

individuos cada uno) en el bosque situado cerca de la desembocadura del río Tivacuno en el Tiputini, es decir, al occidente de Tambococha.

En base a los estudios realizados en varias zonas de la amazonía ecuatoriana por investigadores de la Universidad Católica del Ecuador y por el autor de este artículo (de Vries *et al.*, 1993; Albuja *et al.*, 1988; Albuja, 1992a, 1992b) se puede afirmar que esta especie en la actualidad habita al sur del río Napo, probablemente en los bosques situados entre este río y el Curaray, área perteneciente al Parque Nacional Yasuní. No existen registros de esta especie al norte del río Napo, por lo que concuerdo con la opinión de Thorington y además comparto el criterio sobre la validez de esta especie, porque considero que se trata de monos de mayor tamaño y muy diferentes de *S.f.lagonotus*; por la coloración son fácilmente diferenciables. Todos los individuos de *S.tripartitus* observados en el medio natural y dados a conocer en este trabajo poseían una coloración y forma muy similar entre sí. Cabe recalcar que las dos localidades estudiadas se encontraron ejemplares de *S.f.lagonotus*.

La población de este primate aparentemente se halla en buen estado de conservación, los animales no se muestran huidizos y soportan la presencia humana sin presentar mayor alteración en su comportamiento. La localidad Tambococha, por hallarse a varios kilómetros de distancia de los poblados de los ríos Napo y Yasuní y por las dificultades de acceso que presenta el área debido a las inundaciones del bosque, la caería por parte de los nativos quichuas y colonos es muy escasa y afecta principalmente a los primates más grandes (*Alouatta* y *Lagothrix*).

El bosque del área donde habitan estos primates se presenta casi inalterado, existen pocos rastros de intervención humana, tales como las trochas y campamentos realizados en los estudios de sismica para la prospección petrolera. Sin embargo, debido al hallazgo de petróleo en varias zonas de este sector amazónico, existe una inminente amenaza a la vida y estabilidad de las poblaciones de esta interesante especie, así como también al resto de especies de este ecosistema, por efecto de los impactos que ocasiona la explotación petrolera, especialmente por la construcción de la carretera Pompeya-Iro, en plena ejecución.

Se recomienda efectuar estudios más profundos para complementar y actualizar la información existente relacionada con la distribución; puesto que, si su distribución se restringe a una pequeña

área de bosque de la amazonía ecuatoriana, esta especie estaría gravemente amenazada.

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### PARASITIC INFECTION IN RED HOWLING MONKEYS IN FOREST FRAGMENTS

Red howling monkeys, *Alouatta seniculus*, in the central Amazonian basin persist in forest fragments resulting from deforestation which can be as small as 10 ha. The highly arboreal howler monkeys stay in the mid- to upper levels of the forest and rarely travel out of the fragments into secondary growth. Thus, they remain functionally isolated in the fragments, unlike the sympatric golden-handed tamarins, *Saguinus midas*, which travel through low secondary growth.

In a study of the effects of habitat fragmentation on red howling monkeys, I focused on the relationship between primate density and endoparasitic infection. Stuart *et al.* (1990) showed that the prevalence of endoparasitic infections was higher in *Alouatta palliata* populations occurring at higher densities. With crowding in a restricted

area, there are greater opportunities for transmission of infectious ova and larvae. I predicted that the prevalence of infection would be higher in groups in smaller forest fragments, since the probability of infection and reinfection and that of coming into contact with contaminated fecal material would be greater due to increased host density.

I carried out this study for fourteen months in upland *terra firme* forest in the reserves of the "Projeto Dinâmica Biológica de Fragmentos Florestais" (Instituto Nacional de Pesquisas da Amazônia/Smithsonian Institution), about 80 km north of Manaus, Brazil. I worked with thirteen red howling monkey groups in three isolated 10 ha fragments, two isolated 100 ha fragments and in continuous forest. Group size was found to be similar between reserves of different sizes (mean = 6.07, range 4-8 individuals). However, the overall density of howlers and other primate species was considerably higher in the 10 ha reserves than in the 100 ha fragments or continuous forest (Table 1).

To determine the prevalence of parasitic infection, I collected fecal samples (N=217) from identified individuals and examined them for the presence of parasites. Overall, 37% of the samples contained parasitic ova of eight helminth species. The parasites found also included four nematodes, two trematodes, one cestode and one acanthocephalan. This is the first finding of an acanthocephalan in a wild howling monkey. The most frequently recorded ova were those of nematodes and trematodes.

Parasitic infection and primate density were positively correlated. The number of samples with parasites present per reserve increased with the density of red howling monkeys ( $r=0.79$ ,  $p<0.05$ ). Samples from the 10 ha reserve monkeys had the greatest number of parasites, followed by the continuous forest, and those from the 100 ha reserves had the lowest (Table 1). An even stronger

positive correlation existed between the percentage of samples with parasites present and the total primate density per reserve ( $r=0.88$ ,  $p<0.01$ ). Again, the 10 ha reserves with the highest number of primates had the highest number of samples with parasites, while the 100 ha reserves, with the lowest primate densities, had the lowest number of samples with parasites. The same pattern resulted when primate density excluding howling monkeys was considered ( $r=0.09$ ,  $p<0.005$ ).

These results indicate that the higher the number of red howling monkeys, and of all primates, in a small isolated reserve, the greater the incidence of endoparasitic infection. However, Stuart *et al.* (1993), working with wild muriquis (*Brachyteles arachnoides*), in the highly fragmented southeastern Atlantic forest of Brazil, found that the prevalence of endoparasitic infection was not positively related to muriqui density. Fecal samples from brown howling monkeys occurring sympatrically with the muriquis contained no ova or larvae. They suggest that differences in vegetation, climate, and the level of disturbance among sites may explain their results. The smaller isolated reserves of the present study, resulting in inflated host densities, crowding, and the use and reuse of areas contaminated with infectious ova and larvae may contribute to the higher prevalence of endoparasitic infection in red howling monkeys in 10 ha fragments.

I am grateful to the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, for permission to carry out this research, and to the "Projeto Dinâmica Biológica de Fragmentos Florestais" (Smithsonian Institution/INPA) for logistical support.

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**Table 1.** Primate density and percentage of red howling monkey fecal samples with parasites present. N = No. of fecal samples analyzed.

Reserve Size ha	Howler Density ind/km <sup>2</sup>	Total Primate Density ind/km <sup>2</sup>	No.Sympatric Species	N	% with Parasites
10	120	270	3	33	60.0
10	50	120	3	22	42.9
10	70	130	2	26	29.2
100	18	42	3	42	29.6
100	20	36	3	28	21.2
10000+	23	61	6	66	38.1

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#### FOURTEEN NEW LOCALITIES FOR THE MURIQUI *BRACHYTELES ARACHNOIDES*

The woolly spider-monkey or murequi, *Brachyteles arachnoides*, is an endangered species endemic to the Atlantic forest of southeastern Brazil. Its biology and distribution have been reviewed by Strier (1992), Mittermeier *et al.* (1987), and Mendes and Chiarello (1993). According to Coimbra-Filho *et al.* (1993), fewer than 2,000 individuals are believed to exist, distributed among 15 widely scattered localities. However, in this paper we report the discovery of another 14 localities where murequis, locally known as "monocarvoeiro", are known to occur in the states of São Paulo, Paraná and Rio de Janeiro. This work is the result of several years of biological inventories, and part of a broader effort by the Instituto Florestal de São Paulo to gain a better knowledge of the native fauna and to elaborate sound strategies for its conservation.

##### São Paulo

The *Ilha do Cardoso State Park (PEIC)* is located on the southern coast (around 25° 03'S, 47° 53'W). This 14,000 ha park is covered by Atlantic forest from sea level to 950 m. In April 1989, four adult murequis were observed in tall (25-30 m) forest (altitude 180 m) near the Pico dos Três Irmãos. Later, in January 1991, two individuals were seen sunning themselves on a large emergent tree by the side of the Pico do Cardoso (altitude 600 m). This record represents the first population to be found on an island. The known population is four individuals in one group. A systematic study of the island's fauna was conducted over four years, starting in 1989, and this small troop was the only one known to exist. Since 1991 no further record or sign of these monkeys has been found, and it is known that at least two of them were killed by local inhabitants. This population is probably extinct.

The *Alto Ribeira State Park (PETAR)* of 35,000 ha is located in the karst region of the Serra de

Paranapiacaba massif (around 24° 25'S, 48° 35'W), and is mostly covered by middle (from 100 m altitude) to high (up to 1,000 m altitude) elevation Atlantic forest. In November 1989, two murequis, an adult female and a three-month old male, were captured by poachers at Bairro da Serra, municipality of Iporanga. The male was sent to the Rio de Janeiro Primate Center (CPRJ/FEEMA) (see Coimbra-Filho *et al.*, 1993). In April 1990, 12 murequis, including at least one infant and two juveniles, were observed at Caboclos valley, at an altitude of 400 m. The forest there is dominated by 20-30 m tall trees with few emergents, and a dense undergrowth with many lianas and epiphytes. Local people informed us of other groups, and it seems likely that there are at least three, or about 25 individuals, in the Park.

The *Serra do Mar State Park (Núcleo Mongaguá)* is located on the coast of São Paulo (around 23° 55'S, 4° 00'W). It has an area of 30,000 ha with altitudes ranging from 100 to 800 m. In May 1982, two adult monkeys were observed at 200 m at Morro do Chapéu. According to locals, three individuals were killed in 1980 at the same site. We also found a purse which had been made from the skin of a murequi. The minimum estimated population for this Park is one group, with two individuals.

The *Serra do Mar State Park (Núcleo Curucutu)* is located in the Serra do Mar massif (around 23° 47'S, 46° 25'W). This Park has an area of 23,697 ha, with altitudes ranging from 200 to 800 m above sea level. In 1991, two murequis were observed by C. Coelho Jr, a biologist carrying out a faunal inventory in the area. The animals were seen in a forest at 600 m altitude, near the source of the Rio Cubatão. The minimum estimated population is one group with two individuals.

The *Serra do Mar State Park (Núcleo Pedro de Toledo/Itariri)*, on the central coast of São Paulo (24° 10'S, 47° 07'W), has an area of 10,323 ha, with altitudes from 100 to 500 m above sea level. In July 1988, four *Brachyteles* were observed in dense Atlantic forest at an altitude of 400 m near Engenheiro Ferraz, a railway station between São Vicente and Pararlheiros. The Guarani Indians who live in the reserve are known to hunt monkeys in this locality as well as the nearby Indian settlement of Bananal. Minimum estimated population is one group with five individuals.

The *Jurupará State Park* is located in the Serra de Paranapiacaba massif. This 26,300 ha reserve is covered by middle to high elevation Atlantic forest.