GOING TO POT

The Neotropical Bushmeat Crisis and its Impact on Primate Populations

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1. Executive summary

The devastating effects of the bushmeat[1] trade on wild primates in Central and West Africa are well recognized (Damania *et al*. 2005; Bowen-Jones & Pendry 1999; Noss 1998). In contrast, **the largely uncontrolled hunting of primates in Central and South America has received little attention**. As in Africa, the convergence of large-scale deforestation, increasing commercial hunting, and the capture of live animals has devastating effects on Neotropical primates, and is set to push many species to the brink of extinction.

Drawing on almost 200 primarily scientific publications, this report comprehensively reviews the scale of primate use across 22 Central and South American countries. In doing so, **we demonstrate that current levels of offtake are unsustainable across most Neotropical primates' range** and that effective conservation measures are urgently required.

In at least 16[2] of the 22 Neotropical nations examined (see chapter 3) **hunting for bushmeat poses a critical threat to primate populations.** There is a paucity of data for the remaining five countries (Argentina, Belize, El Salvador, Nicaragua and Uruguay), However, this does of course not imply a paucity of problems. One country, Chile, does not have any primates at all.

Approximately eight million people in South America regularly consume bushmeat as a source of protein (Rushton *et al*. 2005). A significant portion of bushmeat from tropical forests consists of primates (Robinson & Bennett 2004; Schulte-Herbrüggen & Rossiter 2003; Robinson & Bodmer 1999). While local farmers and subsistence hunters are consumers and increasingly traders (Rushton *et al*. 2005; Ojasti 1996), wealthier households also consume considerable amounts of bushmeat (Peres 2000a).

Rural populations in the Brazilian Amazon alone are estimated to consume between 2.2 and 5.4 million primates per year (Appendix, table 1). Because of their slow reproductive rate and low population densities many primate species cannot sustain this immense offtake (Jerozolimski & Peres 2003; Bodmer & Puertas 2000; Horwich 1998). Hunting of large and medium sized Neotropical primates, such as woolly (*Lagothrix* sp.), spider (*Ateles* sp.), howler (*Alouatta* sp.) and capuchin (*Cebus* sp.) monkeys occurs at a rate which poses an extreme threat to their long-term survival. Although current hunting levels are lower in some areas, this does not necessarily indicate decreased threat. Instead, these numbers may reflect overexploitation in the past that has lead to generally low population numbers (Alvard *et al*. 1997). **The increasing commercialisation of bushmeat hunting, modern hunting techniques and equipment, expanding infrastructure, and growing human populations, combined with serious habitat degradation and fragmentation further exacerbate the situation** (see chapter 2).

Whereas the extent of habitat destruction in the Neotropics is widely acknowledged, the serious impact of hunting is often ignored. However, the **hunting of primates for food, rather than habitat loss is predicted to pose the most serious threat to the survival of large primates in Central and South America within the next two decades** (Wilkie & Godoy 2001; Peres 2001). As in Africa, habitat fragmentation and hunting are synergistic, causing newly accessed forest regions to become available to hunters (Peres 2001).

Data from hunted areas in many different Amazonian sites show that large primate biomass has dropped by up to 93.5%, in comparison to areas where hunting is absent. The impact of this reduction goes beyond the effects on primate species. There is a domino effect on the forest ecosystem as a whole (Chapman & Onderdonk 1998). Primates are important seed dispersers (de Castro 2003; Mollison 2003). Highly mobile woolly and spider monkeys feed on fruits, and woolly monkeys in particular consume the fruit of over 200 different woody plants (Di Fiore 2004; Ráez-Luna 1995). **The removal of these species therefore significantly affects the ability of plants to disperse their seeds and changes the dominance relationship between tree species. In the medium term this leads to changes in forest composition, structure, and biodiversity** (Estrada 2006; Roldán & Simonetti 2001; Wilkie & Godoy 2001; Wright *et al*. 2000).

The hunting of Neotropical primates outlined in this report illustrates how **a traditional way of life has become biologically devastating**. There are no easy answers to this dilemma, and any resolution of this continent-wide conservation crisis depends on the genuine commitment from all stakeholders. Preventing the disappearance of many primate species in the Neotropics requires urgent national and international action. **To protect national biodiversity and the integrity of their forests, range states are therefore encouraged to prohibit primate hunting and strengthen the implementation and enforcement of binding protection measures** (see Chapter 5). This report also provides recommendations to the *Convention on Biological Diversity* (CBD) and the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES).

[1] Bushmeat is defined as meat for human consumption derived from wild animals.
[2] Brazil, Bolivia, Colombia, Costa Rica, Ecuador, French Guiana, Guatemala, Guyana, Honduras, Mexico, Panama, Paraguay, Peru, Suriname, Trinidad, and Venezuela.

2. The Neotropical bushmeat crisis

2.1. Why primate hunting is on the rise

Changes in infrastructure
Until the 1960s, when federally funded highway construction programs were initiated, large parts of the Amazon were inaccessible. Since then networks of roads have penetrated formerly isolated regions. With the roads came human settlements, which colonised previously uncharted forests. Historically, hunting activities were limited to areas on the periphery of human settlements. Today all forest areas within ten kilometres of a road or navigable river are accessible on foot and are therefore subject to hunting pressure (Peres 2000a). More than three-quarters of the Amazon basin can now be reached on foot (Peres & Lake 2003). New roads encourage new settlements and further deforestation, which in turn provide entry points for hunters and traders from the outside (Durand & Lazes 2004; Mäki *et al*. 2001). In fact, the population density of highly sought after species is strongly linked with proximity to rivers or roads (Peres & Lake 2003; Robinson & Bennett 2002; Peres 2001). The construction of a road in Ecuador's Yasuni National Park by an oil company, for example, increased the accessibility of primates to hunters by 180% - essentially increasing the number of common wolly monkeys available to hunters from 49 to 138 per hunter (Greenberg 2000). Even trails cut by researchers have raised local accessibility by 62% increase, which amounts to an additional 31 woolly monkeys per hunter (Greenberg 2000).


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Head of a smoked woolly monkey, Yurimaguas, Peru

Modern weapons and equipment
An increasing number of indigenous groups have shifted from traditional hunting practices to more efficient, modern methods (Mena 2000; Stearman 2000), which intensifies hunting pressure (Bennett & Robinson 2000). Shotguns have a longer range and wider target area than traditional blow pipes; bows and arrows or nets increase the variety of potential target species, particularly arboreal primates. The almost universal exchange of traditional weapons with shotguns amongst indigenous communities during recent decades constitutes the most significant change in hunting methods (Jerozolimski & Peres 2003). Replacing traditional snares and traps with long-lasting wire cable snares also results in higher hunting success (Hill 2002). Besides the proliferation of modern weapons, the use of other equipment such as outboard motors, trucks, flashlights and batteries further enhances hunting efficiency (Jerozolimski & Peres 2003; Bennett & Robinson 2000; De Souza-Mazurek *et al*. 2000). Together these developments have facilitated and fuelled commercial bushmeat hunting.

Growing human populations
Demand is the key factor behind unsustainable primate hunting. The quantity of primate meat taken is proportional to the size of the market, or the number of consumers (Bowen-Jones & Pendry 1999). Humans in Mesoamerica are estimated to number approximately 48 million. Access to modern medicine led to accelerated population growth especially amongst impoverished rural communities, and with a steady growth rate of 3% since the 1950s, human populations are expected to double within the next 25-35 years (Appendix, Table 5). The human population in the Amazon basin of South America numbers some 300 million, growing by 2.6% each year (Estrada 2006; WRI 2003). Such human population growth will increase the hunting pressure on already fragile wildlife populations.

Socioeconomic change
Historically, hunters would only have fulfilled the subsistence needs of their families. More recently however, bushmeat hunting has become increasingly commercialised (Bennett & Robinson 2000; Greenberg 2000). Smoked and salted primate meat is now sold at local markets (Palomino 2006, 2005; Silvius *et al*. 2004). Investments in modern weapons and equipment can be repaid by selling meat and hunters are reportedly eager to increase their hunting quotas once they derive economic benefits from market sales (Jerozolimski & Peres 2003; Bennett & Robinson 2000). Moreover, traditional taboos, which once helped to protect wild animals and plants, are increasingly breaking down, as are systems of allocating traditional hunting territories to specific hunters or families (Noss & Cuéllar 2001; Bennett & Robinson 2000; Peres 2000a).

2.2. The Impact of hunting on Neotropical primates

Primates are a favourite target for hunters. They live in social groups and are easy to locate because of their noisy behaviour. While tracking other prey species such as ungulates is much more time consuming (Horwich 1998; Bodmer *et al*. 1988), large monkeys, such as woolly (*Lagothrix* sp.), spider (*Ateles* sp.), capuchin (*Cebus* sp.) and howler (*Alouatta* sp.), are frequently targeted because they provide more meat and have the greatest market value (Cormier 2006; Peres 2000b; Robinson & Bennett 2000; Horwich 1998; Ráez-Luna 1995). At the same time, their populations are particularly susceptible to over-exploitation and, in several cases, have been locally extirpated (Rylands 2003; Barnett *et al*. 2002; Mena *et al*. 2000; Peres 2000a,b, 1996). Their chances of recovery are hindered by their slow reproduction rate, including relatively long periods between births, the births of single infants and limited reproductive capacity of some females due to complex group structures. In certain areas within Amazonian Brazil, Peru, Bolivia and Costa Rica, large-sized primates of more than 5 kg have become extremely rare or are already locally extinct (Daily *et al*. 2003; Peres 2001, 2000b; Robinson & Redford 1991). A survey at 24 forest sites in the Brazilian Amazon, which investigated the impact of different hunting levels, indicated that population densities of larger primate species at hunted sites were reduced by up to 83% (in the case of the black spider monkey) and 89% (in the case of the common woolly monkey), compared to sites with lower hunting pressure (Peres 2000b). Hunting has also caused population declines in many other primate species, including red uakari (*Cacajao calvus*), brown howler (*Alouatta fusca*), mantled howler (*A. palliata*), red howler (*A. seniculus*), long-haired spider (*Ateles belzebuth*), and masked titi monkey (*Callicebus personatus*).

In addition to being hunted for food, primates are also killed for 'medicinal' purposes, and occasionally as bait for large cats, fish or shrimp, with woolly and spider monkeys again being the mostly targeted species (Mittermeier 1987a). Furthermore, in many tourist shops throughout much of Amazonia hats from monkey-skins, necklaces from monkey teeth, skulls, bones, hands, feet or tails have been observed on sale (Mittermeier & Konstant 1996/1997).

Consequentially, once populations of larger primates are depleted, medium-sized species experience the same fate because they are "next in line" in terms of body mass (Ward & Chism 2003; Peres 2000b). Small primate species such as marmosets (*Callithrix* sp.), Goeldi's monkeys (*Callimico goeldii*), squirrel monkeys (*Saimiri* sp.) and tamarins (*Saguinus* sp.) are targeted primarily for the pet trade, however if larger species diminish, these species are also hunted for food (Mittermeier 1987a). In some areas, small species such as tamarins and squirrel monkeys are reportedly highly sought after to obtain teeth for necklaces and armbands rather than for food (Cormier 2006).

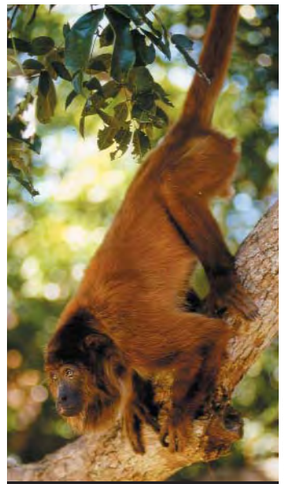
Hunting also disrupts the age and sex structure of populations: In some areas hunters actively seek out females accompanied by juveniles, so that the offspring can be sold to the pet trade (Chapman & Peres 2001, Mittermeier 1987a). The Waimiri Atroari Indians in Brazil are reported to kill five times as many female spider monkeys as males, because body fat in females is greater and their meat is considered "tastier". Spider monkeys are the species of mammal most commonly hunted by this tribe (De Souza-Mazurek *et al*. 2000), and the impact of such a large-scale removal of reproductive females will undoubtedly be fatal for the population. The spider monkey is one of the first genera to disappear within areas of intensive hunting (De Souza-Mazurek *et al*. 2000; Peres 1990).

The impact of even a relatively small number of hunters can be immense. Three rubber tappers with their families were reported to have killed more than 200 woolly monkeys, 100 spider and 80 howler monkeys in less than two years. At that site, these three species were drastically reduced or even locally eradicated (Peres 1990). Further examples are given in chapter 3.

The majority of studies on the volumes of subsistence hunting are based on data obtained from household interviews or surveys at markets. However, data tend to neglect the "collateral" mortality, as the number of fatally wounded animals or deaths of unweaned infants can be very high (Chapman & Peres 2001; Peres 2000b).

2.3. Sustainable primate hunting?

There are two types of primate hunting in the Neotropics: The first is 'subsistence' hunting within rural regions, whereby a proportion of the meat is offered at local markets (Silvius *et al*. 2004, Alvard 1995). This type of hunting is relatively selective in that larger species are targeted, since one single bullet results in more meat (Defler *et al*. 2005). The result is that larger species are the first to be depleted, and are then replaced by smaller species, as described above. On average, indigenous groups consume 0.49 specimens of black spider monkeys (*Ateles pansicus*), 0.5 red howlers (*Alouatta seniculus*) and 2.51 brown capuchins (*Cebus apella*) per person per year; however, there is variation amongst the different indigenous groups (De Souza-Mazurek *et al*. 2000). When the hunting quotas of indigenous peoples and new settlers are combined, by far the most hunted species is the brown capuchin (with an average of 2.1 animals per consumer and year), followed by the common woolly monkey (with 1.4 individuals), night monkeys (0.8), spider monkeys (0.49), titi monkeys (0.47), howlers (0.42) and capuchins (0.29) (Redford & Robinson 1987).


© Sigi Wiesel/PRO WILDLIFE
Red howler monkey, Brazil

The second type of hunting is non-selective, and is driven by loggers seeking food. Commercial logging is closely linked to bushmeat hunting, as many of the roads cleared by the timber industry provide an infrastructure easily allowing hunters to reach previously unexploited areas (Hill 2002). The majority of loggers kill directly along the logging trail (Schulte-Herbrüggen & Rossiter 2003). Within only one year, loggers in Madre de Dios, Peru killed 54,190 primates, including long-haired spider monkeys (*Ateles belzebuth*), equatorial saki monkeys (*Pithecia aequatorialis*) and red howlers (*Alouatta seniculus*). Primates represented two thirds of all mammals hunted for logging camps in Madre de Dios. As a result of this tremendous hunting pressure, populations of long-haired spider monkeys and red howlers are in a steep decline in and around active logging sites (Schulte-Herbrüggen & Rossiter 2003).

Subsistence hunting has been conducted for centuries; however, during recent decades, due to increasing human population, and the opening up of formerly inaccessible areas, many primate species have suffered an alarming decline. A switch from cheaper methods (i.e. snaring and bow-hunting) to gun hunting results in a greater impact (Damania *et al*. 2005; Mena *et al*. 2000; Stearman 2000), however, even traditional hunting methods can result in over-exploitation if hunting pressure is intensified by burgeoning human populations (De Souza-Mazurek *et al*. 2000; Alvard 1995; Ráez-Luna 1995). Indigenous tribes increasingly use highways and trucks to reach hunting areas that are far from their villages, and as a result, within these areas their preferred prey has become rare (De Souza-Mazurek *et al*. 2000). As a consequence of acculturation, hunting within these areas is no longer limited to subsistence use, but increasingly for the purpose of trade within and outside the indigenous community (Noss & Cuéllar 2001; Greenberg 2000; Ojasti 1996). With increased human populations, mobility, infrastructure, and efficiency, hunting pressure on primates will become more serious.

Primates are one of the most sought-after groups of mammals in the Neotropics and are subsequentially over-hunted in areas such as Costa Rica (Daily *et al*. 2003), Mexico (Mandujano *et al*. 2005; Estrada *et al*. 2002 a,b), Nicaragua (McCann *et al*. 2002), Brazil (Peres 2001; Peres & Dolman 2000), Bolivia (O'Shea *et al*. 2003), Colombia (Defler *et al*. 2003; Rylands *et al*. 1997), Ecuador (Sirén *et al*. 2006), French Guiana (Roussilhon 1988), Guyana (Sussman & Phillips-Conroy 1995), Peru (Robinson & Bennett 2002; Bodmer & Lozano 2001), and Trinidad (Agoramoorthy & Hsu 1995). For example, where primates once proliferated along riverbanks in Peru, hunters now travel two to three days upriver into the jungle to locate monkeys (Mollison 2003).

Whilst common woolly monkeys (Lagothrix lagothricha) comprise the highest biomass of any Neotropical primate, they are highly vulnerable to even low-intensity hunting (Peres 1996; Vickers 1991). Woolly monkeys are intensely hunted in many

Amazonian States (Peres 2000a; Ayres *et al*. 1991). They live in large groups but occur in relatively low group density. Therefore, even locally, limited hunting pressure can wipe out a significant proportion of the regional population, making this species one of the first to become extinct at hunting sites (Peres 1990).

Whereas a few indigenous groups in Central and South America hunt mainly for subsistence, for example, the Izoceno communities in Bolivia, many tribes have changed traditional beliefs and regulations, resulting in hunting practices that are geared toward a commercial end and therefore have dramatic impacts on the target species. The Guarani communities in Argentina, Bolivia, Brazil, Paraguay and Uruguay have, in the past, interpreted the rule to hunt only for the family's need just as the need for the next meal. This concept has changed in the present day to mean earning a steady income from commercial hunting (Noss & Cuéllar 2001).

According to Bodmer & Lozano (2001), hunting for primates at all levels will have a disastrous result due to their acute vulnerability. The following chapter underlines the serious situation for primates over most of the Neotropics, and urges for national measures to halt primate hunting.

3. Central and South America

3.1. Central America

3.1.1. Belize

a) Habitat change:
Roughly 43% of Belize's land area is designated as protected. While this is a positive move by the government towards the long-term viability of Belize's environment, the conversion of forest areas into agricultural land intensified during the 1990s (see Table 5), and the uncontrolled expansion of the tourist industry has had an increasing impact on the remaining areas. Due to the lack of fines, habitat destruction proceeds within even protected areas (Alexander 2000).

b) Hunting:
Three primate species are native to Belize: Mantled howler (*Alouatta palliata*), black howler (*Alouatta pigra*), and Geoffroy's spider monkey *(Ateles geoffroyi*), all of whom are affected by accelerating habitat destruction (Alexander *et al*. 2005; Estrada *et al*. 2005). In some regions, hunting of howlers and spider monkeys has frequently been reported, with juvenile primates being occasionally sold as pets (Dahl 1987). In 1985, the Community Baboon Sanctuary (CBS) was established in northern Belize as a model of grassroots participatory development, set up to protect one of the few healthy populations of black howlers. Within the CBS, it is estimated that a local population of approximately 1,000 black howlers are protected from hunting (Silver *et al*. 1998). Though primate hunting is widely opposed by the Creole community at the CBS, the Chinese population and British soldiers have been reported to hunt various species, including black howlers (Jones & Young 2004). The authors fear that demand for primates will increase, either for pets or as a food supply for loggers and other groups. At the Wildlife Care Centre in Belmopan, howler and spider monkeys that were formerly kept as pets are released following rehabilitation (Monkey Bay Wildlife Sanctuary 2006).

3.1.2. Costa Rica

a) Habitat change:
Costa Rica has experienced a serious loss of natural forest, and has the second highest rate of human population growth in Central America (see Table 5). Corridors between forest patches, once quite numerous, are increasingly disrupted by expanding plantations and roads, which also isolates local primate populations (Boinski & Sirot 1997).

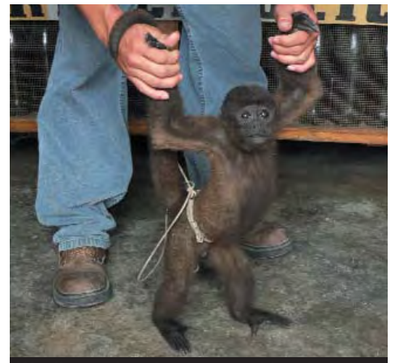
b) Hunting:
Costa Rica is home to seven primate species (see Table 4). Three primates inhabit dry forests in Costa Rica: Geoffroy's spider monkey (*Ateles geoffroyi ornatus,* classified by IUCN (2006) as endangered), mantled howler (*Alouatta palliata*), and white-faced capuchin (*Cebus capucinus*). As a result of hunting, the spider monkey is the least common and most threatened species. Consequentially, it is now absent in large sections of the country (Zaldívar *et al*. 2004; Chapman *et al*. 1989). In the Las Cruces region (Coto Brus), both Geoffroy's spider monkey and mantled howler are locally extinct due to hunting (Daily *et al*. 2003). A comparative study between primate populations in both the Corcovado National Park, where hunting is effectively prohibited, and Golfo Dulce Forest Reserve, where hunting is allowed but restricted (i.e. quotas, seasons, permits), documented significantly decreased numbers of spider monkeys (by 85,7%), howler monkeys (by 50%), squirrel monkeys (by 75%) and white-faced capuchins (by 50%) in the reserve (Carrillo *et al*. 2000).

At least two indigenous groups are currently hunting primates, the Guaymi and the Cabecares. Among the Guaymi, 51% of interviewees reported to be consumers of primate meat, with Geoffroy's spider monkey being the most preferred species (Gonzales-Kirchner & Sainz de la Maza 1998). Additionally, primates are hunted due to their supposed 'medicinal' value (e.g. mantled howler) and for their appeal as pets (mainly Geoffroy's spider monkey and white-faced capuchin). Finally, Guaymi are killing the white-faced capuchins who they believe are damaging their crops (Gonzales-Kirchner & Sainz de la Maza 1998). The Cabecares are also hunting howler and capuchin monkeys (Ojasti 1996).

c) Primates as pets
Several primate species, including spider monkeys, are kept as pets, with a small number being rescued and reintroduced into the wild (Primate Info Net 2006). The pet trade is also a severe threat to the squirrel monkey (Boinski *et al*. 1998). From the 1970s to the late 1980s, squirrel monkeys were exported in large numbers for the international pet trade. To obtain young animals for the pet trade, mothers carrying offspring are targeted. Once the mother is shot dead, the juvenile is retrieved from her carcass (Boinski & Sirot 1997).

3.1.3. El Salvador

a) Habitat change:
With 327 people per square kilometre, El Salvador maintains the highest human population density in Central America (Garber *et al*. 2005; UN World Populations Prospects Report 2004). El Salvador also has the most dramatic deforestation rate within Mesoamerica (see table 5). Only a tiny portion (0.4%) of the total area is protected, which is far less than in other Mesoamerican countries (Estrada *et al*. 2005). Consequentially, the pressure on primate populations in El Salvador is extremely high.


Woolly monkey, kept as a pet in a bar

b) Hunting:
The only primate species in El Salvador is the Geoffroy's spider monkey (*Ateles geoffroyi*). Due to political upheaval, field studies ceased for 20 years, thus data on density, habitat preference, and viability of spider monkey populations are poor (Garber *et al*. 2005). One study, however, estimates that the remaining populations of spider monkeys are limited to a very small range of less than 3.5 miles² (Morales 2000). In some areas within the monkey's territory, there are rangers who now control subsistence hunting (Morales-Hernández 2002).

3.1.4. Guatemala

a) Habitat change:
Guatemala has the second highest human population in Central America, with a density of 116 people per square kilometre (UN World Populations Prospects Report 2004). Deforestation is accelerating, with only 26% of the total forested areas still remaining (see Table 5).

b) Hunting:
3 primate species are native to Guatemala: mantled howler (*Alouatta palliata*), the endangered black howler (*Alouatta pigra*), and Geoffroy's spider monkey (*Ateles geoffroyi*), however field data is scarce (Garber *et al*. 2005). The mantled howler in Guatemala survives only in isolated populations, and is thought to be endangered (Horwich 1998). This monkey is found in five protected areas, though it remains susceptible to hunting pressure in and around these areas. Serious deforestation, caused partially by pulp processing factories, is an additional threat to the survival of the mantled howler (Silva López *et al*. 1998). The Geoffroy's spider monkey is under pressure from both hunting for meat and capture for pet markets (Silva López *et al*. 1998). Troops of black howlers have been reported in the Tikal National Park, within the protected Mayan ruins, highlighting the importance of strongly protected sites for the conservation of primates (Estrada *et al*. 2004).

3.1.5. Honduras

a) Habitat change:
Honduras has lost more than 50% of its original forest cover, and deforestation is accelerating (see table 5). The human population growth rate in Honduras is the highest in Mesoamerica, with a present rate of 3.0% (Estrada *et al*. 2005; Garber *et al*. 2005).

b) Hunting:
There are three primate species in Honduras: mantled howler (*Alouatta palliata*), Geoffroy's spider monkey (*Ateles geoffroyi*), and white-faced capuchin (*Cebus capucinus*). The data on primate populations and ecology are particularly scarce (Garber *et al*. 2005). Hunting is a substantial threat to these three primate species, even within protected areas. During a survey carried out in 1987, in the Cususo National Park, the mantled howler was the only species found (Snarr & Edwards 2005). Evidence of hunting activities in the Guanales area includes by hunting platforms, the sounds of shotguns, and the presence of hunting dogs. Interviews with local people confirmed that howler and spider monkeys are among the larger mammals targeted for hunting (Snarr & Edwards 2005). Researchers concluded that capuchin and spider monkeys, which could not be observed during the survey, were either extirpated within the national park or at least reduced to low population numbers. Honduras considers primate conservation research a priority, given the unclear status of its native populations (Garber *et al*. 2005).

3.1.6. Mexico

a) Habitat change:
Mexico has already lost more than 95% of its original rainforest cover (Durand & Lazos 2004). Only 5% of the country's land is under protected status. Mexico has by far the highest human population within Central America, numbering almost 102 million people in 2003. Primates suffer heavily from habitat degradation caused by agriculture and cattle ranching (Estrada *et al*. 2002a; Silva López *et al*. 1988). Tabasco State, where all of the native primate species can be found, has experienced 60-93% deforestation (Estrada *et al*. 2001; see also table 5).

b) Hunting:
Three primate species are native to Mexico: Mantled howler (*Alouatta palliata mexicana*) which is classified as critically endangered (IUCN 2006), black howler (*Alouatta pigra*), and Geoffroy's spider monkey (*Ateles geoffroyi*, with the subspecies A.g. vellerosus and A.g. yucatanensis). Despite the Federal Hunting Law prohibiting the possession and Hunting, all three native species are susceptible to hunting, even within reserves (Luna *et al*. 1987). As a result, primate populations have become decimated or locally extinct (Estrada *et al*. 2002a, b; Lara & Jorgenson 1998; Ojasti 1996). Hunters target mainly adult howler monkeys for food, particularly in the states of Tabasco, Vera Cruz and Quintana Roo (Lara & Jorgenson 1998).

The population of mantled howlers has decreased by 90% in the vicinity of Los Tuxtlas, with remaining populations surviving only in isolated patches of land (Mandujano *et al*. 2005; Horwich 1998). Black howler populations in unprotected forest sites at Palenque are significantly smaller when compared to those within protected sites and, due to hunting, were absent in half of the forest fragments studied (Estrada *et al*. 2002b).

The spider monkey is also under heavy hunting pressure within several Mexican states (Estrada *et al*. 2004; Duarte-Quiroga & Estrada 2003; Silva López *et al*. 1988). Surveys of Estrada & Coates-Estrada (1996) indicate that a population decline of 20% for spider and more than 66% for howler monkeys in Los Tuxtlas has occurred within a decade. This decline, coupled with the absence of howler monkeys in 40% of forest sites and spider monkeys in 90% of forest sites, indicates that habitat destructions and hunting have resulted in extensive local extinction for both species in the region.


Marmoset for sale in Moyobamba market

c) Pet trade:
All three Mexican primate species can be purchased as pets. Geoffroy's spider monkey represented 67% of the primates on sale during a survey in Mexico City, followed by black and mantled howler, which together made up 15% (Duarte-Quiroga & Estrada 2003). Additionally, non-native primate species can be found (e.g. common marmosets, common squirrel monkeys, white-fronted, white-faced, and brown capuchins), and are sold for US$ 1,750-2000 (Duarte-Quiroga & Estrada 2003). The confinement of spider monkeys is widespread throughout Mexico, particularly in the states of Campeche, Chiapas, Tabasco and Quintana Roo (Estrada *et al*. 2004; Duarte-Quiroga & Estrada 2003; Silva López *et al*. 1988). These species are sold for US$15 per individual in rural markets, and up to US$ 500 in large cities (Duarte-Quiroga & Estrada 2003; Lara & Jorgenson 1998). This trade has substantially increased since the mid 1970s (Lara & Jorgenson 1998). Mexican legislation prohibits the sale of wild primates, however the law is hardly ever enforced (though in recent years seizures of live specimens have increased and a rehabilitation and reintroduction program for former pet monkeys has been established (Duarte-Quiroga & Estrada 2003; Lara & Jorgenson 1998). The sanctuary U Yumil ´Ceh is currently rescuing and releasing Geoffrey's spider monkeys.

3.1.7. Nicaragua

a) Habitat change
Nicaragua has the second highest human population growth rate in Central America, at 2.8% per year (see table 5). Nicaragua also has the second highest deforestation rate within Mesoamerica (see table 5): Since 1950, 50% of its forests have been destroyed (McCann *et al*. 2002), and today only 25% of the country remains forested (table 5). Data on the status and distribution of native primate populations are scarce due to political and economic instability (Garber *et al*. 2005; McCann *et al*. 2002). For the mantled howler (*Alouatta palliata*) on the island of Ometepe, the extent of habitat destruction is expected to have fatal consequences (Winkler *et al*. 1999).

b) Hunting
Nicaragua is home to 3 primate species: Mantled howler, Geoffroy's spider monkey (*Ateles geoffroyi*, with the two subspecies *A. g. geoffroy* and *A. g. frontatus*), and white-faced capuchin (*Cebus capucinus* with the two subspecies *C. c. limitaneus* and *C.c. imitator*). Spider monkeys and capuchins have become very rare locally e.g. around the Mombacho Volcano Nature Reserve, and are currently threatened with extinction, as a result of hunting (McCann *et al*. 2002). Miskito Indians claim to be consuming capuchin monkeys only as "secondary food" (Ojasti 1996).

c) Primates as pets
Spider monkeys and capuchins are commonly kept as pets and the offtake is having a serious impact on wild populations (McCann *et al*. 2002).

3.1.8. Panama

a) Habitat change
In recent decades, Panama has experienced serious forest loss. Currently, only 38% of the country remains forested (see table 5), which has a strong negative impact on native primate populations.

b) Hunting
Panama is home to at least ten primate species (see table 4). Most hunting is illegal, and Geoffroy's tamarin (*Saguinus geoffroyi*), mantled howler (*Alouatta palliata*) and white-faced capuchin (*Cebus capucinus*) are occasionally targeted by poachers (Wright *et al*. 2000). The Coiba Island howler (*Alouatta coibensis*), endemic to the Azuero peninsula, is the most threatened howler species. Both subspecies, *A. c. coibensis* and *A.c. trabeata*, are suffering from habitat loss, excessive hunting and systematic culling, with *A.c. trabeata* last being recorded in 1986 (Horwich 1998; Rylands *et al*. 1996/1997; Froehlich & Froehlich 1987). Populations of the critically endangered Azuero spider monkey (*Ateles geoffroyi azuerensis*), which appears to have been extirpated from other regions, are also restricted to the Azuero peninsula (IUCN 2006; Rylands *et al*. 1996/1997).

c) Primates as pets
In 1986, the Primate Refuge and Sanctuary of Panama was established to rehabilitate and reintroduce primates who were confiscated from illegal trade (Primate Foundation of Panama 2003). Most animals belong to the species Geoffroy's tamarin (>69), followed by Colombian night monkey (*Aotus lemurinus*, >30), Geoffroy's spider monkey (*Ateles geoffroyi*, 15), white-faced capuchin (12) and mantled howler (7).

3.2. South America

3.2.1. Argentina

a) Habitat change
Argentina is plagued by the second highest forest destruction rate in South America (see table 5). Deforestation caused by agricultural expansion (mainly due to black and soybean production) is an enormous threat to the fragile Chaco region in northern Argentina (Fernandez-Duque *et al*. 2001). Between 1972 and 2001, almost 600,000 ha (i.e. 20%), of the forests were destroyed, and this trend appears to be accelerating (Grau *et al*. 2005). The total area of soybean plantations in Argentina has increased from a few thousand hectares in the 1970s to 14 million hectares today. This trend is strongly increasing, with potential expansion estimated at over 30 million hectares (Bickel 2005a).

b) Hunting
Four species are native to Argentina: black howler (*Alouatta caraya*), brown howler (*Alouatta guariba*), Azara's night monkey (*Aotus azarae*), and the black-horned capuchin (*Cebus nigritus*). Data on hunting or capture of primates are not available.

3.2.2. Brazil

a) Habitat change
Brazil is the largest country in Central and South America and is famous for its unique biodiversity. The rate of deforestation, however, is alarming. Between July 2004 and August 2005, rain forests were decimated by almost 19,000 km² and within the following 12 months, by 16,700 km² (AP 2006). Deforestation is particularly high in the states of Mato Grosso and Para due to logging, forest clearance for cattle ranching, and industrial agriculture. Mato Grosso is responsible for an 87% increase in Brazilian cropland (from 2001 to 2004) and 40% of new deforestation (Morton *et al*. 2006). Soybean expansion is a major cause for the large-scale deforestation (Grau *et al*. 2005). Only 3.25% of Brazilian Amazonia is protected, and many of the national parks and reserves exist only on paper (Peres & Zimmerman 2001). Different scenarios predict 28-42% of habitat loss by 2020 for the entire Brazilian Amazon, which would lead to fatal consequences for primates (Grelle 2005). In the Atlantic forest, at least 24 primate species and subspecies are native, and 80% of them are endemic, making the Atlantic forest region of Brazil one of the world's top priority areas for primate conservation (Chiarello & de Melo 2001; Horwich 1998; de S. Pinto & Rylands 1997). Only 5-12% of the original Atlantic rainforest remain as isolated forest patches (Chiarello & de Melo 2001; Bryant *et al*. 1997), with road construction and rapid encroachment presenting an increasing threat (Horwich 1998). Various primates inhabit the cerrado, a bush savannah in the central plateau of Brazil (Rylands *et al*. 1988), however current surveys estimate that up to 80% of the cerrado has been converted into farmland (Cavalcanti & Joly 2002).

b) Hunting
At least 109 primate species are native to Brazil (see table 4), making it the country with the highest diversity of primates worldwide. More than half are endemic, with 26 species included in the IUCN Red List (2006), and 24 threatened, according to Brazil's national Institute for the Environment, IBAMA (Costa *et al*. 2005). Hunting is a serious threat to primates throughout much of Brazil (Ferrari & Queiroz 1994), especially in the Atlantic forest (Costa *et al*. 2005; Rylands *et al*. 1988) and the Brazilian Amazon (Cullen *et al*. 2001; Peres & Dolman 2000; Peres 2000a, b). The annual number of hunted primates is estimated at 2.2 to 5.4 million individuals, in the Brazilian Amazon alone (see table 1).

Various publications document the serious situation for primates in the Federal States of Acre (Peres 2001; Peres & Dolman 2000; Ojasti 1996), Amazonas (Peres & Dolman 2000; Ojasti 1996); Bahia (Peres 2001; Rylands *et al*. 1997; Santos *et al*. 1987), Espírito Santo (Chiarello & de Melo 2001), Maranhao (Fragaszy *et al*. 2004; Lopes & Ferrari 2000), Minas Gerais (Crockett 1998; Ferrari & Diego 1995), Pará (e.g. Jerozolimski & Peres 2003; Lopes & Ferrari 2000), Mato Grosso (Peres 2001), Rondonia (Peres 2001; Ojasti 1996), and Tocantins (Peres 2001). Populations of several primate species are significantly lower at sites with intense hunting compared to non-hunted sites, e.g. in eastern Pará and western Maranhao (Lopes & Ferrari 2000). Examples of native Brazilian primate species that are currently impacted by increased hunting pressure include:

- Populations of the Southern muriqui (*Brachyteles arachnoides*), the largest Neotropical primate, which have been locally decimated in southern Bahia (Peres 2001) and Minas Gerais (Ferrari & Diego 1995). Additionally, there are less than 500 remaining members of the critically endangered Northern muriquis species (*Brachyteles hypoxanthus*), which are seriously threatened by hunting (Hirsch *et al*. 2002; Rylands *et al*. 1997).

- Woolly (*Lagothrix* spp.) and spider monkeys (*Ateles* spp.) are intensely hunted because of their large body size. Their numbers have declined drastically or they are locally extinct at many sites (Barnett *et al*. 2002; Peres 1990). The Chamek spider monkey (Ateles chamek) and the common woolly monkey (*Lagothrix lagothricha*) have become locally extinct along the extension of a highway in Acre due to hunting (Peres 2001). Both the long-haired spider monkey (*A. belzebuth*) and the common woolly monkey have recently been extirpated from the Jaú National Park, one of the largest rainforest national parks in the world (Barnett *et al*. 2002). A recent survey conducted in 24 forest sites in the Brazilian Amazon, each with different hunting levels, indicated that population densities of larger primate species at hunted sites were reduced by up to 83% in the case of black spider monkeys (*A. paniscus*) and 89% in the case of common woolly monkeys, when compared to sites with low hunting pressure (Peres 2000b). The white-whiskered spider monkey (A. marginatus), endemic to the Brazilian Amazon (Zimmerman *et al*. 2001) and the most threatened Amazonian spider monkey (Rylands *et al*. 1996/1997), is also targeted.

- The endemic bearded saki (*Chiropotes satanas*) has become locally extinct at several sites due to deforestation and high hunting pressure (Ferrari *et al*. 1999; Rylands *et al*. 1997).

- The masked titi monkey (*Callicebus personatus*) is locally extinct or drastically reduced in Espírito Santo (Chiarello & de Melo 2001; Rylands *et al*. 1988), and also is hunted heavily for food in southern Bahia (Santos *et al*. 1987).

- The medium-sized brown howler, *Alouatta fusca*, has already disappeared at many sites due to hunting (Chiarello & de Melo 2001; Crockett 1998; Peres 1997; Chiarello & Galetti 1994). The red-handed howler (*A. belzebul*) is also heavily hunted in Mato Grosso (Zimmerman *et al*. 2001).

- Medium-sized capuchins have increasingly become the targets of hunters: The Ka'apor capuchin (*Cebus kaapori*), one of the most threatened primate species in the Amazon basin (Lopes & Ferrari 1996), and one that was only recently discovered, is facing heavy hunting pressure and widespread habitat fragmentation, making it one of the most threatened primates in the Amazon basin (Lopes & Ferrari 1996). Populations of the buff-headed capuchin (*Cebus xanthosternos*) are restricted to the Atlantic forests of Bahia, are severely affected by hunting and collection for the pet trade (Rylands *et al*. 1997), and as a result of intense hunting pressure, have been wiped out over much of their range (Peres 2001; Santos *et al*. 1987). Even populations of the most abundant and adaptable species such as the brown capuchin (*Cebus apella*) have been reduced by intense hunting to a level under the minimum to guarantee its long-term survival (Chiarello & de Melo 2001; Ferrari & Diego 1995; Santos *et al*. 1987).

- The Geoffroy's marmoset (*Callithrix geoffroyi*), endemic to the Atlantic forest, is declining over wide areas of its restricted range (Oliveira *et al*. 2003)

- Until the 1980s, the fairly small buffy sakis (*Pithecia albicans*) were killed only occasionally for food, however, due to the rarity of larger, more sought-after primates (Johns 1986), even their safety is no longer guaranteed.

- In combination with logging, Uakaris (*Cacajao* sp.) are threatened predominantly by hunting (Rylands *et al*. 1997) and are already locally extinct at several sites (Peres 2001).

- Populations of the golden-headed lion tamarin (*Leontopithecus chrysomelas*) have mostly been reduced by habitat destruction, in addition to illegal hunting and capture for the pet trade (Rylands *et al*. 1991-1992).

When hunted by farmers, a significant number of the primates targeted are not only utilised for subsistence, but are also sold commercially. The meat of howler monkeys is available from restaurants in Manaus (Amazonas), Porto Velho (Rondonia), and Rio Branco (Acre) (Ojasti 1996).

At least 30 indigenous groups of people are hunting primates, with most of them preferring large-sized species such as cebids (see table 2). Additionally, at many sites, farmers are hunting a variety of different primate species, including howler, spider and capuchin monkeys (Ojasti 1996).

- The Guajá Indians in Maranhao hunt all primate species within their reserve for food and, during the wet season, primate meat can make up to 30% of the total animals consumed (Fragaszy *et al*. 2004). Orphaned primates, whose mothers were hunted, are kept as pets (Hill 2002).

- The Parakana Indians in Pará now use trucks and motor boats to reach distant areas as the larger-bodied primate species have disappeared near their settlement (Jerozolimski & Peres 2003).

- In the central Amazon, black spider monkeys are most frequently hunted by the Waimiri Atroari Indians, however red howlers (*Alouatta seniculus*), brown capuchins and brown-bearded sakis (*Chiropotes satanas*) are also targeted. Since preferred prey have already become rare near settlements, the Waimiri use trucks and highways to reach distant hunting areas, which significantly increases the radius of hunting impact on primate populations (Jerozolimski & Peres 2003; De Souza-Mazurek *et al*. 2000). For spider monkeys, the situation is particularly precarious due to the fact that 80% of hunted specimens consist of reproductive females, whose meat is desired as "more fat and tasty" (De Souza-Mazurek *et al*. 2000).

- More than 200 brown capuchins and 99 bearded sakis (*Chiropotes utahicki*) were killed for consumption in a village home to 133 Kayapó Indians, in less than a year (Chapman & Peres 2001). Woolly monkeys are the most hunted primate species, followed by white-nosed sakis (*Chiropotes albinasus*), white-fronted capuchins (*Cebus albifrons*), red-bellied titi monkeys (*Callicebus moloch*) and silvery marmosets (*Mico argentatus*) (Ayres *et al*. 1991). In response to the disappearance of large-bodied species, Kayapò Indians now use trucks and motor boats to reach distant hunting grounds (Jerozolimski & Peres 2003).

- The Rio Jordao Kaxinawá Indians of western Acre have driven the majority of hunted species to local extinction, including the black spider and common woolly monkey (Peres & Zimmerman 2001).

c) Primates as pets
Captive primates can be found within most villages and small towns of Brazilian Amazon, with one out of 30 households having pet monkeys. Target species include: woolly, squirrel and spider monkeys, howlers, tamarins, and marmosets. The number of pet monkeys is estimated at more than 45,000 at any one time throughout the region. Chapman & Peres (2001) emphasise the very high mortality during capture and keeping, which results in a high turnover of pet monkeys and an additional pressure on wild populations.

3.2.3. Bolivia

a) Habitat change
Bolivia's extensive forest remains largely intact, however trails used by hunters have been cut through many areas (Robinson & Redford 1991). Soybean crop expansion is a major cause for the large-scale deforestation in Bolivia (Grau *et al*. 2005), and the rapid deforestation rate is expected to continue (Steininger *et al*. 2001). As in other South American countries, this trend is boosted by the human population growth (see table 5).

b) Hunting
Bolivia is home to at least 20 primate species (see table 4). Primates are currently under heavy hunting pressure from indigenous groups, farmers, and rubber collectors. Hunting pressure is high in Tahuamanu (Peres & Dolman 2000) and Pando, Madre

de Dios (Cameron & Buchanan-Smith 1991-1992), where large-bodied species have been seriously decimated. Even moderate hunting pressure has reduced density of howlers in several areas (Peres 1997). Hunting by both farmers and indigenous groups is far above sustainable levels.

- Approximately 10,000 seasonal workers and their families, who are extracting Brazil nuts, also hunt. Extrapolated to the total number of seasonal workers, this would amount to 26,860 hunted brown capuchins per year. Other targeted primates include red howler (*Alouatta seniculus*), saddlebacked tamarin (*Saguinus fuscicollis*), red-bellied titi monkey (*Callicebus moloch*), common squirrel monkey (*Saimiri sciureus*), white-fronted capuchin (*Cebus albifrons*), and black spider monkey (*Ateles paniscus*) (Rumiz & Maglianesi 2001).

- In Pando, during a recent survey, only 5 out of 10 possible primate species were recorded, with Chamek spider monkey (*Ateles chamek*), bald-faced saki (*Pithecia irrorata*), titi monkey, mustached tamarin (*Saguinus mystax*), and Bolivian squirrel monkey (*Saimiri boliviensis*) being absent. Even small primate species such as tamarins - normally found elsewhere in Bolivia - have now become very rare due to high hunting pressure (O'Shea *et al*. 2003).

- In only five years (1991-1996), as a result of hunting, Goeldi's monkey (*Callimico goeldii*) has disappeared from several sites in the Pando area. Human activities appear to have erased Goeldi's monkeys at San Felipe as well (Christen 1999).

- In the South of Cobija, over a period of ten years, populations of titi monkeys and bald-faced sakis were reduced by half or more due to hunting, and the large Cebus species were determined to be missing entirely (Kohlhaas 1988).

- In the Beni Biosphere Reserve, black spider monkey, red howler, brown capuchin, and Bolivian squirrel monkey have only been intensively hunted since the 1960s, but it has had fatal consequences for targeted populations: During a survey in 1996, all native primates except for squirrel monkeys were no longer present in intensively hunted forest areas (Roldán & Simonetti 2001). Among the primate hunters are indigenous Chimane families, predominantly targeting spider monkeys and red howlers. During the 1980s, the situation worsened due to the introduction of firearms and the increasing number of settlements in the area, which resulted in the critical decline of both spider monkeys and red howlers. The Chimanes occasionally hunt capuchins and squirrel monkeys, using their meat for food or bait, and keeping their offspring for the pet trade. Recently, the population of both species have declined (Garcia & Tarifa 1988).

- The Yuqui Indians have decimated woolly monkeys, black spider monkeys, and red howlers in several areas and have recently eradicated them locally (Robinson & Redford 1991; Cameron *et al*. 1989). The Sirionó Indians are also hunting primates, including spider monkeys, capuchins, howlers, night and squirrel monkeys (Cormier 2006; Townsend 2000; Ojasti 1996). New road construction has increased colonisation and encouraged the entry of sport and commercial hunters into the territory of the Sirionó. While these types of hunting are prohibited by Bolivian law, enforcement is extremely poor (Townsend 2000).

c) Primates as pets
In Bolivia, titi monkeys, including the endemic Bolivian titi monkey (*Callicebus modestus*), are hunted for food, and their offspring are taken and sold for the pet trade. Saddlebacked tamarin, squirrel monkey, brown capuchin, Bolivian red howler, Geoffroy's woolly monkey, and Chamek spider monkey are also kept as pets (Rowe & Martinez 2003). Inti Wara Yassi, a Bolivian Sanctuary, is rehabilitating former pet monkeys (spider and squirrel monkeys, capuchins, night and titi monkeys, sakis, tamarins) (Primate Info Net 2006).


Young woolly monkey for sale

3.2.4. Chile

Chile is the only South American country with no native primates. Nevertheless, keeping monkeys (e.g. woolly, spider, squirrel and howler monkeys, mustached tamarins, and capuchins) as pets became popular between the 1980s-1990s. Most monkeys are caught from the wild in neighbouring countries such as Peru, Bolivia and Argentina. A centre for the rescue and rehabilitation of primates, established near Santiago de Chile in 1996, has received and rehabilitated more than 120 confiscated and donated primates. The centre is running an education program in order to discourage the keeping of primates as pets (Lopez 2004).

3.2.5. Colombia

a) Habitat change
Colombia's forests account for 10 percent of the world's biodiversity, making it one of the most species-rich countries in the world. Today 44% of its original forest areas remain and deforestation is at a level of 6,000 to 8,900 km² each year (see table 5). The Andean forests of Colombia experienced large-scale destruction and less than 10% remain (Rylands *et al*. 1996/1997).

b) Hunting
Colombia is one of the most primate-rich countries in the world, with at least 34 confirmed species and many subspecies, some of which are endemic (see table 4). Commercial hunting has been prohibited since 1978, however, subsistence hunting and removal for captive breeding purposes remains legal. Primates are commonly hunted for food, particularly in the Amazonian region; however they are also occasionally hunted for their skins and body parts, or as bait for hunting large cats, fish or turtles. According to Mittermeier (1987a) monkey skins are used to produce brow bands, horse bridles and saddle covers (Alderman 1989). Several primate species are on the brink of extinction due to excessive hunting, which occurs even in protected areas (Rylands *et al*. 1997):

- Colombia is home to a vital segment of the total population of woolly monkeys. The common woolly monkey (*Lagothrix lagothricha*) is the most persecuted of all Colombian primates (Rylands *et al*. 1997; Nishimura *et al*. 1995). Due to heavy hunting pressure, its population has become seriously depleted in the Macarena area and the Amazon region (Mittermeier 1987a; Camacho & Defler 1985).

- Spider monkeys (*Ateles* sp.) are intensely hunted (Rylands *et al*. 1996/1997; Camacho & Defler 1985), and are among the most threatened Neotropical primate species: The endemic brown spider monkey (*A. hybridus brunneus*) has recently been classified as one of the 25 most endangered primate species of the world (Mittermeier *et al*. 2005). The hooded spider mon key (*A. geoffroyi grisescens*) is predicted to become the first extinct primate species in Colombia as a result of hunting (Defler *et al*. 2003; Defler 1989). Additionally, the situation is serious for the black spider monkey (*A. paniscus*) (Camacho & Defler 1985), however hunting by the two main minority groups living in the spider monkey's range continues unrestricted.

- The black-headed uakari (*Cacajao melanocephalus*) is threatened because of its spotted distribution, combined with its reputation amongst hunters as an easily hunted species (Barnett & Brandon-Jones 1997; Defler 1989).

- Red (*Alouatta seniculus*) and mantled howler (*A. palliata*) have already been extirpated over much of their range (Camacho & Defler 1985).

Hunting has drastically reduced the populations of large primate species within indigenous reserves of the Colombian Amazonia and Utría National Park of Colombian Chocó (Palacios & Peres 2005). At least five indigenous groups in Colombia are involved in primate hunting: The Maku (hunting collared titi and woolly monkeys), the Makuna (hunting spider, titi and woolly monkeys), the Tukano (targeting red howlers, long-haired spider monkeys, uakaris, collared titi and night monkeys, white-fronted capuchins), the Bari (taking howlers, capuchins, spider and night monkeys) and the Mocagua (hunting woolly monkeys) (Cormier 2006; Ojasti 1996). One quarter (by weight) of the hunted wildlife of the Bari consists of primates (Ojasti 1999). Recently, different indigenous communities decided to place a total ban on the hunting of common woolly monkeys and white-fronted capuchin (*Cebus albifrons*) in their territories (Bennett 2006; Maldonado 2006).

c) Primates as pets
Prior to 1974, Colombia had a major role in the international primate trade. Between 1964 and 1974 approximately 140,000 monkeys were exported to the U.S. alone. Since then, exports are only allowed with special permits for scientific purposes (Alderman 1989). Monkeys are still caught, however, for the pet trade, with infants of the larger species often being a by-product of hunting, and the smaller species being specifically targeted for trade (Alderman 1989). The white-footed tamarin (*Saguinus leucopus*), endemic to Colombia, is often trapped for pet markets (Defler *et al*. 2003).

3.2.6. Ecuador

a) Habitat change
Ecuador's forests are experiencing the highest deforestation rate in South America with only 37% of the total land area still covered with forest (see table 5). The main factors in this destruction are logging, the petrol industry and agricultural expansion for monocultures. The forests of the central valley have been dramatically reduced and only 4% of the original forest cover remains on the western slopes (Tirira 2006).

b) Hunting
Ecuador is home to at least 21 primate species (see table 4). In rural parts of eastern Ecuador subsistence hunting is extremely popular. At Sarayaku, almost 90% of households contain at least one hunter. During the last few decades many wild species such as the common woolly monkey (*Lagothrix lagothricha*), have become very rare as a result of hunting (Sirén *et al*. 2006). During surveys conducted by Rowe & Martinez (2003) no primates larger than titis were observed, illustrating the tremendous hunting pressure on these primates for meat. Even in the Yasuní National Park, which is home to ten primate species, occasional hunting has been reported (Di Fiore 2004; Rodman *et al*. 1999).

Indigenous people are permitted to hunt wildlife in Ecuador, and many of them now possess shotguns. At least four indigenous groups - the Huaorani, the Siona-Secoya Indians, the Shuar and the Quichua community - are hunting primates. Common woolly monkeys are the most sought-after primates, however red howlers (*Alouatta seniculus*), white-fronted capuchins (*Cebus albifrons*) and many other species are also targeted (Cormier 2006; Sirén *et al*. 2004; Mena *et al*. 2000; Ojasti 1996; Vickers 1991). More than 27% of the hunted wildlife is primates (Ojasti 1999). Offtake is far from a sustainable level, which is evidenced by a substantial reduction or local extinction of species such as the common woolly monkey, white-fronted capuchins, monk sakis (*Pithecia monachus*), and red howlers (Sirén *et al*. 2004; Mena *et al*. 2000; Robinson & Redford 1991). Within a six-year-period of the establishment of a Siona-Secoya village, the capture frequency of woolly monkeys decreased by half (Ojasti 1996), illustrating the effect of hunting on the local density of that species. The switch from traditional hunting techniques to shotguns (currently used for 85% of prey), as well as increased access to primate populations through roads and trails, and greater commercialisation of bushmeat is further exacerbating the situation (Greenberg 2000; Mena *et al*. 2000).

According to the Red Book of Threatened Species of Ecuador, it is estimated that only 50 breeding pairs of the endemic and critically endangered brown-headed spider monkey (*Ateles fusciceps fusciceps*) remain in the wild (Tirira 2006). Once widely distributed in the tropical forests of western Ecuador, it is now present only in four localities as a result of commercial and subsistence hunting, as well as habitat loss (Rylands *et al*. 1997).

c) Primates as pets
Offtake for the pet market is a major threat not only to medium and small-sized primates, but also the orphans of larger species. In Ecuador, an intense commercial trade in primates as pets has been observed, which has affected widow titi monkeys (*Callicebus lucifer*), saddlebacked and black-mantled tamarins (*Saguinus fuscicollis* and *S. nigricollis*), brown capuchins (*Cebus apella*), common woolly monkeys, long-haired spider monkeys (*Ateles belzebuth*) and pygmy marmosets (*Callithrix pygmaea*) (de la Torre & Yépez 2003; Rowe & Martinez 2003, de la Torre *et al*. 2000).

3.2.7. French Guiana

a) Habitat change
As an overseas territory of France, and therefore falling under EU jurisdiction, French Guiana has a special role among the Neotropical countries. It still has large remaining tracts of undisturbed tropical rainforest. Though 88% of the total land area remains covered with forest, the road system is quite functional and offers hunters good access to the country's interior (Duplaix 2001). Also, it has by far the highest human population growth rate in Central and South America, at 4.9% (see table 5).

b) Hunting
Eight primate species are native to French Guiana (see table 4). These include the bearded saki (*Chiropotes satanas*), which is classified by IUCN (2006) as endangered. Hunting is the main threat for primates and it occurs in all areas that are accessible by road or boat, which describes the majority of the country (de Thoisy *et al*. 2005). Native Indians (e.g., Wayana and Wayapi), gold-diggers, farmers, explorers and adventurers are currently hunting, either for subsistence or commerce (Cormier 2006; Roussilhon 1988). Though the sale of primates is illegal, their meat is offered at many markets and restaurants all over the country. Enforcement measures have increased since 1993, however there are only few inspectors controlling a large area (Duplaix 2001). The larger species such as howler monkey, spider monkey, and tufted capuchin are heavily impacted by over-hunting. Primates have disappeared from many villages due to intense hunting activities, and the current human population growth will propel this trend (Roussilhon 1988). Depending upon the regional preferences of communities, primate meat can make up to 15% of the total hunted bushmeat (de Thoisy *et al*. 2005). Capuchins (*Cebus* sp.) account for 50% of all hunted primates, spider-monkeys (*Ateles* sp.) 25% and red howlers (*Alouatta seniculus*) 20%. As a result of the declining populations of large-bodied primates, smaller species (which were previously ignored) are now hunted. Primate orphans are often sold for the pet trade, and stuffed specimens of a variety of species, including howler and squirrel monkeys, bearded sakis and white-faced sakis (*Pithecia pithecia*) are openly sold in shops (Roussilhon 1988). Within a primary rainforest area in the Southwest of Kourou, black spider-monkeys (*Ateles paniscus*) and wedge-capped capuchins (*Cebus olivaceus*) have been wiped out by uncontrolled hunting, although this area was formally protected (Vié *et al*. 2001). In the last few decades, a significant portion of hunted primates have been exported to Martinique and Guadeloupe and perhaps even to Europe (Roussilhon 1988).

3.2.8. Guyana

a) Habitat change
In contrast to many South American countries, Guyana retains 86% of its original forest (Lehman 2004), even though only three areas (2.3% of the total land area) are protected (WRI 2003). Guyana has the lowest annual human population growth of all Central and South American countries, at 0.6%. Nevertheless, within only one decade its forest cover has been reduced by 3% (see table 5).

b) Hunting
Guyana is home to nine primate species (see table 4). Primates are intensively hunted at several sites, including Pomeroon and Canje (Lehman 2000). Population surveys indicate a serious decline in group densities within two decades as a result of ongoing hunting and habitat destruction. In general, the group density of all primate species has been reduced by two thirds, and within the Apoteri region, it has dropped by 85%. While smaller species, such as common squirrel monkey (*Saimiri sciureus*) and golden-handed tamarin (*Saguinus midas*) are often caught for the pet trade, large-bodied species, such as red howler (*Alouatta seniculus*), black spider monkey (*Ateles paniscus*), capuchins (*Cebus albifrons*, *C. apella*, and *C. olivaceus*) and bearded saki (*Chiropotes satanas*) are hunted for bushmeat (Sussman & Phillips-Conroy 1995).

3.2.9. Paraguay

a) Habitat change
Before Paraguay's Zero Deforestation Law came into effect in December 2004, it had the second highest deforestation rate in the world. Since then, deforestation in the Upper Parana Atlantic Forest has been stemmed by over 85%. This law, however, is due to expire in December 2006 (WWF 2006 a,b). Deforestation within the semi-arid Chaco forest occurs at an estimated 200,000 ha per year, and most of this clearing is illegal (Bickel 2005b). Soybean crop expansion remains a major cause for the large-scale deforestation in Paraguay (Grau *et al*. 2005). Annual human population growth is one of the highest in South America (see table 5). Due to a lack of control over wildlife trade (CITES Notification No. 2003/058), a moratorium on trade in CITIES species came into effect in September 2003, and is still valid.

b) Hunting
At least 6 primate species are native to Paraguay (see table 4). Primates are mainly threatened by habitat destruction; however they are also impacted by hunting and the pet trade. Hunting is carried out predominantly by indigenous groups for subsistence (e.g. Brown capuchin (*Cebus apella*), and black-and-gold howler (*Alouatta caraya*) are both hunted by the Aché Indians in Eastern Paraguay), and European descendants are also using primates as a food resource (Stalling 1985). Capuchins are the second most hunted animals in the Mbaracayu Reserve, surpassed only by armadillos (Hill & Padwe 2000). The Aché Indians are permitted to hunt with bows and arrows for subsistence. Within a 53-day period of active hunting, as many as 221 capuchins were killed, indicating that this species is commonly hunted for food (Stallings 1985). Black-and-Gold howlers are also hunted, but in lower numbers (Stallings 1985). Besides the Aché tribe, Paraguayan and Brazilian frontiersmen, peasants and Guarani horticultural Indians are also hunting in the reserve, (Hill & Padwe 2000). It is usually too expensive for settlers to hunt primates for food In the drier Chaco, where most primates are small and the price of ammunition is high. Northern Chaco Indians do not consume primate meat, due to taboos and the abundance of other food. In western Chaco, Manjuy Indians actively hunt Azara's night monkey (*Aotus azarae*) and white-coated titi (*Callicebus pallescens*) and, as a result, these species are locally threatened (Stallings 1985).

c) Pet trade
When Paraguay became a party to CITES it prohibited the trade in primates, however, the illegal pet trade is ongoing. Infant primates, mainly titi monkeys and night monkeys, are often removed from the wild by Chacoan Indians. In eastern Paraguay, brown capuchins are commonly kept as pets (Stallings 1985).

3.2.10. Peru

a) Habitat change
Between 1990 and 2000, Peru lost 5% of its natural forest cover, which is moderate in comparison to other Neotropical countries. However, due to the large size of its forested area, this translates into vast tracts of deforestation. Annual human population growth is 2% (see table 5) and deforestation is expanding rapidly, particularly around towns and settlements. There is also massive illegal logging, even in national parks (Fagan & Shoobridge 2005).

b) Hunting
At least 34 primate species and 53 taxa are native to Peru (see table 4). Several of Peru's primate species are endemic such as the Andean night monkey (*Aotus miconax*), the point endemic Andean titi monkey (*Callicebus oenanthe*) and the critically endangered yellow-tailed woolly monkey (*Oreonax flavicauda*). Primates are one of the most hunted mammalian groups in Peru, especially throughout the Peruvian Amazon (Bodmer & Lozano 2001; Aquino 1998). Intense hunting has been documented for several areas such as Madre de Dios (Naughton-Treves *et al*. 2003; Schulte-Herbrüggen & Rossiter 2003), San Martin (Palomino 2005; Silvius *et al*. 2004; Mark 2003; Mollison 2003; Rowe & Martinez 2003), Tumbes (Encarnación & Cook 1998), and Loreto (Bodmer 2004). In the Tambopata-Candamo Reserve, Madre de Dios, every primate species except the saddle-backed tamarin (*Saguinus fuscicollis*) has disappeared due to hunting and human disturbance (Naughton-Treves *et al*. 2003).

The amount of primate meat sold locally varies between 0.4% (Silvius *et al*. 2004) and 8% (Bennett & Robinson 2000) of total meat for sale. For example, in Iquitos, primates are sold openly and account for up to 5% of the bushmeat on sale. The volumes peak in spring, when primates have a greater body fat as a result of their extensive food supply (Palomino 2005; Ojasti 1996).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Smoked primate meat, Yurimaguas, Peru

All large and medium-sized primates are heavily affected by hunting. According to Aquino (1998), primates of less than four kilograms in weight are hunted for subsistence, while larger species are sold at regional markets. Many species face serious depletion or have become locally extinct.

- The yellow-tailed woolly monkey, *Oreonax flavicauda* (formerly *Lagothrix flavicauda*), is endemic to the Peruvian Andes at altitudes of 1,700-2,700 m (Butchart *et al*. 1995). The inaccessibility of its habitat had protected this species until the 1950s (Leo Luna 1987). Since then, colonisation, road building projects, and logging have encroached on its range. Its large size and social behaviour make it an easy target for hunters (Butchart *et al*. 1995). From the mid 1970s to the mid 1980s, approximately 600 individuals were hunted by peasants and, as a result, several local populations disappeared (Leo Luna 1987). Presently, its estimated total population of less than 250 specimens means that it is classified as critically endangered in the IUCN Red List (2006).

- Common woolly monkeys (*Lagothrix lagothricha*) are the most heavily hunted primate species. In several areas, such as Diamante and Yomiwato, local populations have sharply decreased as a result (Robinson & Bennett 2002; Alvard *et al*. 1997; Peres 1997). Near the Tapiche River in Loreto, woolly monkeys have been driven to near extinction (Bennett *et al*. 2001).

- Populations of Chamek spider monkey (*Ateles chamek*) are locally extirpated in Diamante as a result of serious hunting pressure (Peres 1997; Alvard 1995). Long-haired spider monkeys (*Ateles belzebuth*) have also been seriously impacted, near Puerto Maldonado (Schulte-Herbrüggen & Rossiter 2003).

- The black-mantled howler (*Alouatta palliata*) has become highly endangered, due mainly to intense hunting (Leo Luna 1987). Red howlers (*Alouatta seniculus*) have been reduced by 58% within the last three decades near the Tapiche River in Loreto (Bennett *et al*. 2001), have sharply declined near Puerto Maldonado (Schulte-Herbrüggen & Rossiter 2003), and become locally extinct in Diamante (Alvard 1995).

- The Andean titi monkey (*Callicebus oenanthe*), point endemic to the Rio Mayo valley, is facing intense hunting pressure throughout its limited range (Mark 2003; Rowe & Martinez 2003).

- The distribution area of the red uakari has been severely reduced due to hunting, leading to its near extinction in some areas (Ward & Chism 2003; Leo Luna 1987).

- Populations of white-fronted and brown capuchin (*Cebus albifrons* and *C. apella*) are clearly over-exploited at many sites in the Peruvian Amazon (Novaro *et al*. 2000; Peres & Dolman 2000; Bodmer *et al*. 1988).

In 1995 alone, in the Loreto region, the annual number of primates hunted was estimated at 42,000-208,000, with most of them being large-bodied primates (Bodmer 1995). A decade later, the number was estimated at 28,000 specimens, consisting mainly of common woolly monkeys, also red titi monkey, white-fronted and brown capuchin, red howler, spider monkeys, monk saki, red uakari, and squirrel monkeys (Bodmer & Lozano 2001).

Through the Supreme Decree No. 34-2004-AG (published in September 2004), the Peruvian Government not only mandated the national conservation status of primates but also prohibited the hunting, capturing, owning, transporting and exporting of certain species. The Decree lists *Alouatta palliata, Aotus miconax, Ateles belzebuth, Oreonax flavicauda*, and *Saguinus labiatus* as "endangered". *Ateles chamek, Cacajao calvus, Callicebus oenanthe, Callicebus torquatus, Callimico goeldii*, *Lagothrix cana*, and the common woolly monkey (*Lagothrix lagothricha*) are "Vulnerable". *Alouatta seniculus* and *Lagothrix poeppigii* are classified as "near threatened" (Heymann 2004). Enforcement remains poor, however, and the meat of these species is still openly sold in regions such as Iquitos (Palomino 2006).

At least 14 different indigenous groups are hunting primates in Peru, with most of them preferring large-bodied species (see table 3). Additionally, various primate species including howlers, sakis, capuchin and spider monkeys are killed by farmers (Ojasti 1996).

Large primate species have been seriously depleted due to over-hunting in certain areas, particularly around Diamante, where the Piro hunters are using shotguns (Robinson & Bennett 2002). By weight, primates make up 8% of the diet of Matsigenka bow-hunters at Yomiwatu, and 18% of the diet of Piro hunters at Diamante (Alvard *et al*. 1997).

c) Primates as pets
In the areas of San Martin and Loreto, an active pet trade exists involving the selling of juvenile primates (e.g. common woolly monkeys, Chamek spider monkey, long-haired spider monkey, white-fronted and brown capuchins, tamarins, squirrel and night monkeys), and these animals are sold openly at local markets (Palomino 2005; Mark 2003; Mollison 2003; Rowe & Martinez 2003). In the area of Tumbes, mantled howlers, white-fronted capuchins, and common squirrel monkeys have been decimated, and the pet trade is reported to be one of the primary causes for the decline (Encarnación & Cook 1998). Near Moyobamba in the Rio Mayo valley, the sanctuary Ikamaperu is rehabilitating and releasing former pet monkeys, with a focus on woolly and spider monkeys (Palomino 2005).

3.2.11. Suriname

a) Habitat change
Suriname has the second highest human population growth rate in South America (see table 5), however large portions of rainforests remain undisturbed. Suriname has established a remarkable number of protected areas; although enforcement and control appear insufficient (Duplaix 2001) and gold mining is causing increasing deforestation (Peterson & Heemskerk 2001).

b) Hunting
Suriname is home to eight primate species (see table 4). Hunting represents the main threat to primates, with large species such as the black spider monkey (*Ateles paniscus*), red howler (*Alouatta seniculus*), bearded saki (*Chiropotes satanas*), brown (*Cebus apella*) and weeper capuchin (*Cebus olivaceus*) being the most frequent targets. Most rural people eat monkey meat (81% of interviewees), the popular species being bearded saki, red howler, and capuchins, followed by spider monkeys and white-faced saki. Nearly one third of the hunted animals in Suriname's bush were monkeys (Mittermeier 1991). Continued hunting in the vicinity of permanent villages has resulted in the local extinction or decimation of most target species, whereas in undisturbed areas primate populations are stable. Even within the Brownsberg Natuurpark primates are hunted, and black spider monkeys have already been decimated (Norconk 2003).

3.2.12. Trinidad

a) Habitat change
Trinidad is facing one of the highest deforestation rates in South America. In 2000, only 50% of the country's area remained forested (see table 5). Habitat destruction is accelerating, even within sanctuaries (Phillips & Abercrombie 2003; Rylands *et al*. 1997). Forest clearing, oil exploration, and teak plantations are among the most serious causal factors (Agoramoorthy & Hsu 1995).

b) Hunting
Trinidad has two endemic primate species, the red-howler monkey (*Alouatta seniculus insulanus*) and the white-fronted capuchin (*Cebus albifrons trinitatis*). The latter species is classified as "critically endangered" (IUCN 2006), and is limited to three areas only. Recent surveys, however, did not record the white-fronted capuchin in one of these areas (the Central Range Sanctuary), and its absence is attributed to widespread habitat loss and hunting (Rylands *et al*. 1996/1997).

Trinidad's two species are under severe hunting pressure, even within sanctuaries (Phillips & Abercrombie 2003; Rylands *et al*. 1997). During a survey in the 1990s, within three protected areas, 85% of local people reported in an interview to have either eaten or hunted primates. Furthermore, remains of red howlers (skulls, bones and dried skins) were observed at a hunting camp (Agoramoorthy & Hsu 1995). In the Bush-Bush Sanctuary, the density of the red howler has decreased by 25% (Agoramoorthy & Hsu 1995).

3.2.13. Uruguay

a) Habitat change
In the last few decades, Uruguay has documented an increase of forested areas. This is because native forests have been reduced to a minimal amount, and forest plantations have become the primary activity in the agriculture sector. Human population is increasing by an average of 2.1%, and 2.4% in rural areas (see also table 5).

b) Hunting
It is believed that only one primate species is native to Uruguay: black-and-gold howler (*Alouatta caraya*). The status of this species remains unclear, however, as only a single animal has been observed in the wild so far, although potential habitat is available (Villalba *et al*. 1995). Data on the hunting and capture of primates are unavailable, however, it is certain that other highly sought-after bushmeat species are under immense hunting pressure and some, such as the collared peccary, have already become extinct (Mones & Ximenez, 1980). Accordingly, if Uruguay is in fact home to howler monkeys, they are likely to be targeted by hunters as well.

3.2.14. Venezuela

a) Habitat change
Since 1992, due to political and economic instability, deforestation has increased at an alarming level, and only 54% of forested land area remains (see table 5). Deforestation has been propelled further by expansion of agriculture, as well as mining for gold and diamonds.

b) Hunting
Venezuela is home to at least 17 primate species (see table 4). Black-headed uakaris are a preferred target of hunters (Barnett & Brandon-Jones 1997). Though in Northern Venezuela primates are not generally considered prey animals, rural people and gold miners hunt capuchins and howler monkeys for food. This has led to local disappearance of red howlers near existing mines (Urbani 2006; Ojasti 1996; Rodríguez & Boher 1988). During the last few years, primates have also been eaten in some cities (Alio 2006).

According to Cormier (2006), primate hunting in Venezuela has been documented for three indigenous groups. The Barí are targeting red howlers, long-haired spider monkey, owl monkey, and white-fronted capuchin, the Piaroa hunt white-fronted capuchin, and the Yanomami Indians are hunting Cebids. Furthermore, Ojasti (1996) reports that the Yékwana and Yanomamo communities consume a variety of primate species, including howler and spider monkeys as well as sakis.

In Guri Lake in Eastern Bolívar, red howlers, brown capuchins, white-faced saki, and bearded saki were widely distributed in the 1980s; however hunting and capture have posed serious threats to these populations (Kinzey *et al*. 1988).

The Margaritan capuchin (*Cebus apella margaritae*) is endemic to the island of Margarita. It is considered to be the country's most threatened primate species and is listed as critically endangered (IUCN 2006; Rodriguez and Rojas-Suarez 1999, Rylands *et al*. 1997). The Margaritan capuchin is hunted as pest species and for the pet trade, and hunting even occurs in national parks, such as Cerro El Copey. The total population is estimated at between 250 and 300 specimens (Rylands *et al*. 1996/1997).

c) Primates as pets
Capuchins are the primate species preferred as pets in northeastern Bolívar (Urbani 2006). The volume of offtake is not known, however it is known that the trade in primate infants was established in the 1980s (Rodríguez & Boher 1988). White-faced sakis are occasionally kept as pets (Urbani 2006). The rescue centre Asociación de Rescate de Fauna (ARFA) also regularly rehabilitates and reintroduces weeper capuchins (*Cebus olivaceus*) and red howlers (*Alouatta seniculus*) (Alio 2006).

4. Conservation strategies

The present offtake of millions of Neotropical primates - 2.9 to 5.4 million per year in the Brazilian Amazon alone - is clearly unsustainable and has had dramatic consequences for wild populations. Local populations of several species have already been extirpated, and even species that originally were abundant and widely distributed are now becoming endangered. The volume of primate hunting is likely to further increase in the near future due to human population growth, the expansion of infrastructure into formerly remote areas, and greater efficiency in modern hunting equipment. The time has come to realise the serious impact on the Neotropical biodiversity, and to initiate a series of conservation measures in order to prevent the extinction of an increasing number of primate species.

Which measures could contribute to counteract the over-hunting of primate population? Many options exist in theory, however in practice some of them fall short of expectations:

- **Habitat protection** is certainly a vital step to secure the unique biodiversity in the Neotropics, including the establishment or expansion of protected areas and the creation of biological corridors (Estrada *et al*. 2004; Boinski *et al*. 1998; Vickers 1991). Since remaining forest areas are often privately owned, either by Indians or colonists, conservation measures must also involve private land owners (Ráez-Luna 1995). Under the Mesoamerican Biological Corridor Project of 1997, each nation has proposed a system of corridors that will connect the existing system of protected areas (Garber *et al*. 2005); however this concept has not yet been translated into practical and detailed plans (WRI 2003). It therefore remains unclear whether this concept is actually able to contribute to the long-term survival of primates in the region. It has become obvious that habitat protection alone is insufficient to secure the survival of many Neotropical primate species as long as hunting laws and their enforcement are weak.

- A review of existing **hunting regulations** is urgently needed, as many Central and South American countries have legalised the hunting of primates under certain conditions. **Implementation and enforcement** measures in many Neotropical countries are weak (Silvius *et al*. 2004; Duplaix 2001; Townsend 2000). Local authorities often fail to apply national laws when information, instructions and training are insufficiently provided (Defler *et al*. 2003). It must also be acknowledged that allowing the hunting of primates under certain restrictions can be far more difficult to enforce than prohibition of hunting altogether.

- Long-term studies in West Africa have documented that increased hunting within nature reserves is directly linked to a reduced supply of other protein sources, for example, fish (Brashares *et al*. 2004). Accordingly, **the substitution of other protein sources for primate meat** with other protein sources might be an option in both West Africa and the Neotropics. In northwest Peru, however, attempts to substitute wild ungulate and large rodent meat for primate meat failed quite markedly in the early 1990s (Ward & Chism 2005). Furthermore, wild ungulates are already over-harvested (Peres & Lake ` 2003; Peres 1996). The farming of wildlife for meat production cannot economically compete with hunting due to its high production costs, and it may even have a negative impact on conservation efforts. For example, stimulating demand for farmed bushmeat may encourage increased hunting (Rushton *et al*. 2004). Attempts to build up regional livestock farming and agriculture also remain difficult due to cultural and habitat conservation conflicts.

- **Environmental education** is one of the critical tools used to enhance the awareness and acceptance of conservation measures for primates. Restrictions on the hunting of endangered species will only be successful if local people understand and accept these measures. Environmental education programmes in Ecuador and Brazil are promising, as they create an awareness of the threats to primates and their habitat (de la Torre & Yépez 2003; Rylands *et al*. 1991-1992).

- **Economic benefit** from conservation measures is also an important component of any conservation strategy. Analysis of the reasons for hunting restraint exhibited by the Creole community at the Community Baboon Sanctuary, Belize, documented that such restraint is predominantly the result of utilitarian and cultural factors, including the economic benefit from ecotourism and the absence of a commercial market for howler meat (Jones & Young 2004). Additionally, involving the local people in national park management as rangers, assistants etc. increases their willingness to support conservation measures (Alexander 2000; Vickers 1991).

- **Ecotourism** is an excellent way of promoting forest and primate conservation, as it provides local people with economic benefit that offsets the costs of having restricted access to natural resources (Defler *et al*. 2003). It must be guaranteed, however, that minimum standards are established in order to limit the impact of tourism on local primate populations. It has been documented that primate groups have reduced their social play behaviour and the use of habitat as a reaction to the presence of tourists (de la Torre *et al*. 2000). Other potential impacts are the transmission of diseases and habitat change (Hill 2002; Chapman & Peres 2001). Therefore, while the benefits of ecotourism are manifold, its implementation must be carefully planned.

- **Sanctuaries** have been established in several Central and South American countries to counteract the devastating consequences of primate hunting and the pet trade. Although such institutions are only able to mitigate a tiny portion of the total problem, their work is highly valuable. Most of the sanctuaries run education programs and thereby broaden public awareness. Furthermore, particularly for highly endangered species, such sanctuaries represent a refuge for individuals who will benefit from future reintroduction programs.

5. Recommendations

The following recommendations are not intended to be final, but rather should be used as an initial focus to discuss conservation measures for primates on a national and international level.

5.1. Recommendations to range states

- Range states should prohibit the hunting, capture, and sale of primates, since sustainable utilisation of this highly vulnerable group is impossible to realise due to low reproduction rates, low population densities, long generation times, long life spans, and existing pressures of hunting and habitat loss (Sirén *et al*. 2004; O'Shea *et al*. 2003; Bodmer & Lozano 2001; Peres 2001).

- Enforcement must be strengthened to ensure the implementation of hunting, logging and trade bans, as well as to ensure the safety of protected areas (Palomino 2006; Duplaix 2001; Townsend 2000). This should include regular surveys at local markets and pet shops.

- Protected areas and surrounding buffer zones should be increased and their monitoring improved to ensure the viability of primate populations (Estrada *et al*. 2004; Boinski *et al*. 1998). Such reserves need a minimum size to enable the survival of primate populations, and they should be embedded in a forest matrix in order to establish "megareserves" (Peres 2005).

- Local education programs should be developed and respectively extended (particularly in rural and remote areas), to involve local people in primate conservation (Rowe & Martinez 2003; Garcia & Tarifa 1988).


Woolly monkey in the wild

- Range states should require logging operators to take measures against primate hunting by, among other actions, providing sufficient food for their workers and monitoring transport vehicles to prevent the shipment of bushmeat.

- Environmental impact assessments should become a requirement for future development planning (including for roads, logging concessions etc) in remote forested areas and sensitive ecological zones.

5.2. Recommendations to the Convention on Biological Diversity (CBD)

The Convention on Biological Diversity (CBD) discussed the issue of bushmeat hunting for the first time in 2000. As a result it mandated its *Subsidiary Body on Scientific, Technical and Technological Advice* (SBSTTA) to consider the impact caused by the harvesting of non-timber forest resources, including bushmeat (Decision V/4). At the following CoP in 2002, through Decision VI/22, the CBD Parties agreed to establish a bushmeat liaison group. The CBD is now encouraged to also focus on the bushmeat crisis in Central and South America:

- The CBD parties should explicitly address the issue of the Neotropical bushmeat crisis in the context of the CBD Bushmeat Liaison Group. Furthermore, the CBD should ask parties from the Neotropics to report on the bushmeat consumption in their countries, together with its impact on primate populations.

- The Bushmeat Liaison Group should closely cooperate with CBD parties from the Neotropical region to collect and review data on the volume of bushmeat from primates, the impact on primate populations, national laws for the conservation and use of primates, and their implementation and enforcement.

- The CBD should ask parties to develop policies in order to protect tropical forests, expand a network of protected areas and biological corridors, and strengthen implementation and enforcement.

5.3. Recommendations to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

Since 2000, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has been aware of the African bushmeat crisis and has discussed measures to reduce the bushmeat hunting of African primates. Similar to the situation in Africa, the Neotropical primate bushmeat trade is mostly conducted on a national level. Nevertheless, so far CITES has only acknowledged its ability to contribute to a reduction of this serious problem within the African region. CITES should now take similar measures to preserve the biodiversity of Neotropical primates as well.

- The CITES parties should decide to establish a Neotropical Bushmeat Working Group, similar to its current Central Africa Bushmeat Working Group but with the specific needs of the Neotropical region as part of its mandate.

- The Neotropical Bushmeat Working Group should analyse the current situation for primates in Central and South America, and develop national action and management plans regarding the trade in bushmeat in Central and South America, including public awareness campaigns and enhanced enforcement efforts.

- CITES Parties should be asked to collect data on the bushmeat trade, together with the primate species affected, and report these to CITES within a predefined amount of time. In addition, the implementation and efficiency of national laws should be reviewed by each CITES Party.

- The CITES Secretariat should draw the attention of relevant organisations (e.g. FAO, ITTO) to the bushmeat crisis in the Neotropics and invite them to participate in the Working Group.

Foraging woolly monkey

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7. Appendix

Table 1: Number of primates hunted in the Brazilian Amazon

Estimates of primates hunted per year by low-income rural populations of Brazilian Amazonia (based on Peres 2000a).

Primate taxon	Common name	Minimum number of individuals consumed	Maximum number number of individuals consumed
Cebus spp.	Capuchin monkeys	972,707	2,384,846
Lagothrix lagothricha	Common wooolly monkey	510,057	1,250,539
Alouatta spp.	Howler monkeys	311,143	762,850
Ateles spp.	Spider monkeys	227,471	557,704
Pithecia spp.	Sakis	42,236	103,554
Aotus spp.	Night monkeys	40,485	99,260
Callicebus spp.	Titi monkeys	36,640	89,833
Chiropotes spp.	Sakis	31,532	77,308
Saguinus spp.	Tamarins	8,442	20,697
Cacajao spp.	Uakaris	8,416	20,663
Saimiri spp.	Squirrel monkeys	6,711	16,454
TOTAL		**2,195,840**	**5,383,708**

Table 2: Primate hunting by indigenous groups in Brazil

Hunting in the Federal States of Acre (AC), Amapá (AP), Amazonas (AM), Maranhao (MA), Mato Grosso (MT), Pará (PA), Rondonia (RO), and Roraima (RR), according to Cormier 2006, Jerozolimski & Peres 2003; Peres & Zimmerman 2001.

Indigenous group	State	Primate species
Akwe-Shavante	MT	Unspecified
Arara	PA	*Cebus apella*
Araweté	PA	Unspecified
Bororo	MT	Unspecified
Camayura	MT	Unspecified
Guajá	MA	*Alouatta belzebuth, Aotus infulatus, Cebus apella, Cebus kaapori, Chiropotes satanas, Saguinus midas, Saimiri sciureus*
Juruna (Yudjá)	MT	*Ateles* sp., *Cebus* sp
Kalapalo	MT	Unspecified
Kaxinawá	AC	*Ateles chamek, Lagothrix lagothricha*
Kayapó	MT	Unspecified
Ka'apor	MA	*Cebus* sp., unspecified
Maku		*Callicebus torquatus, Lagothrix lagothricha*
Matis	AM	*Alouatta seniculus, Aotus* sp., *Ateles paniscus, Callicebus moloch, Cebus apella, Lagothrix lagothricha, Saguinus mystax, Saimiri sciureus*
Matses	AM	*Ateles chamek, Lagothrix lagothricha, Pithecia monachus*
Mehinaku	MT	Unspecified
Mundurucú	PA, AM, MT	Unspecified
Nambiquara	RO	Unspecified
Parakana	PA	Unspecified
Parintintin	AM	Unspecified
Tapirapé	MT	*Alouatta* sp., *Cebus* sp.
Tenetehara	MA	Unspecified
Trumai	MT	Unspecified
Waimiri Atroari	AM, RR	*Alouatta seniculus, Ateles paniscus, Cebus apella, Chiropotes satanas*
Wari (Pakaa Nova)	RO	Unspecified
Wapishana	RR	Unspecified
Wayana	PA	Unspecified
Wayapi	AP	Unspecified
Xavante	MT	Unspecified
Yanomami	RR, AM	Cebids, unspecified
Ye'kwana	RR	Cebids, unspecified

Table 3: Primate hunting by indigenous groups in Peru

based on Cormier (2006) and Ojasti (1996)

Indigenous group	Primate species
Aguaruna	*Alouatta seniculus, Aotus trivirgatus, Ateles* sp., *Callicebus moloch, Cebus albifrons*
Amahuaca	*Ateles* sp. and unspecified
Bajo Urubamba	Unspecified
Campa	*Alouatta* sp., *Ateles sp., Cebus* sp., *Lagothrix* sp.
Cashinahua	*Ateles sp.*, Cebus *sp.*
Huambisa	*Ateles* sp., *Callicebus moloch, Pithecia monachus, Saimiri sciureus*
Jivaro	*Alouatta* sp.; *Aotus* sp., *Cebus* sp., *Saimiri* sp.
Matses	*Ateles chamek, Lagothrix lagothricha, Pithecia monachus*
Matsigenka	*Alouatta seniculus, Aotus trivirgatus, Ateles paniscus, Callicebus moloch, Cebus albifrons, Cebus apella, Lagothrix lagothricha, Pithecia monachus, Saguinus fuscicollis, Saguinus imperator, Saimiri sciureus*
Piro	*Alouatta seniculus, Aotus sp., Ateles paniscus, Callicebus moloch, Cebus albifrons, Cebus apella, Lagothrix lagothricha, Saguinus nigricollis, Saimiri sciureus*
Sharanahua	Unspecified
Shipibo	*Cebus albifrons*
Urarina	Unspecified
Yagua	*Alouatta seniculus, Aotus sp., Callicebus sp., Cebus albifrons, Cebus apella, Lagothrix lagothricha, Pithecia monachus, Saguinus fuscicollis, Saguinus mystax, Saimiri sciureus*

Table 4: Primates of the Neotropics and reasons for their offtake

* IUCN status according to Red List 2006; for Brazilian endemic species: Red List Brazil (Rylands 2003); ** subspecies *Ateles geoffroyi frontatus* and *A.g. panamensis*. CR = critically endangered; DD = data deficient; EN = endangered; LC = least concern; LR = lower risk; NT = near threatened; VU = vulnerable.

Species	Countries of Origin	Population status*	CITES App.	Reasons for hunting
Family Callitrichidae				
Goeldi's monkey *Callimico goeldii*	Bolivia, Brazil, Colombia, Peru	NT	I	Mainly bushmeat, to a lesser extent pet trade
Rio Acari marmoset *Callithrix acariensis*	Brazil		II	Mainly pet trade
White-eared marmoset *Callithrix aurita*	Brazil	**EN**	I	Mainly bushmeat, to a lesser extent pet trade
Buffy-headed marmoset *Callithrix flaviceps*	Brazil	**EN**	I	Bushmeat and pet trade
Geoffroy's marmoset *Callithrix geoffroyi*	Brazil	VU	II	Bushmeat and pet trade
Black-crowned dwarf marmoset *Callithrix humilis*	Brazil		II	Bushmeat and pet trade
Common marmoset *Callithrix jacchus*	Brazil	LR / LC	II	Mainly pet trade
Wied's marmoset *Callithrix kuhlii*	Brazil	LR / LC	II	Mainly pet trade
Manicoré marmoset *Callithrix manicorensis*	Brazil		II	Mainly pet trade
Maués marmoset *Callithrix mauesi*	Brazil		II	Mainly pet trade
Black-headed marmoset *Callithrix nigriceps*	Brazil		II	Mainly pet trade
Black tufted-ear marmoset *Callithrix penicillata*	Brazil	LR / LC	II	Mainly pet trade
Pygmy marmoset *Callithrix pygmaea*	Bolivia, Brazil, Colombia, Ecuador, Peru		II	Mainly pet trade
Sateré marmoset *Callithrix saterei*	Brazil	DD	II	Mainly pet trade
Rio Acari marmoset *Mico acariensis*	Brazil	DD	II	Mainly pet trade

Silvery marmoset *Mico argentatus*	Bolivia, Brazil	DD	II	No data
Golden-white tassel-ear marmoset *Mico chrysoleucus*	Brazil	DD	II	No data
Emilia's marmoset *Mico emiliae*	Brazil		II	No data
tassel-eared marmoset *Mico humeralifer*	Brazil	DD	II	No data
Black-crowned dwarf marmoset *Mico humilis*	Brazil	DD	II	No data
Aripuana marmoset *Mico intermedius*	Brazil	LR / LC	II	No data
Golden-white bare-ear marmoset *Mico leucippe*	Brazil	DD	II	No data
Manicoré marmoset *Mico manicorensis*	Brazil		II	No data
Marca's marmoset *Mico marcai*	Brazil		II	No data
Maués marmoset *Mico mauesi*	Brazil		II	No data
Black-tailed marmoset *Mico melanurus*	Bolivia, Brazil, Paraguay		II	No data
Black-headed marmoset *Mico nigriceps*	Brazil	DD	II	No data
Sateré marmoset *Mico saterei*	Brazil	DD	II	No data
Pied bare-faced tamarin *Saguinus bicolor*	Brazil	**CR** declining	I	Mainly pet trade
Saddlebacked tamarin *Saguinus fuscicollis*	Bolivia, Brazil, Columbia, Ecuador, Peru	LC (DD for 2 subspecies)	II	Bushmeat and pet trade
Lesson's saddleback tamarin *Saguinus fuscus*	Brazil, Colombia	LR / LC	II	No data
Red-crested tamarin *Saguinus geoffroyi*	Colombia, Costa Rica, Panama	LR / LC	I	Bushmeat and pet trade
Graells' black-mantle tamarin *Saguinus graellsi*	Colombia, Ecuador, Peru		II	No data
Emperor tamarin *Saguinus imperator*	Bolivia, Brazil, Peru	LR / LC	II	Bushmeat and pet trade
Mottled-face tamarin *Saguinus inustus*	Brazil, Colombia	LR / LC	II	Bushmeat and pet trade
Red-bellied tamarin *Saguinus labiatus*	Bolivia, Brazil, Peru	LR / LC	II	Bushmeat and pet trade
White-footed tamarin *Saguinus leucopus*	Colombia	VU declining	I	Mainly pet trade
Bare-faced tamarin *Saguinus martinsi*	Brazil	LR / LC	II	Bushmeat and pet trade
Golden-handed tamarin *Saguinus midas*	Brazil, French Guiana, Guyana, Suriname	LR / LC	II	Bushmeat
Mustached tamarin *Saguinus mystax*	Brazil, Peru	LR / LC	II	Bushmeat and pet trade
Black-handed tamarin *Saguinus niger*	Brazil	LR / LC	II	Bushmeat and pet trade
Black-mantled tamarin *Saguinus nigricollis*	Brazil, Colombia, Ecuador, Peru	LR / LC	II	Bushmeat and pet trade
Cotton-top tamarin *Saguinus oedipus*	Colombia, Panama (?)	**EN**	I	Mainly pet trade
Golden-mantled tamarin *Saguinus tripartitus*	Ecuador, Peru	LR / LC	II	No data
Black-faced lion tamarin *Leontopithecus caissara*	Brazil	**CR** declining	I	Bushmeat and pet trade
Golden-headed lion tamarin *Leontopithecus chrysomelas*	Brazil	**EN** declining	I	Bushmeat and pet trade
Black lion tamarin *Leontopithecus chrysopygus*	Brazil	**CR** Declining	I	Bushmeat and pet trade
Golden lion tamarin *Leontopithecus rosalia*	Brazil	**EN** increasing	I	Bushmeat and pet trade
Familiy Aotidae				
Azara's night monkey *Aotus azarae*	Argentina, Bolivia, Paraguay, Peru	LR / LC	II	Mainly bushmeat
Brumback's owl monkey *Aotus brumbacki*	Colombia, Venezuela?			Mainly bushmeat

Hershkovitz's night monkey *Aotus hershkovitzi*	Colombia		II	Mainly bushmeat
Kuhl's owl monkey *Aotus infulatus*	Brazil		II	Bushmeat and pet trade
Colombian night monkey *Aotus lemurinus*	Colombia, Costa Rica, Ecuador, Panama	VU (**EN** for 1 subspecies)	II	Mainly pet trade
Andean night monkey *Aotus miconax*	Peru	VU	II	Mainly bushmeat
Ma's night monkey *Aotus nancymaae*	Brazil, Colombia, Peru	LR / LC	II	Mainly bushmeat
Peruvian night monkey *Aotus nigriceps*	Bolivia, Brazil, Colombia, Paraguay, Peru	LR / LC	II	Mainly bushmeat
Owl monkey *Aotus trivirgatus*	Brazil, Colombia, Costa Rica, Ecuador, Panama, Peru	LR / LC	II	Mainly bushmeat
Noisy night monkey *Aotus vociferans*	Brazil, Colombia, Ecuador, Peru	LR / LC	II	Mainly bushmeat
Family Pithecidae				
Northern Bahian blond titi monkey *Callicebus barbarabrownae*	Brazil	**CR** Declining	II	Mainly bushmeat
Baptista lake titi monkey *Callicebus baptista*	Brazil	LR / LC	II	No data
Prince Bernhard's titi monkey *Callicebus bernhardi*	Brazil	LR / LC, Only recently described	II	No data
Brown titi monkey *Callicebus brunneus*	Bolivia (?), Brazil, Peru (?)	LR / LC	II	No data
Booted titi monkey *Callicebus caligatus*	Brazil, Peru (?)	LR / LC	II	No data
Ashy black titi monkey *Callicebus cinerascens*	Brazil	LR / LC	II	No data
Coimbra's titi monkey *Callicebus coimbrai*	Brazil	**CR** Declining	II	No data
Red titi monkey *Callicebus cupreus*	Bolivia (?), Brazil, Colombia (?), Ecuador (?), Peru(?)	LR / LC	II	Mainly bushmeat
Dusky titi monkey *Callicebus discolor*	Brazil (?), Colombia (?), Ecuador, Peru	LR / LC	II	No data
White-eared titi monkey *Callicebus donacophilus*	Bolivia, Brazil (?), Paraguay (?)	LR / LC	II	No data
Hershkovitz's titi monkey *Callicebus dubius*	Bolivia, Brazil, Peru	LR / LC	II	No data
Hoffmann's titi monkey *Callicebus hoffmannsi*	Brazil	LR / LC	II	No data
Widow titi monkey *Callicebus lucifer*	Brazil, Colombia, Ecuador (?), Peru	LR / LC	II	Mainly pet trade
Collared titi monkey *Callicebus lugens*	Brazil, Colombia, Venezuela	LR / LC	II	No data
Medem's titi monkey *Callicebus medemi*	Colombia, Ecuador (?)	LR / LC	II	Bushmeat and pet trade
Coastal black-handed titi monkey *Callicebus melanochir*	Brazil	VU Declining	II	No data
Bolivian titi monkey *Callicebus modestus*	Bolivia (only known from Rio Beni basin)	VU	II	Mainly bushmeat, to a lesser extent pet trade
Red-bellied titi monkey *Callicebus moloch*	Brazil, Ecuador (?)	LR / LC	II	Mainly bushmeat, to a lesser extent pet trade
Black-fronted titi monkey *Callicebus nigrifrons*	Brazil	NT	II	Bushmeat
Andean titi monkey *Callicebus oenanthe*	Peru (only known from Rio Mayo valley)	VU	II	Bushmeat and pet trade
Beni titi monkey *Callicebus olallae*	Bolivia	VU	II	Mainly bushmeat, to a lesser extent pet trade
Ornate titi monkey *Callicebus ornatus*	Colombia	VU Declining	II	No data
White-coated titi monkey *Callicebus pallescens*	Bolivia, Brazil, Paraguay		II	Mainly bushmeat
Masked titi monkey *Callicebus personatus*	Brazil	VU	II	Mainly bushmeat
Widow titi monkey *Callicebus purinus*	Brazil	LR / LC	II	No data
Red-headed titi monkey *Callicebus regulus*	Brazil	LR / LC	II	No data
Stephen Nash's titi monkey *Callicebus stephennashi*	Brazil	LR / LC	II	No data

Collared titi monkey *Callicebus torquatus*	Brazil, Colombia, Venezuela (?)	LR / LC	II	Mainly bushmeat
Equatorial saki *Pithecia aequatorialis*	Ecuador, Peru	LR	II	Bushmeat
Buffy/white saki *Pithecia albicans*	Brazil	LR / LC	II	Bushmeat
Bald-faced saki *Pithecia irrorata*	Bolivia, Brazil, Peru (?)	LR / LC	II	Bushmeat
Monk saki *Pithecia monachus*	Brazil, Colombia, Ecuador, Peru	LC (VU for 1 subspecies)	II	Bushmeat
White-faced saki *Pithecia pithecia*	Brazil, French Guiana, Guyana, Suriname, Venezuela (?)	LR / LC	II	Bushmeat and pet trade
White-nosed saki *Chiropotes albinasus*	Brazil	LR / LC	I	Bushmeat
Black saki *Chiropotes chiropotes*	Brazil, Venezuela	LR / LC	II	Bushmeat
Bearded saki *Chiropotes satanas*	Brazil, French Guiana, Guyana, Suriname, Venezuela	**EN** Declining	II	Mainly bushmeat, to a lesser extent pet trade
Uta Hick's bearded saki *Chiropotes utahickae*	Brazil	VU Declining	II	Bushmeat
Bald / Red uakari *Cacajao calvus*	Brazil, Columbia Peru (C.c. ucayalii)	NT (VU for 4 subspecies)	I	Mainly bushmeat, to a lesser extent pet trade
Black-headed uakari *Cacajao melanocephalus*	Brazil, Colombia (?), Venezuela	LR / LC	I	Bushmeat
Family Cebidae				
White-fronted capuchin *Cebus albifrons*	Bolovia, Brazil, Colombia, Ecuador, Guyana, Peru, Trinidad, Venezuela	LR / LC (**CR** for *C.a. trinitatis)*	II	Bushmeat and pet trade
Brown capuchin *Cebus apella*	Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Venezuela	LR / LC (**CR**: for *C.a. margaritae)*	II	Bushmeat and pet trade
White-faced capuchin *Cebus capucinus*	Colombia, Costa Rica, Ecuador, Honduras, Nicaragua, Panama	LR / LC (VU for *C.c.curtus*)	II	Mainly bushmeat, to a lesser extent pet trade
Ka'Apor capuchin *Cebus kaapori*	Brazil	VU	II	Bushmeat
Black-striped capuchin *Cebus libidinosus*	Brazil			Mainly bushmeat, to a lesser extent pet trade
Large-headed capuchin *Cebus macrocephalus*	Brazil, Colombia, Ecuador, Peru	LR / LC	II	Mainly bushmeat, to a lesser extent pet trade
Black-horned capuchin *Cebus nigritus*	Argentina (?), Brazil		II	Bushmeat
Weeper capuchin *Cebus olivaceus*	Brazil, Colombia, French Guiana, Guyana, Suriname, Venezuela	LR / LC	II	Mainly bushmeat, to a lesser extent pet trade
Crested capuchin *Cebus robustus*	Brazil	VU	II	Bushmeat and pet trade
Yellow breasted capuchin *Cebus xanthosternos*	Brazil	**CR**	II	Bushmeat and pet trade
Bolivian squirrel monkey *Saimiri boliviensis*	Bolivia, Brazil, Colombia (?), Peru, Venezuela (?)	LR / LC	II	Bushmeat and pet trade
Red-backed squirrel monkey *Saimiri oerstedi*	Costa Rica, Panama	**EN / CR** declining	I	Mainly pet trade
Common squirrel monkey *Saimiri sciureus*	Brazil, Colombia, French Guiana, Guyana, Suriname, Peru, Venezuela	LR / LC	II	Bushmeat and pet trade
Bare-eared squirrel monkey *Saimiri ustus*	Brazil	LR / LC	II	No data
Black squirrel monkey *Saimiri vanzolinii*	Brazil	VU Declining	II	Mainly pet trade

Family Atelidae				
Red-handed howler *Alouatta belzebul*	Brazil	LR	II	Mainly bushmeat
Black-and-gold howler *Alouatta caraya*	Argentina, Bolivia (?), Brazil, Paraguay, Uruguay (?)	LR / LC	II	Mainly bushmeat
Coiba Island howler *Alouatta coibensis*	Panama		I	Mainly bushmeat
Brown howler *Alouatta fusca*	Brazil		II	Mainly bushmeat
Brown howler *Alouatta guariba*	Argentina, Brazil	NT (**CR**: *A.g.guariba)*	II	Mainly bushmeat
Black howler *Alouatta nigerrima*	Brazil	uncommon	II	Mainly bushmeat
Mantled howler *Alouatta palliata*	Belize, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru (?)	LC (**CR**: *A.p. mexicana* ; VU: *A.p. coibensis)*	I	Mainly bushmeat, to a lesser extent pet trade
Black howler *Alouatta pigra*	Belize, Guatemala, Mexico	**EN** Declining	I	Mainly bushmeat, to a lesser extent pet trade
Bolivian red howler *Alouatta sara*	Bolivia	LR / LC	II	Mainly bushmeat, to a lesser extent pet trade
Red howler *Alouatta seniculus*	Bolivia (?), Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname, Trinidad, Venezuela	LR / LC (VU: *A.s. insulanus*)	II	Bushmeat
Red-handed howler *Alouatta ululata*	Brazil	**CR**	II	Bushmeat
Long-haired spider monkey *Ateles belzebuth*	Brazil, Colombia, Ecuador, Peru	VU Declining	II	Mainly bushmeat, to a lesser extent pet trade
Chamek spider monkey *Ateles chamek*	Bolivia, Brazil, Peru	LR / LC	II	Mainly bushmeat, to a lesser extent pet trade
Brown-headed spider monkey *Ateles fusciceps*	Colombia (?), Ecuador, Panama		II	Mainly bushmeat, to a lesser extent pet trade
Geoffroy's spider monkey *Ateles geoffroyi*	Belize, Colombia, Costa Rica, Ecuador (?), El Salvador, Honduras, Guatemala, Mexico, Nicaragua, Panama	LR / LC (**CR** for 3 subspecies; **EN** for 3 subspecies)	I**	Mainly bushmeat, to a lesser extent pet trade
Brown spider monkey *Ateles hybridus*	Colombia, Venezuela (?)	**CR** Declining	II	Mainly bushmeat, to a lesser extent pet trade
White-whiskered spider monkey *Ateles marginatus*	Brazil	**EN** Declining	II	Bushmeat
Black spider monkey *Ateles paniscus*	Brazil, French Guiana, Guyana, Suriname, Venezuela (?)	LR / LC	II	Mainly bushmeat, to a lesser extent pet trade
Yellow-tailed woolly monkey *Oreonax flavicauda*	Peru	**CR**	I	Bushmeat
Geoffroy's woolly monkey *Lagothrix cana*	Bolivia, Brazil, Peru	NT	II	Bushmeat
Common woolly monkey *Lagothrix lagothricha*	Brazil, Colombia, Ecuador, Peru, Venezuela (?)	LR (NT in Brazil)	II	Mainly Bushmeat, to a lesser extent pet trade
Colombian woolly monkey *Lagothrix lugens*	Colombia, Venezuela	VU	II	Mainly Bushmeat, to a lesser extent pet trade
Poeppig's woolly monkey *Lagothrix poeppigii*	Brazil, Ecuador, Peru	NT	II	Mainly Bushmeat, to a lesser extent pet trade
Southern muriqui *Brachyteles arachnoides*	Brazil	**EN** Declining	I	Mainly Bushmeat, to a lesser extent pet trade
Northern muriqui *Brachyteles hypoxanthus*	Brazil	**CR** Declining	II	Mainly Bushmeat, to a lesser extent pet trade

Table 5: Background data on habitat destruction in the Neotropics

Natural forest coverage, habitat degradation and human population growth in Central and South America (based on World Resources Institute 2003)

Country	Natural forest area [ha]	Plantations [ha]	Changes in natural forest cover 1990-2000	Original forest as % of total land	Forest area 2000, as % of total land	Human Population (total)	Human Population Increase (%)
Central America							
Belize	1,345,000	3,000	- 21 %	92 %	59 %	236,000	2.5 %
Costa Rica	1,790,000	178,000	- 13 %	98 %	39 %	4,200,000	2.8 %
El Salvador	107,000	14,000	- 46 %	99 %	6 %	6,520,000	1.6 %
Guatemala	2,717,000	133,000	- 20 %	99 %	26 %	11,995,000	2.6 %
Honduras	5,335,000	48,000	- 11 %	100 %	48 %	6,732,000	3.0 %
Mexico	54,938,000	267,000	- 11 %	56 %	28 %	101,842,000	1.9 %
Nicaragua	3,232,000	46,000	- 27 %	100 %	25 %	5,347,000	2.8 %
Panama	2,836,000	40,000	- 16 %	97 %	38 %	2,942,000	1.9 %
South America							
Argentina	33,722,000	926,000	- 10%	5 %	12 %	37,900,000	1.4 %
Brazil	538,924,000	4,982,000	- 4 %	64 %	64 %	174,706,000	1.7 %
Bolivia	53,022,000	46,000	- 3 %	54 %	48 %	8,705,000	2.2 %
Chile	13,519,000	2,017,000	- 7 %	40 %	21 %	15,589,000	1.6 %
Colombia	49,460,000	141,000	- 4 %	92 %	44 %	43,495,000	2.0 %
Ecuador	10,390,000	167,000	- 12 %	79 %	37 %	13,112,000	2.3 %
French Guiana	7,925,000	1,000	0 %	93 %	88 %	176,000	4.9 %
Guyana	16,867,000	12,000	- 3 %	99 %	79 %	765,000	0.6 %
Paraguay	23,345,000	27,000	- 5 %	22 %	57 %	5,778,000	2.8 %
Peru	64,575,000	640,000	- 5 %	74 %	51 %	26,523,000	2.0 %
Suriname	14,100,000	13,000	0 %	92 %	86 %	421,000	2.9 %
Trinidad & Tobago	244,000	15,000	- 8 %	93 %	50 %	1,306,000	2.0 %
Venezuela	48,643,000	863,000	- 5 %	75 %	54 %	25,093,000	2.0 %