
17 The mountain tapir (*Tapirus pinchaque*) and Andean bear (*Tremarctos ornatus*): Two charismatic, large mammals in South American tropical montane cloud forests

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ABSTRACT

Mountain tapir and Andean bear are the two largest mammals in the tropical Andes, both charismatic, survivors of old lineages of mammal evolution, and threatened with extinction. Their current distribution is montane cloud forest and *páramos* (high-altitude grasslands) in South America, where they feed on fruits and vegetative parts, having an important role as seed dispersers. The distribution and population size of both species was analyzed based on expert opinion and a rule-and-base model within a GIS context. A gap analysis was performed to determine the animals their conservation status within National Parks. Areas of past and present distribution for the mountain tapir were 205 000 km² and 31 400 km², respectively. Based on existing suitable habitat, the population of mountain tapirs in their current range was estimated at 5700 individuals at the most. The overall population of Andean bears ranges between expert estimates of 5000–10 000 individuals. Several conservation recommendations emerge from the present analysis and review for the two species.

INTRODUCTION

The tropical cloud forests of the Andean region support some of the greatest plant and animal species diversity on Earth (Rahbek and Graves 2001; Barthlott *et al.*, 2005; Brehm *et al.*, 2005; Krömer *et al.*, 2005), with a remarkable number of endemic and rare species (Duellman, 1988; Kessler, 2002; Kattan and Franco, 2004). At the same time, the tropical Andes is one of the most endangered biodiversity “hot spots” (Myers *et al.*, 2000; Brooks *et al.*, 2002; cf. Mosandl *et al.*, 2008) due primarily to the conversion of forests to agriculture and cattle ranching, a process that continues today (Kattan *et al.*, 2004). Among the threatened species in these extreme habitats are the two largest mountain mammals in the Andes, the mountain tapir (*Tapirus pinchaque*) and Andean bear (*Tremarctos ornatus*). These two herbivores occupy some of the most remote remaining forest patches where deforestation has not yet reached. In spite of this isolation, the populations of these two animals are increasingly fragmented and pressured by hunting for their parts, mainly hooves and paws for medicinal and aphrodisiac purposes. If measures are not taken soon, the populations of these two animals may become too small and patchy to make the species viable. This chapter aims to review the available information on the two largest and charismatic mammal species of the tropical montane cloud

forests in South America, and to analyze their current distribution, population size, and conservation constraints.

NATURAL HISTORY

Evolution

MOUNTAIN TAPIR

Currently there are four species of tapirs, one in South-East Asia (*Tapirus indicus*) and three in the Neotropics (*Tapirus terrestris*, *T. bairdii*, and *T. pinchaque*). In the past, the family Tapiridae had a prolific adaptive radiation with significantly more species than today (Prothero and Schoch, 1989; Holbrook, 1999). Together with other perissodactyls ("odd-toed" or "odd-hoofed" mammals like rhinoceros), tapirs declined in terms of their diversity and abundance during the late Cenozoic, in large degree due to climatic changes and the emergence of artiodactyl (even-hoofed like wild boar and deer) ruminants (Schoch, 1989). The extinction of tapirs and other large animals in North America also coincided with the migration of the first humans to this continent (Frison, 1998). Phylogenetic studies of the existing tapirs suggest that the Central American species (*T. bairdii*) got separated from the American lineage about 19–20 million years ago, and that the two South American species (*T. terrestris* and *T. pinchaque*) appeared later in the evolutionary history of this group (Ashley *et al.*, 1996). The appearance of these two species coincided with the formation of the Isthmus of Panama (Schoch, 1989) and the uplift of the Andes during the late Pliocene (Van der Hammen, 1982). Currently, mountain tapirs are found only in the Andes of Colombia (Acosta *et al.*, 1996; Lizcano and Cavelier, 2000a; Lizcano *et al.*, 2002), Ecuador (Downer, 1996, 1997), and northern Perú (Lizcano and Sissa, 2003).

ANDEAN BEAR

The Andean or spectacled bear, *Tremarctos ornatus*, is an intermediate-sized bear, showing sexual dimorphism in size, with males (≤ 200 kg) being considerably larger than females (≤ 65 kg; Peyton, 1999). Pelage is usually black with variations of dark red-brown phenotypes (Peyton, 1999). The English name, spectacled bear, and the Spanish name, *oso frontino*, come from the white to yellowish fur that often encircle the eyes. These markings are unique to each individual and can extend to forehead, muzzle, neck, and chest (Roth, 1964). Some other common names along its distribution range are *ukuku*, *ukumari*, and *oso real*. The Andean bear are probably the most arboreal of all living bears and are well adapted to climb trees and steep slopes (Peyton, 1999). Its large and massive jaw muscles plus its characteristic fourth premolar enable these bears to grind and crunch tough and fibrous foods (Davis, 1955; Thenius, 1976). Such features support the idea that Andean bear are possibly the most herbivorous of all living bear species (Peyton, 1999).

The chromosome number ($2n = 52$) of *T. ornatus* is unique among the rest of the living bear species which have a nearly identical karyotype and 74 chromosomes, except for the giant panda with its 42 chromosomes (Nash and O'Brien, 1987). The Andean bear and the panda are the basal taxa of the ursid radiation (Talbot and Shields, 1996), making them the living representatives of the oldest lineages of bear evolution. Tremarctinae bears may have emerged some 3 million years later than the Ailuropodinae (the genus of the giant pandas), which appeared some 15–25 million years ago (O'Brien *et al.*, 1985). A possible affinity between the Andean bear and the panda bear is also suggested by the fact that both species are herbivorous foragers and neither possesses "typical" bear behavioral patterns (i.e. neither hibernates nor roars; O'Brien *et al.*, 1985). The arrival of Tremarctinae bears to South America may be dated back to the Early Pleistocene, about 1.8 million years ago (Soibelzon, 2005).

Habitat use and activity

MOUNTAIN TAPIR

The main habitats of the mountain tapir are Andean tropical upper montane cloud forest and *páramo* from north-eastern Colombia to northern Perú, at altitudes between c. 1700 and 4300 m.a.s.l. (Downer, 1996, 1997). In Colombia, tapirs are not present on the Western Cordillera or in the Sierra Nevada de Santa Marta, probably because of geographic barriers (notably deep dry valleys separating these mountain ranges from the Central and Eastern Cordilleras). Tapirs use *páramos* and open man-made grasslands associated with nearby forests. Their foot prints have also been observed in snow-capped mountains above 4500 m.a.s.l. Mountain tapirs tend to be more active in mature than in secondary forest. Nocturnal activity is higher during periods of full moon, compared with periods of new and quarter moons (Lizcano and Cavelier, 2000b). In Ecuador's Sangay National Park, mountain tapirs displayed a bimodal activity pattern, being most active during the early hours of the morning and the early hours of the evening (Downer, 1996).

ANDEAN BEAR

The Andean bear inhabits dry thorn forests, seasonal forest (evergreen to deciduous), humid to wet forests, including different kinds of cloud forests, *páramo*, and *puna*, the dry grasslands above the tree line in Peru and Bolivia (Yerena and Torres, 1994; Peyton, 1999). Most of the remaining cloud forest habitat for the Andean bear occurs on the eastern slopes of the eastern Andes (Peyton, 1999), facing the Orinoco, Amazon, and Paraná basins. It is recognized that the best habitats for Andean bear include humid to very humid montane or cloud forest (Peyton, 1999), which typically occupy a range between 1000 and 3000 m.a.s.l. Both mature and secondary forests provide food and shelter for Andean bear. The habitat use of the Andean bear has been described as seasonal, switching between forest and *páramo* when food

Table 17.1 Selected families and genera of plant food items for Andean bear in montane forests

Fruits and/or seeds	Vegetative parts (within parentheses part of the plant that is eaten)
Anacardiaceae: <i>Schinus</i> , Annonaceae: <i>Ammona</i> , Arecaceae: <i>Catoblastus</i> , <i>Ceroxylon</i> , <i>Aiphanes</i> , Cecropiaceae: <i>Cecropia</i> , Clusiaceae: <i>Clusia</i> , Cyclanthaceae: <i>Ciclanthus</i> , Ericaceae: <i>Vaccinium</i> , <i>Gaultheria</i> , <i>Disterigma</i> , <i>Pernettya</i> , <i>Cavendishia</i> , Fabaceae: <i>Inga</i> , <i>Amburana</i> , Fagaceae: <i>Quercus</i> , Lauraceae: <i>Beilschmiedia</i> , <i>Ocotea</i> , <i>Aniba</i> , <i>Phoebe</i> , <i>Nectandra</i> , <i>Persea</i> , Moraceae: <i>Ficus</i> , Myrtaceae: <i>Psidium</i> , <i>Eugenia</i> , Proteaceae: <i>Panopsis</i> , Rosaceae: <i>Prunus</i> , <i>Rubus</i> , Sapotaceae: <i>Chrysophyllum</i> , <i>Lucuma</i> , Solanaceae: <i>Physalis</i>	Arecaceae (stem meristematic tissue): <i>Catoblastus</i> , <i>Dictyocaryum</i> , <i>Bactris</i> , <i>Ceroxylon</i> , <i>Geonoma</i> , <i>Iriarte</i> , Araceae (stem): <i>Anthurium</i> , Bromeliaceae: <i>Tillandsia</i> , <i>Guzmania</i> , <i>Pitcairnia</i> , <i>Vriesia</i> , <i>Aechmea</i> , Cyatheaceae (rhizome): not specified, Cyclanthaceae (stems): <i>Carludovica</i> , <i>Asplundia</i> , Dicksoniaceae: <i>Dicksonia</i> , Haloragaceae (stems): not specified, Orchidaceae (pseudobulbs): <i>Epidendrum</i> , Poaceae (shoots): <i>Chusquea</i> , <i>Guadua</i> , <i>Neurolepis</i>

Peyton (1980); Suárez (1985); Poveda (1986); Mondolfi (1989); Goldstein (1990); Rodriguez (1991); Rumiz *et al.* (1999); Figueroa and Stucchi (2002); Castellanos (2004).

availability in the forest is low (Peyton, 1980; Paisley, 2001; Paisley and Garshelis, 2006). Andean bears prefer high-elevation cloud forest and are not present in dry montane and Andean foothill forests (Rios-Uzeda *et al.*, 2006). Their activity patterns are mainly diurnal (Paisley and Garshelis, 2006). Andean bears make resting beds on the forest floor or on tree branches (Peyton, 1999; Castellanos, 2004). They are known to climb vines and trees in order to reach food (Peyton, 1999) and employ a destructive foraging technique that results in the creation of platforms of bent branches that have been described as tree nests (Peyton, 1987).

Diet and seed-dispersal role

MOUNTAIN TAPIR

Mountain tapirs eat a wide variety of plants (Downer, 2001). Although they have the potential to browse throughout the understory, they seem to concentrate on "eating grounds," which are often tree-fall gaps of different successional stages, shrubby vegetation between páramo and upper montane cloud forest, and open páramos, especially during the dry season. In Colombian montane forests, tapirs consume plant species like *Chusquea fendlerii* (Poaceae) and *Cavendishia nitida* (Ericaceae), which are both very abundant. Along tapir trails on ridges, the animals consume species like ferns of the genera *Blechnum* (Polypodiaceae), *Miconia* (Melastomataceae), and *Oreopanax* (Araliaceae), while on trails along creeks, the animals eat *Gunnera manicota* (Gunneraceae), *Plantago australis* (Plantaginaceae), and *Myrrhindendron pennellii* ("arracachuela": Apiaceae). In the ecotone between páramo and upper montane cloud forest, tapirs consume *Lachenilla* sp. (Rosaceae). Observations of the feces of the mountain tapir suggest that although it may have some preferences (e.g. *Chusquea* sp. and *Myrrhindendron pennellii*; N. Monsalve, personal communication), tapirs browse a large number of other plant species as well (Lizcano, 1996; Lizcano and Cavelier, 2004).

Laboratory experiments and field observations in Ecuador have demonstrated that the seeds of 86 of the 205 vascular plants eaten by the mountain tapir germinated from the tapir's feces (Downer, 1999). In Sangay National Park the aster *Gynoxis* spp. (particularly *G. buxifolia*), was the most abundant food source (Downer, 2001), various ferns ranked second, horsetails (*Equisetum* spp.) third, and *Brachyotum* spp. (Melastomataceae) fourth (Downer, 1996). *Lupinus* spp. (Fabaceae) was the most sought-after food group (highest preference ratio) relative to its abundance in habitat (Downer, 1996, 1999, 2001). Evidence exists that the mountain tapir plays a vital role as a seed disperser in the northern Andes where it has mutualistically co-evolved with that plant community for c. 3 million years (Downer, 1999, 2001).

ANDEAN BEAR

This species is an opportunistic feeder, and may be considered somewhere between a frugivore/herbivore and a frugivore/omnivore (*sensu* Robinson and Redford, 1986), depending on resource availability (Dierenfeld, 1988). They are known to feed on an ample variety of plant species, depending on the habitat type where they are foraging and on the biogeographic region where they are located (Rivadeneira-Canedo, 2008). Plant items can be divided into two categories, depending on the part of the plant that is consumed: fruits which are believed to be the most important source of energy, and vegetative parts which are important when fruits are scarce and as a diet supplement (Table 17.1).

The Andean bear has been reported to feed occasionally on insects, rodents, birds, and livestock (Peyton, 1980; Goldstein, 1990). Its role as livestock predator or scavenger is still debated (Castellanos, 2003). Cattle parts are occasionally found within bear scats, and dead livestock remains are usually consumed by bears (Goldstein, 1991; Castellanos, 2003). The Andean bear may be the least aggressive of all bear species (Peyton, 1999), but *Tremarctos ornatus* is opportunistic and may be both a scavenger and an occasional predator.

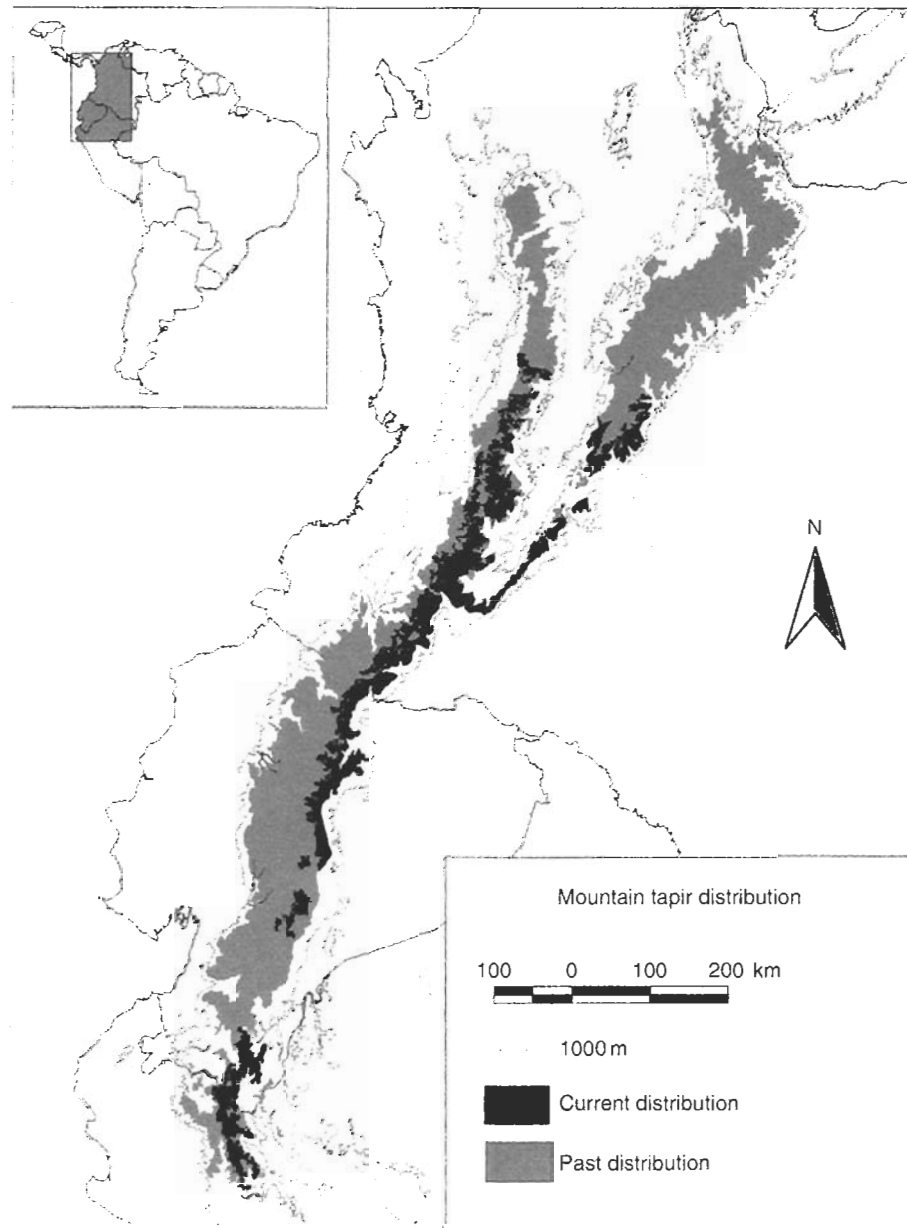


Figure 17.1. Map of past (pre-Columbian) and present distribution of the mountain tapir within its overall geographic range.

DISTRIBUTION AND POPULATION SIZE

Distribution

MOUNTAIN TAPIR

The past (i.e. pre-Columbian) distribution of the mountain tapir in Colombia (Figure 17.1) was estimated by plotting those geographic locations (i.e. streams, peaks, ridges, farms, townships, counties) above 2000 m.a.s.l. with the name “danta” or “tapir” onto a map of the past distribution of montane cloud and rain forests. In doing so it was assumed that locations were named after the tapir because the species occurred in these localities at one or

more points in time. Since these locations are situated between 2000 and 4000 m.a.s.l. where the only tapir is *T. pinchaque*, it is unlikely that the sites were named after a different species. The names of the geographic places were obtained by manually reviewing 144 topographic maps of the Andes of Colombia (scales 1 : 50 000–1 : 100 000). Additional locations were obtained from the *Diccionario Geografico de Colombia* (IGAC, 1996), records and reports in the scientific literature (Hershkovitz, 1954; Schauenberg, 1969; Velasco, 1991; Downer, 1996; Lizcano and Cavelier, 2000a; Lizcano *et al.*, 2002), and expert opinion (J. Hernandez, personal communication). Interviews with the heads of the natural resources offices of the various Andean

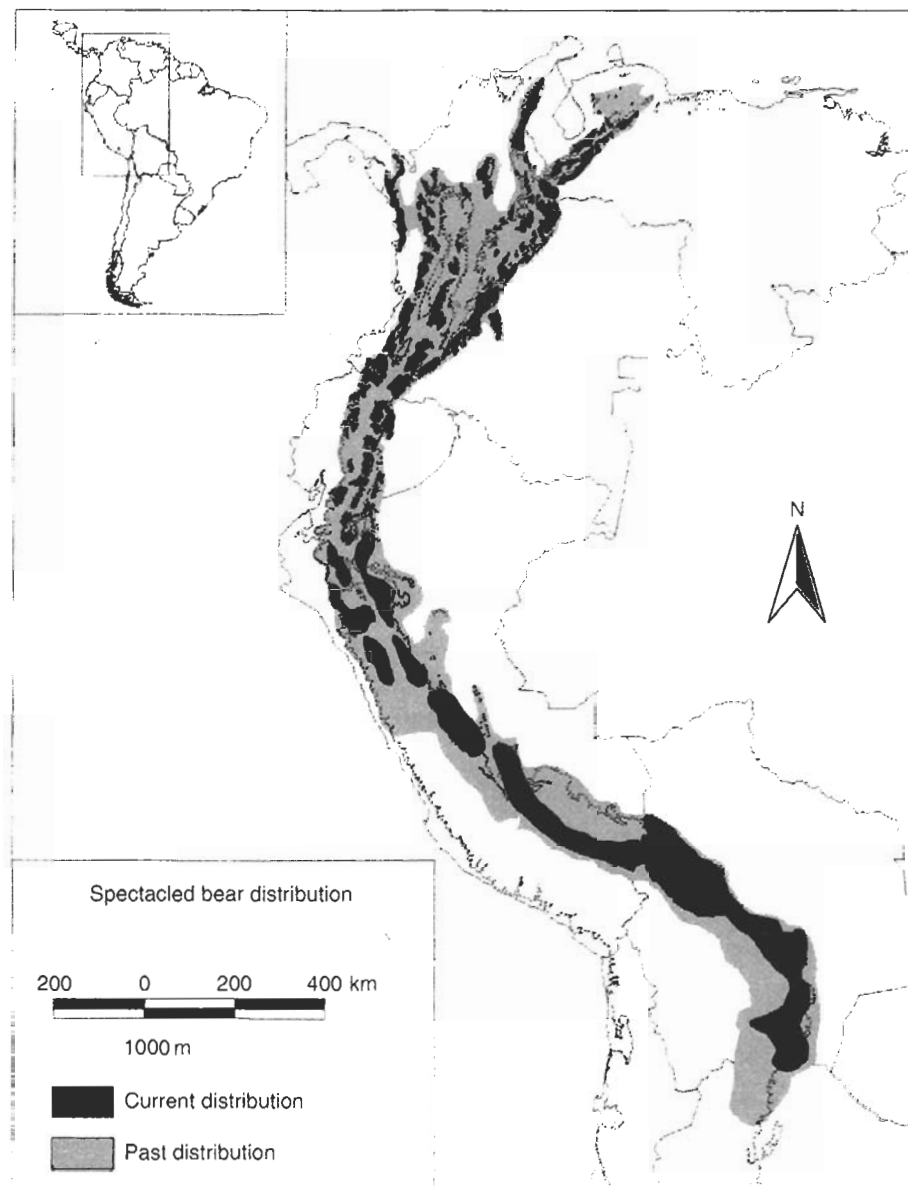


Figure 17.2. Map of past (pre-Columbian) and present distribution of the Andean bear within its overall geographic range.

municipalities as well as in-field verification also provided information on past and present distribution of the species. Mountain tapirs were considered absent from areas that contained less than 100 000 ha of montane rain forests in the pre-Columbian past and for which there were no geographic locations, records, or reports of their presence. The map of past distribution of montane rain forests of Colombia (1 : 1 500 000) was taken from Cavelier and Etter (1995). From this, only the montane rain/cloud forests and associated páramos between 2000 and 4000 m.a.s.l. were used as the conservatively estimated typical altitudinal distribution of *T. pinchaque* in Colombia (Downer, 1996; Lizcano *et al.*, 2002). For Ecuador and Perú, expert opinion was used, along with published information (Downer, 1996, 1997; Lizcano and Sissa, 2003), and a GIS-based analysis where tapir habitat was defined

as forested areas in excess of 1000 ha between 2000 and 4000 m elevation. Currently there are mountain tapirs in the eastern and central Andes of Colombia, the eastern and western Andes (northern portion) of Ecuador, and the northern Andes of Perú, and in recent decades they have been reported as far south as the Huanca-bamba Depression, which may well have been the evolutionary southern limit of the species (Figure 17.1).

ANDEAN BEAR

The Andean bear's geographic range encompasses all of the Andes, from Venezuela to the Bolivia–Argentina border (Peyton, 1999). It is the only bear, together with the Asiatic sun bear (*Helarctos malayanus*), to reach the southern hemisphere (Figure 17.2). The Andean bear occurs throughout this portion of the

Andes, except for most large intra-montane valleys and high mountain plateaux. Such valleys and plateaux are usually densely populated by humans (Peyton, 1999; Suárez, 1999; cf. Hofstede *et al.*, this volume). In Venezuela the bear's range encompasses all of the Cordillera de Mérida and Sierra de Perijá (Mondolfi, 1989; Yereña, 1999). In Colombia, it includes nearby Andean mountain ranges such as the Sierra de Macarena and the Serranía del Darién (possibly even within Panamá), but excludes the Sierra Nevada de Santa Marta (Orejuela and Jorgenson, 1999; Rodríguez, 2001). In Perú, bear distribution does not reach some southern portions of the coastal and central Andean ranges (Peyton, 1999). In Bolivia, its distribution is restricted to the eastern slope of the Andean range (Rumiz and Salazar, 1999). The bear's altitudinal range goes from 250 m.a.s.l. up to the permanent snow line, at about 4750 m.a.s.l. (Peyton, 1999). Current distribution is more restricted than it was prior to European colonization. Drastic habitat alteration and hunting during the last 500 years or so have shaped the current distribution of the Andean bear. It is particularly interesting to note that no bear representation has been found in ancient Inca and Chimu art forms (Peyton, 1981). However, it was found to be an integral part of the Apolobamban culture in Bolivia, supporting the theory that the bear mythic theme in South America had pre-Columbian origins (Paisley, 2001).

Densities and home range

MOUNTAIN TAPIR

There are only two studies that have used radio-tracking on mountain tapirs. In Ecuador, the average home-range size of three adult tapirs (two animals were tracked for three years and one for two) was 8.8 km² of projectional flat area in the mountainous Sangay National Park (Downer, 1996). In Colombia, a pilot study using GPS collars in the central Andes determined the home range of an adult mountain tapir male, as calculated by the minimum convex polygon (MCP) method as 3.5 km², or 2.5 km² using the fixed kernel method (Lizcano and Cavelier, unpublished data). Differences in home range are even bigger when comparing the mountain tapir with Baird's tapir in Costa Rica, which has an average annual home range of 10.7 km² (Foerster, 2001), based on an extensive study of 26 animals over five years.

Limited evidence indicates that individual mountain tapirs shift their home ranges, especially when perturbed by livestock and hunters (Downer, 2002). Significant seasonal shifts within an individual's home range have been documented to occur in Sangay National Park (Downer, 1997). This is demonstrated when habitat use is correlated with the core area of a seasonal home range (Lizcano and Cavelier, 2004). Many local people living within mountain tapir distributions testify that mountain tapirs migrate to higher elevations during drier seasons and to lower elevations during wetter seasons. They also claim that

lunar phase affects altitudinal movements. A correlation between lunar phase and tapir activity was found in both the central Andes of Colombia (Lizcano and Cavelier, 2000b) and in Sangay NP (C. Downer, unpublished data).

ANDEAN BEAR

No rigorous and empiric estimates of Andean bear density have been published. A theoretical estimation based on a body weight–density model for frugivorous–omnivorous mammals (Robinson and Redford, 1986) yielded an estimate of 1.26 individuals km⁻² (Yereña, 1994). Interviews with experienced poachers in Venezuela about the number of bears living in two different and isolated forest patches yielded a figure of 0.04 bears km⁻² (Yereña, 1994). Peyton (1999) indicates that the highest relative bear densities are to be found in wetter cloud forest between Colombia and Perú.

In Bolivia, a study showed home ranges of 7.4 and 6.6 km² for two young adult bears (Paisley, 2001) with one of them showing a larger (11 km²) home range some months later (Rechberger *et al.*, 2001). Home range studies with wild-born bears are currently being undertaken in Ecuador. Preliminary home range calculations showed average home ranges of 66 km² for males ($n = 2$) and 14 km² for females ($n = 4$). Females have well-defined, stable, and overlapping home ranges, while males use movement corridors over much larger areas that are harder to define because of the difficulties in tracking them in mountain terrain (Castellanos, 2003, 2004). Such estimates are roughly approximate to theoretical estimation, based on a body weight–home range model (Harestad and Bunnell, 1979), which predicted a mean home range for Andean bear at 48.6 km² (Yereña, 1994).

Population size

MOUNTAIN TAPIR

To obtain estimates of past and present population size for the mountain tapir, the density estimates were multiplied by the area in which the species is believed to occur. Estimated density ranged from 1 individual per 551 ha (Lizcano and Cavelier, 2000a) to 1 individual per 587 ha (Downer, 1996). Areas of past and present distribution for the mountain tapir as obtained from Figure 17.1, were 205 000 km² and 31 400 km², respectively. Based on existing suitable habitat, the estimated population of mountain tapirs in all their current range would be between 5000 and 5700 individuals. However, the possibility exists that many of these intact habitat areas are without tapirs due to extirpation by the intense hunting pressure that is common in the Andes. Furthermore, a considerable number of conservationists and ecologists familiar with the northern Andes and its pervasive and uncontrolled hunting and livestock invasion would put the surviving number considerably lower (Downer, 1997, 2002). If only half of the remaining habitat is actually occupied by the

Table 17.2 Estimation of the number of mountain tapirs within major portions of the Protected Area system within the geographic distribution range of the species

Category	Name	Country	Area (km ²)	Low number of tapirs	High number of tapirs
National Park	Los Nevados	Colombia	98.503	17	18
National Park	Las Hermosas	Colombia	301.045	51	55
National Park	Nevado Del Huila	Colombia	1084.443	185	197
National Park	Sumapaz	Colombia	714.590	122	130
National Park	Cueva de los Guacharos	Colombia	39.816	7	7
National Park	Alto Fragua – Indi Wasi	Colombia	64.463	11	12
National Park	Cordillera de Los Picachos	Colombia	264.495	45	48
National Park	Purace	Colombia	618.197	105	112
National Park	Podocarpus	Ecuador	1069.749	182	194
Ecological Reserve	Cayambe-Coca	Ecuador	1438.606	245	261
National Park	Sumaco Napo Galeras	Ecuador	525.865	90	95
National Park	Antisana	Ecuador	617.042	105	112
National Park	Llanganatis	Ecuador	824.778	141	150
National Park	Sangay	Ecuador	1294.180	220	235
National Sanctuary	Tabaconas-Namballe	Peru	238.907	41	43
Total			9194.679	1567	1669

species, there may only be between 2675 and 2850 mountain tapirs left today.

ANDEAN BEAR

Larger Andean bear populations are believed to be concentrated in the cloud forests of the eastern slopes of the Eastern Cordillera, southward from the Ecuador–Colombia border (Peyton, 1999). According to Andean bear specialists, and based on its present distribution, vegetation maps, and relative abundance estimates, some 18 000 individuals may still exist in total (Peyton, 1999). Recent estimates based on genetic analysis suggest the following population numbers (Ruiz-García *et al.*, 2005): Venezuela, 910–1130; Colombia, 3600–6900; Ecuador 780–2780. Thus, the overall population might be between c. 5000 and c. 10 000. The Andean bear Action Plan of the World Conservation Union (IUCN) considers the minimum area for a conservation unit to maintain a viable Andean bear population without fairly intensive management as being 1900 km² of appropriate habitat (Peyton, 1999).

Gap analysis

MOUNTAIN TAPIR

A map of the mountain tapir's present distribution was overlaid with the map of Protected Areas above 2000 m.a.s.l. in the Colombian, Ecuadorian, and Peruvian Andes. Estimates of the population size of the mountain tapir inside protected areas were calculated by multiplying the areas of montane forest within the parks times the estimated densities (Table 17.2). Many Andean

National Parks and Reserves also contain other vegetation types unsuitable for mountain tapirs, primarily lowland rain forest whereas a more precise estimate should also factor in the proportion of protected areas present as treeless *páramo*. However, the presently used method will serve to identify the status of the mountain tapir's most critical survival habitat: montane (cloud) forest.

According to Table 17.2, less than 10 000 km² (29.3%) within the distributional range of the mountain tapir (estimated at 31 400 km²) falls within the Protected Area system, with the smallest area (239 km²) in Perú. However, the Municipal Province of Ayabaca, Piura State, Perú, has recently declared an Ecological Reserve in the Cordillera de las Lagunillas (or Cordillera Piurana, as it is known) whereas the adjoining Huancabamba Province also wants to have its territory declared off-limits to mining activities and is preparing a proposal for Nature Reserve status.

ANDEAN BEAR

Some 50 habitat fragments have been recognized along the Andean bear geographic range, totalling around 260 000 km² (Peyton, 1999). The four largest fragments of continuous bear habitat occur on the eastern slopes of the Oriental Andes, within Perú and Bolivia; these two countries comprise over two-thirds of overall bear range (Peyton, 1999).

A recent estimation of Andean bear habitat availability from northern Perú up to Venezuela and Colombia, based on satellite images, states that there are 110 potential habitat fragments ranging in size from nearly 36 000 down to 113 km². All of

Table 17.3 Existing or proposed "corridor" projects affecting Andean bear and its habitat, according to IUCN survey (iucn.sur.org) and authors' data. Names mostly reflect already existing protected areas

Location	Project
Argentina/ Bolivia	Baritú-Tariquía (Regional Corridor for the Yungas)
Bolivia	Tariquía-Amoró, Amoró-Madidi
Bolivia/Perú	Amoró-Vilcabamba
Perú	Bahuaia Sonene-Alto Purús
Perú/Ecuador	Cóndor-Kutukú
Ecuador	Podocarpus-Yacuambí, Podocarpus-Sabanilla, Sangay-Llanganates, Cotacachi Cayapas-Awacachi, Cotacachi Cayapas-Cayapas Mataje, Chocó-Andino de Maquipucuna
Ecuador/ Colombia	Manabí-Chocó
Colombia	Páramo Bordoncillo-Laguna La Cocha, Guácharos-Puracé, Guácharos-Serranía Churumbelos, Corredor Bremen-Barbas (Quindío), Tatamá-Paraguas, Cordillera Central, Guantiva-Guanentá (Bosques Altoandinos de Roble)
Venezuela	Batallón-Sierra Nevada (Pueblos del Sur), Sierra Nevada-Guaramacal (Ramal de Calderas), Guache-Terepaima (Sierra de Portuguesa)

these 110 fragments total 208 086 km², 25% of which are under some Protected Area status (Rodríguez *et al.*, 2003). This number of potential fragments is twice that reported by Peyton (1999), but the two estimations are not entirely comparable because of differences in scale, data sources, and methodology. It is foreseeable that a more detailed survey would reveal many more fragments throughout the bear's distributional range. A similar study for the rest of the bear's distribution (i.e. the southern parts of the Andes) is not currently available, but undoubtedly the largest habitat fragments are to be found within the eastern Andean slopes of Perú and Bolivia.

THREATS AND RECOMMENDATIONS FOR CONSERVATION

MOUNTAIN TAPIR

Today, all four tapir species surviving in the world are threatened by hunting and habitat loss (IUCN, 2006). Probably the most threatened species is the mountain tapir. It is listed as "endangered" (IUCN, 2006) and is included as an Appendix I species ("most restricted") by CITES. Currently, mountain tapir populations are in decline because they are hunted for use both as food and for traditional medicine (Brooks *et al.*, 1997). An action plan for the rescue of this species has been published (Downer, 1997) and is currently being updated but awaits funding. This action plan outlines urgently needed conservation education programs combined with the promotion of more nature-harmonious lifestyles. Of particular concern is the increase in human adaptation of livestock culture and its impact on cloud forest and páramo habitats (Downer, 2002; cf. Baez *et al.*, this volume). This may

jeopardize the quality and quantity of water supply for many species, including humans (cf. Buytaert, 2004; Buytaert *et al.*, 2006).

ANDEAN BEAR

Andean bear conservation is threatened by the accelerated pace of habitat conversion to agriculture (including illegal crops) and hunting (including illegal trading of bear parts) (Peyton, 1999). Habitat loss and fragmentation are the most important long-term threats (cf. Mulligan, this volume). However in some areas poaching may be an even larger threat to bear populations than deforestation (Yerena, 1999). Many bears are killed annually by professional poachers and by peasants to get food for their families, to use body parts for traditional medicine, to protect domestic animals, or to minimize raiding into crop fields (Peyton, 1999; Yerena, 1999).

The IUCN Bear Action Plan states several recommendations for Andean bear (Peyton, 1999), including:

- To strengthen institutions involved with the species and its habitat, at all social levels including government, communities, and private initiatives, with special emphasis on coordination, cooperation, and capacity building.
- To do more research and monitoring, on existing and potential bear habitat, relative population densities, relationship between diet and reproduction in the wild, role as seed dispersers for valuable trees, trends in deforestation, hunting mortality, economic loss from crop and livestock, and public attitudes towards bears.
- To create stewardship mechanisms for bear conservation so that communities co-existing with these animals and their habitat develop a real sense of ownership toward the natural

resources and the land, within a framework of sustainable development.

- To educate the public about the benefits of preserving both watersheds and bears, since watershed protection is essential for humans as well as for bears, especially in a cloud forest setting.
- To concentrate and expand management and conservation to the largest conservation units, and to the areas between them.

Some additional goals based on an eco-regional approach (Rodríguez *et al.*, 2003) would include reducing the rate of habitat loss and to increase connectivity among populations and habitat (Table 17.3). Such goals cannot be achieved without targeting the dramatic social, economic, and political conflicts afflicting rural communities throughout the Andes, and require policies and actions based on sustainable development criteria, land use planning, adequate legal framework, and mechanisms for real and effective participation of people.

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