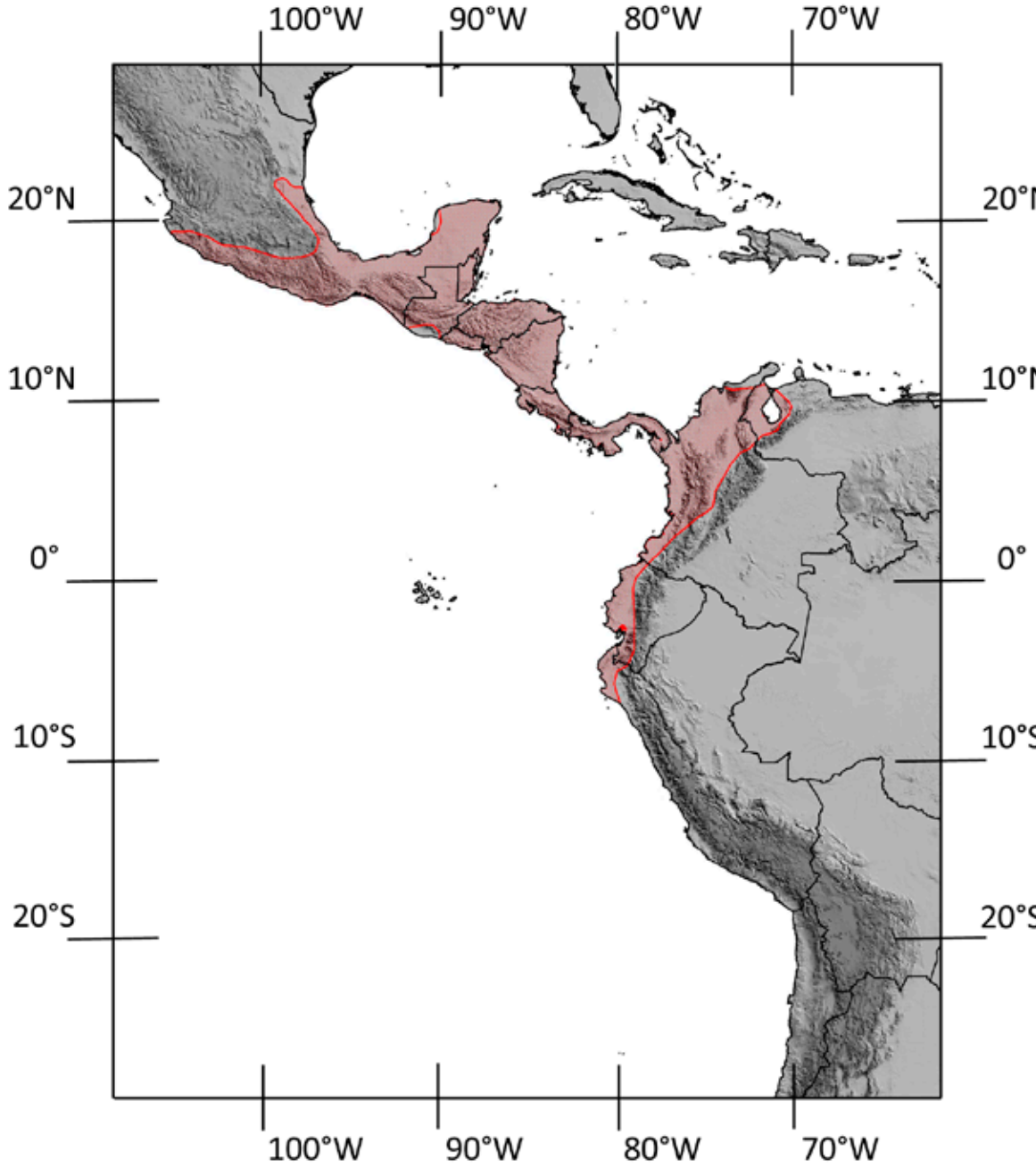


Figure 7. *Tamandua mexicana*. Based on Hall (1981); Wetzel (1982); Wetzel (1985); Cuervo-Díaz *et al.* (1986); Eisenberg (1989); Pacheco *et al.* (1995); Emmons and Feer (1997); Reid (1997); Alberico *et al.* (2000); Cuarón (2005); Gardner (2007); Tirira (2007); Aguiar and Fonseca (2008).

Tamandua tetradactyla

Least Concern (LC)

Photograph: Monalisa Duarte

Common Names: Southern tamandua (English), tamandua (English), collared anteater (English), lesser anteater (English), tamanduá (Spanish), oso melero (Spanish), brazo fuerte (Spanish), hormiguero de collar (Spanish), tamandúa de collar (Spanish), tamanduá-mirim (Portuguese), tamanduá de colete (Portuguese), mambira (Portuguese), fourmilier à collier (French), tamandou tétradactyle (French), tamandou à quatre doigts (French).

Assessment Rationale: *T. tetradactyla* is listed as Least Concern in view of its wide distribution, presumed large population, its occurrence in a number of protected areas, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category.

Taxonomic Note: There are four subspecies of *T. tetradactyla* (Gardner, 2007).

Geographic Range: *T. tetradactyla* is found to the east of the Andes from Colombia, Venezuela, Trinidad Island, and the Guianas (French Guiana, Guyana, and Suriname), south to northern Uruguay and northern Argentina (Fig. 8). It ranges from sea level to 2,000 m asl (Emmons and Feer, 1990). The extent of occurrence of this species is approximately 12,800,000 km^2.

Population: *T. tetradactyla* is a relatively common species.

Habitats and Ecology: The southern anteater is adaptable to a variety of habitats, including gallery forests adjacent to savannas, and lowland and montane moist tropical rain forest (Eisenberg, 1989). It can also be found in mangroves (F. Miranda, pers. comm., 2010).

Typically, this solitary species has pale tan or golden fur with a black vest, but uniformly tan to black coloration also occurs (Wetzel, 1985). It mainly feeds on ants and termites, but also attacks bees nests to eat honey (Emmons and Feer, 1990). Both genders reach sexual maturity at two years of age. The female gives birth to a single young once per year (Silveira, 1968). Gestation length estimates vary from 130 to 150 days.

Threats: There are no major threats to this small anteater, although in some portions of its range it is hunted for meat, by domestic dogs, or (inappropriately) used as a pet species (Aguiar and Fonseca, 2008; Noss *et al.,* 2008; D.A. Meritt Jr., pers. comm., 2010). Tamanduas that are found in the wild are donated or sold to private persons or zoos, and may be involved in animal traffic. Habitat loss and degradation, wildfires, and road traffic represent a threat in some areas. In Uruguay, *T. tetradactyla* is affected by habitat loss due to the increase in eucalyptus plantations (A. Fallabrino, pers. comm., 2010).

Conservation: *T. tetradactyla* is present in a number of protected areas. Further systematic studies on the

southern tamandua are needed to investigate population densities and dynamics in different parts of its range. Studbooks for captive tamanduas exist in some range countries, and a Population Management Plan has been established in AZA zoos.

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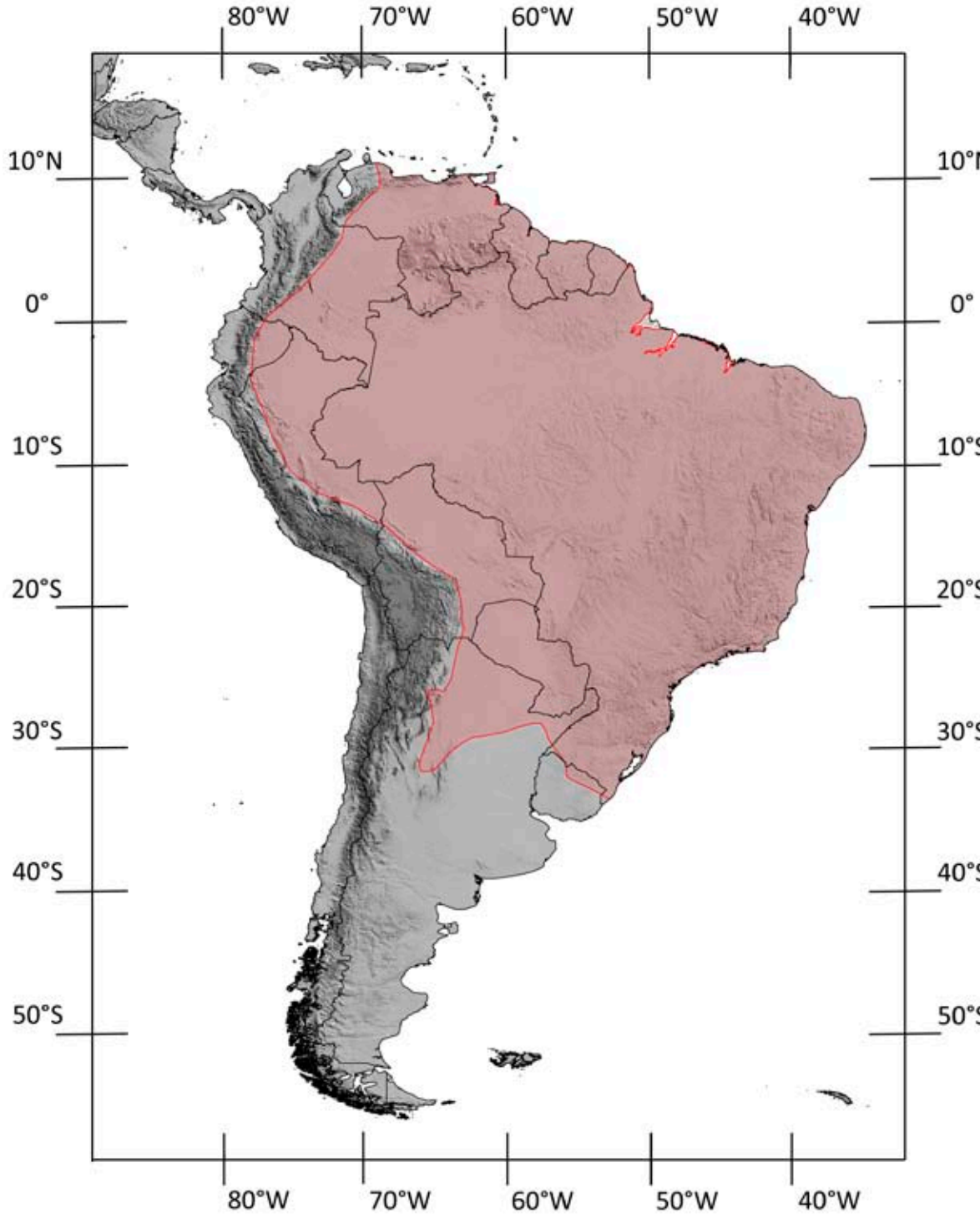

Figure 8. *Tamandua tetradactyla.* Based on Sanborn (1953); Wetzel (1982); Wetzel (1985); Eisenberg (1989); Emmons and Feer (1990); Pacheco *et al.* (1995); Anderson (1997); Alberico *et al.* (2000); Engstrom and Lim (2000); Agüero *et al.* (2003); Fallabrino and Castiñeira (2006); Vizcaíno *et al.* (2006); Fra *et al.* (2007); Gardner (2007); Aguiar and Fonseca (2008); Tirira (1999); Noss *et al.* (2008); Fallabrino *et al.* (2009); Smith (2009); Torres *et al.* (2009). A. Agüero, pers. comm. (2009) ; T. Rogel, pers. comm. (2009).

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The 2010 Sloth Red List Assessment

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Agustín Manuel Abba

Abstract

The conservation status of all sloth species was re-assessed in May and June 2010 by the IUCN/SSC Anteater, Sloth and Armadillo Specialist Group. Four out of six species were categorized as Least Concern. Two sloths were classified in a threatened category according to the IUCN Red List of Threatened Species; *Bradypus torquatus* was listed as Vulnerable, and *Bradypus pygmaeus* as Critically Endangered. Sloths are mainly threatened by hunting, illegal pet trade, and by habitat degradation and fragmentation. According to the 2010 assessment, the taxonomy of all six species requires further research. Data on their population size, range, and dynamics, as well as their life history, is still insufficient.

Keywords: Conservation status, threats, *Bradypus*, *Choloepus*, Pilosa, Xenarthra

Introduction

Six years after the last assessment (Fonseca and Aguiar, 2004), the IUCN/SSC Anteater, Sloth and Armadillo Specialist Group re-evaluated the conservation status of the four *Bradypus* and two *Choloepus* species in May and June 2010. The IUCN Red List Categories and Criteria, version 3.1 (IUCN, 2001) were used. Eight researchers provided data on the geographic range, population size and status, habitat and ecology, threats, and existing conservation measures of sloths. All assessments were checked for consistency by at least two specialists.

Five sloths maintained their Red List category, while *Bradypus torquatus* was downgraded from Endangered to Vulnerable due to new and more accurate data on its extent of occurrence (Table 1). As in 2004, four out of six species were categorized as Least Concern. The population trend of these sloths is, however, unknown (Table 1). Two sloths were classified in a threatened category: *Bradypus pygmaeus* was listed as Critically Endangered, and, as mentioned before, *Bradypus torquatus* was re-categorized as Vulnerable (Table 1). Both species have negative population trends and thus require close monitoring.

Sloths are mainly threatened by hunting, either to be used as a protein source or to be (illegally) sold as pets (at least four out of six species), and by habitat degradation and fragmentation (*B. torquatus* and *C. hoffmanni*). Several research gaps have been identified; according to the 2010 assessment, the taxonomy of all six species requires further research (Fig. 1). Furthermore, data on their population size, range, and dynamics, as well as their life history, is still insufficient.

All sloths occur in at least one protected area, and education programs are in place in part of the range of five species (Fig. 2). *Bradypus torquatus* is the only xenarthran for which an action recovery plan exists. *Bradypus variegatus* is listed in CITES Appendix II, and the Costa Rican populations of *C. hoffmanni* are included in Appendix III (CITES, 2009). No harvest management or area-based management plans exist for any sloth species.

We thank all researchers, graduate students, rangers, and enthusiasts who participated in the 2010 Sloth Red List Assessment. Detailed species descriptions and updated range maps can be found on the following pages.

Table 1. Historical overview of the Red List categories and current population trends of the six sloth species. See glossary for definitions of the categories.

Species	1996	2004	2010	Population trend
Bradypus pygmaeus	--	**CR** B1ab(i,ii,iii)	**CR** B1ab(ii,iii)	↓
Bradypus torquatus	**EN**	**EN** B1ab(i,ii,iii)	**VU** B2ab(i,ii,iii)	↓
Bradypus tridactylus	**LR/lc**	**LC**	**LC**	**?**
Bradypus variegatus	**LR/lc**	**LC**	**LC**	**?**
Choloepus didactylus	**DD**	**LC**	**LC**	**?**
Choloepus hoffmanni	**DD**	**LC**	**LC**	**?**

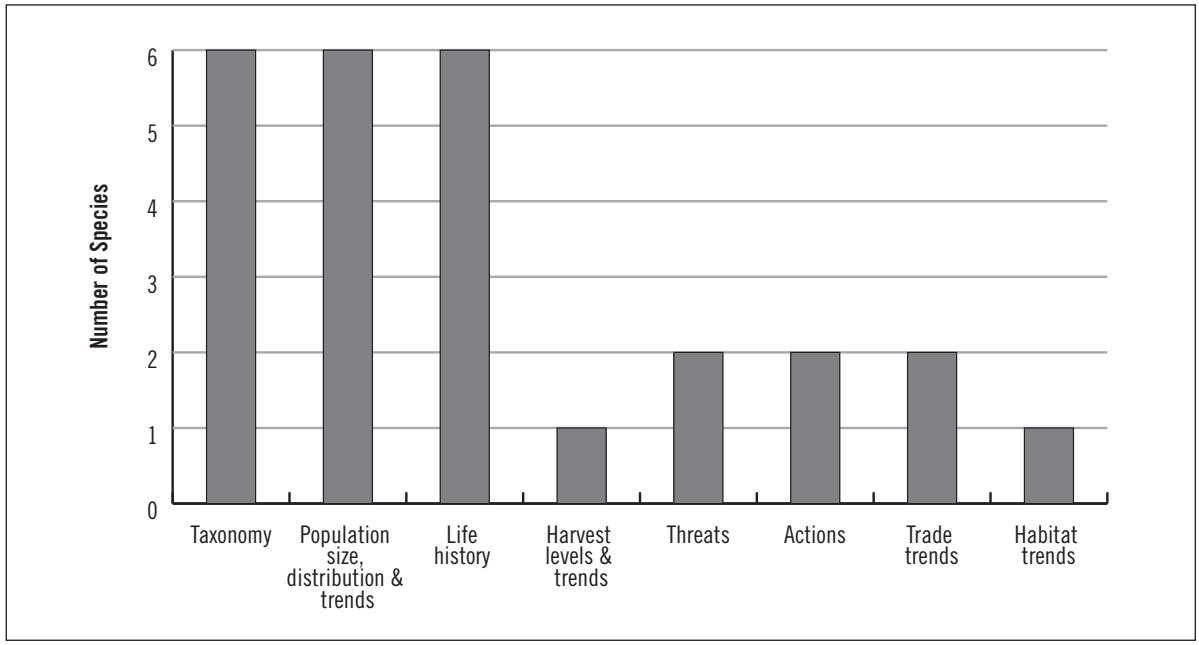


Figure 1. Research priorities for sloths

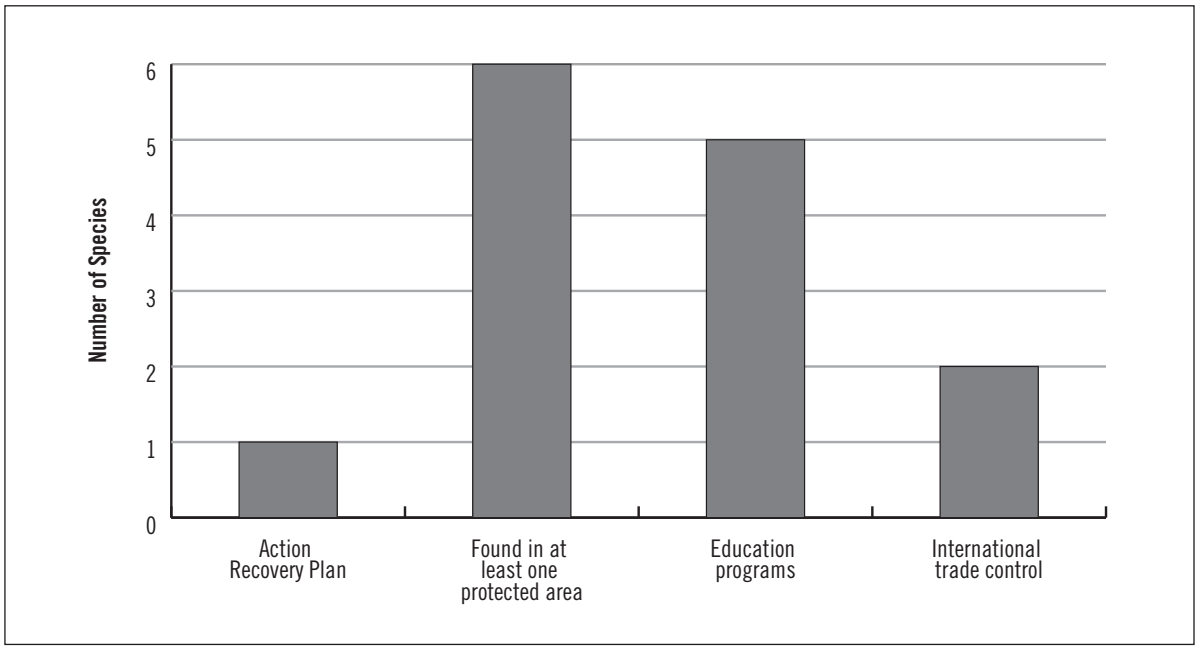


Figure 2. Existing conservation measures for sloths

Bradypus pygmaeus

Critically Endangered (CR B1ab(ii,iii))

Photograph: Bryson Voirin

Common Names: Pygmy three-toed sloth (English), perezoso pigmeo (Spanish), preguiça anã (Portuguese).

Assessment Rationale: *B. pygmaeus* is listed as Critically Endangered as this species has a very restricted range, being found only on one very small island less than 5 km² in size, and there is likely a continuing decline in the quality of habitat and area of occupancy due to habitat degradation.

Taxonomic Note: *B. pygmaeus* has only recently been described as a separate species (Anderson and Handley, 2001).

Geographic Range: *B. pygmaeus* is known only from Isla Escudo de Veraguas, in the islands of Bocas del Toro, Panama (Fig. 3). Sloths on the younger islands of the Bocas del Toro archipelago are conspecific with *Bradypus variegatus* (Anderson and Handley, 2001, 2002). Isla Escudo de Veraguas has an area of approximately 4.3 km² and is about 17.6 km from the mainland of Panama. Based on the area of red mangrove forest on Isla Escudo de Veraguas, the area of occupancy is estimated at 1.3 to 1.5 km².

Population: There is no information available on the population status of *B. pygmaeus*. The population is likely to be relatively small and presumably consists of less than 500 individuals.

Habitats and Ecology: This smallest of all sloths has only been recorded in the red mangrove forests surrounding the island, currently estimated at 1.3 to 1.5 km². It has not been recorded from forest patches within the island. As far as is known, it primarily, if not exclusively, feeds on mangrove leaves.

Threats: Although the island is uninhabited, there are seasonal visitors (fishermen, lobster divers and local people) who are known to opportunistically hunt the sloths (B. Voirin, pers. comm., 2010). Preliminary studies suggest a low level of genetic diversity among pygmy sloths (Silva *et al.*, 2010; N. Moraes-Barros, pers. comm., 2010), which could lead to endogamic depression if the (already low) population size decreases any further.

Conservation: *B. pygmaeus* is endemic to a single island of Panama, which is protected as a wildlife refuge and is contained within the Comarca Indigenous Reserve. There is a need to improve the enforcement of this protected area, which currently receives little attention from wildlife protection authorities. Conservation of the species could be improved through local awareness programs, specifically those promoting sloths as conservation flagship species.

Assessors: Anderson, R., Moraes-Barros, N. and Voirin, B.

Evaluators: Superina, M. and Abba, A.M.

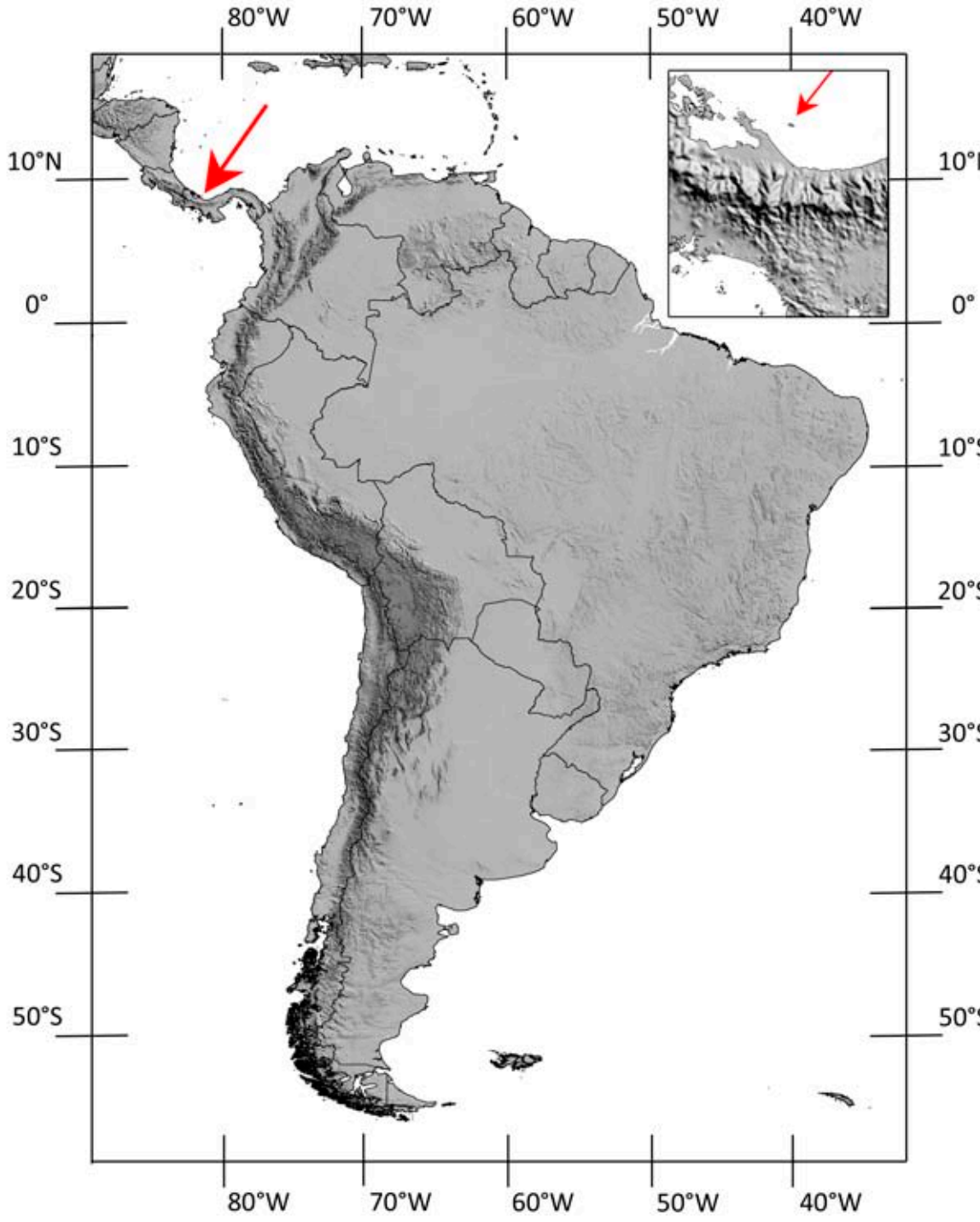


Figure 3. *Bradypus pygmaeus*. Based on Anderson and Handley (2001); Gardner (2007); Aguiar and Fonseca (2008).

Bradypus torquatus

Vulnerable (VU B2ab(i,ii,iii))

Photograph: Kevin Schafer, www.kevinschafer.com

Common Names: Maned three-toed sloth (English), maned sloth (English), preguiça (Portuguese), preguiça-de-coleira (Portuguese), bicho-preguiça (Portuguese).

Assessment Rationale: *B. torquatus* was previously listed as Endangered based on its very restricted extent of occurrence. However, new data and a detailed range analysis based on all confirmed locations and habitat preferences revealed that the extent of occurrence is larger than previously thought. Recent analyses of the available habitat left for *B. torquatus* suggest that this species has an area of occupancy less than 1,000 km² (based on remaining forest within its highly fragmented range). Nevertheless, its range, area of occupancy, and habitat are in continuing decline due to ongoing habitat loss and degradation in the Brazilian Atlantic forest. Furthermore, it is threatened by hunting. *B. torquatus* is therefore listed as Vulnerable, with the caveat that a re-assessment should be performed as soon as more data on the wild populations become available.

Taxonomic Note: There are three genetically distinct populations of this species in the states of Bahia, Espírito Santo and Rio de Janeiro (Moraes-Barros *et al.*, 2002, 2006; Lara-Ruiz *et al.*, 2008). The northern population (in southern Bahia) might be considered a separate subspecies (Lara-Ruiz *et al.*, 2008), although indistinguishable from the others in external morphology (A. Chiarello, pers. comm., 2010). For information on the genetic diversity of maned sloths, see also Lara-Ruiz (2004).

Geographic Range: *B. torquatus* is restricted to the coastal Atlantic forests of eastern Brazil (Fig. 4). Historically, it possibly occurred throughout the coastal forest of Bahia through to the state of Pernambuco (footnote by O. Pinto in Wied's 19th century account; Coimbra-Filho, 1972). At present, the southern part of the state of Bahia is the primary stronghold for the species. Maned sloths were recently reported from the state of Sergipe (Chagas *et al.*, 2009) but thus far no records have been collected in the adjacent state of Alagoas. The extensive deforestation of suitable habitat in this state suggests that it is unlikely to survive there. A natural biogeographic gap occurs in northern Espírito Santo, perhaps due to a higher degree of deciduity in the forests of this region (Hirsch and Chiarello, in press). The species does not occur from the left bank of Doce River to the vicinity of Mucuri River. It has been reported from extreme northern Minas Gerais on the left bank of Jequitinhonha River. *Bradypus torquatus* has been introduced to some National Parks in Espírito Santo (Caparaó National Park) and Rio de Janeiro (Tijuca National

Park), among other areas, although it is not known if the species is still present at these sites. It ranges from sea level to 1,290 m asl. Its extent of occurrence is estimated at 90,000 km^2 (Hirsch and Chiarello, in press) and its area of occupancy at 1,000 km^2 (Hirsch and Chiarello, unpublished data).

Population: In some parts of Bahia and Espírito Santo, the animals are locally abundant in forest fragments (Chiarello, pers. comm., 2010) although the population density is not well known. Genetic studies indicate no gene flow between the populations of southern Bahia (Ilhéus) and Espiríto Santo (Santa Teresa), and those of Poço das Antas (Rio de Janeiro). It appears that these populations have been isolated before the anthropogenic fragmentation of habitat, possibly beginning in the Pleistocene (Moraes-Barros *et al.*, 2006; Lara-Ruiz *et al.*, 2008). In general, little genetic diversity is exhibited within individual populations, but the northernmost population (Bahia) is the genetically more diverse (Moraes-Barros *et al.*, 2006; Lara-Ruiz *et al.*, 2008). Overall, the global population of *B. torquatus* is assumed to be decreasing in response to the continuing loss and fragmentation of suitable habitat, the Atlantic forest (Ribeiro *et al.*, 2009).

Habitats and Ecology: This largely arboreal species is found in wet tropical forest, most typically in areas with an annual precipitation of 1,200 mm or higher and lacking a dry season. Most records are from evergreen forests, and just a handful of sightings are from semi-deciduous forests (Hirsch and Chiarello, in press). It can be found in secondary forest habitats, including "cabrucas" (cocoa plantations under native forests in southern Bahia; Cassano *et al.*, in press). Some animals have been sighted in forest fragments as small as 20 ha, although the long-term persistence of populations at these sites is unknown. It is a strict folivore that feeds on a relatively small number of food plants (Chiarello, 2008). Chiarello (1998) found that leaves from 21 species formed 99% of the diet of three animals. Like other congeneric sloths, animals descend from trees periodically to urinate and defecate. The females give birth to one young per year, predominantly at the end of the wet season and beginning of the dry season (February-April), and copulation concentrates in the late dry and early wet seasons (August-October; Dias *et al.*, 2009). Sexual maturity is probably reached between the second and third year and longevity in the wild is over 12 years (Lara-Ruiz and Chiarello, 2005).

Threats: The rate of deforestation in the Atlantic forest of eastern Brazil has decreased dramatically in the last three decades but has not stopped (Ribeiro *et al.*, 2009), so the pressure on habitat continues. In southern Bahia the economic crisis of the cocoa plantation (*Theobroma cacao*) puts a pressure on farmers of this product to clear their forest to make room for other economic alternatives, mainly pastures. In other areas, native forests are cleared for other reasons, including coal production, agriculture and city sprawl. The genetic integrity of distinct populations is threatened by the release of confiscated animals at different sites without knowledge or understanding of their origins. Additional threats include subsistence hunting and accidental mortality of *B. torquatus* on roads. Sloths attract the attention when spotted and might be killed just for the sake of curiosity. Although the species is not actively pursued by hunters, individuals might sometimes fall victims of subsistence hunting when spotted by local people. Although hunting is legally forbidden in Brazil, enforcement is ineffective and practically inexistent.

Conservation: *B. torquatus* is present in a number of protected areas, such as the Biological Reserves of Una (Bahia), Augusto Ruschi (Espírito Santo) and Poço das Antas (Rio de Janeiro), among others. The low genetic diversity within fragmented populations indicates a need to develop corridors of suitable habitat between these populations. Confiscated animals should be genetically characterized to determine the most appropriate release site. Data on dispersal ability, sex ratio, mating system, and population density are virtually unknown but important for conservation planning and monitoring. The species has been successfully translocated (Chiarello *et al.*, 2004). Awareness programs are in place in Espírito Santo, Brazil.

Assessors: Chiarello, A. and Moraes-Barros, N.

Evaluators: Hayssen, V. and Abba, A.M.

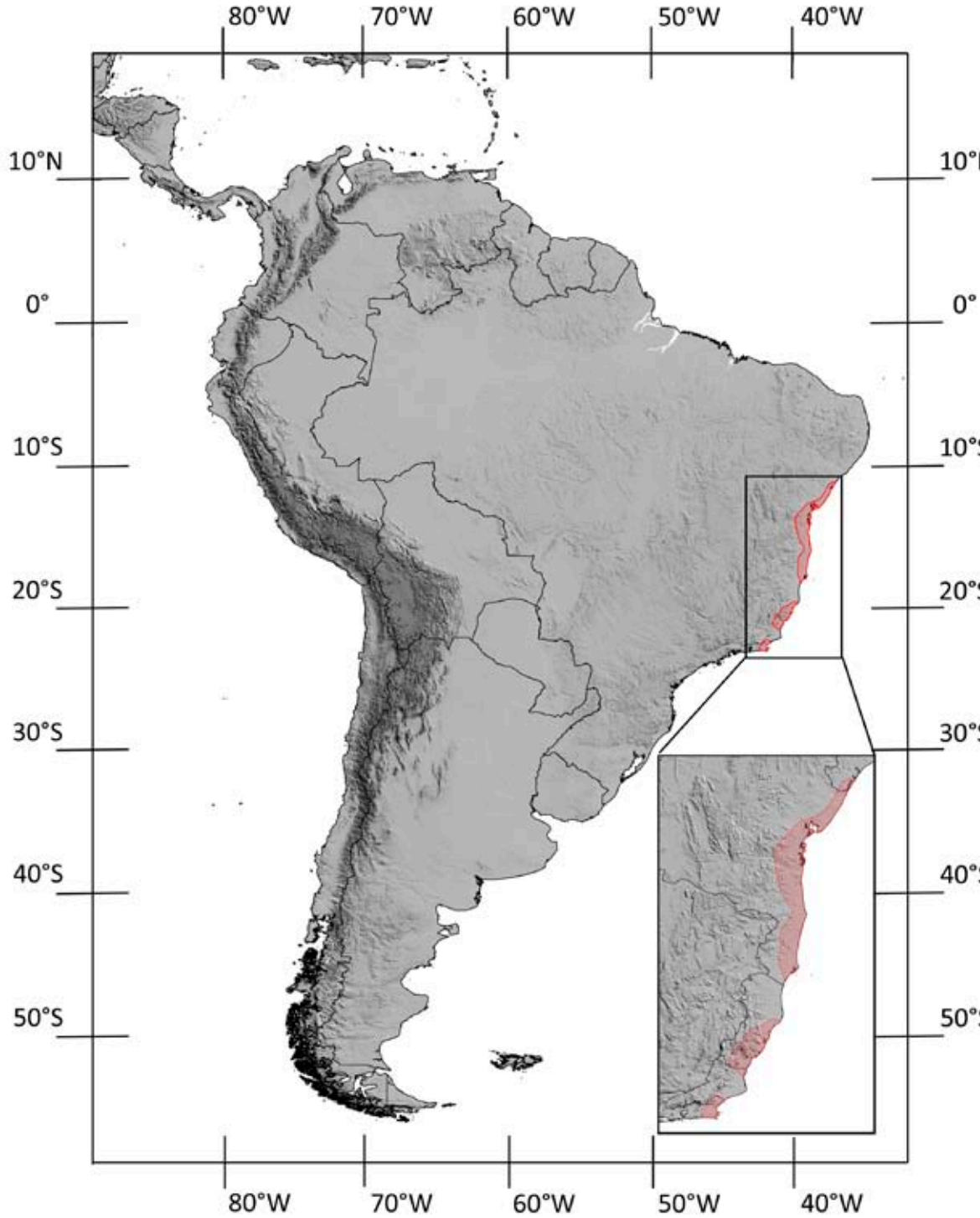


Figure 4. *Bradypus torquatus.* Based on Wetzel (1982); Emmons and Feer (1997); Eisenberg and Redford (1999); Gardner (2007); Aguiar and Fonseca (2008); Chagas *et al.* (2009); Hayssen (2009a); Boffy *et al.* (2010); Hirsch and Chiarello (in press); A. Chiarello, pers. comm. (2010).

Bradypus tridactylus

Least Concern (LC)

Photograph: Monique Pool

Common Names: Pale-throated three-toed sloth (English), pale-throated sloth (English), perezoso de tres dedos (Spanish), preguiça (Portuguese), preguiça-de-bentinho (Portuguese), preguiça-do-norte (Portuguese), ai (Portuguese).

Assessment Rationale: *B. tridactylus* is listed as Least Concern in view of its wide distribution in one of the most pristine areas of the Amazon basin, and its having been recorded as locally relatively abundant.

Geographic Range: *B. tridactylus* occurs in the Guyana Shield region, from Venezuela south of the Orinoco (although its distribution crosses at the delta region) into northern Brazil (south to the Amazonas/Solimões), through to Guyana, Suriname and French Guiana (Fig. 5). It does not occur south of the Amazon River. Its extent of occurrence is estimated at 1,000,000 km^2.

Population: Population density estimates vary from 1.7 animals per km^2 in French Guiana (Taube *et al.,* 1999) to 2.21 animals per hectare (or 221 animals per km^2) in Manaus, Brazil (Chiarello, 2008).

Habitats and Ecology: *B. tridactylus* is found in lowland and montane tropical moist forest. It has been recorded on "tepuis" (table-top mountains). The head and throat of adult sloths are yellowish to white and contrast with the grayish body that bears white spots. Males can be distinguished from females by their dorsal orange-yellow patch with a broad black central line (Hayssen, 2009b). Both males and females reach reproductive age at three to six years. A single young is born after a gestation of six months (Taube *et al.*, 2001; Gilmore *et al.*, 2008).

Threats: There are no major threats to this sloth species.

Conservation: *B. tridactylus* has been recorded from many protected areas.

Assessors: Chiarello, A. and Moraes-Barros, N.

Evaluators: Superina, M. and Abba, A.M.

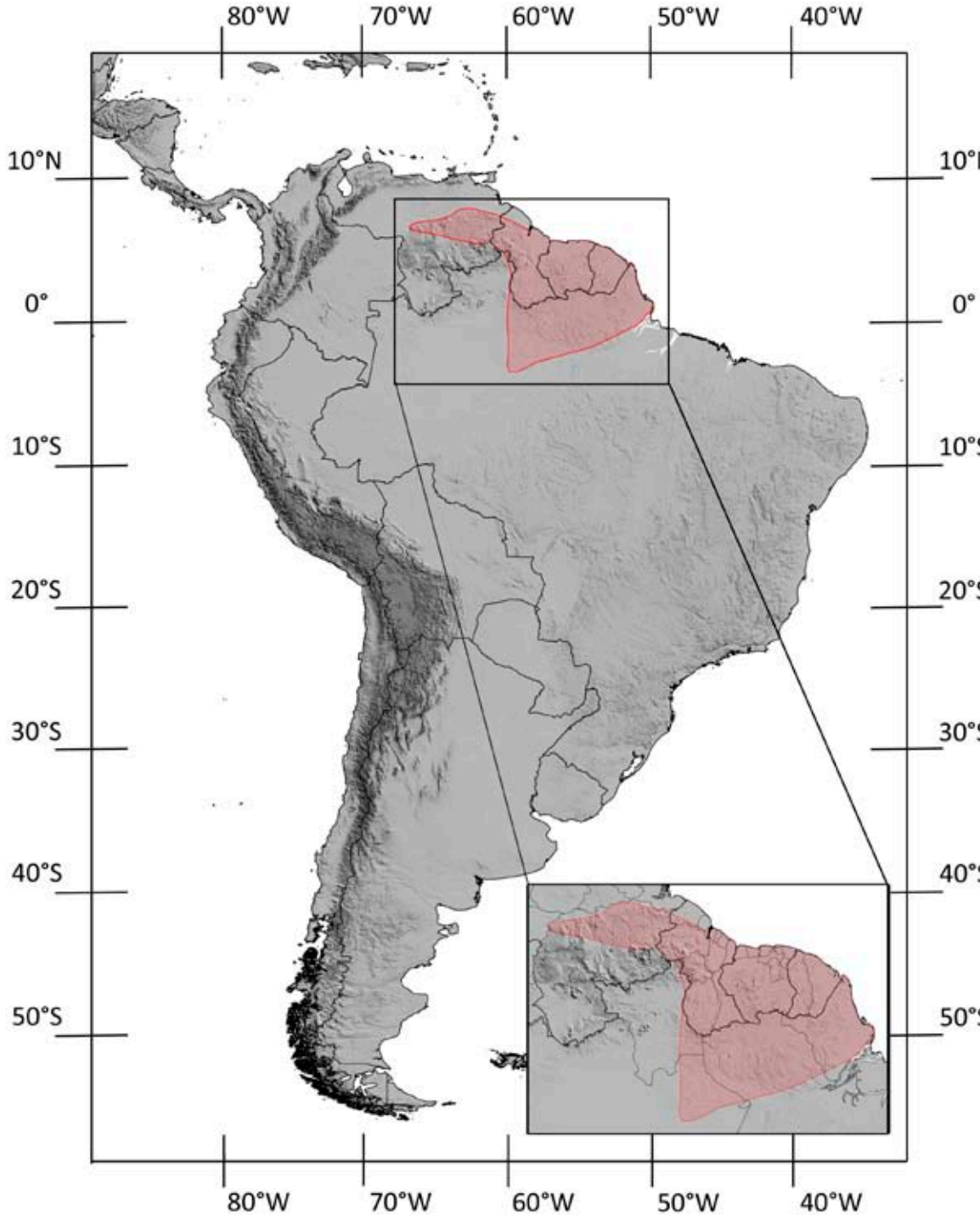
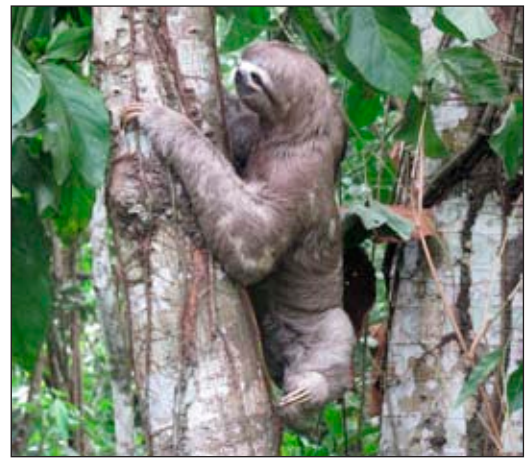


Figure 5. *Bradypus tridactylus.* Based on Wetzel (1982); Emmons and Feer (1997); Eisenberg and Redford (1999); Taube *et al.* (1999); Engstrom and Lim (2000); Gardner (2007); Aguiar and Fonseca (2008); Hayssen (2009b); Moraes-Barros *et al.* (2010); N. Moraes-Barros, pers. comm. (2009).

Bradypus variegatus

Least Concern (LC)



Photograph: Simonne Schinem

Common Names: Brown-throated three-toed sloth (English), brown-throated sloth (English), Bolivian three-toed sloth (English), perezoso tridáctilo (Spanish), perezoso bayo (Spanish), perezoso grisáceo (Spanish), guasa (Spanish), preguiça (Portuguese), preguiça-comum (Portuguese), bicho-preguiça (Portuguese), preguiça de óculos (Portuguese), ai (Portuguese), paresseux tridactyle (French), bradype (French), aï de Bolivie (French), paresseux tridactyle de Bolivie (French).

Assessment Rationale: *B. variegatus* is listed as Least Concern in view of its wide distribution including a large part of the Amazon forest, presumed large population, its occurrence in a number of protected areas, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category.

Taxonomic Note: Seven subspecies are recognized according to Gardner (2007). Recent phylogeographic studies revealed that *B. variegatus* from the Central American, western Amazon and Atlantic forests constitute distinct and unique evolutionary units that are distinguishable by molecular and morphological traits (Moraes-Barros *et al.*, 2002, 2006, 2007).

Geographic Range: *B. variegatus* ranges from Honduras in the north, through southern Central America. In South America, it ranges from Colombia into western and southern Venezuela, and south into Ecuador, eastern Peru and Bolivia, into Brazil and northern Argentina (where it is probably extinct; Fig. 6). Its distribution overlaps with *B. torquatus* in the central part of the Atlantic forest (Hirsch and Chiarello, unpublished data). In Brazil, the species currently occurs in forested areas of the Amazon, Atlantic forest, and Cerrado biomes. There are historical records of *B. variegatus* in the Caatinga biome (Moraes-Barros, unpublished data). Its presence in the Pantanal biome of Brazil remains unconfirmed, but the species might occur in the contact zones between this biome and the Amazon forest to the north. Additional field studies are thus necessary in order to properly define the current species distribution in the Cerrado, Caatinga and Pantanal. The southernmost distribution of this sloth in Brazil was reported by Cabrera (1957) as the state of Rio Grande do Sul, which could, however, not be confirmed (Gardner, 2007). It is historically absent from the state of Santa Catarina (Brazil) and northeastern Argentina; the southernmost confirmed record of the species is near Londrina, in the state of Paraná, Brazil, but today it is considered extinct in this state (Mikich and Bernils, 2004). The last record from Argentina was collected in Jujuy province and dates back to 1916 (Vizcaíno *et al.*, 2006), but field studies specifically aiming at this species are lacking from this country. *B. variegatus* is found from sea level to at least 2,400 m asl (Ureña *et al.*, 1986). The extent of occurrence of this species amounts to approximately 10,000,000 km^2. Its area of occupancy

is declining; this is particularly true for the Brazilian Atlantic forest and the Colombian populations.

Population: Population densities of *B. variegatus* have been estimated at 2.2 to 6.7 animals per hectare in the Brazilian Amazon (Queiroz, 1995), 8.5 animals per hectare in Panama (Montgomery and Sunquist, 1975), and 0.6 to 4.5 animals per hectare in the tropical dry forest of Colombia (Acevedo and Sanchez, 2007). No demographic information is available from the remaining area of distribution. *B. variegatus* is commonly found in public squares, where densities can reach 12.5 animals per hectare (Manchester and Jorge, 2009). Severe fragmentation has been reported from the populations in Colombia and from the eastern Brazilian subspecies *B. v. brasiliensis*, which presents the lowest levels of genetic diversity among all *B. variegatus*. The genetic diversity is only comparable to that observed in the Critically Endangered pygmy sloth (*B. pygmaeus*). Molecular studies also indicate that genetic diversity in the northern Atlantic forest subspecies *B. v. variegatus* is lower than values observed for sympatric populations of *B. torquatus* (Moraes-Barros *et al.,* 2006).

Habitats and Ecology: The brown-throated three-toed sloth has been recorded from a number of forest types, including seasonal mesic tropical forest, semi-deciduous forest (inland Atlantic forest), cloud forest, and lowland tropical forest. It inhabits cacao plantations in Costa Rica (Vaughan *et al.*, 2007). This sloth species produces one litter of one infant at intervals of at least 19 months (Bezerra *et al.*, 2008; T. Plese, pers. comm., 2010). Mating period varies depending on the year and geographical region, but occurs mainly in spring (*i.e.*, from July to November in South America and from February to May in Central America).

Threats: It appears that there are no major threats to *B. variegatus* at the global level. Nevertheless, some populations, especially in Colombia and Brazil, are declining due to deforestation leading to severe habitat degradation and fragmentation. Furthermore, they are hunted by local indigenous communities. In Brazil, especially in the northeastern region and in the Amazon, and in Colombia the common sloth is hunted and sold in public markets as food, medicine, and as a pet species. In several touristic sites, *B. variegatus* is used by locals to entertain visitors. Wild-caught individuals, especially offspring, are sold as pets to tourists in Colombia (Moreno and Plese, 2006). This illegal trade is increasing and represents a cause of concern due to its impact on the wild populations.

Conservation: *B. variegatus* is present in many protected areas. It is included in CITES Appendix II. Education and awareness programs are being carried out by Fundación Unau in Colombia.

Assessors: Chiarello, A., Plese, T. and Moraes-Barros, N.

Evaluators: Superina, M. and Abba, A.M.

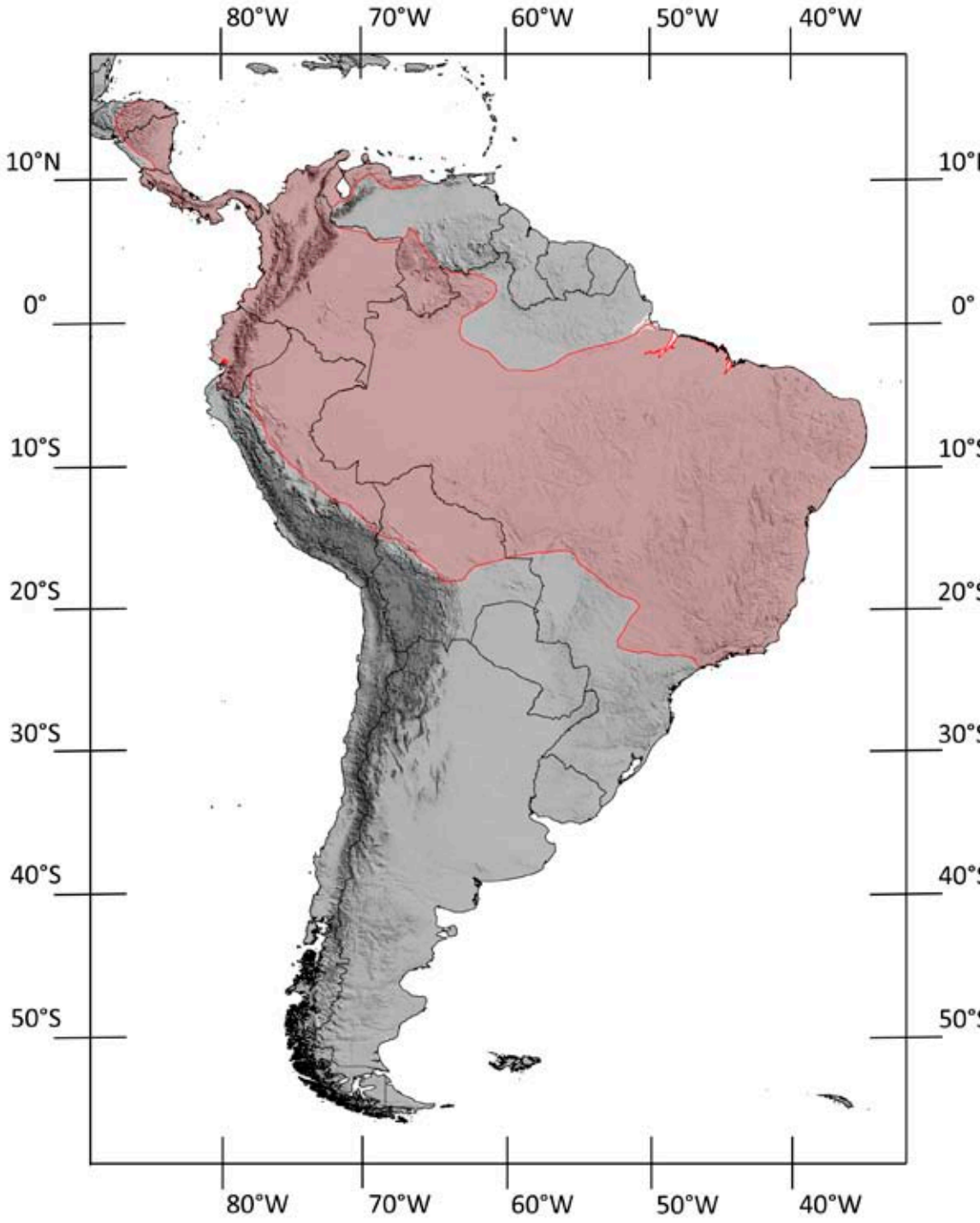


Figure 6. *Bradypus variegatus.* Based on Hall (1981); Ureña *et al.* (1986); Eisenberg (1989); Redford and Eisenberg (1992); Pacheco *et al.* (1995); Emmons and Feer (1997); Reid (1997); Eisenberg and Redford (1999); Lord (2000); Cáceres (2004); Mikich and Bernils (2004); Moreno and Plese (2005); Medri *et al.* (2006); Gardner (2007); Tirira (2007); Aguiar and Fonseca (2008); Romero *et al.* (2008); Hayssen (2010); Moraes-Barros *et al.* (2010); Í. M. Medri, pers. comm. (2009); N. Moraes-Barros, pers. comm. (2009); T. Plese, pers. comm. (2009).

Choloepus didactylus

Least Concern (LC)

Photograph: John A. Nyakatura

Common Names: Southern two-toed Sloth (English), Linné's two-toed sloth (English), perezoso de dos dedos (Spanish), perico ligero (Spanish), preguiça-real (Portuguese), unau (Portuguese).

Assessment Rationale: *C. didactylus* is listed as Least Concern in view of its wide distribution, presumed large population, its occurrence in a number of protected areas, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category.

Geographic Range: The southern two-toed sloth ranges through Venezuela (the delta and south of the Río Orinoco) and the Guianas (French Guiana, Guyana, and Suriname) south into Brazil (Maranhão state west along the Rio Amazonas/Solimões) and west into the upper Amazon Basin of Ecuador and Peru (Fig. 7). Its southern limit in the western Amazon of Brazil is unclear. It occurs in the southern departments of Colombia, with its northern limit being the departments of Meta and Guainía. It ranges from sea level up to 2,438 m asl (Britton, 1941). The extent of occurrence of this sloth is approximately 4,200,000 km^2.

Population: In Suriname, *C. didactylus* has been found at densities of 0.9 animals per hectare (Taube *et al.,* 1999). In the Brazilian Amazon, estimated densities range from 0.13 individuals per hectare (Manaus region) to 0.88 animals per hectare in the flooded forests (Mamirauá Reserve; Queiroz, 1995; Chiarello, 2008).

Habitats and Ecology: This sloth species is found in tropical moist lowland and montane forest. Two-toed sloths have nocturnal and solitary habits. Gestation length seems to be approximately ten months (Eisenberg and Maliniak, 1985) but estimates are quite variable. Males and females reach sexual maturity at approximately two years of age. Longevity in captive conditions is at least 18 years.

Threats: There are no major threats to *C. didactylus*. Because they are usually found high in the canopy, motionless and virtually invisible, they are not as commonly hunted as armadillos or tamanduas, and there are taboos against their consumption by some native groups. They are probably hunted opportunistically, but there is no serious bushmeat trade.

Conservation: *C. didactylus* is present in many protected areas.

Assessors: Plese, T. and Chiarello, A.

Evaluators: Abba, A.M. and Superina, M.

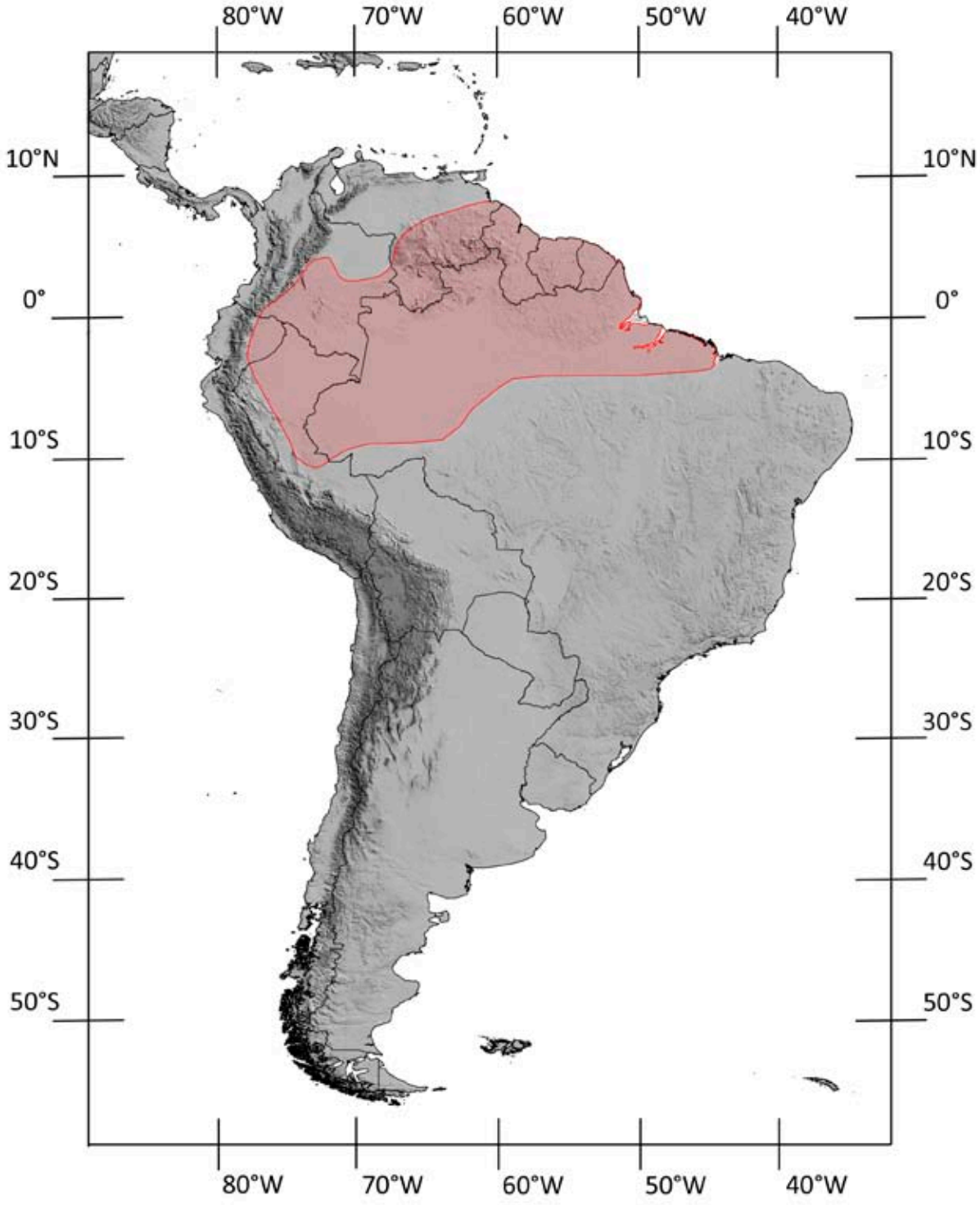


Figure 7. *Choloepus didactylus*. Based on Hall (1981); Pacheco *et al.* (1995); Emmons and Feer (1997); Adam (1999); Engstrom and Lim (2000); Gardner (2007); Tirira (2007); Aguiar and Fonseca (2008).

Choloepus hoffmanni

Least Concern (LC)

Photograph: Fundación Unau

Common Names: Hoffmann's two-toed sloth (English), perezoso (Spanish), perico ligero (Spanish), unau (Spanish), unau d'Hoffmann (French).

Assessment Rationale: *C. hoffmanni* is listed as Least Concern in view of its wide distribution, presumed large population, its occurrence in a number of protected areas, its tolerance of a degree of habitat modification, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category. However, because of ongoing deforestation, the northern population (nominate subspecies) of this species could potentially be assessed as Near Threatened.

Taxonomic Note: Five subspecies are recognized by Gardner (2007).

Geographic Range: *C. hoffmanni* has two disjunct populations. The northernmost population ranges from Nicaragua south into western Venezuela. The southern population is found from north-central Peru through extreme western Brazil (south-western Amazonas and probably Acre states) to central Bolivia (Fig. 8). There is a doubtful, outlying record for this species from the Rio Aripuanã, Mato Grosso state, Brazil (Fonseca and Aguiar, 2004). Its range within Brazil is unclear, and further surveys are needed. This species ranges from sea level to 3,300 m asl in Costa Rica; up to 1,925 m asl in Panama; and up to 1,150 m asl in the southern Andes of Venezuela. In Colombia, the species is found in the biogeographical regions of the Andean zone, Caribbean and Chocó, more specifically in the departments of Cauca, Chocó, Cundinamarca, Nariño, Quindío, Sucre, Valle del Cauca, and Santanderes from sea level up to 3,000 m asl (Alberico *et al.*, 2000; Moreno, 2003; Acevedo and Sanchez, 2007). Its extent of occurrence is approximately 1,600,000 km^2.

Population: This two-toed sloth occurs at densities of 1.05 animals per hectare on Barro Colorado Island, Panama (Montgomery and Sunquist, 1975). It has been found at densities of 0.3 to 1.5 animals per hectare in the Andean region of Colombia, while densities in the lowlands of northern Colombia were 0.2 to 0.83 individuals per hectare (Alvarez, 2004; Acevedo and Sanchez, 2007) and only 0.079 sloths per hectare in the natural reserve "La Montaña del Ocaso", Quindío, Colombia (Aguilar-Isaza and López-Obando, 2009).

Habitats and Ecology: *C. hoffmanni* is found in lowland and montane tropical forest, both deciduous and mixed-deciduous. In Central America, it occurs in evergreen and semi-deciduous tropical moist forest

as well as in secondary forest, but it is rare or absent in lowland dry forest. In Costa Rica, it is able to use cocoa plantations as habitat and frequently ventures into relatively open pastures in search of isolated feeding trees (Vaughan *et al*., 2007). It can also occur in dry grassland with thorny shrubs and trees (Nicaragua; Genoways and Timm, 2003). These sloths are rather solitary. Their herbivore-omnivore diet consists mainly of leaves, fruits and sap of some trees. Both genders reach reproductive maturity at three years of age. Gestation length is approximately 11 months.

Threats: It appears that there are no major threats to *C. hoffmanni* at the global level. Nevertheless, populations in the northwestern part of its range, especially in Colombia and Central America, are declining due to severe habitat degradation and fragmentation. Furthermore, they are hunted by indigenous communities. Wild-caught individuals, especially offspring, are sold as pets to tourists in Colombia (Moreno and Plese, 2006). This illegal trade is increasing and represents a cause of concern due to its impact on the wild populations.

Conservation: *C. hoffmanni* is present in many protected areas. It is included in CITES Appendix III for Costa Rica (CITES, 2009). Further research is needed to establish whether there are taxonomic differences between the two disjunct populations. Ongoing education and awareness programs are carried out by Fundación Unau in Colombia.

Assessors: Plese, T. and Chiarello, A.

Evaluators: Abba, A.M. and Superina, M.

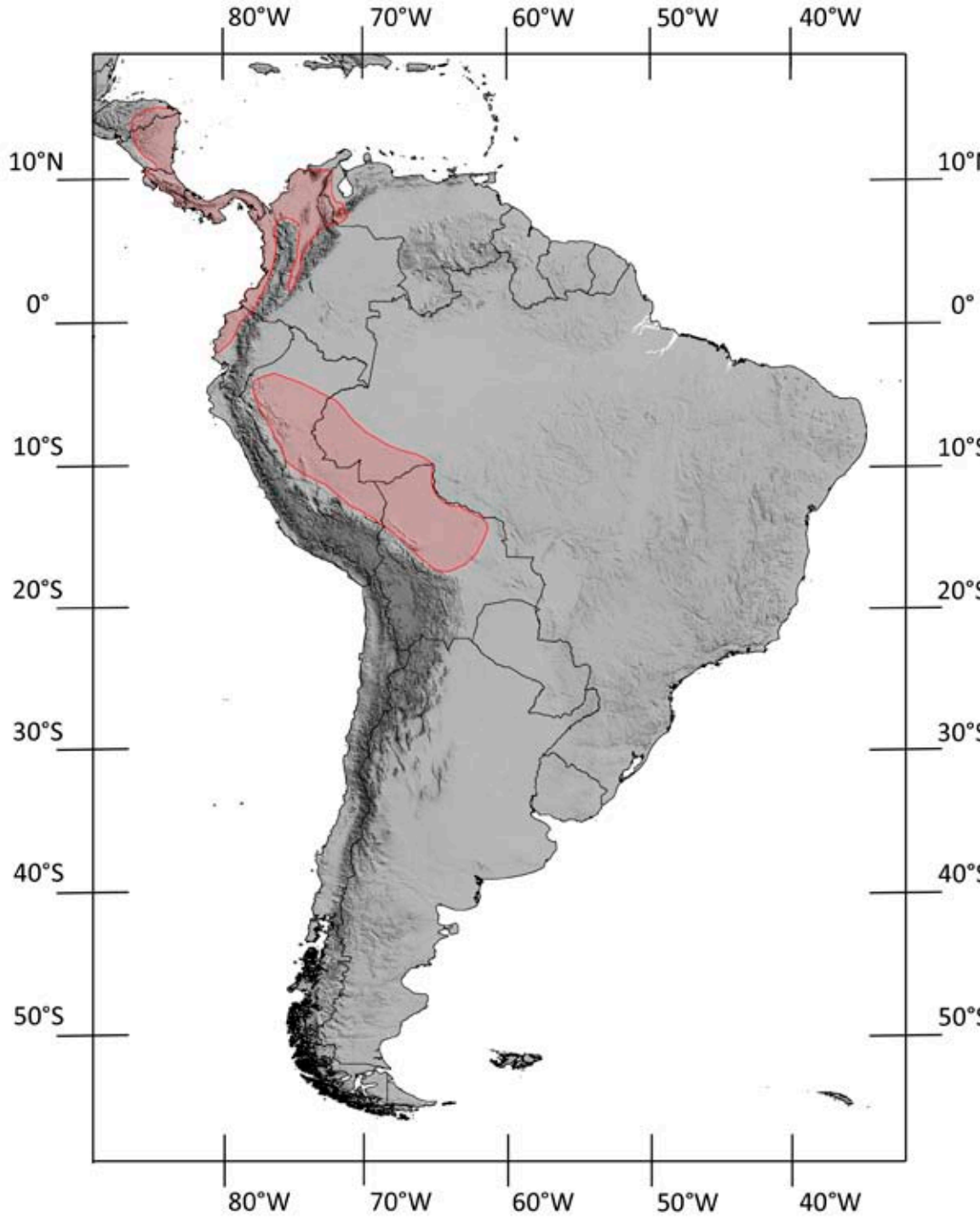


Figure 8. *Choloepus hoffmanni*. Based on Wetzel (1982); Eisenberg (1989); Salazar Bravo *et al.* (1990); Pacheco *et al.* (1995); Anderson (1997); Emmons and Feer (1997); Reid (1997); Eisenberg and Redford (1999); Alberico *et al.* (2000); Genoways and Timm (2003); Moreno (2003); Acevedo and Sanchez (2007); Gardner (2007); Tirira (2007); Aguiar and Fonseca (2008).

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The 2009/2010 Armadillo Red List Assessment

Agustín Manuel Abba
Mariella Superina

Abstract

The conservation status of the 21 extant armadillo species was re-assessed by specialists of the IUCN/SSC Anteater, Sloth and Armadillo Specialist Group between December 2009 and May 2010. Information on their geographic range, population size and status, habitat and ecology, threats, and existing conservation measures was collected from the literature and personal communications. Four armadillo species were classified as Vulnerable, four as Near Threatened, and four were categorized as Data Deficient. Less than half of all armadillo species were listed as Least Concern. Virtually all assessed species are affected by hunting as well as habitat fragmentation and degradation. The populations of only two species are thought to be increasing, while those of at least seven species are in decline. Much work is still needed to ensure the long-term survival of all species. Most armadillo species occur in at least one protected area, but other conservation actions are scarce.

Keywords: Conservation status, threats, Dasypodidae, Cingulata, Xenarthra

The IUCN/SSC Anteater, Sloth and Armadillo Specialist Group re-assessed the conservation status of the 21 extant armadillo species between December 2009 and May 2010. Version 3.1 of the IUCN Red List Categories and Criteria (IUCN, 2001) was used in all cases. Information on their geographic range, population size and status, habitat and ecology, threats, and existing conservation measures was collected from the literature and personal communications. In total, 30 researchers provided data for the 2009/2010 Armadillo Red List Assessment and checked all evaluations for consistency.

As in the 2004 assessment (Fonseca and Aguiar, 2004), four armadillo species are considered Vulnerable (VU), but the reasons for their classification as such has slightly changed (see species descriptions). The two fairy armadillos (*Chlamyphorus truncatus* and *Calyptophractus retusus*) were listed as Near Threatened (NT) in previous assessments (Table 1); their status has been changed to Data Deficient (DD) due to the lack of basic information on their ecology, range, and threats. As a consequence, four instead of six species are currently categorized as Near Threatened, and four are classified as Data Deficient.

Less than half of all armadillo species (43%) are considered Least Concern (LC; Fig. 1). This situation may worsen in the future, as virtually all assessed species are affected by hunting as well as habitat fragmentation and degradation (Fig. 2). Only four species do not seem to be affected by any threat type, while the factors affecting the long-term survival of two species (*Cabassous centralis* and *Dasypus yepesi*) could not be identified. It is possible that persecution by dogs and cats is affecting more species than *Chlamyphorus truncatus* and *Dasypus hybridus* (Fig. 2), but field data to confirm this are lacking.

The populations of only two species, *Dasypus novemcinctus* and *Chaetophractus villosus*, are thought to be increasing, while those of at least seven species are in decline (Table 1). Population trends for over half of all armadillo species remain unknown, underlining the importance of long-term field studies on these mammals. But not only data on population trends are lacking — we are in dire need of basic information on the natural history, threats, harvest levels (for hunted species), and even the taxonomy of many armadillo species (Fig. 3).

An evaluation of existing conservation measures for armadillos reveals that much work is still needed to ensure the long-term survival of all species. Four species are included in the CITES Appendices: *Priodontes maximus* is listed in Appendix I, *Chaetophractus*

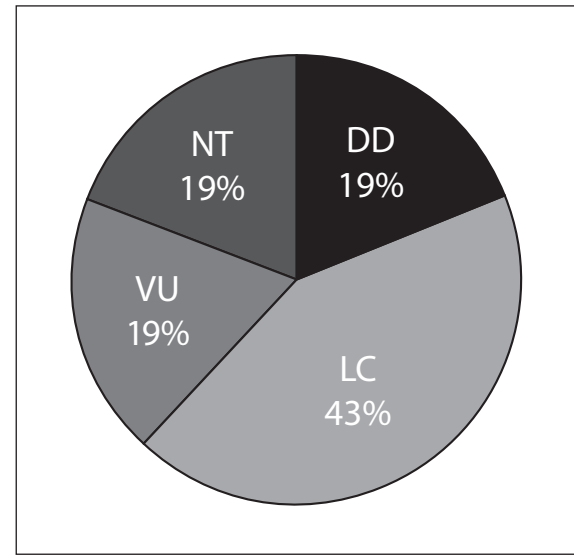

Figure 1. Percentages of species in each Red List category, according to the 2009/2010 Armadillo Red List Assessment.

nationi in Appendix II, while the Costa Rican and Uruguayan populations of *Cabassous centralis* and *Cabassous tatouay*, respectively, are listed in Appendix III (CITES, 2009). Virtually all armadillo species occur in at least one protected area, but other conservation actions are scarce (Fig. 4). No action recovery, harvest management, area-based management plans, or reintroduction programs exist for any species.

We thank all researchers, graduate students, rangers, and enthusiasts who participated in the 2009/2010 Armadillo Red List Assessment. Detailed species descriptions and updated range maps can be found in the following pages.

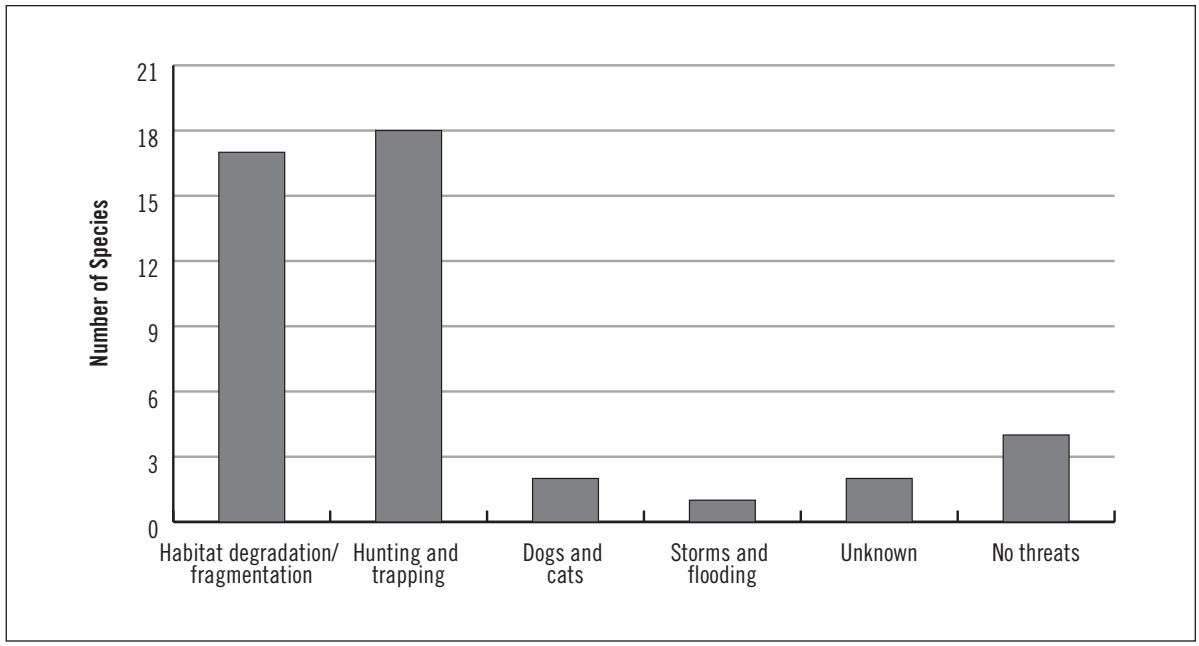

Figure 2. Main threats affecting wild armadillos.

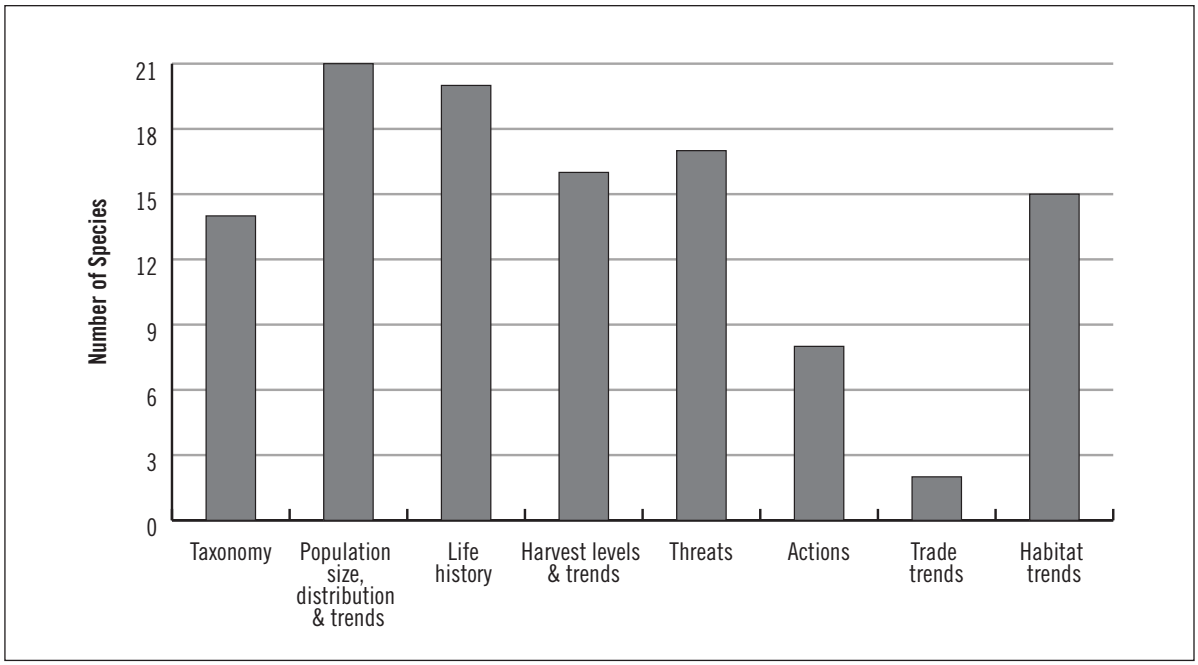

Figure 3. Research priorities for armadillos.

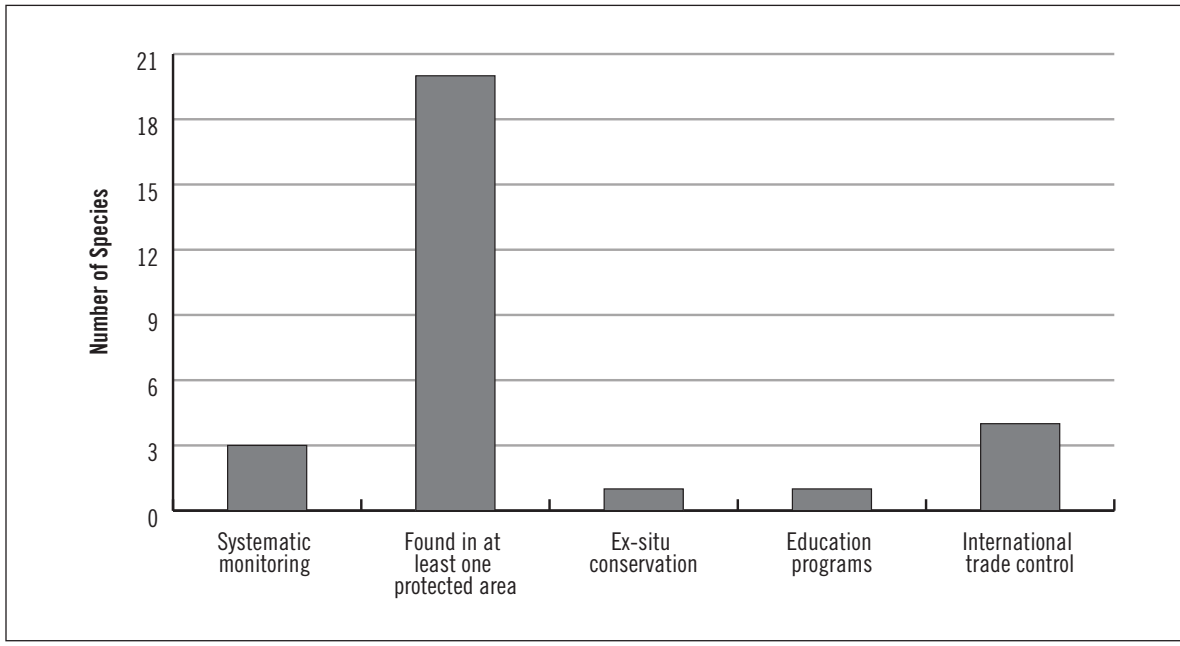

Figure 4. Existing conservation actions for armadillos.

TABLE 1. Historical overview of the Red List categories and current population trends of the 21 extant armadillo species. See glossary for definitions of the categories.

Species	1996	2004	2009/2010	Population trend
Cabassous centralis	**DD**	**DD**	**DD**	**?**
Cabassous chacoensis	**DD**	**NT**	**NT**	**?**
Cabassous tatouay	**LR/nt**	**LC**	**LC**	**?**
Cabassous unicinctus	**LR/lc**	**LC**	**LC**	**?**
Calyptophractus retusus	**VU** A1c	**NT**	**DD**	**?**
Chaetophractus nationi	**VU** A1d	**VU** A2d	**VU** A2acd	↓
Chaetophractus vellerosus	**LR/lc**	**LC**	**LC**	=
Chaetophractus villosus	**LR/lc**	**LC**	**LC**	↑
Chlamyphorus truncatus	**EN** A1abcd	**NT**	**DD**	↓
Dasypus hybridus	**LR/lc**	**NT**	**NT**	↓
Dasypus kappleri	**LR/lc**	**LC**	**LC**	**?**
Dasypus novemcinctus	**LR/lc**	**LC**	**LC**	↑
Dasypus pilosus	**VU** B1+2c	**VU** B1ab(iii)	**VU** B2ab(iii)	**?**
Dasypus sabanicola	**DD**	**LC**	**LC**	**?**
Dasypus septemcinctus	**LR/lc**	**LC**	**LC**	**?**
Dasypus yepesi	–	**DD**	**DD**	**?**
Euphractus sexcinctus	**LR/lc**	**LC**	**LC**	=
Priodontes maximus	**EN** A1cd	**VU** A2cd	**VU** A2cd	↓
Tolypeutes matacus	**LR/nt**	**NT**	**NT**	↓
Tolypeutes tricinctus	**VU** A1bcd	**VU** A2bc	**VU** A2cd	↓
Zaedyus pichiy	**DD**	**NT**	**NT**	↓

Cabassous centralis

Data Deficient (DD)

Photograph: Carlos Delgado, www.aburranatural.org

Common Names: Northern naked-tailed armadillo (English), tatú de rabo molle (Spanish), armadillo zopilote (Spanish), armadillo de cola desnuda de Centro América (Spanish), armadillo cola de trapo (Spanish), armadillo coletrapo centroamericano (Spanish).

Assessment Rationale: C. centralis is listed as Data Deficient due to limited knowledge on the current status of extant populations and a lack of information on the impacts of habitat loss and other threats. Habitat destruction is, however, advancing at a fast pace throughout the range of *C. centralis*, which may soon justify its classification as Vulnerable under criterion A4c.

Taxonomic Note: The wide range of this species might be obscuring the presence of locally distributed forms that may constitute separate species.

Geographic Range: C. centralis ranges from Chiapas state in Mexico through Central America to western Colombia, north-western Ecuador and north-western Venezuela (Fig. 5). It occurs from sea level to around 3,000 m asl. The extent of occurrence is 780,000 km^2 but no information is available on the area of occupancy.

Population: C. centralis is apparently rare and patchily distributed. Individuals are not commonly seen or captured, which may be due to its secretive habits. The population trend is unknown.

Habitats and Ecology: C. centralis occurs in dry to moderately moist (mesic), deciduous and semi-deciduous forests, at forest edges in rocky terrain and in open habitats such as dry savanna (Reid, 1997). It has also been recorded in tropical moist montane forests, as well as in the subparamo of the Colombian Central Andean highlands (Díaz-N. and Sánchez-Giraldo, 2008). Deforestation rates are high in large parts of its range. This naked-tailed armadillo can be found in secondary forest habitat and also tolerates a moderate mix of forest and agricultural land. It is a solitary, insectivorous species that seems to be more fossorial than other armadillos.

Threats: The threats to this species are not known. Throughout most of its range, *C. centralis* is not hunted for food because of its pungent odor and local beliefs. The species is, however, indiscriminately hunted along its known Andean distribution. Some Andean populations are facing severe impacts due to urbanization of their natural habitat. *C. centralis* is distributed throughout the tropical dry forest, one of the most threatened habitats of northwestern South America, which in Colombia has been reduced to 1.5% of its original area (Etter, 1993). Although its sensitivity to habitat loss is not known and the species seems to tolerate some degree of habitat degradation, it is more common in primary, well-preserved forests. The severe habitat transformations are therefore likely to have a negative impact on the species.

Conservation: It has been recorded from a number of protected areas, such as Cotacachi-Cayapas Ecological Reserve, Mache-Chindul Ecological Reserve, Manglares Cayapas-Mataje Ecological Reserve and Bilsa Protected Forest in Ecuador. There is a need to determine the population status of the species throughout its range, as well as potential threats.

Assessors: Superina, M. and Abba, A.M.

Evaluators: Tirira, D., Díaz-N., J.

Contributors: Tirira, D., Díaz-N., J. and Arteaga, M.C.

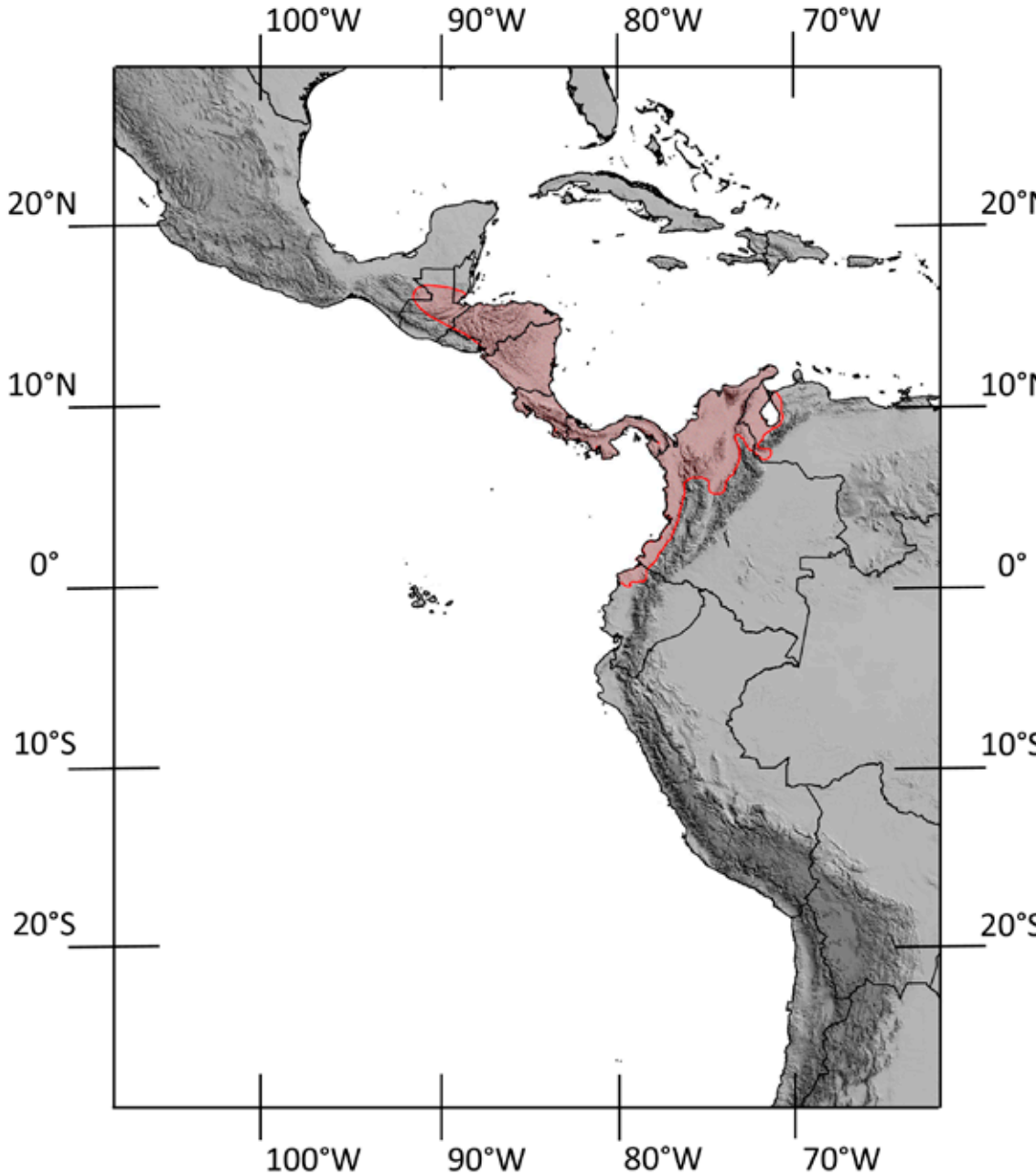

Figure 5. *Cabassous centralis.* Based on Wetzel (1982); Eisenberg (1989); Albuja (1991); Emmons and Feer (1997); Reid (1997); Cadena *et al.* (1998); Alberico *et al.* (2000); Ceballos and Oliva (2005); Gardner (2005); Tirira (2007); Aguiar and Fonseca (2008); Díaz-N. and Sánchez-Giraldo (2008).

Cabassous chacoensis

Near Threatened (NT)

Photograph: Jakob Unger

Common Names: Chacoan naked-tailed armadillo (English), cabasú chaqueño (Spanish), cabasú chico (Spanish).

Assessment Rationale: C. chacoensis is listed as Near Threatened given an inferred population decline of about 20–25% over the past 10 years that resulted from habitat loss and hunting. It almost qualifies as Threatened under criterion A2cd.

Taxonomic Note: This species was described by Wetzel in 1980.

Geographic Range: C. chacoensis has been recorded from the Gran Chaco of western Paraguay and central Argentina (Fig. 6). It has not been observed in Bolivia. The extent of occurrence is 438,000 km^2 but no information is available on its area of occupancy.

Population: The abundance of *C. chacoensis* is not known. In general, it is rarely sighted.

Habitats and Ecology: This largely fossorial species is restricted to chaco-seco (thorn forest) habitats (Meritt, 1985). It is not present in cultivated areas. There is little available information on the life history and other biological characteristics of *C. chacoensis*. Habitat degradation and fragmentation are advancing at a fast pace in the range of this species.

Threats: This species is threatened by habitat degradation from agricultural activity, subsistence hunting for food by local people, as well as predation by dogs.

Conservation: It has been recorded in several Argentinean national and provincial parks, such as Parque Nacional Copo, Río Pilcomayo, Formosa, and Talampaya, among others.

Assessors: Superina, M. and Abba, A.M.

Evaluators: Rogel, T., Agüero, J. and Meritt Jr., D.A.

Contributors: Rogel, T. and Meritt Jr., D.A.

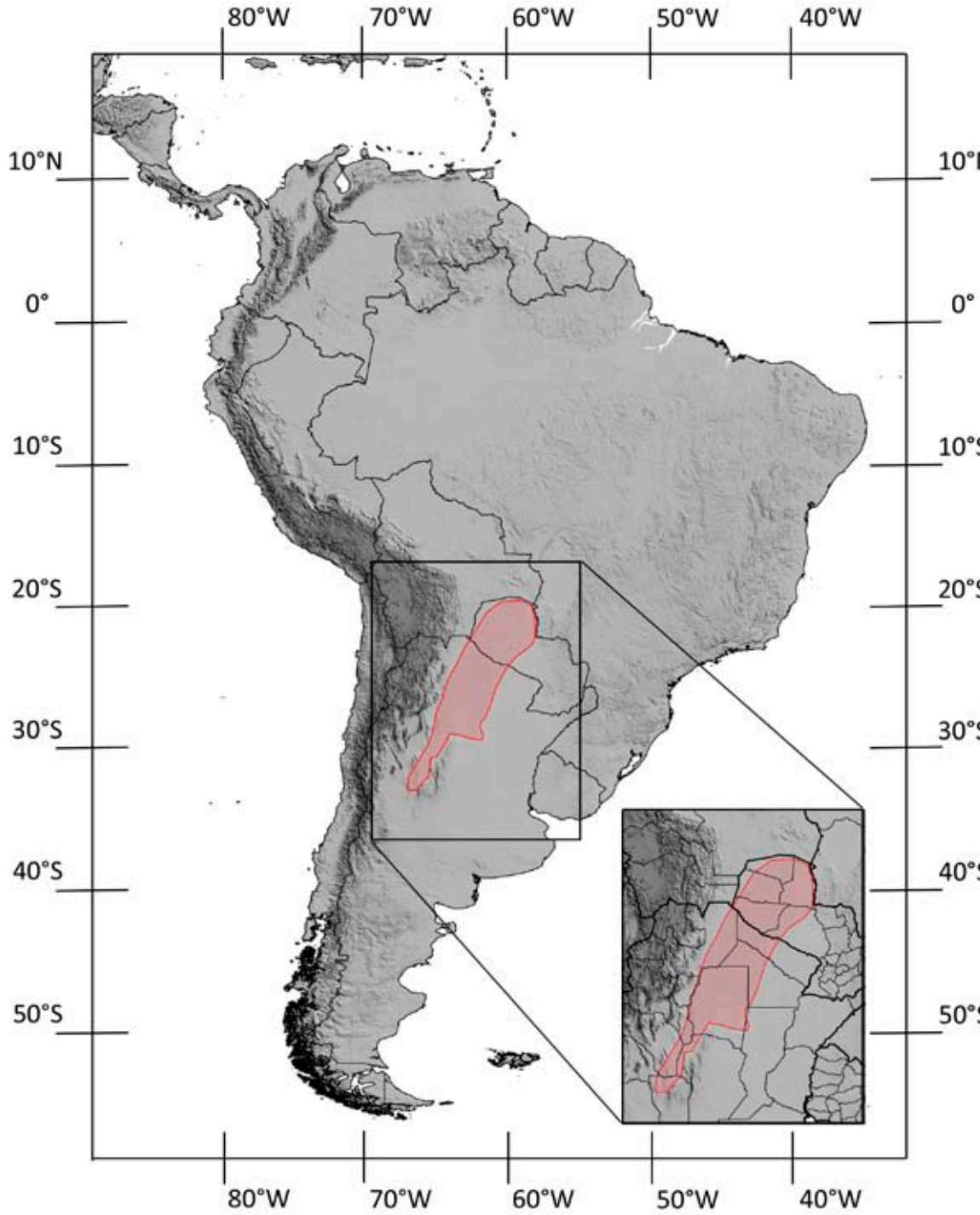

Figure 6. *Cabassous chacoensis*. Based on Wetzel (1982); Redford and Eisenberg (1992); Agüero *et al.* (2005); Gardner (2005); Vizcaíno *et al.* (2006); Abba and Vizcaíno (2008); Aguiar and Fonseca (2008); Nellar *et al.* (2008); Monguillot and Miatello (2009); Smith (2009); A. M. Abba, pers. comm. (2009); T. Rogel, pers. comm. (2009).

Cabassous tatouay

Least Concern (LC)

Photograph: Flávio Ubaid

Common Names: Greater naked-tailed armadillo (English), cabasú de orejas largas (Spanish), tatú de rabo molle (Spanish), tatu rabo-mole (Portuguese), tatou à queue nue (French).

Assessment Rationale: C. tatouay is listed as Least Concern in view of its wide distribution, presumed large population, its occurrence in a number of protected areas, its tolerance of a degree of habitat modification, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category.

Taxonomic Note: Due to the overlapping range of different *Cabassous* species and the description of *C. chacoensis* only 30 years ago (Wetzel, 1980), it is possible that many specimens (especially historical records) of this genus are erroneously classified. The exact distribution and its conservation status therefore need to be revised once these specimens are correctly identified.

Geographic Range: This species is present in eastern and southern Brazil, north-eastern Uruguay, north-eastern Argentina and south-eastern Paraguay (Fig. 7). Records from Buenos Aires Province, Argentina, are erroneous (Abba and Vizcaíno, 2008). The extent of occurrence is 2,300,000 km^2 but no information is available on the area of occupancy.

Population: It is not uncommon and can be regularly encountered within suitable habitat.

Habitats and Ecology: C. tatouay inhabits tropical lowland and submontane forest, as well as open areas (Redford and Eisenberg, 1992). It is also found in agricultural areas and may occur in secondary forest (Mikich and Bernils, 2004; Aguiar and Fonseca, 2008). This naked-tailed armadillo is highly fossorial. Habitat degradation and fragmentation are advancing at a fast pace in the range of this species.

Threats: There is extensive habitat loss in much of its range, including in the Cerrado and Atlantic Forest. In addition, the species is hunted locally.

Conservation: C. tatouay is present in many protected areas.

Assessors: Abba, A.M. and Superina, M.

Evaluators: Gonzalez, E. and Hernández, D.

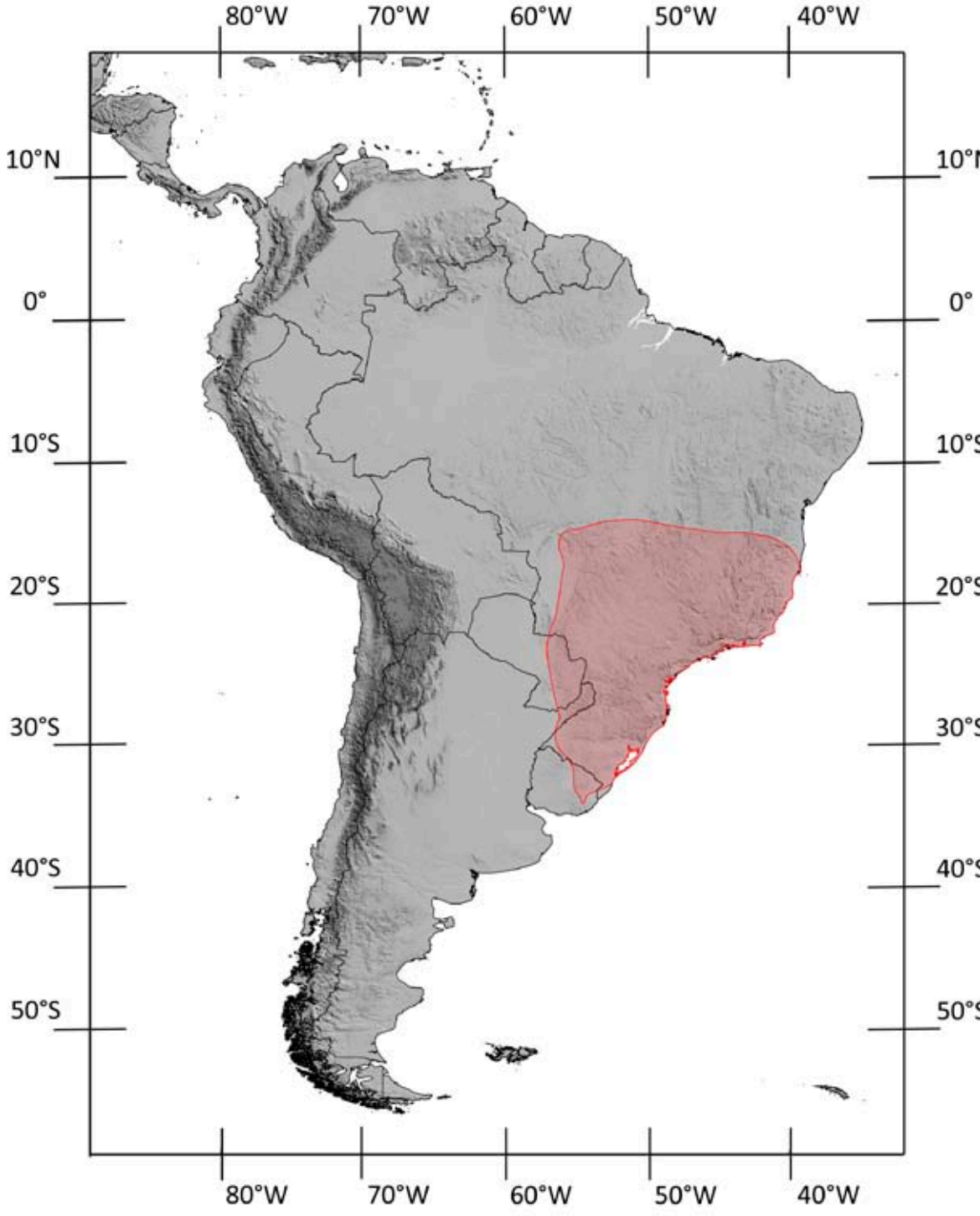

Figure 7. *Cabassous tatouay.* Based on Wetzel (1982); Redford and Eisenberg (1992); Eisenberg and Redford (1999); Cherem *et al.* (2004); Mikich and Bernils (2004); Gardner (2005); Vizcaíno *et al.* (2006); Abba and Vizcaíno (2008); Aguiar and Fonseca (2008); Smith (2009).

Cabassous unicinctus

Least Concern (LC)

Photograph: Thiago Maccarini

Common Names: Southern naked-tailed armadillo (English), cabasu (English), cabasú de orejas largas (Spanish), armadillo coletrapo amazónico (Spanish), tatu-de-rabo-mole (Portuguese).

Assessment Rationale: C. unicinctus is listed as Least Concern in view of its wide distribution, presumed large population, its occurrence in a number of protected areas, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category.

Taxonomic Note: Two subspecies have been recognized (Wetzel, 1980). It is, however, possible that this taxon comprises more than one species, with the northern and southern populations representing separate species (E. Cuéllar, pers. comm., 2004).

Geographic Range: The southern naked-tailed armadillo is found east of the Andes from northern Colombia, Peru, Ecuador, Bolivia, through to Venezuela, Guyana, French Guiana and Suriname in the north, to the state of Mato Grosso do Sul (Brazil) in the south (Fig. 8). Its presence in northeastern Brazil is doubtful and needs to be confirmed (Anacleto and Diniz, 2006). The extent of occurrence is 9,660,000 km^2 but no information is available on the area of occupancy.

Population: It is a relatively common species.

Habitats and Ecology: *C. unicinctus* inhabits tropical lowland and submontane forest. Although it is not found in agricultural areas, it possibly occurs in secondary forest. Habitat degradation and fragmentation are advancing at a fast pace in the range of this species.

Threats: There are no major threats to this species. Populations in the south of the range are subjected to some hunting and habitat loss (*e.g.*, Machado *et al.,* 1998; Aguiar and Fonseca, 2008).

Conservation: It is present in some protected areas.

Assessors: Superina, M. and Abba, A.M.

Evaluators: Anacleto, T.C.S. and Medri, I.M.

Contributors: Medri, I.M. and Moraes Tomas, W.

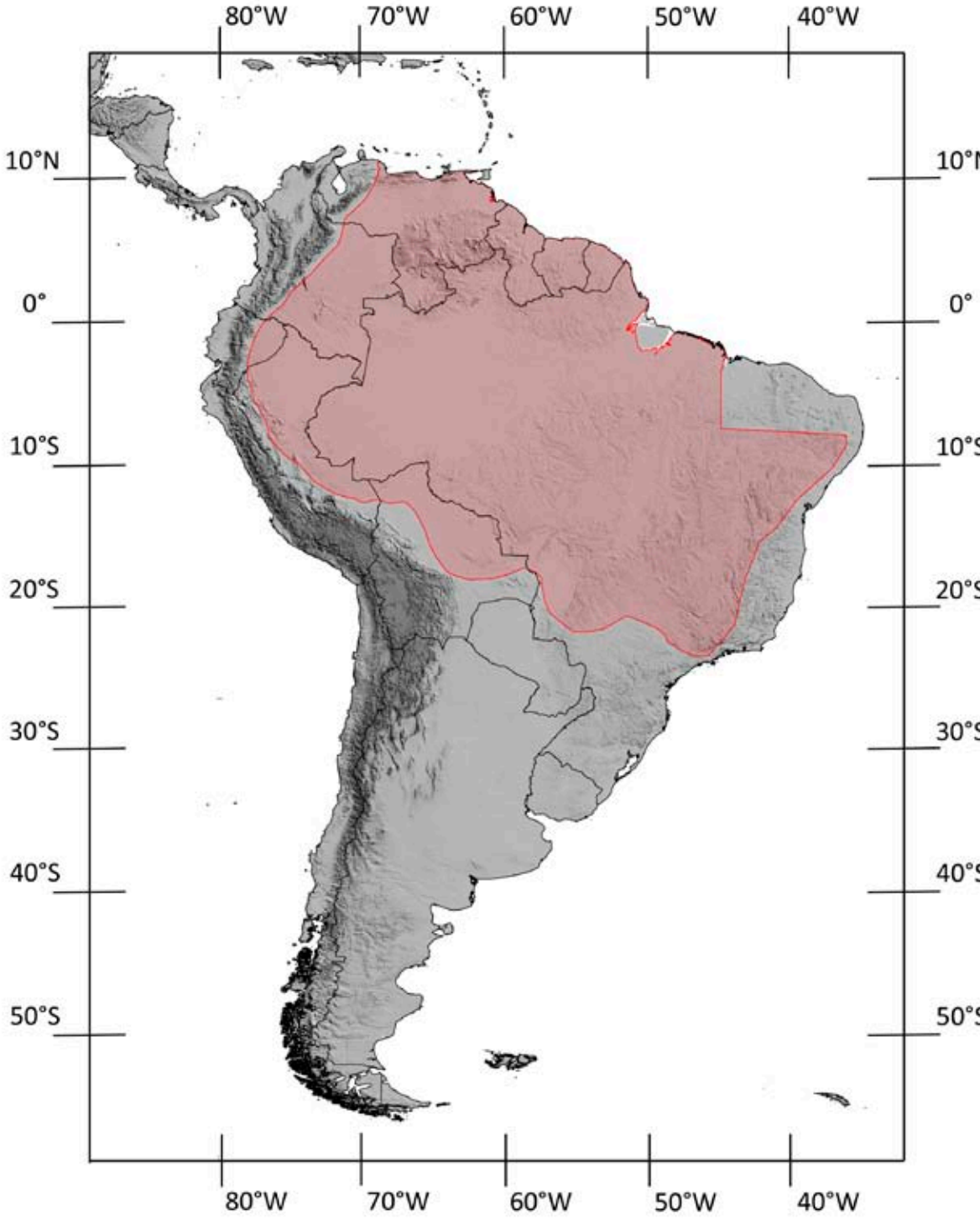

Figure 8. *Cabassous uniciнctus*. Based on Wetzel (1982); Pacheco *et al*. (1995); Anderson (1997); Emmons and Feer (1997); Machado *et al.* (1998); Alberico *et al*. (2000); Engstrom and Lim (2000); Gardner (2005); Anacleto and Diniz (2006); Tirira (2007); Aguiar and Fonseca (2008); Tomas *et al*. (2009); Í. M. Medri, pers. comm. (2009).

Calyptophractus retusus

Data Deficient (DD)

Photograph: Romer Miserendino

Common Names: Greater fairy armadillo (English), greater pichi ciego (English), Chacoan fairy armadillo (English), Burmeister's armadillo (English), pichiciego mayor (Spanish), culo tapado (Spanish).

Assessment Rationale: *C. retusus* is classified as Data Deficient because virtually nothing is known about this species. It is known to be patchily distributed in appropriate microhabitats that are subjected to ongoing habitat loss. The species is actively persecuted throughout its range, and a population reduction in the order of 20-25% over the past 10 years is not unlikely.

Taxonomic Note: Two subspecies have been described (Yepes, 1939). Two synonyms are still commonly used for *Calyptophractus retusus* Fitzinger, 1871: *Burmeisteria retusa* Gray, 1865 was preoccupied by *Burmeisteria* Salter, 1865, a trilobite, and is therefore incorrect. *Chlamyphorus retusus* Burmeister, 1863 should not be used, as recent molecular studies support the taxonomic classification of *Chlamyphorus truncatus* and *Calyptophractus retusus* into distinct genera (Delsuc, 2009).

Geographic Range: This species occurs in the Gran Chaco region of central and south-eastern Bolivia, western Paraguay, and extreme northern Argentina (Fig. 9). Two records reported from farther south by Redford and Eisenberg (1992) are not confirmed. The extent of occurrence is 258,000 km^2 but no information is available on the area of occupancy. A continuing decline is inferred due to habitat conversion and degradation.

Population: The population status of this species is not known. Populations are probably severely fragmented, as the greater fairy armadillo only inhabits loose sandy soils that are not common in the Paraguayan Chaco.

Habitats and Ecology: *C. retusus* is restricted to loose, sandy soils. It is patchily distributed and absent from areas with clayey soils. It can be found in disturbed habitat, and may be encountered close to villages and other populated areas. Habitat degradation and fragmentation is advancing at a fast pace in the range of this species.

Threats: *C. retusus* is threatened by habitat loss in the Chaco region. It is persecuted because of traditional beliefs concerning the animal as an omen of disaster (Cuéllar, 2001; Noss *et al.,* 2008).

Conservation: It has been recorded in a number of protected areas in Bolivia (Cuéllar and Noss, 2003), and Reserva Natural General Pizarro in Salta, Argentina (Regidor *et al.*, 2005). In Paraguay, it is known from Defensores del Chaco National Park (Meritt, 2008).

Assessors: Abba, A.M. and Superina, M.

Evaluators: Cuéllar, E. and Meritt Jr., D.A.

Contributors: Cuéllar, E. and Meritt Jr., D.A.

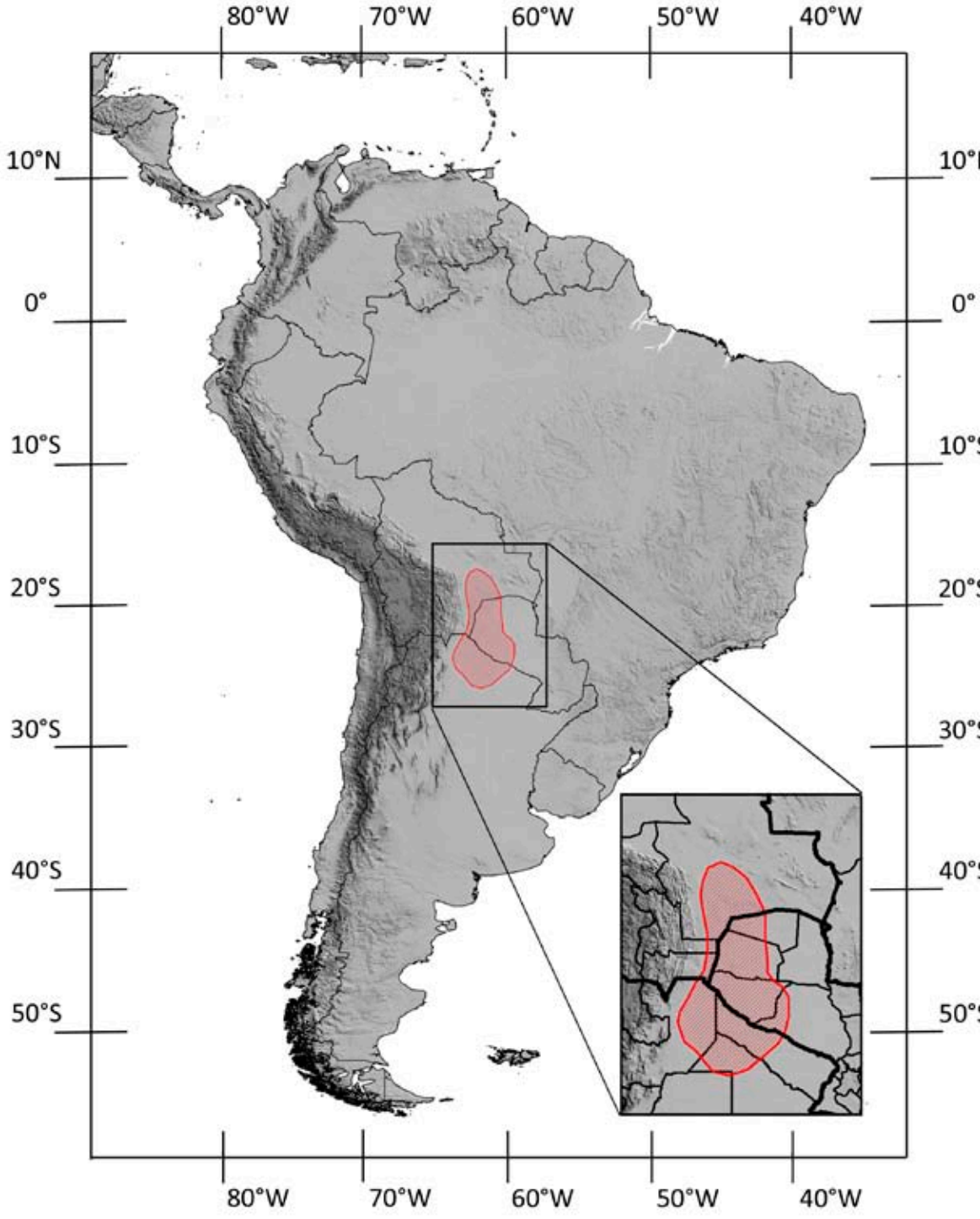

Figure 9. *Calyptophractus retusus*. Based on Yepes (1939); Wetzel (1982); Redford and Eisenberg (1992); Eisenberg and Redford (1999); Gardner (2005); Agüero *et al.* (2005); Vizcaíno *et al.* (2006); Aguiar and Fonseca (2008); Abba and Vizcaíno (2008); Smith (2009); Tarifa and Miserendino Salazar (2009a).

Chaetophractus nationi

Vulnerable (VU A2acd)

Photograph: Gianmarco Rojas Moreno

Common Names: Bolivian hairy armadillo (English), Andean hairy armadillo (English), quirquincho andino (Spanish).

Assessment Rationale: *C. nationi* is listed as Vulnerable because data from Bolivia suggest that populations there have experienced a decline exceeding 30% over the last 10 years, largely due to high rates of exploitation. This species is probably affected by hunting and habitat degradation over its entire range, but the impact of these threats in countries other than Bolivia is unknown due to a lack of field studies.

Taxonomic Note: This taxon may in fact represent a subspecies of *C. vellerosus* (Wetzel, 1985; Gardner, 2005), but more research is required to clarify this issue.

Geographic Range: *C. nationi* is found in Bolivia, Chile, Peru, and northern Argentina (Fig. 10). Its distribution is poorly known because it is often confused with *C. vellerosus*. In Argentina, it has been recorded in localities farther south than its current range (Carrizo *et al.*, 2005), but these records need to be confirmed to exclude the possibility that they correspond to *C. vellerosus. C. nationi* is found from 2,400 to 4,000 m asl. The extent of occurrence is 383,000 km^2 but no information is available on the area of occupancy.

Population: No data are available on the total population size, but Peredo (1999) estimated a population of 13,000 individuals in an area of 340 km^2. A population reduction of 30% in the past 10 years is probable in Bolivia; no data are available from the other range countries. The negative impact on wild populations has not ceased, and an ongoing decline in mature individuals is probable.

Habitats and Ecology: This omnivorous species inhabits high altitude grasslands, where it digs its burrows in sandy soils (Redford and Eisenberg, 1992; Pérez Zubieta, 2008). There is not much information about its life history. Assuming this species is similar to its congeners *C. villosus* and *C. vellerosus*, both genders reach sexual maturity at one year of age, and the female gives birth to one yearly litter of one or two young.

Threats: *C. nationi* is intensively harvested commercially for its meat and carapace, including for charangos (musical instruments) and also handicrafts (Reichle, 1997; Romero-Muñoz and Pérez Zubieta, 2008). Cáceres (1995) estimated yearly harvest rates of 2,000 individuals in Bolivia. Habitat degradation in the altiplano of Bolivia (where 70% of the *C. nationi* population occurs) is advancing at a fast pace, and habitat loss occurs due to sand excavation for concrete production (Peredo, 1999) and agricultural activities (Ríos and Rocha, 2002).

Conservation: It is present in many protected areas. Hunting of this species in Bolivia continues, even though this is prohibited (Pérez Zubieta *et al.*, 2009).

Assessors: Superina, M. and Abba, A.M.

Evaluators: Pérez Zubieta, J. and Bermúdez Larrazabal, L.

Contributor: Vizcaíno, S.F.

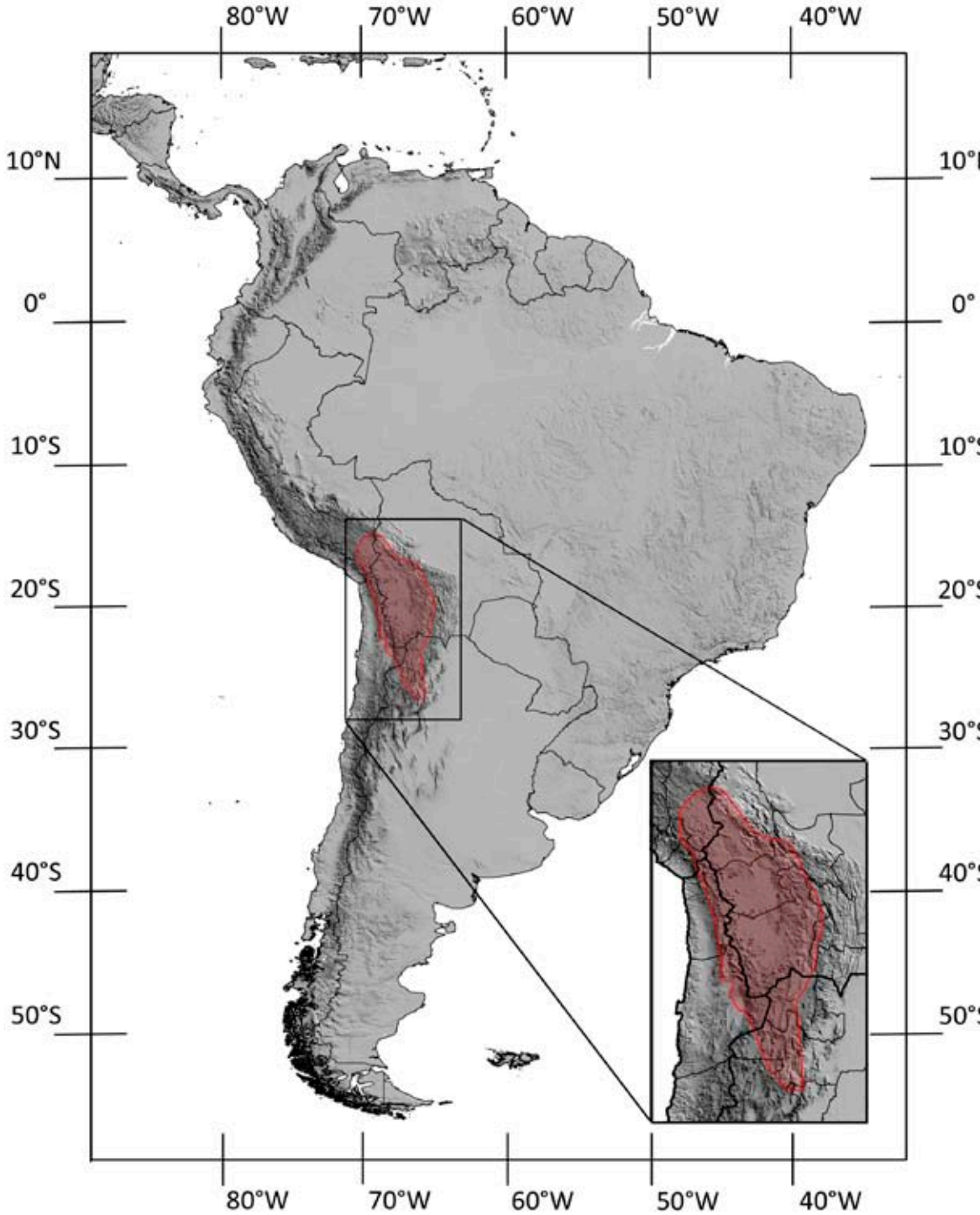

Figure 10. *Chaetophractus nationi*. Based on Wetzel (1985); Redford and Eisenberg (1992); Anderson (1997); Carrizo *et al.* (2005); Gardner (2005); Vizcaíno *et al.* (2006); Aguiar and Fonseca (2008); Iriarte (2008); Pérez Zubieta *et al.* (2009).

Chaetophractus vellerosus

Least Concern (LC)

Photograph: Agustín M. Abba

Common Names: Screaming hairy armadillo (English), piche llorón (Spanish).

Assessment Rationale: *C. vellerosus* is listed as Least Concern because, although susceptible to hunting in parts of its range, it is widespread and rates of offtake are not believed to be at a level that would warrant listing in a category of threat. The disjunct population in Buenos Aires Province is subjected to habitat modification within its restricted range. Further studies are needed to determine the taxonomic status of this particular population.

Taxonomic Note: Two subspecies are described but require confirmation: *C. v. vellerosus* and *C. v. pannosus* (Gardner, 2007).

Geographic Range: This species is generally known from the Chaco region of Bolivia, Paraguay and Argentina. A small, isolated population inhabits an area of around 900 km^2 on the coast of Buenos Aires Province, Argentina. It is separated from the core population by approximately 500 km (Fig. 11). Records from Chile are probably *C. nationi*. It is found from sea level to 1,000 m asl. The extent of occurrence is approximately 1,320,000 km^2 but no information is available on the area of occupancy.

Population: The population status of *C. vellerosus* is not known, but the wild populations are thought to be stable.

Habitats and Ecology: *C. vellerosus* is primarily found in xeric environments, in both lowland and upland areas with loose sandy soils; it has been recorded from rangeland pasture and agricultural areas. The animal constructs burrows, and it is absent from rocky areas where burrows cannot be excavated (Greegor, 1985; Abba *et al.*, 2007; Abba, 2008; Abba and Cassini, 2008). It can be found in some degraded habitats (arable land, pastureland and plantations). Males and females reach maturity at one year of age, and the female gives birth to one yearly litter of one or two young. Gestation length is 60 days.

Threats: *C. vellerosus* is heavily hunted for its meat and carapace (including for charangos; Aguiar and Fonseca, 2008), especially by indigenous groups in some parts of the Chaco region in Bolivia (Cuéllar and Noss, 2003; Noss *et al.*, 2008). It is also persecuted as an agricultural pest. In addition, some animals are killed by dogs. The isolated population on the coast of Buenos Aires Province, Argentina, is negatively affected by mining activities (Abba, 2008).

Conservation: *C. vellerosus* is present in a number of protected areas. The highest density of this species in a protected area probably occurs in the Kaa-Iya National Park (3.4 million hectares), Bolivia.

Assessors: Abba, A.M. and Superina, M.

Evaluators: Poljak, S. and Cuéllar, E.

Contributor: Vizcaíno, S.F.

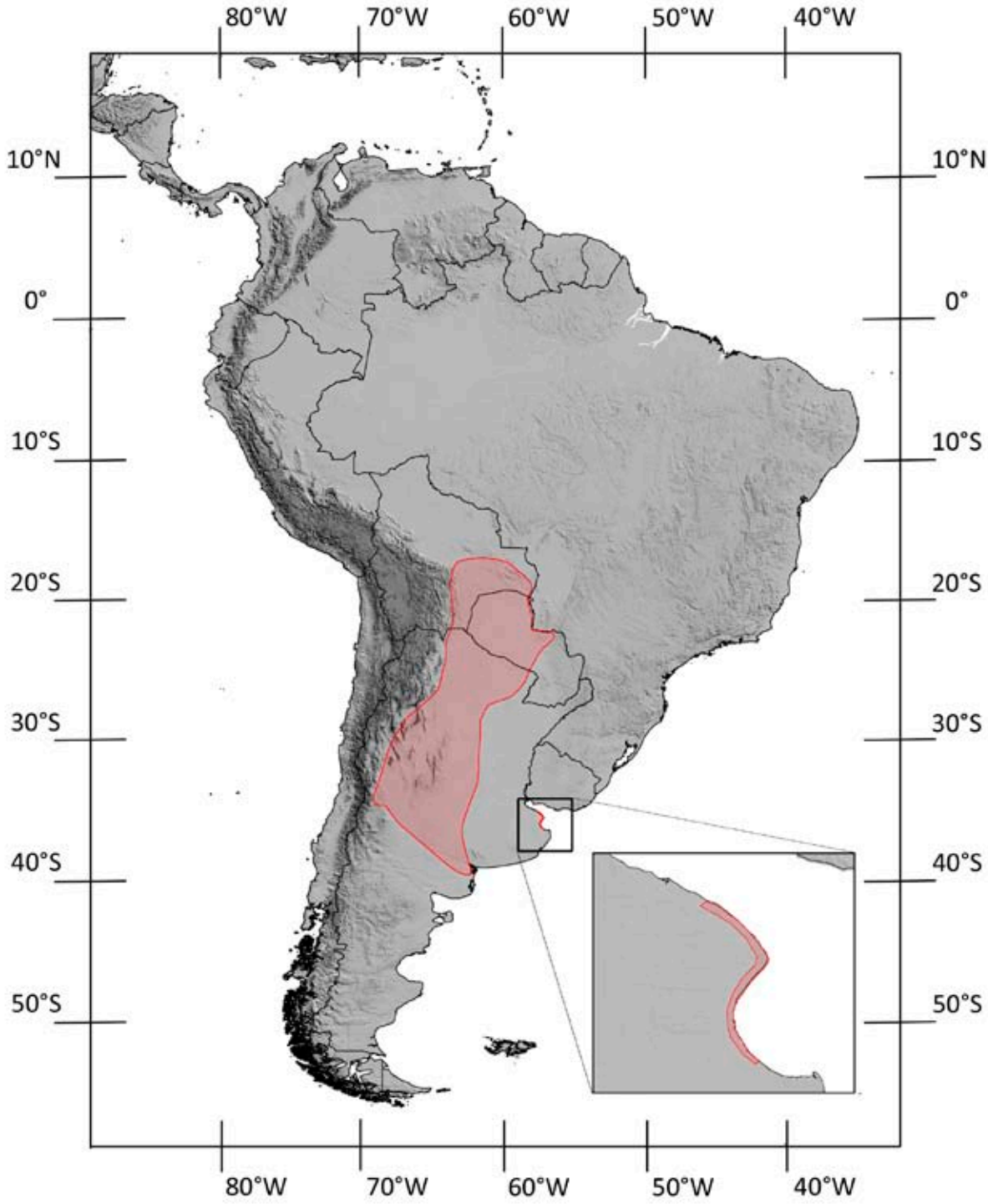

Figure 11. *Chaetophractus vellerosus*. Based on Crespo (1974); Carlini and Vizcaíno (1987); Redford and Eisenberg (1992); Anderson (1997); Cuéllar and Noss (2003); Gardner (2005); Vizcaíno *et al.* (2006); Abba *et al.* (2007); Abba (2008); Abba and Cassini (2008); Abba and Vizcaíno (2008); Aguiar and Fonseca (2008); Noss *et al.* (2008); Smith (2009); Tarifa and Romero-Muñoz (2009b); A. M. Abba, pers. comm. (2009); T. Rogel, pers. comm. (2009).

Chaetophractus villosus

Least Concern (LC)

Photograph: Kevin Schafer, www.kevinschafer.com

Common Names: Large hairy armadillo (English), peludo (Spanish).

Assessment Rationale: *C. villosus* is listed as Least Concern in view of its wide distribution, presumed large population, its presence in a number of protected areas, its tolerance of a degree of habitat modification, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category.

Geographic Range: It is present in the Gran Chaco of Bolivia, Paraguay, and Argentina and as far south as Santa Cruz, Argentina and Magallanes, Chile (Fig. 12). It has been introduced in Tierra del Fuego Province, Argentina (Poljak *et al.*, 2007; Poljak *et al.*, 2010). It ranges from sea level up to 1,500 m asl (Argentina). The extent of occurrence is approximately 2,525,000 km^2 but no information is available on the area of occupancy.

Population: This is one of the most common armadillo species in Argentina (Abba, 2008).

Habitats and Ecology: *C. villosus* is present in a wide variety of grasslands (including pampas and chaco), savanna, and forest habitats. It is also found in cultivated landscapes (Abba *et al.*, 2005; Abba *et al.*, 2007; Abba, 2008) and some degraded habitats (arable land, pastureland, rural gardens, and plantations). Males and females reach sexual maturity at one year of age, and the female gives birth to one yearly litter of one to three young. Gestation length is 68 days.

Threats: In general, there appear to be no major threats to this species. In some parts of its range it is locally used for food and charangos (Aguiar and Fonseca, 2008). It is also persecuted as a pest species in agricultural areas, and is subjected to sport hunting. Animals may also be killed on roads and by dogs (Abba *et al.*, 2007; Abba, 2008).

Conservation: This species is present in many protected areas.

Assessors: Abba, A.M. and Superina, M.

Evaluators: Bolkovic, M.L. and Poljak, S.

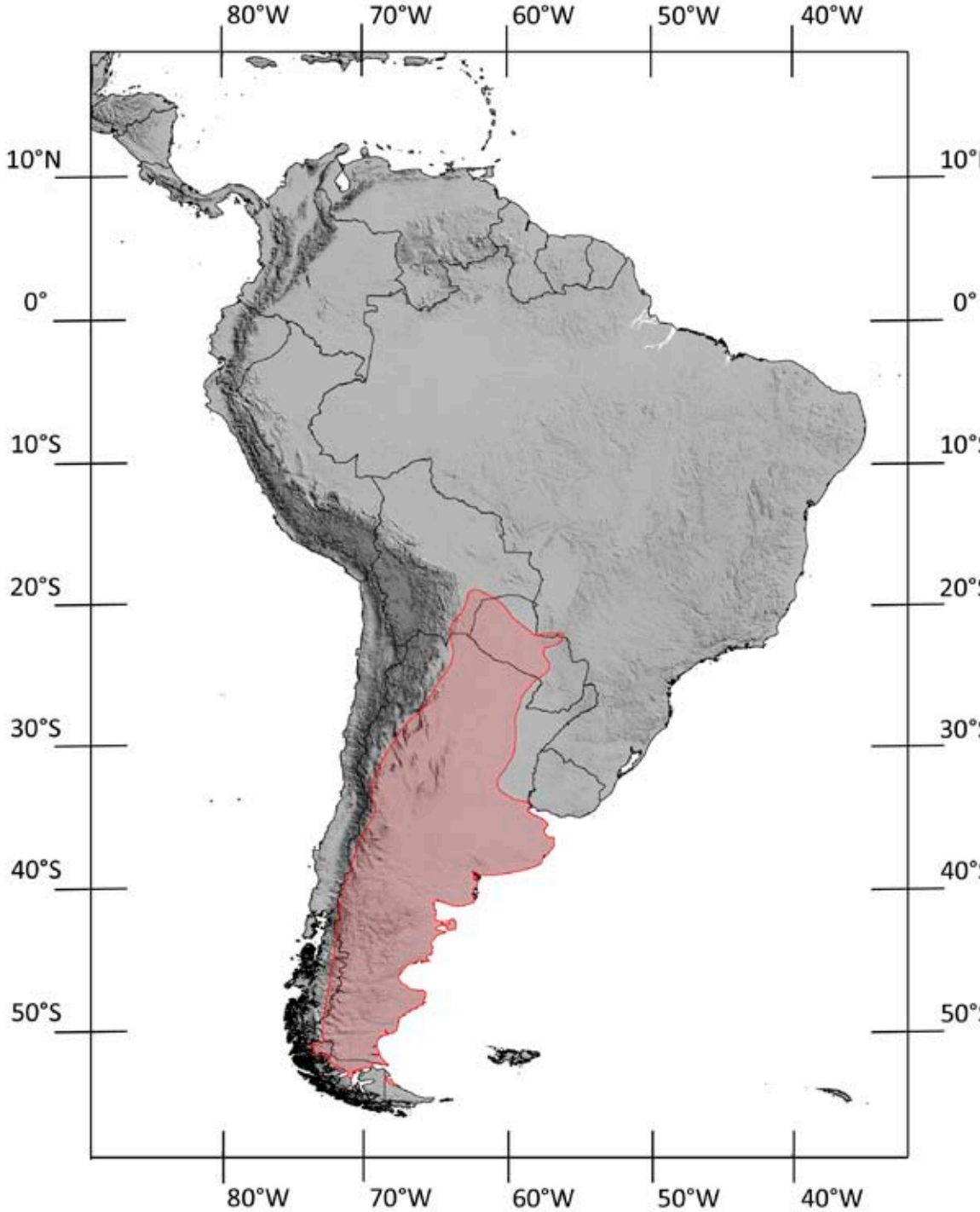

Figure 12. *Chaetophractus villosus*. Based on Redford and Eisenberg (1992); Ergueta and Morales (1996); Anderson (1997); Gardner (2005); Vizcaíno *et al.* (2006); Poljak *et al.* (2007); Aguiar and Fonseca (2008); Iriarte (2008); Smith (2009); Tarifa and Romero-Muñoz (2009b); A. M. Abba, pers. comm. (2009).

Chlamyphorus truncatus

Data Deficient (DD)

Photograph: Mariella Superina

Common Names: Pink fairy armadillo (English), lesser pichi ciego (English), lesser fairy armadillo (English), pichiciego (Spanish).

Assessment Rationale: *C. truncatus* is listed as Data Deficient as there is little information on its population status, and its biology and ecology are poorly known. Throughout its range there is extensive habitat degradation, especially from cattle, but the actual effect on the populations is not well understood. *C. truncatus* remains a priority for further survey work, as the availability of additional information may well show that the species requires listing as Near Threatened or in a threatened category.

Taxonomic Note: Three subspecies have been described (Yepes, 1932).

Geographic Range: *C. truncatus* is endemic to central Argentina, where it is found in the provinces of Buenos Aires (southern part only), Catamarca, Córdoba, La Pampa, La Rioja, Mendoza, Río Negro, San Juan, and San Luis (Fig. 13). It ranges from sea level up to 1,500 m asl. The extent of occurrence is approximately 350,000 km^2 but no information is available on its area of occupancy.

Population: It may be relatively rare. Nothing is known about its population size or trend, but a reduction in sightings has been reported (Superina, 2006). The populations are fragmented; records are very isolated from each other. The species seems to have very specific habitat requirements.

Habitats and Ecology: This poorly known, nocturnal species is found in dry grassland and sandy plains with shrubby vegetation. Suitable habitat is declining.

Threats: Habitat conversion due to agriculture (plowing of fields) and cattle ranching (compaction of soil) are the predominant threats this species is facing, but predation by domestic cats and dogs is also contributing to its decline.

Conservation: It is present in a number of protected areas, including the National Parks Lihué Calel and Talampaya, and the provincial reserves Telteca and Ñacuñán in Mendoza. There is national and provincial legislation specifically in place for its protection, such as Provincial Law 6,599 in Mendoza. Further studies into the population status, demography and ecology of this species are needed.

Assessors: Superina, M. and Abba, A.M.

Evaluators: Seitz, V. and Roig, V.G.

Contributor: Roig, V.G.

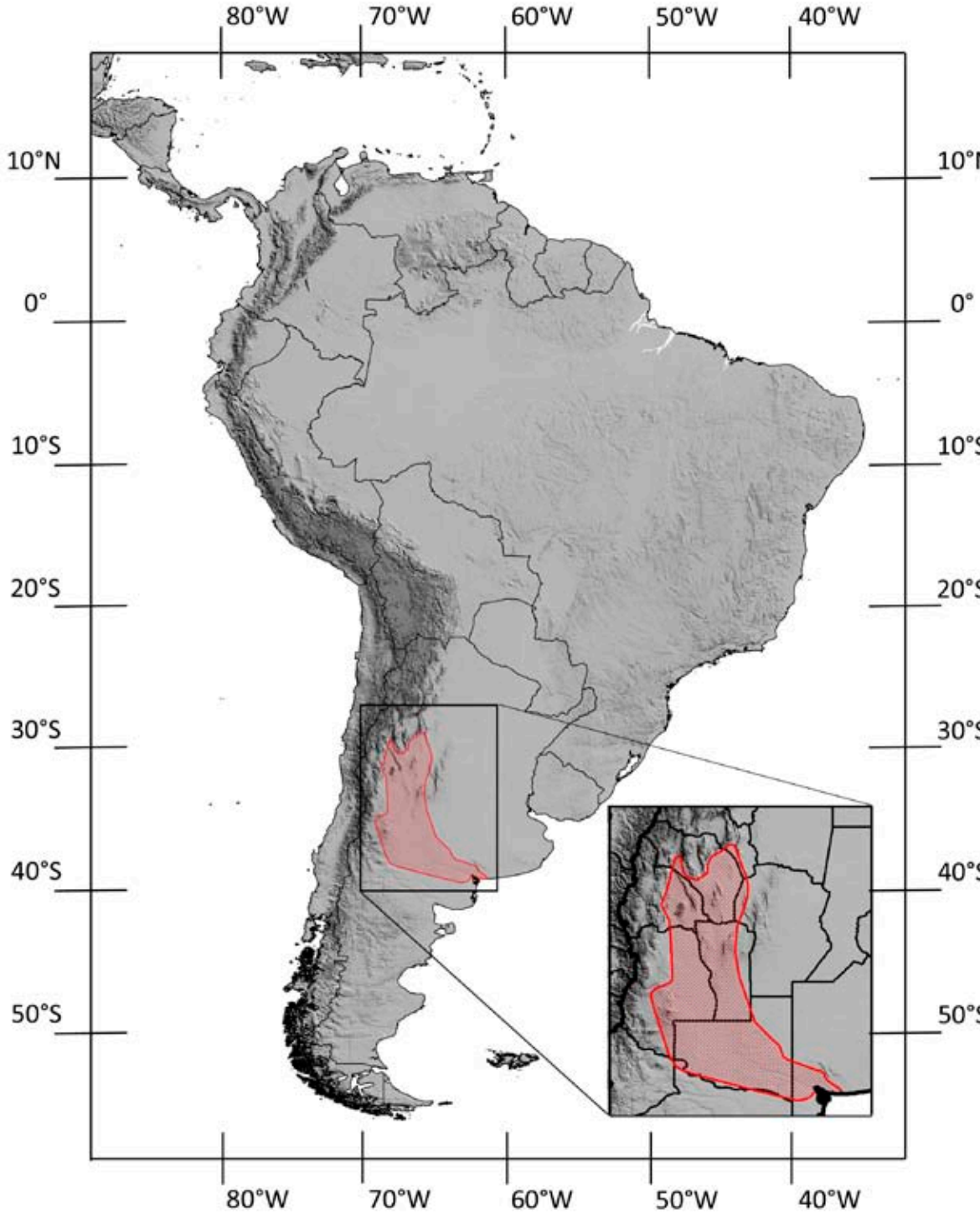

Figure 13. *Chlamyphorus truncatus*. Based on Wetzel (1982); Redford and Eisenberg (1992); Gardner (2005); Superina (2006); Aguiar and Fonseca (2008); and point localities reported by the following persons: M. Superina, A. M. Abba, V. Seitz, J. Monguillot, E. Fra, J. Corts, C. Maldonado, P. Collavino, G. Ferraris, G. Loza, T. Rogel, E. Martinez, R. Pereyra, L. Orozco, M. Jordan, C. Aguerre, A. Dalmasso, D. Martin, D. Martí, R. Yacante, J. Pereyra.

Dasypus hybridus

Near Threatened (NT)

Photograph: Agustín M. Abba

Common Names: Southern long-nosed armadillo (English), mulita (Spanish), mulita pampeana (Spanish).

Assessment Rationale: *D. hybridus* is listed as Near Threatened, as it is believed to have undergone a decline on the order of 20–25% over the past 10 years due to severe habitat loss and hunting throughout its range. The species was previously more widespread and locally more common (over 30 years ago). It almost qualifies as Threatened under criterion A2cd.

Taxonomic Note: For many years, *D. hybridus* was considered synonym of *D. septemcinctus*.

Geographic Range: *D. hybridus* is found in Argentina, Uruguay, Paraguay, and southern Brazil. It occurs as far south as the province of Buenos Aires, Argentina (Abba, 2008; Fig. 14). The distribution is more restricted than depicted by Redford and Eisenberg (1992) and Wetzel (1985), as localities in the west near the Andes are based on incorrectly identified individuals. The exact northern limit of its range is uncertain due to its morphological similarity to *D. septemcinctus*. It ranges from sea level up to 2,000 m asl. The extent of occurrence is approximately 1,420,000 km^2 but no information is available on its area of occupancy.

Population: It was previously common (although there are no population density estimates available), but it is sensitive to habitat loss through urbanization, and agricultural expansion has meant that populations are declining or absent over much of its former range (Abba *et al.*, 2007). It remains a common species in parts of its range (*e.g.*, the province of Buenos Aires; Abba, 2008).

Habitats and Ecology: *D. hybridus* is typically found in the grasslands and pampas of northern and central Argentina (Abba *et al.*, 2007; Abba, 2008; Abba and Cassini, 2008). It is also present, but less common, in woodland and forest habitats. It can be found in some degraded habitats (arable land, pastureland and plantations). Agricultural activities and cattle ranching are heavily modifying the habitat of this species. Males and females reach maturity at one year of age, and the female gives birth to one yearly litter of six to twelve identical (monozygotic) young. Gestation length is 120 days including diapause.

Threats: *D. hybridus* is threatened by habitat loss through agriculture and urbanization, accidental mortality on roads, direct hunting for food, and predation by dogs (Abba *et al.*, 2007; Abba, 2008).

Conservation: *D. hybridus* has been recorded in a few protected areas, such as the National Parks Campos del Tuyú, El Palmar and Río Pilcomayo. It is considered a conservation priority species in Uruguay (E. Gonzalez, pers. comm., 2010).

Assessors: Abba, A.M. and Superina, M.

Evaluators: Gonzalez, E. and Bolkovic, M.L.

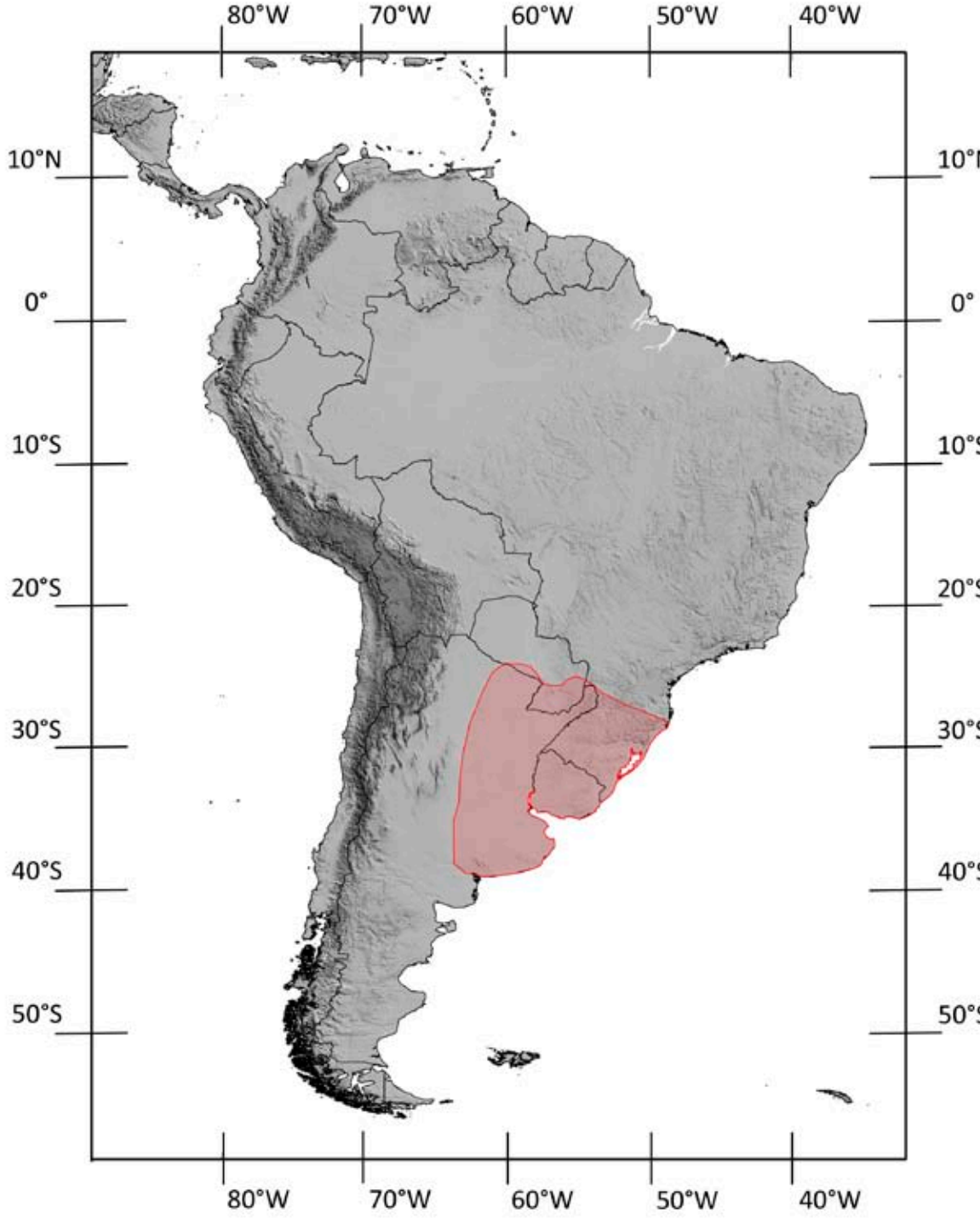

Figure 14. *Dasypus hybridus*. Based on Wetzel and Mondolfi (1979); Wetzel (1982); Wetzel (1985); Redford and Eisenberg (1992); Eisenberg and Redford (1999); Cherem *et al.* (2004); Gardner (2005); Vizcaíno *et al.* (2006); Abba (2008); Abba and Vizcaíno (2008); Aguiar and Fonseca (2008); Smith (2009); A. M. Abba, pers. comm. (2009).

Dasypus kappleri

Least Concern (LC)

Camera trap photograph: Daniel Munari

Common Names: Greater long-nosed armadillo (English), mulita de Kappler (Spanish), tatú-peba grande (Spanish), armadillo coligrueso (Spanish), tatu quinze quilos (Portuguese).

Assessment Rationale: *D. kappleri* is listed as Least Concern in view of its wide distribution, presumed large population, its occurrence in a number of protected areas, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category.

Taxonomic Note: Two subspecies are described (Gardner, 2005).

Geographic Range: This species has been recorded from Colombia (east of the Andes), Venezuela (south of the Orinoco), Guyana, Suriname, French Guiana, and south through the Amazon Basin of Brazil, Ecuador, Peru and northern Bolivia (Pando Department; Fig. 15). In Brazil, it occurs in a large part of the state of Mato Grosso, but has not been recorded from southern Pará state, east of the Rio Tapajós. The easternmost locality is on the left bank of Rio das Mortes, a tributary of the upper Rio Araguaia, western Mato Grosso. There is a potentially disjunct population to the south of Marajó Island (Eisenberg and Redford, 1999). Its extent of occurrence is approximately 5,500,000 km^2 but no information is available on its area of occupancy.

Population: No information is available on the population status of *D. kappleri*.

Habitats and Ecology: This species is restricted to the tropical moist lowland forests of the Orinoco and Amazon river basins. In savanna areas, it is restricted to forest patches. *D. kappleri* constructs burrows in well-drained soil. The females typically give birth to two young (Eisenberg, 1989).

Threats: There are no major threats. Locally, *D. kappleri* is threatened by deforestation, and in Ecuador and Brazil it is subjected to hunting (Tirira, 2001; T.C.S. Anacleto, pers. comm., 2010). It is unable to survive in savannas or open areas.

Conservation: *D. kappleri* is present in a number of protected areas.

Assessors: Abba, A.M. and Superina, M.

Evaluators: Anacleto, T.C.S. and Arteaga, M.C.

Contributors: Anacleto, T.C.S., Medri, I.M. and Moraes Tomas, W.

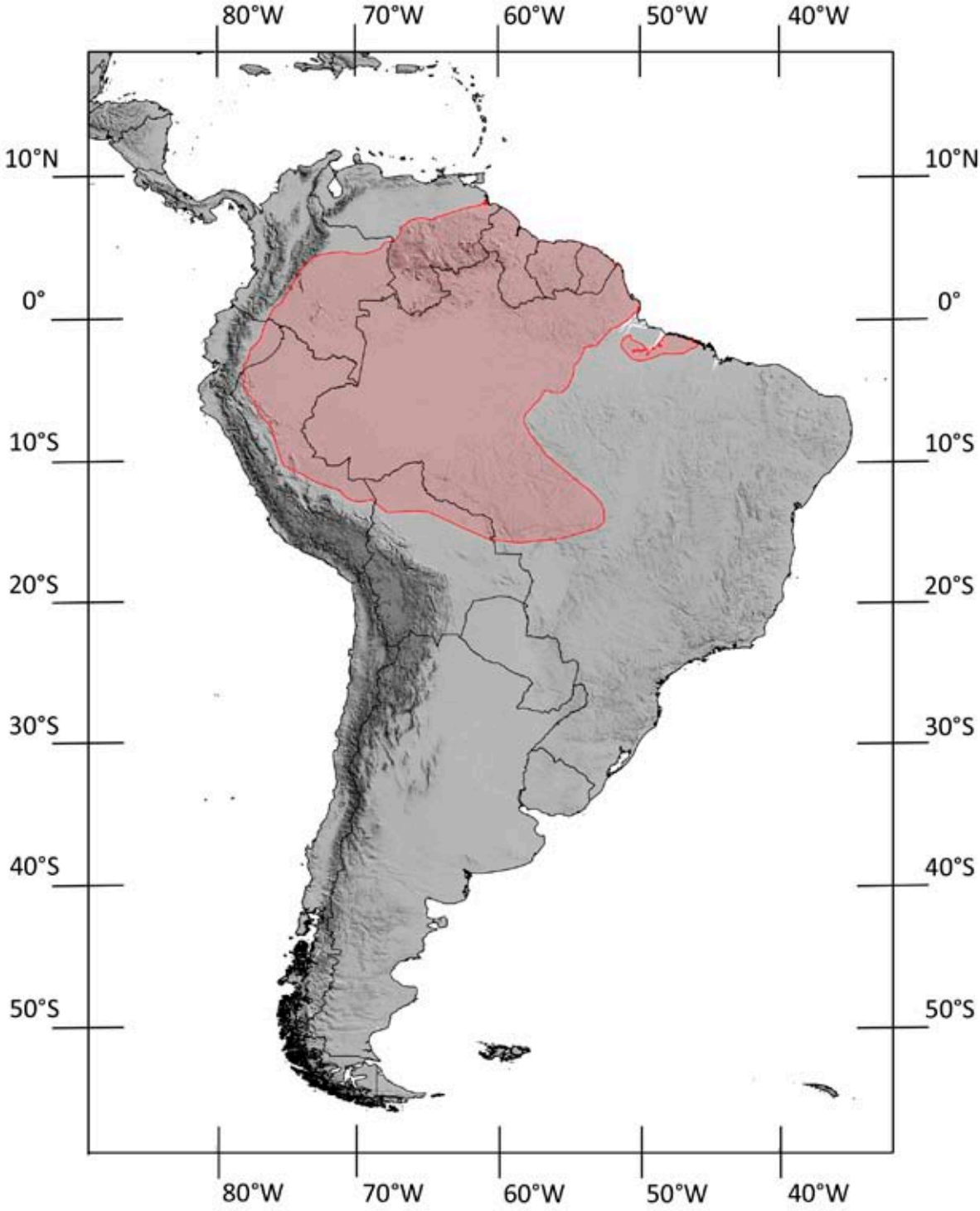

Figure 15. *Dasypus kappleri*. Based on Wetzel (1982); Pacheco *et al.* (1995); Eisenberg and Redford (1999); Tirira (1999); Alberico *et al.* (2000); Engstrom and Lim (2000); Gardner (2005); Tirira (2007); Aguiar and Fonseca (2008); Tarifa and Miserendino Salazar (2009b); Í. M. Medri, pers. comm. (2009).

Dasypus novemcinctus

Least Concern (LC)

Photograph: Mariella Superina

Common Names: Nine-banded armadillo (English), common long-nosed armadillo (English), cachicamo (Spanish), tatú (Spanish), tatu-galinha (Portuguese).

Assessment Rationale: *D. novemcinctus* is listed as Least Concern in view of its very wide distribution, presumed large population, tolerance of habitat alteration, and because there is no evidence of a major population decline.

Taxonomic Note: Six subspecies are recognized by Gardner (2005), four of which occur in South America (Gardner, 2007).

Geographic Range: This species ranges from the southern USA through Mexico and Central America, to South America as far south as northern Argentina (Fig. 16). It is also present in the Lesser Antilles, on Grenada and Trinidad and Tobago. It ranges from sea level up to 2,000 m asl. The extent of occurrence is approximately 19,100,000 km^2 but no information is available on the area of occupancy.

Population: It is a common species.

Habitats and Ecology: *D. novemcinctus* is very adaptable and is present in a wide variety of habitats (McBee and Baker, 1982). It can be found in some degraded habitats, such as heavily degraded subtropical and tropical forests, arable land, pastureland, rural gardens, urban areas and plantations. Males reach sexual maturity at 12 months and females at 18 months of age, and the female gives birth to one yearly litter after a gestation of 140 days including diapause. It has a high rate of reproduction and commonly produces monozygotic (genetically identical) quadruplets. Generation length has been estimated at five years, and longevity is around eight to twelve years.

Threats: There are no major threats to this species, although it is hunted throughout its range. In North America, it is subjected to poisoning as it is often considered a nuisance.

Conservation: *D. novemcinctus* occurs in many protected areas.

Assessors: Abba, A.M. and Superina, M.

Evaluators: McDonough, C. and Loughry, J.

Contributors: McDonough, C. and Loughry, J.

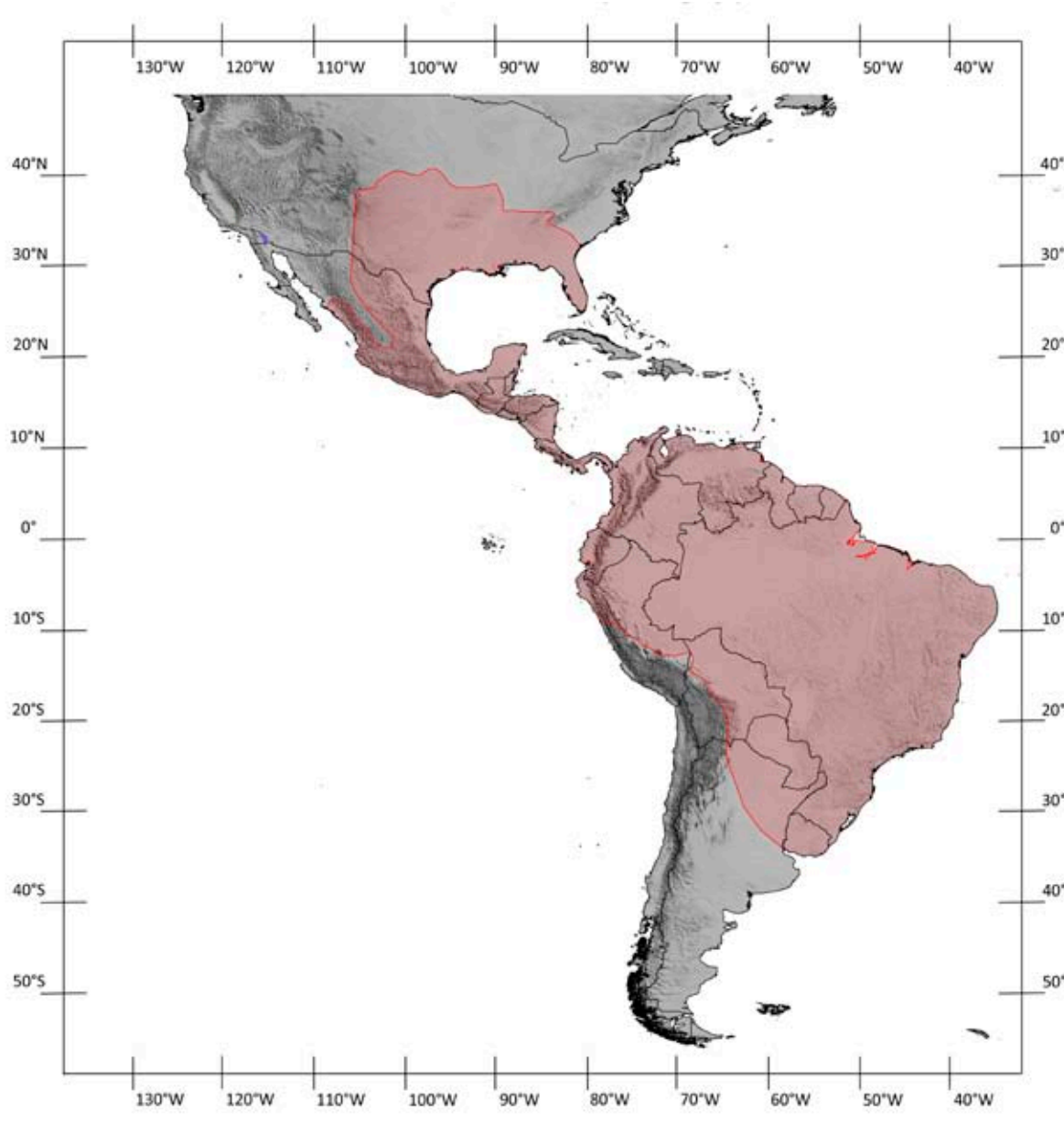

Figure 16. *Dasypus novemcinctus*. Based on McBee and Baker (1982); Platt and Snyder (1995); Taulman and Robbins (1996); Freeman and Genoways (1998); Van Deelen *et al*. (2002); Layne (2003); Gardner (2005); Vizcaíno *et al*. (2006); Gardner (2007); Stuart *et al.* (2007); Abba and Vizcaíno (2008); Aguiar and Fonseca (2008); Frey and Stuart (2009); Hofmann (2009); A. M. Abba, pers. comm. (2009).

Dasypus pilosus

Vulnerable (VU B2ab(iii))

Photograph: Andre Baertschi, www.wildtropix.com

Common Names: Hairy long-nosed armadillo (English), tatú peludo (Spanish), quirquincho peludo (Spanish).

Assessment Rationale: *D. pilosus* is listed as Vulnerable due to the very limited number of known locations, and because there is continuing and accelerating decline of its fragmented habitat.

Taxonomic Note: This species was originally described as *Cryptophractus pilosus* Fitzinger, 1856 (Gardner, 2007).

Geographic Range: *D. pilosus* has been recorded only from the south-western Peruvian Andes in the departments of San Martín, La Libertad, Huánuco, and Junín (Pacheco *et al.*, 1995; Gardner, 2005). It has recently been observed in the department of Amazonas (L. Bermúdez Larrazábal, pers. comm., 2009). The known localities were incorrectly mapped by Wetzel (1982), and repeated in Eisenberg and Redford (1999). It ranges from 500 to 3,000 m asl. The exact range of this species is unknown; its extent of occurrence is estimated at 53,000 km^2. Only five locations are known to date due to the lack of field studies.

Population: There is no information on the population status of *D. pilosus*.

Habitats and Ecology: This little-known species is endemic to the Peruvian yungas (sub-tropical montane deciduous and evergreen forests). It is found in areas with dense or shady cover and limestone formations. Deforestation is advancing at a fast pace within the range of *D. pilosus*, leading to a continuing decline in suitable habitat.

Threats: *D. pilosus* is threatened by severe deforestation of its habitat. It is likely subjected to hunting, but there is no information on the intensity and the degree to which it constitutes a major threat.

Conservation: It has been recorded from the Río Abiseo National Park.

Assessors: Superina, M. and Abba, A.M.

Evaluators: Bermúdez Larrazabal, L. and Loughry, J.

Contributor: Bermúdez Larrazabal, L.

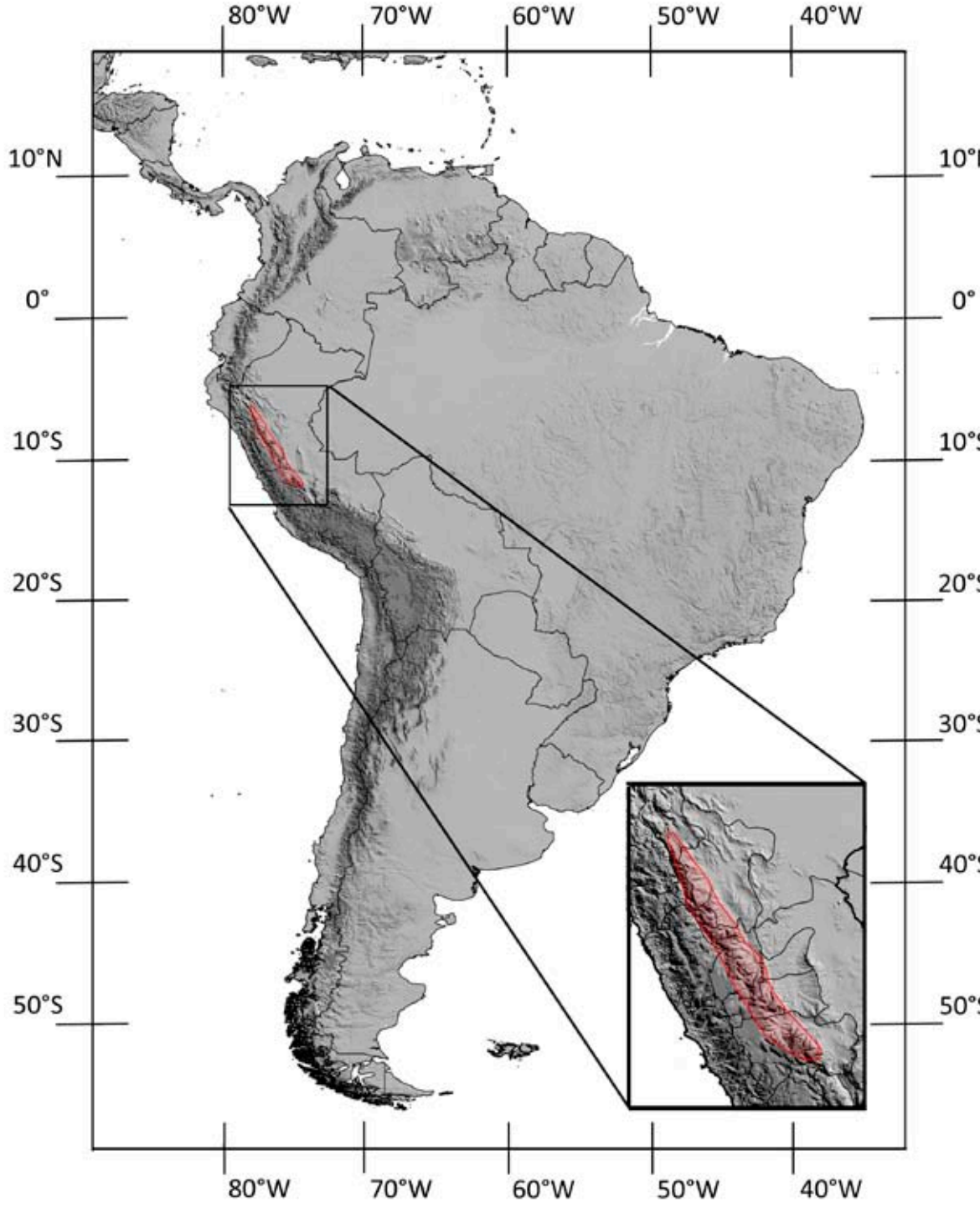

Figure 17. *Dasypus pilosus*. Based on Pacheco *et al.* (1995); Gardner (2005); Aguiar and Fonseca (2008); L. Bermúdez Larrazábal, pers. comm. (2009).

Dasypus sabanicola

Least Concern (LC)

Photograph: Diego Rodriguez

Common Names: Northern long-nosed armadillo (English), llanos long-nosed armadillo (English), tatú de sabana (Spanish), cachicamo sabanero (Spanish).

Assessment Rationale: *D. sabanicola* is listed as Least Concern in view of its wide distribution, the availability of significant areas of suitable intact savanna habitat, and the absence of major threats to this species. There is evidence of severe hunting in some parts of the species' range.

Taxonomic Note: The taxonomic status of this species should be verified through genetic analyses.

Geographic Range: *D. sabanicola* is found throughout the Llanos (the flat plains) of Venezuela and Colombia (Fig. 18). It has been recorded at elevations between 25 and 200 m asl (Eisenberg, 1989). The extent of occurrence is approximately 445,000 km^2 but no information is available on the area of occupancy.

Population: *D. sabanicola* is locally rare. It has been found to be moderately common in intact natural habitats.

Habitats and Ecology: It is generally restricted to open or shrubland habitats in lowland and mid-altitude areas. Animals have a home range of between 1.7 and 11.6 hectares (Ferguson-Laguna, 1984). The female gives birth to one yearly litter of four young.

Threats: In parts of its range it is threatened by intense hunting for subsistence purposes (Ferguson-Laguna, 1984) and by ongoing habitat loss.

Conservation: *D. sabanicola* has been recorded from several protected areas and is protected by national legislation in Venezuela.

Assessors: Superina, M. and Abba, A.M.

Evaluators: Arteaga, M.C. and Lara, P.

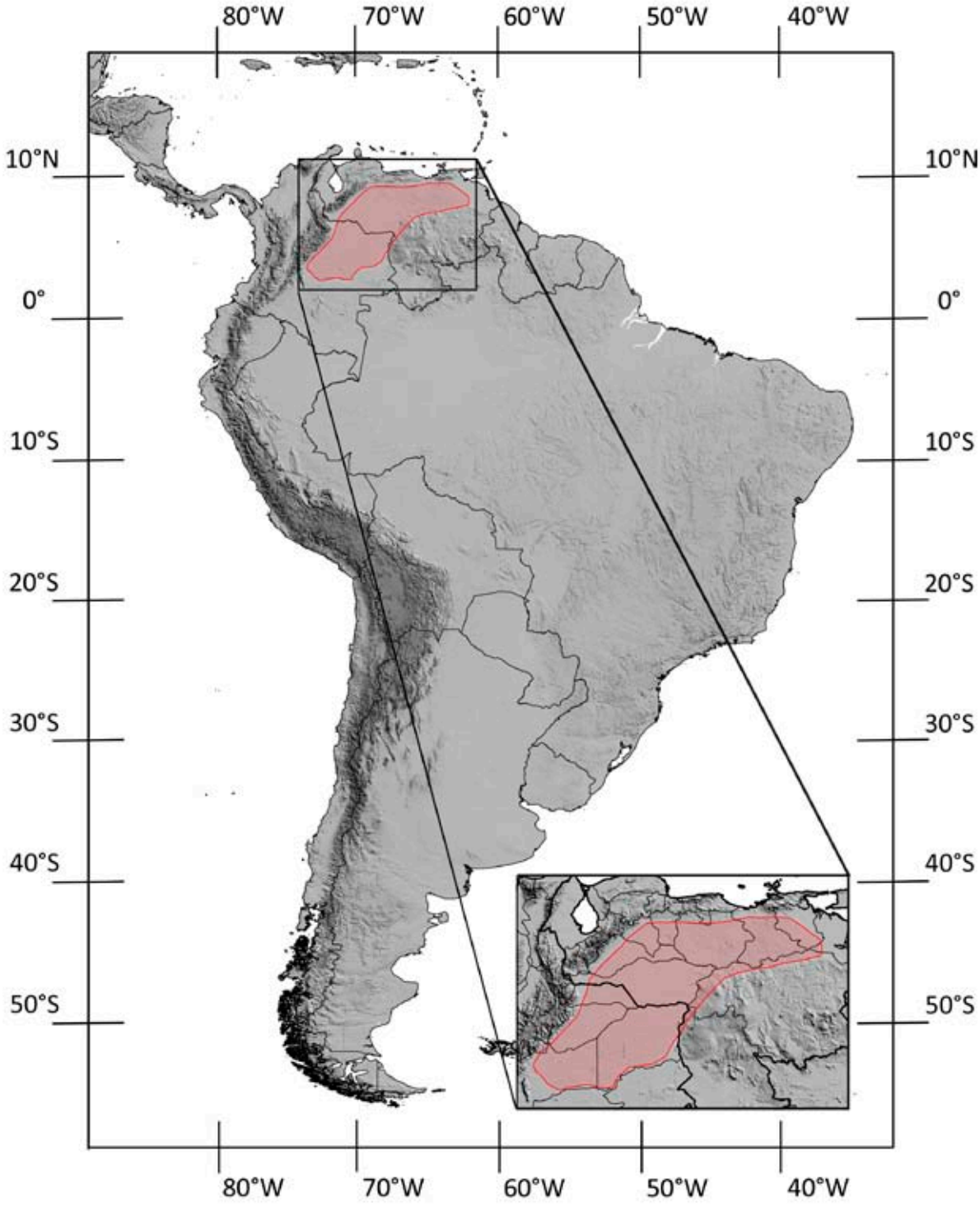

Figure 18. *Dasypus sabanicola*. Based on Wetzel (1982); Ferguson-Laguna (1984); Reid (1997); Eisenberg and Redford (1999); Lord (2000); Gardner (2005); Aguiar and Fonseca (2008).

Dasypus septemcinctus

Least Concern (LC)

Photograph: Teresa Cristina Anacleto

Common Names: Seven-banded armadillo (English), Brazilian lesser long-nosed armadillo (English), mulita chica (Spanish), tatu-mirim (Portuguese).

Assessment Rationale: *D. septemcinctus* is listed as Least Concern in view of its wide distribution, presumed large population, its occurrence in some protected areas, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category.

Taxonomic Note: For many years *D. septemcinctus* was considered synonym of *D. hybridus.*

Geographic Range: *D. septemcinctus* ranges from the lower Amazon Basin of Brazil to the Gran Chaco of Bolivia, Paraguay, and northern Argentina (presence uncertain; Fig. 19). Its southern limit is uncertain due to morphological similarities with *D. hybridus*, *D. yepesi* and juvenile *D. novemcinctus* (see Hamlett, 1939). The extent of occurrence is approximately 5,870,000 km^2 but no information is available on its area of occupancy.

Population: The population status of *D. septemcinctus* is not known.

Habitats and Ecology: *D. septemcinctus* appears to be a grassland species. However, in south-eastern Brazil it prefers to live in gallery forests. It seems to be adaptable to human disturbance and secondary habitat (Aguiar and Fonseca, 2008).

Threats: There are no major threats. Locally, *D. septemcinctus* is threatened by habitat degradation and hunting for food.

Conservation: *D. septemcinctus* is present in some protected areas.

Assessors: Superina, M. and Abba, A.M.

Evaluators: Anacleto, T.C.S. and Medri, I.M.

Contributor: Anacleto, T.C.S.

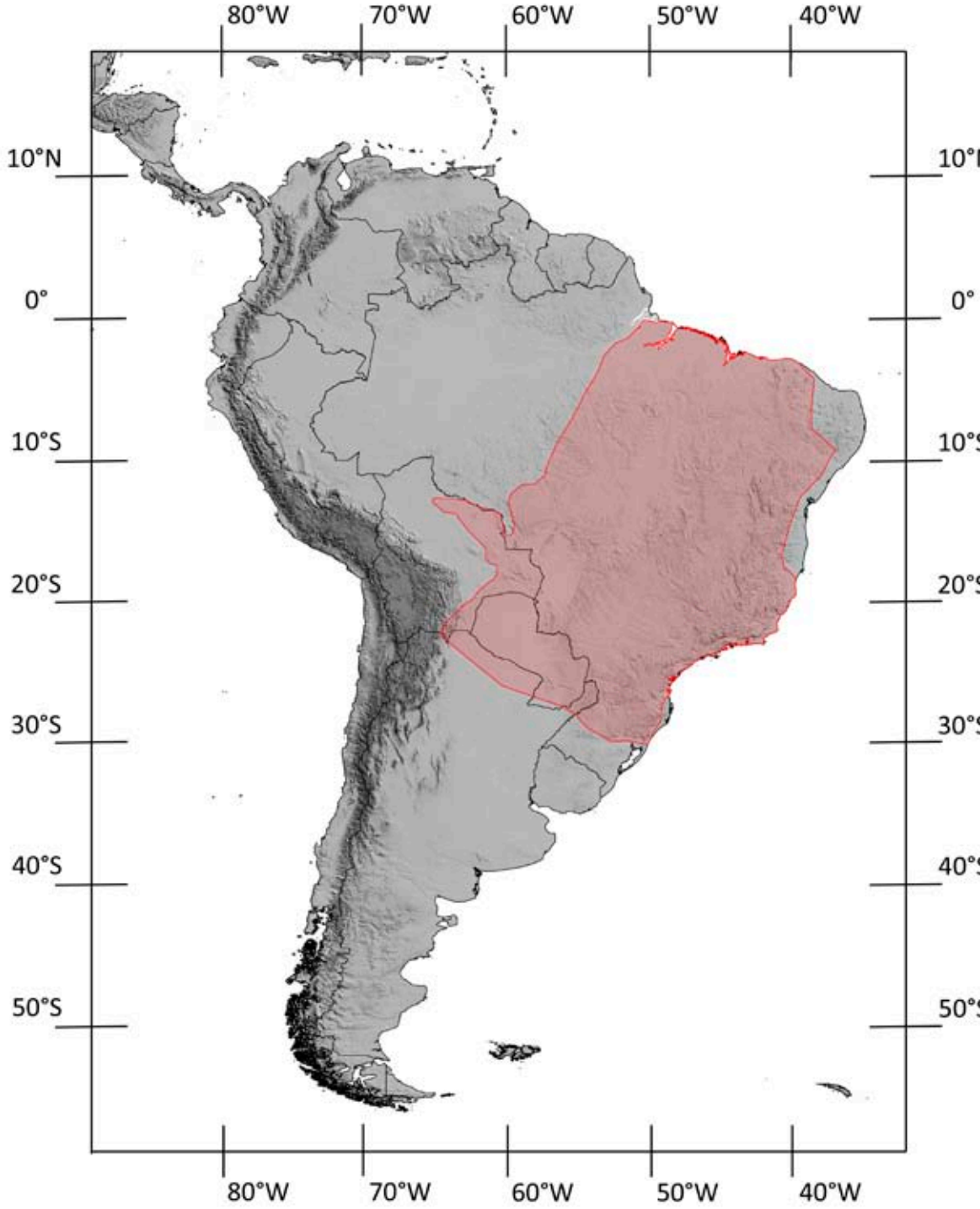

Figure 19. *Dasypus septemcinctus.* Based on Wetzel and Mondolfi (1979); Wetzel (1982); Redford and Eisenberg (1992); Anderson (1997); Emmons and Feer (1997); Gardner (2005); Vizcaíno *et al.* (2006); Abba and Vizcaíno (2008); Aguiar and Fonseca (2008); Smith (2009).

Dasypus yepesi

Data Deficient (DD)

Camera trap photograph: Fundación ProYungas/Ledesma

Common Names: Yunga's lesser long-nosed armadillo (English), Yepes's mulita (English), mulita de Yepes (Spanish).

Assessment Rationale: *D. yepesi* is listed as Data Deficient as there is no information on its population status and no knowledge of major threats.

Taxonomic Note: *D. yepesi* was named by Vizcaíno (1995) and includes specimens previously assigned to *Dasypus mazzai*, *D. hybridus, D. septemcinctus,* and *D. novemcinctus*. Morphological and genetic studies are needed to clarify the taxonomic status of this species.

Geographic Range: It is only known from Jujuy and Salta Provinces, Argentina (Vizcaíno, 1995; Fig. 20). Its range may extend into Bolivia and/or Paraguay. It has been recorded at elevations between 450 and 1800 m asl. The extent of occurrence is estimated at 22,000 km^2 but no information is available on the area of occupancy. Due to the lack of field studies on this species, no more than nine locations are known.

Population: There is no information on the population status of *D. yepesi*.

Habitats and Ecology: *D. yepesi* appears to be tolerant of a variety of ecological conditions from xeric habitats to humid montane forest (Vizcaíno, 1995; Vizcaíno and Giallombardo, 2001; Aguiar and Fonseca, 2008). There is ongoing deforestation in the range of this species.

Threats: The threats to *D. yepesi* are not known, but it can be assumed that it is used as a protein source and habitat destruction is affecting it negatively.

Conservation: *D. yepesi* has been recorded in the National Parks Calilegua and El Rey.

Assessors: Vizcaíno, S.F. and Abba, A.M.

Evaluators: Loughry, J. and Superina, M.

Contributor: Vizcaíno, S.F.

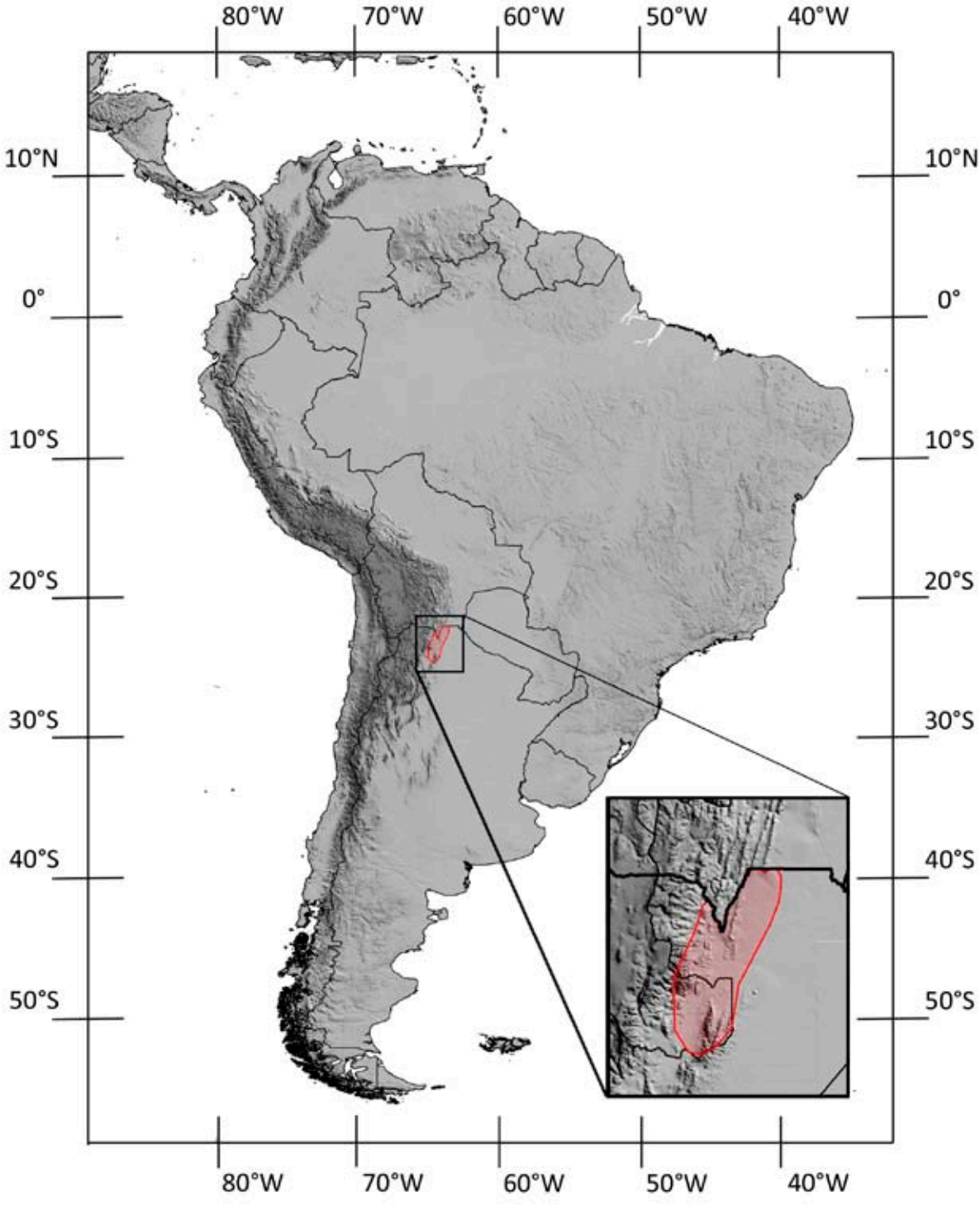

Figure 20. *Dasypus yepesi*. Based on Vizcaíno (1995); Vizcaíno and Giallombardo (2001); Gardner (2005); Aguiar and Fonseca (2008); A. M. Abba, pers. comm. (2009); Fundación Pro Yungas, pers. comm. (2009); S. F. Vizcaíno, pers. comm. (2009).

Euphractus sexcinctus

Least Concern (LC)

Photograph: Flávia Miranda

Common Names: Six-banded armadillo (English), yellow armadillo (English), gualacate (Spanish), tatupeba (Portuguese).

Assessment Rationale: *E. sexcinctus* is listed as Least Concern in view of its wide distribution, presumed large population, its occurrence in a number of protected areas, tolerance of a degree of habitat modification, and because it is unlikely to be declining fast enough to qualify for listing in a threatened category.

Taxonomic Note: Five subspecies are recognized (Gardner, 2007).

Geographic Range: *E. sexcinctus* is present in a wide area of South America, from southern Suriname and adjacent Brazil to Bolivia, Paraguay, Uruguay, and northern Argentina (Fig. 21). It does not occur in Buenos Aires Province (Flores *et al*., 2009). For over 20 years, it was thought that a disjunct population of this taxon existed on the border between Brazil and Suriname (Wetzel, 1985). However, recent studies in northern Brazil confirmed the occurrence of *E. sexcinctus* in Maranhão, Amapá, and parts of northern, northwestern, central, and eastern Pará (see Fig. 21 for references). Most of these records are located in the cerrado. The presence of this species in Peru needs to be confirmed.

Population: It is a common species (Redford and Wetzel, 1985).

Habitats and Ecology: *E. sexcinctus* is found in open areas, savannas, shrubland and dry, semi-deciduous forest. It can be found in secondary forests, and may also occur in primary Amazonian forest (Redford and Wetzel, 1985). Males and females reach maturity at one year of age, and the females possibly give birth to several litters per year; litter size is one to three young.

Threats: There are no major threats. However, *E. sexcinctus* is hunted extensively, mostly for local use.

Conservation: *E. sexcinctus* is present in many protected areas.

Assessors: Medri, I.M. and Superina, M.

Evaluators: Abba, A.M. and Lima, E.M.

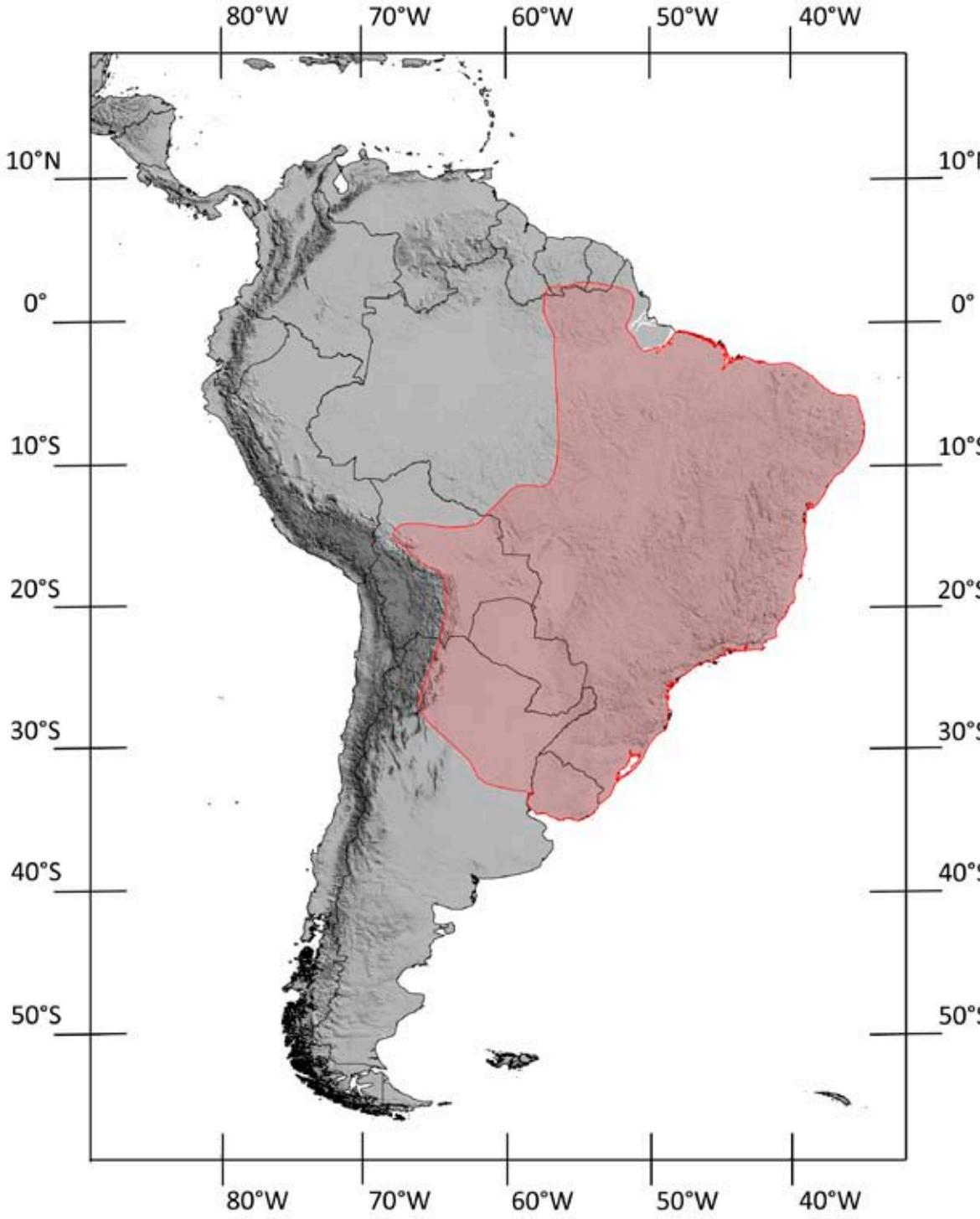

Figure 21. *Euphractus sexcinctus*. Based on Wetzel (1982); Redford and Wetzel (1985); Emmons and Feer (1997); Silva Júnior *et al.* (2001); Silva Júnior and Nunes (2001); Gardner (2005); Silva Júnior *et al.* (2005a, b); Andrade *et al.* (2006); Oliveira *et al.* (2006); Abba and Vizcaíno (2008); Aguiar and Fonseca (2008); Flores *et al.* (2009); Lima *et al.* (2009); A. M. Abba, pers. comm. (2009); Í. M. Medri, pers. comm. (2009).

Priodontes maximus

Vulnerable (VU A2cd)

Photograph: Mariella Superina

Common Names: Giant armadillo (English), tatú guazú (Spanish), tatú carreta (Spanish), armadillo gigante (Spanish), carachupa maman (Spanish), cuspón (Spanish), tatu-canastra (Portuguese), tatou géant (French).

Assessment Rationale: *P. maximus* is listed as Vulnerable because, although widespread, it is rare over its entire range. Estimates for population declines based on habitat loss and hunting are at a level of at least 30% in the past three generations.

Geographic Range: *P. maximus* ranges from northern Venezuela (east of the Andes) and the Guianas (French Guiana, Guyana, and Suriname) south to Paraguay and northern Argentina (Fig. 22). Srbek-Araujo *et al.* (2009) recently confirmed its presence in Espírito Santo, Brazil, although the populations in southeastern Brazil seem to be very reduced. The species may be extinct in Uruguay, and is not listed at all for this country by Fallabrino and Castiñeira (2006). It has been recorded from sea level up to 500 m asl. The extent of occurrence is approximately 9,750,000 km² but no information is available on the area of occupancy. This species has disappeared from large parts of its southern range, and possibly from other portions of its range.

Population: *P. maximus* appears to be naturally rare where it occurs, with a very patchy distribution. Surveys in Suriname over an 18-year period recorded seven individuals in an area of 650 km² (Walsh and Gannon, 1967). The density has been estimated to be from 5.77 to 6.28 per 100 km² using camera trapping (Noss *et al.,* 2004). The wild populations are decreasing.

Habitats and Ecology: This terrestrial species is found close to water within undisturbed primary rain forest habitats. It excavates burrows, usually in grasslands or open areas of the forest. Nowak (1999) suggested that the species had declined by at least 50% over the last decade. In 1954, three individuals were found in an area of 16.7 km² in Espírito Santo, Brazil (Ruschi, 1954). Home range size has been estimated to be at least 450 ha in Brazil (Carter and Encarnação, 1983). There is ongoing deforestation in the range of this species.

Threats: *P. maximus* is threatened by hunting for meat (generally for subsistence) and deforestation of habitat. The illegal capture of giant armadillos for clandestine sale to wealthy animal collectors may also be a threat, but is difficult to quantify.

Conservation: *P. maximus* is listed on Appendix I of CITES. It is present in many protected areas. There is a need to decrease hunting pressure and maintain habitat where viable populations occur.

Assessors: Superina, M. and Abba, A.M.

Evaluators: Porini, G. and Anacleto, T.C.S.

Contributors: Porini, G., Anacleto, T.C.S., Medri, I.M., Miranda, F. and Cuéllar, E.

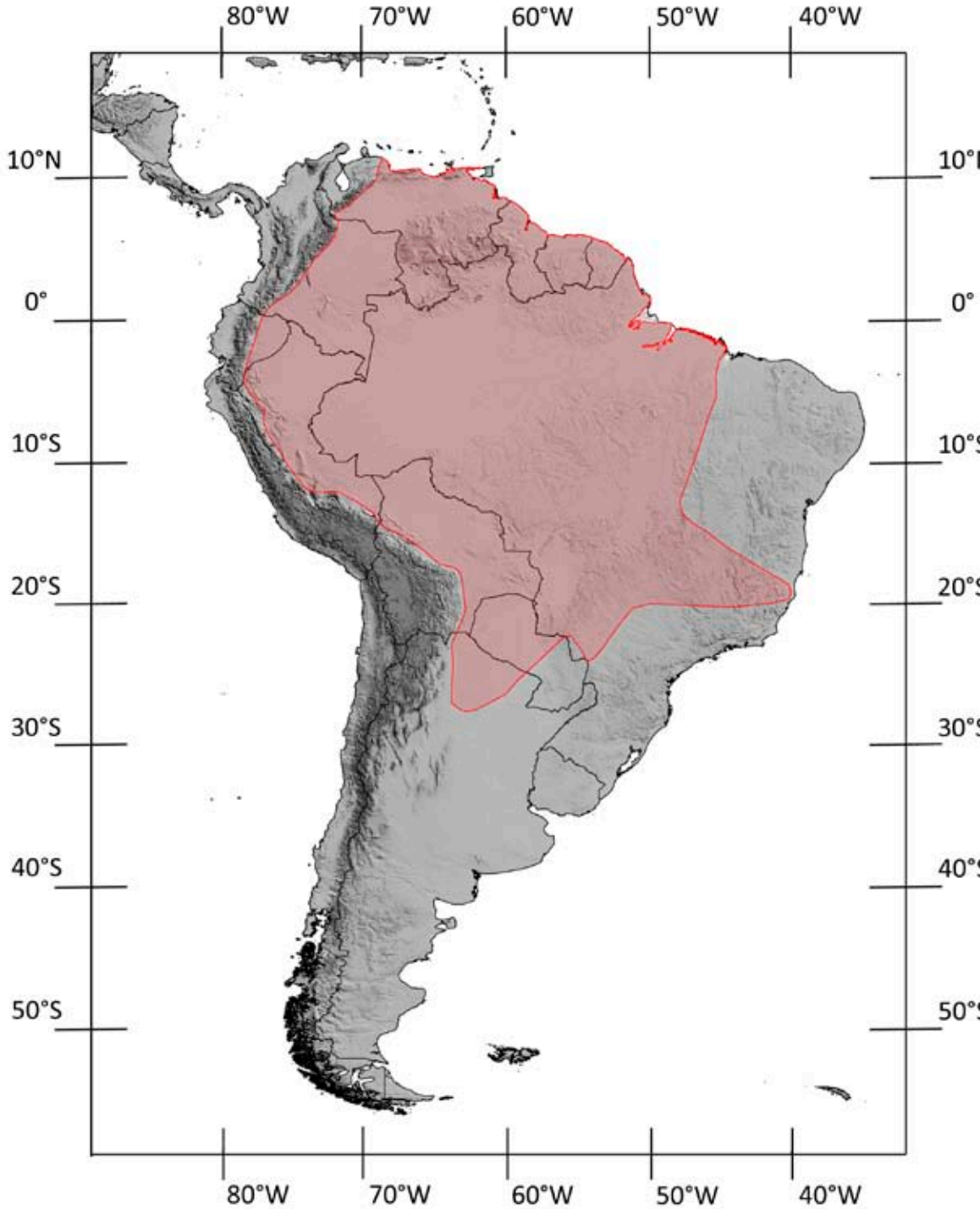

Figure 22. *Priodontes maximus*. Based on Ruschi (1954); Walsh and Gannon (1967); Wetzel (1982); Redford and Eisenberg (1992); Chebez (1994); Emmons and Romo (1994); Pacheco *et al.* (1995); Mares *et al.* (1996); Anderson (1997); Emmons and Feer (1997); Tirira (1999); Engstrom and Lim (2000); Gardner (2005); Fallabrino and Castiñeira (2006); Vizcaíno *et al.* (2006); Tirira (2007); Aguiar and Fonseca (2008); Srbek-Araujo *et al.* (2009); Tarifa (2009b); A. M. Abba, pers. comm. (2009); C. B. Kasper, pers. comm. (2009); Í M. Medri, pers. comm. (2009) ; G. Porini, pers. comm. (2009).

Tolypeutes matacus

Near Threatened (NT)

Photograph: Erika Cuéllar

Common Names: Southern three-banded armadillo (English), corechi (Spanish), tatú bolita (Spanish), mataco bola (Spanish), quirquincho bola (Spanish).

Assessment Rationale: *T. matacus* is listed as Near Threatened because this species is probably in significant decline (albeit at a rate of less than 30% over ten years) due to widespread habitat loss through much of its range, and because of exploitation for food, thus making it close to qualifying for Vulnerable under criterion A2cd.

Geographic Range: It is found from eastern Bolivia and south-western Brazil, south through the Gran Chaco of Paraguay, to Argentina (San Luis Province; Fig. 23). The species was once present in southern Buenos Aires Province (Yepes, 1928) but recent surveys suggest that it is now extinct in this area (Abba and Vizcaíno, 2008; A.M. Abba, pers. comm., 2010). The reason for its disappearing from Buenos Aires is unknown, but may be related to climate. It ranges from sea level up to 800 m asl (Argentina). The extent of occurrence is approximately 1,200,000 km^2 but no information is available on its area of occupancy.

Population: It is abundant in most xeric parts of the Paraguayan Chaco (Redford and Eisenberg, 1992). It was recorded at densities of 1.9 animals per km^2 in the Bolivian Chaco (Cuéllar, 2002). The wild populations are decreasing, mainly due to intense hunting and habitat loss throughout its range.

Habitats and Ecology: *T. matacus* is found in areas of dry vegetation within the Chaco (Bolkovic *et al.*, 1995). It has a low reproductive rate. Both genders reach maturity at one year of age. Females give birth to one yearly litter of one young, and gestation length is between 104 and 116 days.

Threats: *T. matacus* is threatened by hunting for food. As it is not fossorial, it is easier to hunt than other armadillo species. It is also threatened by habitat destruction through conversion of suitable habitat to cultivated land; however, it is able to adapt to low levels of agricultural disturbance. This species is exported to zoos and for pet trade, and there is a high mortality of individuals during this export process.

Conservation: *T. matacus* has been recorded from a number of protected areas. There is a captive population in North America.

Assessors: Abba, A.M. and Superina, M.

Evaluators: Howell, J., Rogel, T. and Agüero, J.

Contributors: Medri, I.M., Miranda, F., Moraes Tomas, W. and Rogel, T.

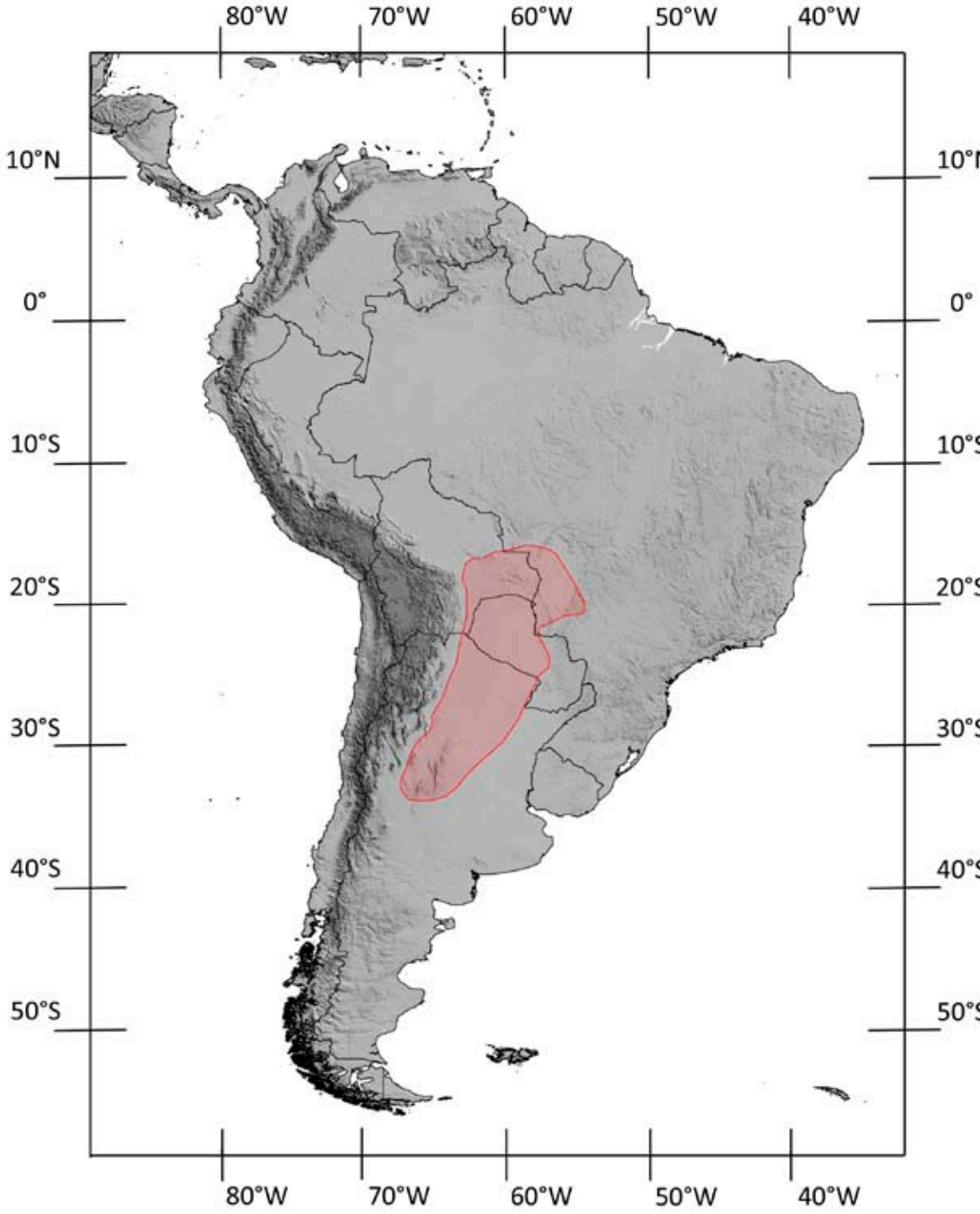

Figure 23. *Tolypeutes matacus*. Based on Redford and Eisenberg (1992); Gardner (2005); Abba and Vizcaíno (2008); Aguiar and Fonseca (2008); Smith (2009); Tarifa (2009a); A. M. Abba, pers. comm. (2009); Í. M. Medri, pers. comm. (2009); T. Rogel, pers. comm. (2009).

Tolypeutes tricinctus

Vulnerable (VU A2cd)

Photograph: Joares May

Common Names: Brazilian three-banded armadillo (English), tatu-bola (Portuguese).

Assessment Rationale: *Tolypeutes tricinctus* is listed as Vulnerable because of a population decline—estimated to be more than 30% over the last 10–12 years—inferred from ongoing exploitation and habitat loss and degradation.

Geographic Range: *T. tricinctus* is endemic to Brazil, where it has been recorded from the states of Bahia, Ceará, Pernambuco, Alagoas, Sergipe, Piauí, Mato Grosso (extreme central eastern portion), Goiás (extreme north), Minas Gerais (extreme northwest), Tocantins (eastern portion), Paraíba, and Rio Grande do Norte (Fig. 24). The extent of occurrence is approximately 700,000 km^2 but no information is available on the area of occupancy. Continuing declines in the areas of occurrence and occupancy are probable due to habitat loss.

Population: *T. tricinctus* was believed to be extinct until its rediscovery in the early 1990s in a handful of scattered localities. It has probably disappeared over much of its range, but it is difficult to survey its populations (Nowak, 1999). This armadillo has a patchy distribution; population densities may be relatively high within certain patches (J. Marinho-Filho, pers. comm., 2010), except in areas where the species is exposed to human pressure.

Habitats and Ecology: *T. tricinctus* mainly occurs in caatinga habitat (dry thorn scrub of north-eastern Brazil), but it is also found in the eastern parts of cerrado habitat (bush savanna in central Brazil). It is not fossorial and has the habit, when threatened, of rolling into an easily portable ball. Population densities have been estimated at 0.97 individuals/km^2 but are expected to be considerably lower in areas with hunting pressure. Significant habitat loss has been recorded in its range, especially in the Cerrado.

Threats: *T. tricinctus* is threatened by heavy hunting pressure and habitat loss. In the Caatinga, the remaining populations are practically isolated in protected areas and are subjected to subsistence hunting. In the Cerrado, the main populations live outside protected areas and are especially threatened by conversion of their natural habitat to sugar cane and soybean plantations.

Conservation: T. tricinctus has been observed in Serra da Capivara and Serra das Confusões National Parks, both in southern Piaui (Marinho-Filho and Reis, 2008). It is present in the Grande Sertão Veredas National Park, northern Minas Gerais (M. L. Reis, pers. comm., 2010). It was also recorded in the Ecological Station of Serra Geral do Tocantins and Jalapão State Park (Tocantins), as well as in the Raso da Catarina Biological Reserve and Veredas do Oeste baiano Wildlife Refuge (Bahia; Marinho-Filho and Reis, 2008; M. L. Reis, pers. comm., 2010). No protected areas exist in the area of highest population density (J. Marinho-Filho, pers. comm., 2010).

Assessors: Superina, M. and Abba, A.M.

Evaluators: Marinho Filho, J. and Reis, M.

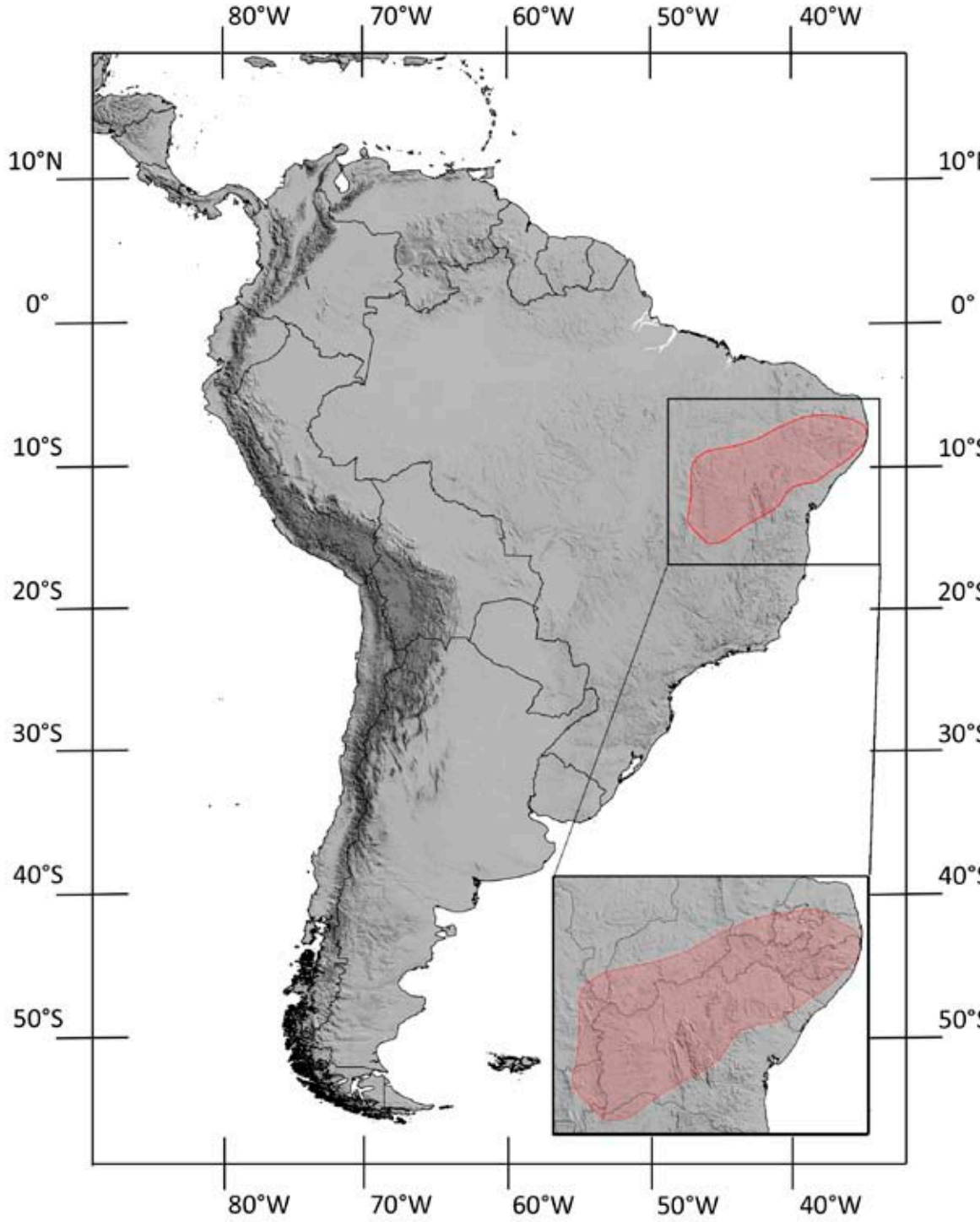

Figure 24. *Tolypeutes tricinctus*. Based on Sanborn (1930); Wetzel (1982); Wetzel (1985); Santos (1993); Silva and Oren (1993); Santos *et al.* (1994); Marinho-Filho *et al.* (1997); Eisenberg and Redford (1999); Reis *et al.* (2002); Reis *et al.* (2005); Gardner (2007); Marinho-Filho and Reis (2008).

Zaedyus pichiy

Near Threatened (NT)

Photograph: Mariella Superina

Common Names: Pichi (English), piche (Spanish).

Assessment Rationale: *Z. pichiy* is listed as Near Threatened because, although relatively widespread and present in a number of protected areas, it is hunted significantly, especially in northern and eastern portions of its range. Local extinctions have been recorded in some areas, although there is little known about the declines in the southern part of its range. Across its range, the species is thought likely to have undergone a decline on the order of 20% over the past ten years or so. It almost qualifies as Threatened under criterion A2d.

Taxonomic Note: Two subspecies are described but require confirmation: *Z. p. pichiy* and *Z. p. caurinus* (Gardner, 2007).

Geographic Range: *Z. pichiy* ranges from central Argentina and eastern Chile south to the Straits of Magellan (Fig. 25). It is found from sea level to 2,500 m asl. The extent of occurrence is approximately 1,300,000 km^2 but no information is available on its area of occupancy.

Population: *Z. pichiy* is not abundant in southern Buenos Aires Province (A.M. Abba, pers. comm., 2004), and its abundance has declined in Mendoza Province within the last ten years (M. Superina, pers. comm., 2004). No data are available on the population size. However, a population reduction of 20% in the past ten years is probable. The negative impact on wild populations has not ceased, and an ongoing decline in mature individuals is probable.

Habitats and Ecology: This mostly solitary species is found in xeric grasslands and shrublands, as well as Patagonian steppe habitats, always with sandy soils (including volcanic soil; Superina, 2008). It can be found in some degraded habitats. Suitable habitat is declining. Animals have a relatively large home range within their arid habitat. Both genders reach maturity at nine months of age, and the female gives birth to one yearly litter of one or two young after a gestation length of 60 days (Superina and Jahn, 2009; Superina *et al.*, 2009a).

Threats: *Z. pichiy* is threatened by hunting for food and sport, including hunting with dogs. An epidemic of an unknown disease has locally affected the species in some areas, and appears to be associated with rainy periods (Superina *et al.*, 2009b). It is threatened to some degree by overgrazing of its habitat by cattle.

Conservation: *Z. pichiy* is present in many protected areas, such as the National Parks Bosques Petrificados, Los Glaciares, Laguna Blanca, Lihué Calel, and Monte León. Hunting of this species in Argentina and Chile continues, even though this is prohibited.

Assessors: Superina, M. and Abba, A.M.

Evaluators: Seitz, V. and Roig, V.G.

Contributor: Roig, V.G.

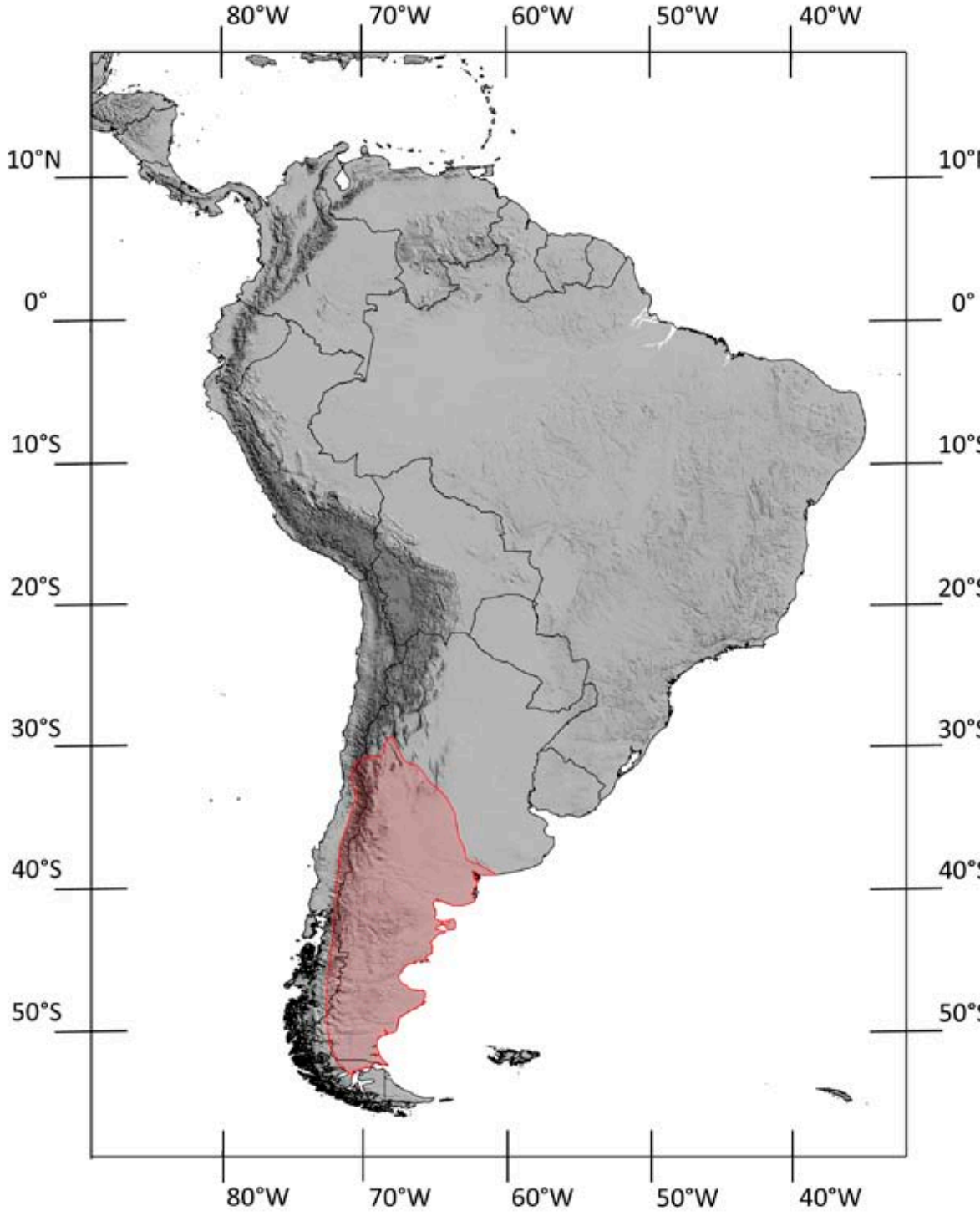

Figure 25. *Zaedyus pichiy*. Based on Wetzel (1982); Redford and Eisenberg (1992); Gardner (2005); Vizcaíno *et al*. (2006); Iriarte (2008); Abba and Vizcaíno (2008); Aguiar and Fonseca (2008); A. M. Abba, pers. comm. (2009); M. Superina, pers. comm. (2009).

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GLOSSARY

This glossary is based on the 2001 IUCN Red List Categories and Criteria, Version 3.1., which were developed by the IUCN Species Survival Commission, Gland, Switzerland and Cambridge, UK. For additional information, please download the complete document from <http://www.iucnredlist.org/technical-documents/categories-and-criteria>.

Population and Population Size

The term 'population' is used in a specific sense in the Red List Criteria that is different from its common biological usage. Population is here defined as the total number of individuals of the taxon. For functional reasons, primarily owing to differences between life forms, population size is measured as numbers of mature individuals only. In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon are used.

Subpopulations

Subpopulations are defined as geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less).

Extent of occurrence

Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy. This measure may exclude discontinuities or disjunctions within the overall distributions of taxa (e.g. large areas of obviously unsuitable habitat) (but see 'area of occupancy', below). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).

Area of occupancy

Area of occupancy is defined as the area within its 'extent of occurrence' (see above) which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases (e.g. irreplaceable colonial nesting sites, crucial feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of threats and the available data. To avoid inconsistencies and bias in assessments caused by estimating area of occupancy at different scales, it may be necessary to standardize estimates by applying a scale-correction factor. It is difficult to give strict guidance on how standardization should be done because different types of taxa have different scale-area relationships.

Red List Categories

Extinct (EX)

A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

Extinct in the Wild (EW)

A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

Critically Endangered (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see table below), and it is therefore considered to be facing an extremely high risk of extinction in the wild.

Endangered (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see table below), and it is therefore

considered to be facing a very high risk of extinction in the wild.

Vulnerable (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see table below), and it is therefore considered to be facing a high risk of extinction in the wild.

Near Threatened (NT)

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

Least Concern (LC)

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

Data Deficient (DD)

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available.

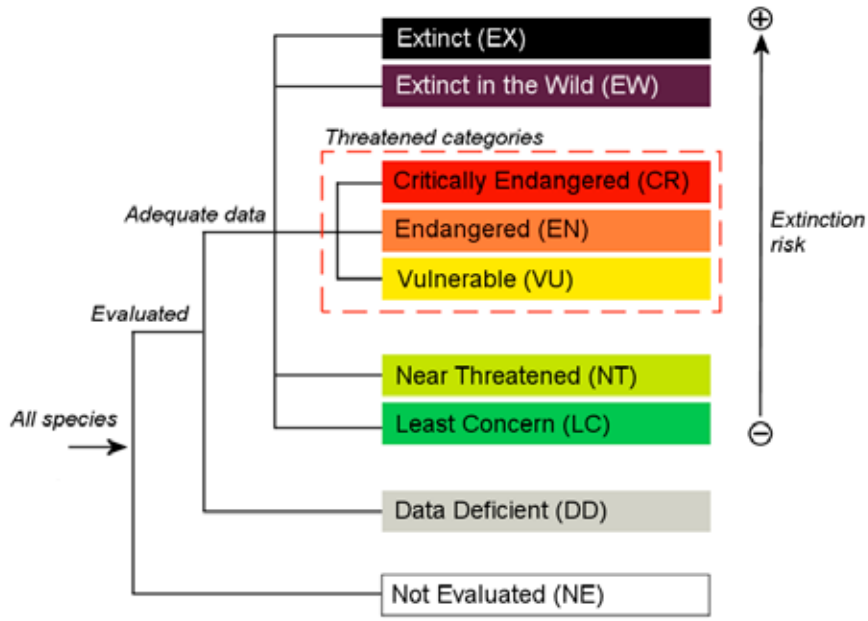
In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

Not Evaluated (NE)

A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

Source:

IUCN. 2001. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.



Summary of the five criteria (A–E) used to evaluate if a taxon belongs in a threatened category (Critically Endangered, Endangered or Vulnerable).

Use any of the criteria A–E	**Critically Endangered**	**Endangered**	**Vulnerable**
A. Population reduction	Declines measured over the longer of 10 years or 3 generations		
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%
Al. Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible **AND** understood **AND** have ceased, based on and specifying any of the following: **(a)** direct observation **(b)** an index of abundance appropriate to the taxon **(c)** a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality **(d)** actual or potential levels of exploitation **(e)** effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.			
A2. Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under Al.			
A3. Population reduction projected or suspected to be met in the future (up to a maximum of 100 years) based on (b) to (e) under Al.			
A4. An observed, estimated, inferred, projected or suspected population reduction (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under Al.			
B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)			
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
AND at least 2 of the following:			
(a) Severely fragmented, **OR** Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** area, extent and/or quality of habitat; **(iv)** number of locations or subpopulations; **(v)** number of mature individuals.			
(c) Extreme fluctuations in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** number of locations or subpopulations; **(iv)** number of mature individuals.			
C. Small population size and decline			
Number of mature individuals	< 250	< 2,500	< 10,000
AND either C1 or C2:			
C1. An estimated continuing decline of at least: (up to a max. of 100 years in future)	25% in 3 years or 1 generation	20% in 5 years or 2 generations	10% in 10 years or 3 generations
C2. A continuing decline **AND** (a) and/or (b):			
(a i) Number of mature individuals in each subpopulation:	< 50	< 250	< 1,000
or			
(a ii) % individuals in one subpopulation =	90–100%	95–100%	100%
(b) Extreme fluctuations in the number of mature individuals.			
D. Very small or restricted population			
Either: Number of mature individuals	< 50	< 250	**D1.** < 1,000
			AND/OR
	Restricted area of occupancy		**D2.** typically: AOO < 20 km² or number of locations ≤ 5
E. Quantitative Analysis			
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations (100 years max.)	≥ 20% in 20 years or 5 generations (100 years max.)	≥ 10% in 100 years

NOTES TO CONTRIBUTORS

Edentata is the official publication of the IUCN/SSC Anteater, Sloth and Armadillo Specialist Group. It aims to publish information that contributes to the conservation of xenarthrans.

A broad range of topics is welcomed and encouraged, including taxonomy, systematics, genetics, biogeography, ecology, conservation, behavior, and health. Manuscripts must describe original research findings that have not been published or submitted simultaneously to other journals. Any overlap of contents with already published papers should be minimal.

Edentata accepts manuscripts of original research findings related to any aspect of xenarthran conservation. It also encourages submission of short communications, field notes, thesis abstracts, news items, recent events, book reviews, congress announcements, and the like.

Manuscripts may be written in English, Portuguese or Spanish. Authors whose first language is not English should please have their texts *carefully reviewed* by a native English speaker.

Once the manuscript has been received, the editors will perform a first evaluation. Manuscripts not satisfying the editorial instructions will be returned to the author without review.

Detailed instructions to authors are available on the website <http://www.xenarthrans.org/bibliography/edentata>.

PAUTAS PARA LOS COLABORADORES

Edentata es la publicación oficial del grupo de especialistas en osos hormigueros, perezosos y armadillos de la UICN/SSC (IUCN/SSC Anteater, Sloth and Armadillo Specialist Group). Está dedicada a la difusión de información que contribuya a la conservación de los xenartros.

Se aceptan manuscritos que se encuentren dentro de una amplia variedad de temáticas, incluyendo: taxonomía, sistemática, genética, biogeografía, ecología, conservación, comportamiento y salud. Los manuscritos deben ser trabajos originales y no haber sido publicados ni enviados simultáneamente a otros medios de publicación. La superposición de contenidos con artículos relacionados ya publicados debe ser mínima.

Edentata acepta artículos sobre investigaciones originales relacionadas con cualquier aspecto de la conservación de xenartros. También se alienta el envío de comunicaciones breves, notas de campo, resúmenes de tesis, noticias, información sobre eventos, revisiones de libros, avisos de congresos, etc.

Los manuscritos pueden estar redactados en inglés, portugués o español. En el caso de autores cuya lengua materna no sea el inglés y envíen manuscritos en ese idioma, deberán someter el texto a una revisión detallada por una persona angloparlante nativa o traductor profesional para garantizar el uso correcto del inglés.

Una vez recibido el manuscrito, el Comité Editorial realizará una primera evaluación y los manuscritos que no cumplan con las normas establecidas serán devueltos a los autores sin pasar al proceso de revisión por pares.

Las normas editoriales detalladas se pueden bajar de la página <http://www.xenarthrans.org/bibliography/edentata>.

INSTRUÇÕES AOS COLABORADORES

Edentata é a publicação oficial do grupo de especialistas em tamanduás, preguiças e tatus da UICN/SSC (IUCN/SSC Anteater, Sloth and Armadillo Specialist Group). Tem como finalidade a difusão de informações que possam vir a contribuir para a conservação dos xenarthros.

Serão aceitos manuscritos que se encontrem dentro da ampla variedade temática, incluindo-se taxonomia, sistemática, genética, biogeografia, ecologia, conservação, comportamento e saúde. Os trabalhos devem ser originais, não publicados ou enviados simultaneamente a outros meios de publicação. A superposição dos conteúdos com artigos relacionados e já publicados, deve ser mínima.

Edentata aceita artigos sobre investigações originais relacionadas com qualquer aspecto de conservação de xenarthros. Comporta ainda comunicações breves, notas de campo, resumos de teses, informações sobre eventos, revisões de livros, avisos de congressos, entre outros.

Serão publicados artigos em inglês, português ou espanhol. Aos autores cuja língua materna não seja o inglês, e que optem por enviar manuscritos nesse idioma, solicita-se uma revisão detalhada por pessoa nativa ou tradutor profissional, a fim de garantir a correção idiomática.

Os manuscritos serão submetidos a uma avaliação inicial pelo Comitê Editorial, sendo procedida a devolução aos autores, sem revisão, dos que não estiverem dentro das normas pré-estabelecidas.

As normas editoriais detalhadas se podem baixar na página <http://www.xenarthrans.org/bibliography/edentata>.

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