Articles

CONSERVATION AND POPULATION STATUS OF THE BROWN HOWLING MONKEY (*ALOUATTA FUSCA CLAMITANS*) IN ARGENTINA

The Present

Due to widespread habitat destruction, the original distribution of the brown howling monkey, *Alouatta fusca*, has been dramatically reduced (Mittermeier, 1986; Mittermeier and Cheney 1987). Its present distribution is limited to small populations scattered throughout its original range, surviving mainly in small nature reserves in south-east Brazil and the Misiones province in Argentina. Little is known about the size and conservation status of the remnant populations, and the records of their occurrence are imprecise (Mendes, 1989). This report is an update of the occurrence and status of the brown howling monkey in Argentina.

Originally, *Alouatta fusca* ranged throughout the Atlantic and Paranaense forests of Brazil from the States of Bahia and Espírito Santo in the north to Rio Grande do Sul and the Argentine Province of Misiones in the south (Cordeiro da Silva, 1981; Kinzey, 1982). Two subspecies of brown howlers are commonly recognized: *A. f. fusca*, from the northern part of the species range, is on the verge of extinction (Mittermeier, 1986) and the *1994 IUCN Red List of Threatened Animals* gave the status of this taxon as endangered (Groombridge, 1993). The southern subspecies, *A. f. clamitans*, is considered vulnerable by IUCN due to extreme fragmentation and the evident decline of populations in many parts of its range.

The first record of the brown howler in Argentina was by Crespo (1954), who reported an individual captured in an Araucaria (*Araucaria angustifolia*) forest (Fig. 1). In 1974, the same author reported another three individuals which had died in the 1965-66 regional yellow fever epidemic (Crespo, 1974). Recently, Massoia *et al.* (1992) reported two further individuals captured in Misiones in 1976 and 1978 respectively. In January 1991, we recorded the vocalizations of brown howlers (at least two groups were howling simultaneously) at Cruce Caballero Provincial Park, a 435 ha reserve of unspoiled Araucaria subtropical forest. In November 1993, at the same site, we encountered a group of brown howlers composed of one adult male, one subadult male, three adult females and one dependent offspring. According to local people, several other groups were living in the proximity of the Cruce Caballero Provincial Park at this time, in areas of high human pressure. Cruce Caballero Provincial Park is currently the only location in Argentina with a confirmed population of brown howling monkeys.

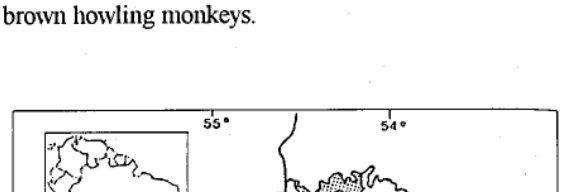


Figure 1. Locations of the records of *Alouatta fusca* in Argentina. Also shown are the largest protected areas in Misiones province. 1. Crespo (1954). 2. Crespo (1974), 3. & 4. Massoia *et al.* (1992). 5. Living groups at Cruce Caballero Provincial Park. 6. Iguazú Na National Park, 7. Uruguaí Provincial Park, 8. Yabotí Reserve.

The Problems

Although the knowledge on the status of the brown howler in Argentina is an ongoing challenge, there are some important points to take into account to understand the conservation problems of this species in this part of its range.

Unsuited protected areas and habitat fragmentation. There are no records of brown howlers in the most important reserves in the region: the Iguazú National Park, the Uruguaí Provincial Park, and the Yabotí Reserve (Fig.1). *A.fusca* has apparently some kind of association with Araucaria forest in Argentina, and there is a serious lack of protection for this type of forest in Misiones. The Cruce Caballero Provincial Park and the San Antonio Strict Natural Reserve are the only reserves protecting tiny fractions of Araucaria forest, and both are suffering the deleterious effects of fragmentation and small size (see for example, Soulé, 1986).

Cover photograph by Clara B. Jones: Aggressive interaction between male (left) and female (right) *Alouatta palliata* (see page 4).

Land use and development. Outside the protected areas the native forest is in an advanced state of degradation and fragmentation due to increasing human pressure. Big timber companies are transforming huge portions of native forest into *Pinus*, *Araucaria* and *Eucalyptus* monospecific plantations. Those lands not converted into plantations are being highly impacted by squatters (poor families from Brazil and Argentina) seeking land for subsistence farming. The high degree of poverty, the problem of land tenure and the misuse of natural resources near Cruce Caballero are important problems to resolve in order to ensure the conservation of the forest remnants.

Rarity of the species and susceptibility to diseases. Both species of howling monkeys living in Misiones, the brown howler (*A. fusca*) and the black howler (*A. caraya*) have extremely low population densities as noted by the extreme difficulty in encountering them (Crespo 1982). In April 1994, a field trip to Cruce Caballero Provincial Park was made in which over 70 km were walked searching for brown howlers without success. We estimate that no more than three groups live within the Park boundaries. This low population density may best be attributed to the devastating effects of the 1965-66 yellow fever epidemic which decimated populations of both species in Misiones province and areas nearby in Brazil and Paraguay (Bejarano, 1974; Crespo, 1974, 1982). Yellow fever has been known to have harmful effects on other howling monkey populations (Collias and Southwick, 1952; Timm, 1994; K.Stoner, pers. comm.). The surrounding areas of the Cruce Caballero Provincial Park also have a high incidence of *Dermatobia* sp. in domestic animals and humans (pers. obs.). At high levels this parasite has been known to increase howling monkey mortality rates (Milton, 1982; Arditi and Placci 1990; Brown and Zunino, 1994). The increased incidence of epidemics due to habitat fragmentation and the ever growing human presence around Cruce Caballero Provincial Park may have a disastrous impact on the surviving population of brown howling monkeys. There is growing understanding that nongenetic factors, and particularly catastrophic events, may be more likely to limit the viability of populations than genetic factors (Lande, 1988 in Young, 1994).

Competition with the black howler. The sympatry of the black and brown howlers in Argentina is still open to controversy. While some authors have reported sympatry (Cordeiro da Silva, 1981; Crespo, 1982; Crockett and Eisenberg, 1987; Redford and Eisenberg, 1992), the scarce information available gives the impression of an area of intermingled populations of *Alouatta caraya* and brown howlers and the replacement of one species by the other. Whichever is the case, the coexistence of black howling monkeys in the same area is an important point to take into account. The black howler lives in very fragmented and disturbed forests and has a large capacity to disperse and colonize patches and remnants of forest in the Bolivian-Chaco region. Higher densities of black howlers are maintained on the Paraná river islands with a secondary growth vegetation and a lower concentration of secondary compounds (Rumiz, 1990). On the other hand, the brown howler seems to prefer moister forest than *A. caraya* and is found in Brazilian Atlantic forest, the southern Araucaria forest of Brazil and Misiones, Argentina (Redford and Eisenberg 1992), all of which were continuous in the past. The recovery of *A. fusca* populations could be prevented because of the extreme fragmentation of the Paranaense forest and its transformation into secondary patches. However, *A. caraya* populations may be relatively unaffected by these changes and consequently replace brown howlers in this part of their range.

The Future

Any conservation project must have as its first objective the study and protection of the environment, considering the conservation of forests and monkeys as a whole. The development of an action plan with the aim of improving the conservation of Argentine forests requires not only interdisciplinarity but also a compromise between conservation and development, to include the rural people that live and use these areas (Brown, 1990). Conservation and development programs for alternative and sustainable agricultural and forestry practices are highly desirable in the region. It is necessary to consider people's needs and social promotion by including local people in the discussion and execution of conservation programs.

To preserve the Paranense forest of Misiones it will be crucial to develop an integrated plan to manage the reserved areas of the northern part of the province and the Iguaçú National Park in Brazil. It is important to promote the formation of state and private reserves (including Araucaria forests) that constitute a continuous corridor connecting the former area to the Yaboti Reserve and the Turbo National Park in Brazil. It will also be important to increase the area of the Cruce Caballero Provincial Park while it is still possible, and link it to other protected areas (Rode and Di Bitetti, 1994).

The development of a plan for the conservation of the brown howling monkey and its environment in Argentina will require considerable research and investigation. Misiones still has some 1,200,000 ha of natural forest, approximately 400,000 ha of which are

under protected status. This area, together with the Brazilian part of Iguaçú and the Turbo National Park, is the largest area of continuous subtropical Paranaense forest remaining (Laclau, 1994). This provides an outstanding opportunity to develop conservation programs in this important natural area in the neotropics. Not only the brown howling monkey but also other endangered species, such as the harpy eagle, the giant river otter and the jaguar, probably have their last opportunity to continue inhabiting the Paranense forest only if efforts are concentrated in developing a coherent conservation plan for this region.

Acknowledgments. We acknowledge Sr. Arce, keeper of the Cruce Caballero Provincial Park for his hospitality. Andrés Johnson and the Fundación Vida Silvestre Argentina for their logistic and technical field support. The Subsecretary of Natural Resources of Misiones provided permission to do field work in Cruce Caballero. We are also grateful to Miguel Castelino, Sandra Chediack, James Stanford, Héctor Grau, Martín Kovalewski, Susana Bravo, Mariana Diuk, and Marcela Amaya Santi for their company and help during the field surveys. Miguel Castelino also helped by tape recording howler vocalizations. Juan Manuel Morales, James Stanford, María Eugenia Morales and Charles Janson helped with the translation of the manuscript.

Mario S. Di Bitetti, Guillermo Placci, Alejandro D. Brown and **Daniela I. Rode**, Laboratorio de Investigaciones Ecológicas de las Yungas (LIEY), Universidad Nacional de Tucumán, CC. 34, (4107) Yerba Buena, Tucumán, Argentina, and Fundación ECORED.

References

Arditi, S. I. and Placci, G.L. 1990. Habitat y densidad de *Aotus azarae* y *Alouatta caraya* en riacho Pilagá, Formosa. *Bol. Primatol. Latinoamericano*, 2(1):29-47.

Bejarano, L. 1974. Estudio sobre fiebre amarilla selvática en la República Argentina. Ministerio de Bienestar Social de la Nación, Buenos Aires, Argentina.

Brown, A. D. 1990. Prioridades de conservación del subtrópico húmedo de la Argentina. *Bol. Primatol. Lat.* 2(1):48-61.

Brown, A. D. and Zunino, G.E. 1994. Habitat, densidad y problemas de conservación de los primates de Argentina. *Vida Silvestre Neotropical*, 3(1): 30-40.

Collias, N. and Southwick, C.W. 1952. A field study of population density and social organization in howling monkeys. *Proc. Am. Phil. Soc.*, 96:143-156.

Cordeiro da Silva, E. 1981. A preliminary survey of brown howler monkeys (*Alouatta fusca*) at the Cantareira reserve (São Paulo, Brazil). *Rev. Brasil. Biol.*, 41(4):897-909.

Crespo, J. A. 1954. Presence of the reddish howling monkey (*Alouatta guariba clamitans* Cabrera) in Argentina. *J. Mammal.*, 35:117-18.

Crespo, J. A. 1974. Comentarios sobre nuevas localidades de mamíferos de Argentina y de Bolivia. *Rev. MACN, Zoología*, 11(1):1-31.

Crespo, J. A. 1982. Ecología de la comunidad de mamíferos del Parque Nacional Iguazú, Misiones. *Rev. MACN, Ecología*, 3(2):45-162.

Crockett, C. M. and Eisenberg, J.F. 1987. Howlers: variation in group size and demography. In: *Primate Societies*, B. Smuts, D. Cheney, R. Seyfarth, R. Wrangham and T. T. Struhsaker (eds.), pp.54-68. The University of Chicago Press, Chicago.

Groombridge, B. 1993. *1994 IUCN Red List of Threatened Animals.* World Conservation Monitoring Centre, Cambridge.

Kinzey, W. G. 1982. Distribution of primates and forest refuges. In: *Biological Diversification in the Tropics*, G. T. Prance (ed.), pp.455-482. Columbia University Press, New York.

Laclau, P. 1994. La conservación de los recursos naturales y el hombre en la selva paranense. *Boletín Técnico de la Fundación Vida Silvestre Argentina*, (20): 1-139.

Massoia, E, Chebez, J.C., Bosso, A., Parera, A. and Masaniche, M. 1992. Nuevas localidades de mamíferos amenazados de la Argentina (primera parte). *APRONA, Bol. Cient.* 21:1-11.

Mendes, S. L. 1989. Estudo ecológico de *Alouatta fusca* (Primates: Cebidae) na Estação Biológica de Caratinga, MG. *Rev. Nordestina Biol.*, 6(2):71-104.

Milton, K. 1982. Dietary quality and demographic regulation in a howler monkey population. In: *The Ecology of a Tropical Forest: Seasonal Rhythms and Long-Term Changes*, E. G. Leigh, A. Stanley Rand and D. M. Windsor (eds.), pp.273-289. Smithsonian Institution Press, Washington, D.C.

Mittermeier, R. A. 1986. A global overview of primate conservation. In: *Primate Ecology and Conservation*, J. G. Else and P. C. Lee (eds.), pp.325-340. Cambridge University Press, Cambridge.

Mittermeier, R. A. and Cheney, D. L. 1987. Conservation of primates and their habitats. In: *Primate Societies.* B. Smuts, D. L. Cheney, R. M. Seyfarth, R. W. Wrangham and T. T. Struhsaker (eds.), pp.477-490. The University of Chicago Press, Chicago.

Redford, K. H. and Eisenberg, J.F. 1992. *Mammals of the Neotropics: The Southern Cone. Volume 2*. The University of Chicago Press, Chicago.

Rode, D. I. and Di Bitetti, M.S. 1994. Parque Provincial Cruce Caballero, Misiones, Argentina. *Yungas*, 4(1-2):8-10.

Rumiz, D. I. 1990. *Alouatta caraya*: population density and demography in northern Argentina. *Am. J. Primatol.* 21:279-294.

Soulé, M. E. 1986. *Conservation Biology: The Science of Scarcity and Diversity*. Sinauer Associates, Sunderland, Massachusetts.

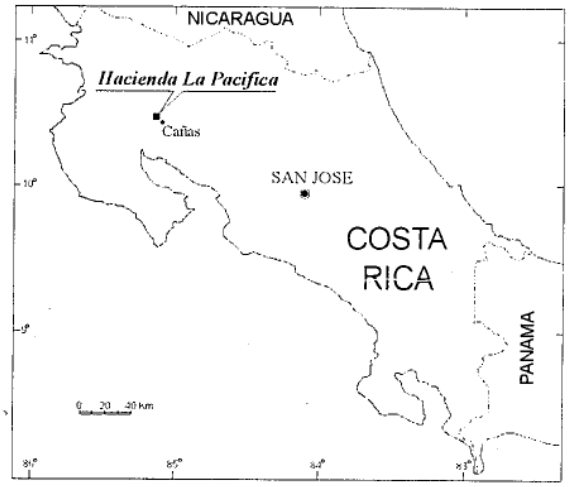
Timm, R. M. 1994. The mammal fauna. In: *La Selva: Ecology and Natural History of a Neotropical Rainforest*, L. A. McDade, K. S. Bawa, H. A. Hespenheide and G. S. Hartshorn (eds.), pp.229-237. The University of Chicago Press, Chicago.

Young T. P. 1994. Natural die-offs of large mammals: implications for conservation. *Conservation Biology*, 8(2):410-418.

Injury and Disease of the Mantled Howler Monkey in Fragmented Habitats

Vulnerability to extinction of a population may be a consequence of insults visiting the bodies of individuals, thereby depressing competitive abilities, reproduction, or predator defense (see Scott, 1988). This note presents data on injury and disease in the mantled howler monkey (*Alouatta palliata* Gray) in three fragmented habitats at Hacienda La Pacifica, Cañas, Guanacaste, Costa Rica. The history of the ranch, its habitats, and a detailed map may be found in Clarke and Zucker (1994), and methods of capture and release are outlined in Scott *et al.* (1976). The study's main purpose was an exhaustive census and morphometric analysis of all howler monkey age-sex classes on the ranch, and was conducted in the early to mid 1970's by Dr Norman J.Scott Jr (U.S.Fish and Wildlife Service, Albuquerque, New Mexico) and his assistants, including this author.

Ad libitum notes of bodily insults were recorded while morphometrics were collected on individual animals. Subjects were classified according to site of capture:



riparian habitat (RIP), deciduous habitat (DEC), and irrigation fields (IRR) (habitats of tropical dry forest environment), and analyzed by sex. Only adults were counted, and individuals could be included in more than one category (for example, "injury" or "disease"). Injuries included dislocated and broken bones, missing teeth, blinded eyes, torn tissue, and scars, while disease included lymphadenopathy, ectoparasites (for example, botfly larvae), fungi, and herpes-like lesions. Table 1 gives these results.

Within habitats, events occur equally between the sexes, similar to the findings of Stuart *et al.* (1990). Between habitats (Total columns), injury occurs equally in RIP, DEC, and IRR (χ^2= 2.69, n.s.) while disease occurs much more frequently in the RIP habitat ($p<.02$, $\chi^2 = 8.9$, df = 2). These results cannot be explained by differences in the representation across habitats of males and females in Scott's census (Table 1, parentheses). Thus, disease appears to be more frequent in RIP habitat as Stuart *et al.*, (1990) found for one specific pathogen of the La Pacifica howlers. These authors identified no ectoparasites (for example, botfly larvae) in their sample. This suggests possible seasonal differences, since the present study was conducted mainly during the dry season months, while that of Stuart *et al.* was carried out primarily during wet season months.

Frankie *et al.* (1974) showed that RIP sites of tropical dry forest environment in Costa Rica are more similar in "tempo and mode" to wet forest sites than to DEC

Table 1. Frequencies of "injury" and "disease" in a fragmented population of howler monkeys at Hacienda La Pacifica, Guanacaste, Costa Rica. Numbers in parentheses = total number of adults by sex and habitat in Scott's census.

HABITAT	INJURY			DISEASE		
	Males	Females	Total	Males	Females	Total
RIP	8	7	15	8 (11)	11 (42)	19
DEC	3	5	8	5 (11)	3 (37)	8
IRR	4	5	9	2 (15)	4 (39)	6