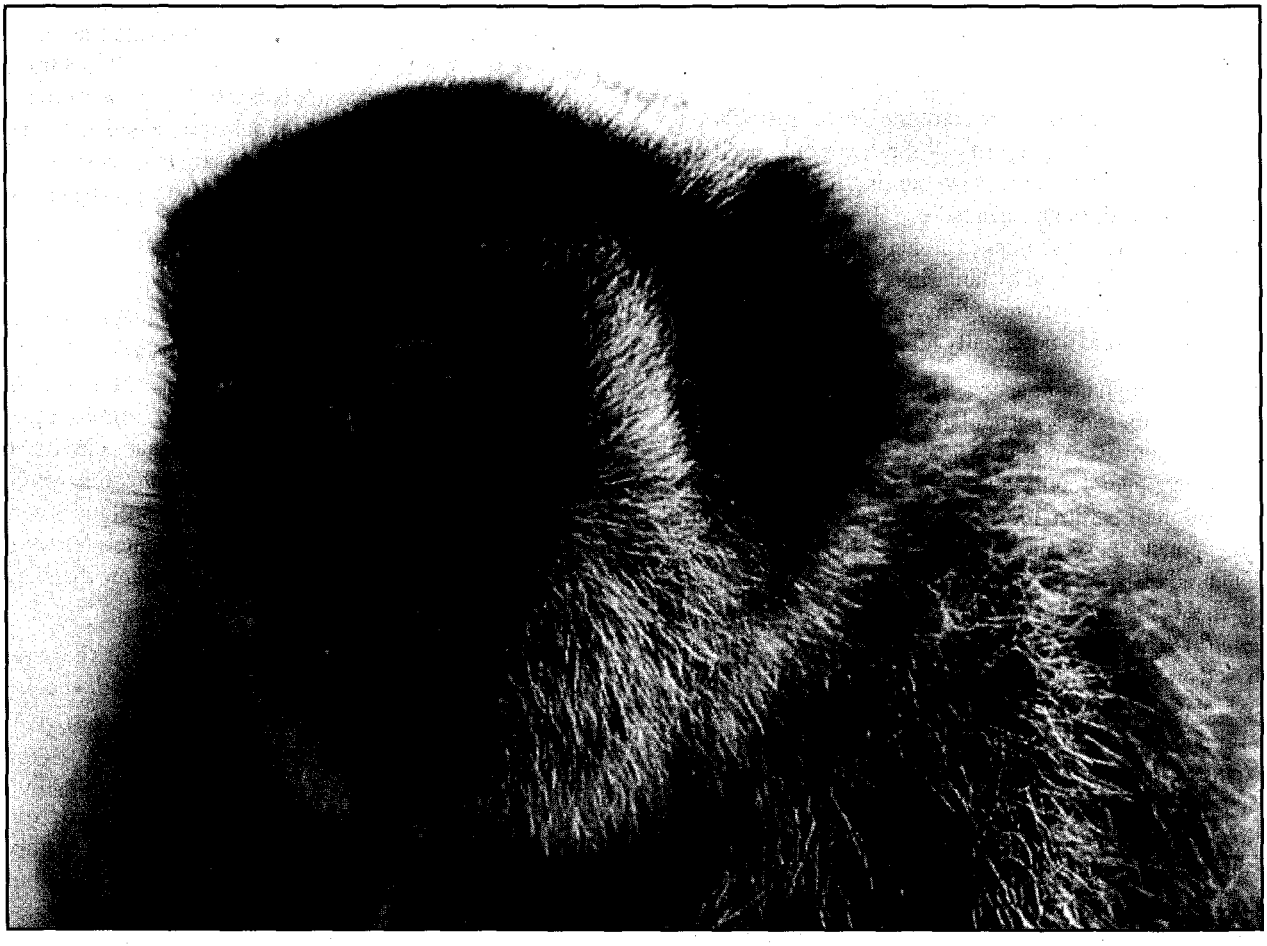
ISSN 1413-4703

NEOTROPICAL PRIMATES

VOLUME 7, NUMBER 3
September, 1999

A Newsletter of the Neotropical Section of the IUCN/SSC Primate Specialist Group



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Articles

Potential Competitors for Exudates Eaten by Saddleback (*Saguinus fuscicollis*) and Moustached (*Saguinus mystax*) Tamarins

Andrew C. Smith

Introduction

The aim of this study was to document competitors for the gums consumed by saddleback (*Saguinus fuscicollis*) and moustached (*S. mystax*) tamarins. Gums are potentially a high energy food source, composed mainly of water, complex polysaccharides, calcium, and trace minerals (iron, aluminium, silicon, magnesium, and sodium) (Nash, 1986). They are most commonly found as small droplets, and whilst they are rapidly depleted they are also rapidly renewed. They can also form larger "globs" or streaks. The way in which they are typically produced means that gum sites seldom permit more than one individual to exploit them at a time (Nash, 1986). Tamarins consume gum from a large number of sources. The majority of these are only used once, with relatively few sources accounting for the majority of gum feeding through repeated use. In contrast to the majority of the fruit resources exploited, even the most important exudate sites used by tamarins provide relatively little food (Smith, 1997). Hence, gums may be considered to be a limited resource of potentially high nutritional value.

Little is known about specific trophic relations within the Amazon rain forest, particularly with respect to relatively minor resources such as exudates. Few Neotropical animals have been reported to eat exudates, with the notable exception of callitrichids. For example, besides tamarins, other potential exudate consumers at the Estación Biologica Quebrada Blanco II in the Peruvian Amazon include such as the white-fronted (*Cebus albifrons*) and brown (*C. apella*) capuchins, and night monkeys (*Aotus nancymai*), based on Hladik and Hladik's (1969) report of gum feeding by related white-throated capuchins (*C. capucinus*) and night monkeys (*A. trivirgatus*). Bush-tailed opossums (*Glironia venusta*), if present, might also eat gums, based on Emmons and Feer's (1990) observation of an individual licking the surface of a branch. Other potential exudate-eaters include the green acouchy (*Myoprocta pratti*) given its taste for gum in captivity (Kelly, 1993), and the Neotropical pygmy squirrels (*Sciurillus pusillus*), observed to feed on "a substance scraped from the inner surface of tree bark" Emmons and Feer (1990, p.176). Amazon dwarf squirrels (*Microsciurus flaviventer*) may also feed on exudate as they occupy a similar ecological niche to Neotropical pygmy squirrels. Further, based on what is known for North American red squirrels (*Tamiasciurus hudsonicus*) (Kilham, 1957), larger Neotropical squirrels may also consume exudate. Species related to these, such as other cebids, opossums, and sciuromorph and caviomorph rodents may also consume gum, as might generalists such as procyonids (e.g. kinkajous, *Potos flavus*, and coatis, *Nasua nasua*) and tayras (*Eira barbara*). Some species of bat, particularly those that feed on fruit and nectar, for example long-tongued bats (Glossophaginae), little fruit bats (Carolliinae), and Neotropical fruit bats (Stenodermatinae) may also take exudates, such as gums, opportunistically. Here I report on my observations regarding the use of exudates as a food source during 1994 and 1995, while carrying out a field study of two tamarin species at the Estación Biologica Quebrada Blanco II in the Peruvian Amazon.

Methods

A mixed-species group of saddleback and moustached tamarins was observed from October 1994 until November 1995 as part of a long-term field study (Smith, 1997) at the Estación Biologica Quebrada Blanco II (4°21'S, 73°09'W) in Peru. Each month several sources of exudate that had recently been exploited by the tamarins were observed from sunrise till sunset (approx. 0550-1750 h). Eleven exudate sites of six species of trees were observed for a total of 257hrs 38min. Notes were taken of any animals that fed upon the exudate, or passed within 10 m of it. Mammals were identified using Emmons and Feer (1990), and birds using Hilty and Brown (1986). No specific identification was possible for arthropods.

Results

The observations are summarised in Table 1. Eleven exudate sites of six species of trees were observed: *Parkia igneiflora* (Mimosaecae; six trees); *Parkia nitida* (Mimosaceae; one tree); *Peltogyne altissima* (Mimosaceae; one tree); *Sloanea floribunda* (Elaeocarpacae; one tree); *Acacia* sp. (Mimosaceae; one tree); and a further tree which was not identified (Field #1494). The majority of the observations were for *Parkia igneiflora*. The exudate sites were visited for a total of 371 minutes, 2.4% of the time that they were observed.

There were few other diurnal competitors for the gum sources used by the tamarins. In addition to both species of tamarins only a squirrel monkey (*Saimiri sciureus*), two Neotropical pygmy squirrels (*Sciurillus pusillus*), two large bees and two large wasps were definitely seen to feed on gum. The behaviour of Amazon dwarf squirrels (*Microsciurus flaviventer*), and other Neotropical pygmy squirrels suggested that gum may have been eaten, but this was not directly observed. It is possible that the scale-breasted woodpecker (*Celeus grammicus*) and the plain brown woodcreeper (*Dendrocincla fuliginosa*) were taking small droplets of gum, but perhaps more plausibly they may have been after insects on the bark surface or larvae in the gum. The southern river otter (*Lutra longicaudis*) was almost certainly not interested in the gum, and was simply travelling through the forest. Of all animals observed to feed, the tamarins used the exudate sources for the greatest proportion of time (*S. fuscicollis*, 51.21%; *S. mystax*, 42.86%).

Cover photograph: The titi monkey, *Callicebus coimbrai*, from Sergipe, Brazil. Photo: S. Kobayashi and A. Langguth, 1999.

Table 1. Summary of animals seen at or near gum sites during dawn to dusk observations.

Tree #	Species	Species (No. in group)	Details	Time feeding (mins)
256	*Parkia igneiflora*	Large wasps (2)	Fed on exudate; 1 bout	2
		S. fuscicollis (5)	Passed, no interest shown	
732	*Parkia igneiflora*	*Lutra longicaudis*	Passed, no interest shown	
522	*Parkia igneiflora*	*Microsciurus flaviventer* (1)	Moved in sub-canopy, 2 bouts*	17; 24
587	*Parkia igneiflora*	*Microsciurus flaviventer* (1)	Moved in sub-canopy, 2 bouts*	3; 12
522	*Parkia igneiflora*	*Sciurillus pusillus* (2)	Moved on trunk for 25 minutes*	?
		Saimiri sciureus (*c.* 25)	Fed on exudate	2
		Large bees (2)	Fed on exudate	2
		S. mystax (7)	Fed on exudate	4
		Dendrocincla fuliginosa (1)	Tapped on trunk for 3 minutes	?
587	*Parkia igneiflora*	*Celeus grammicus* (1)	Moved on trunk for 4 minutes*	?
		Sciurillus pusillus (1)	Pecked trunk for 2 minutes	?
		Sciurillus pusillus (1)	Fed on exudate	13
111	*Parkia igneiflora*	-	-	
111	*Parkia igneiflora*	*S. fuscicollis* (3)	Fed on exudate	1.5
		S. mystax (7)	Passed, no interest shown	
587	*Parkia igneiflora*	*Sciurillus pusillus* (1)	Fed on exudate	3
732	*Parkia igneiflora*	*S. fuscicollis* (3)	Passed 5 times, no interest shown	
1515	*Parkia igneiflora*	*S. fuscicollis* (5)	Fed on exudate, 3 bouts	53; 12; 20
		S. mystax (7)	Fed on exudate	12
732	*Parkia igneiflora*	-		
454	*Parkia nitida*	*S fuscicollis* (3)	Fed on pod-exudate	90
		S. mystax (5)	Fed on pod-exudate	150
1163	*Peltogyne altissima*	*Saimiri sciureus* (*c.* 25)	Passed, no interest shown	
1085	*Sloanea floribunda*	*S. fuscicollis* (3)	Fed on exudate, 2 bouts	6; 15
		S. mystax (7)	Passed, no interest shown	
1085	*Sloanea floribunda*	*S. fuscicollis* (5)	Fed on exudate, 3 bouts	7; 32; 8
1085	*Sloanea floribunda*	-	-	
1085	*Sloanea floribunda*	*S. fuscicollis* (5)	Fed on exudate	18
1471	*Acacia* sp.	-	-	
1471	*Acacia* sp.	*S. fuscicollis* (5)	Passed, no interest shown	
1471	*Acacia* sp.	-	-	
1494	No ID	*S. fuscicollis* (5)	Fed on exudate, 3 bouts	40; 1: 32
		S. mystax (7)	Fed on exudate, 4 bouts	120; 55; 168; 16

* Behaviour suggested that gum was being eaten, but no direct observation of consumption was seen.

Discussion

The results of the study indicate that, saddleback and moustached tamarins were the principal diurnal species to exploit the gums produced by the tree and liana species observed. Squirrel monkeys, Neotropical pygmy squirrels, and possibly Amazon dwarf squirrels may also feed on the gum, but at such low rates that competition with the tamarins would appear to be negligible. Other primates, procyonids, and bats may also exploit gum resources opportunistically, although at an even lower frequency than tamarins.

Gums do not form a sizeable proportion of the diet of most Neotropical mammals, with the notable exception of callitrichids, in particular marmosets (*Callithrix* spp.) and pygmy marmosets (*Cebuella pygmaea*). Typically, few authors have considered gums to present a digestive challenge to the primates that consume them. However, as Power (1991) points out, they may be considered to be a type of dietary fibre (Cummings, 1981; Van Soest, 1982; Kritchevsky, 1988), and thus be difficult for mammals to digest (Monke, 1941; Booth *et al.*, 1949; Hove and Herndon, 1957; Booth and Henderson, 1963). Their complex polysaccharide structure may render them resistant to normal mammalian digestive enzymes (Cummings, 1981; Van Soest, 1982; Kritchevsky, 1988). As a consequence, microbial fermentation may be required for their digestion. They may contain phenolic or other secondary compounds requiring rapid excretion or detoxification. This may reduce the net benefit to below that potentially obtained from the majority of fruits. Coupled with their potentially limited availability, this may explain why the gum sites were visited by so few diurnal animals other than the saddleback and moustached tamarins. Even the rate at which the tamarins exploited the gum sites is well below that recorded for more gumivorous pygmy marmosets. Ramirez *et al.* (1978), for example, carried out focal observations on a *Quararibea rhombifolia* tree, and recorded gum feeding by at least one *Cebuella pygmaea* for 53% of the day.

Acknowledgments

Authorisation to conduct the field work was kindly given by the Dirección Regional de Recursos Naturales y Medio Ambiente in Iquitos (No. 002-94-GRL-CTAR-DRA). I am grateful to Dr. E. Montoya from the Proyecto Peruano de Primatología for his help and support with logistical matters. Financial assistance was provided by the Department of Psychology, University of Reading. I thank Ney Shahuano, Arsenio Cordova and Hugo Huanaquiri for their help in observing the gum trees, and Dr. J. Ruiz at the Herbarium Amazonense (AMAZ), Universidad Nacional de la Amazonía Peruana (UNAP), Iquitos, Peru, for identifying botanical voucher specimens.

Andrew C. Smith, Department of Psychology, University of Reading, P. O. Box 238, Reading, RG6 6AL, UK. E-mail: <tahuayo@hotmail.com>. *Current address*: Department of Psychology, University of Stirling, Stirling FK9 4LA, Scotland, UK.

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An Observation of Carnivory by a Captive Pygmy Marmoset (*Callithrix pygmaea*)

Wendy R. Townsend
Robert B. Wallace

Carnivory is rarely observed amongst most primate species in the wild. Most reports have concerned large bodied species such as baboons (Strum, 1981; Hamilton and Busse, 1982), and especially the cooperative hunting behavior of chimpanzees (Teleki, 1973; Goodall, 1986; Boesch and Boesch, 1989). Nevertheless, many other primate species are known to opportunistically kill and consume vertebrates including, reptiles, birds and small mammals (Wahome *et al.*, 1988; Fedigan, 1990; Cordeiro, 1994; Digby and Barreto, 1998).

Pygmy marmosets (*Callithrix pygmaea*) forage principally on exudates from gum-producing vines and trees, although they also eat significant quantities of arthropods (Soini, 1988; Townsend, in press). Most other species in the *Callithrix* genus are frugivore/insectivores (Stevenson and Rylands, 1988), and callitrichids in general display this dietary pattern with varying degrees of plant exudate consumption (Rylands, 1984; Goldizen, 1987; Rylands and Faria, 1993). In terms of vertebrate consumption, callitrichids have been observed eating frogs, lizards (*Anolis* spp.), and birds, but these take up a small proportion of overall diets (Goldizen, 1987; Snowdon and Soini, 1988; Stevenson and Rylands, 1988; Peres, 1993; Digby and Barreto, 1998; Townsend, in press).

In 1984 in Araracuara, Colombian Amazon, one of us (WRT) witnessed an attack by a wild caught pet pygmy marmoset upon a bird. The observer was sitting at a round, wide-edged table with a group of people when a small finch stunned itself against a window and was brought in and placed upon the table. A male pygmy marmoset was on the ground with a long string attached to its owner. Upon spotting the bird, the marmoset jumped up to the edge of the table and for a split second, looked at the bird. The marmoset then disappeared from view until its head appeared about one quarter of the way around the table. It looked quickly at the bird and disappeared again, only reappearing as it crept all the way around the edge of the table. The marmoset then jumped on the bird from behind, put its left hand on the bird's throat and with the right hand on its beak, twisted the head upward leaving the neck exposed and bit directly into the bird's neck. Lowering the beak as the bird was convulsing, the marmoset then began biting through the bird's brain case. The owner removed her pet from the bird before it could be determined to what extent the primate would have consumed it's prey.

In a review of the *Callithrix* genus, fledgling birds and eggs had been suggested as possible dietary constituents for free-ranging animals (Stevenson and Rylands, 1988). Recent observations of vertebrate predation by common marmosets (*C. jacchus*) in the wild (Digby and Barreto, 1998) and in captivity (Rothe, 1999) have confirmed this hypothesis. Eggs and nestlings are also occasionally consumed by buffy-headed marmosets (*C. flaviceps*) and buffy tufted-ear marmosets (*C. aurita*) (Ferrari, 1988; Muskin, 1984). To our knowledge, this represents the first recorded case of a pygmy marmoset killing a bird, and is especially interesting given that *C. pygmaea* is the smallest Neotropical primate species. The fact that the marmoset initially attempted to consume the brain of the bird is notable given that this organ is particularly energy rich. Observations of free-ranging populations have revealed similar behavior with regards to lizards and frogs which are 'highly contested among group members' (Stevenson and Rylands, 1988). Thus, the prioritization of brain consumption in vertebrate prey probably reflects an optimal foraging strategy in an intra-specific feeding competition context.

Critically, not only did the captive marmoset kill and begin

to consume the bird (until prevented), it also clearly 'stalked' its prey, as has been reported for free-ranging populations during invertebrate foraging (Soini, 1988; Stevenson and Rylands, 1988). Indeed, a similar observation of stalking, capturing, killing (with a bite to the head) and consuming a bird is reported for a captive *Saguinus* (Schauffelin, 1958 in Snowdon and Soini, 1988). A working hypothesis is that this hunting behavior may be opportunistically extended to birds in the wild. Digby and Barreto (1998) report that free-ranging common marmosets 'seek out and inspect bird nests', and that birds were occasionally observed mobbing marmosets suggesting recognition of a predator threat. Intriguingly, Soini (1988) reports that pygmy marmoset core use areas have fewer birds than surrounding areas of the home range, and that flocking birds are often chased. Soini (1988) suggests this behavior maybe designed to reduce inter-specific feeding competition with birds. This observation suggests there may also be some risk to those that are careless.

Wendy R. Townsend, Proyecto de Investigación sobre los Recursos Naturales, CIDOB/DFID, Casilla 6135, Santa Cruz, Bolivia, and **Robert B. Wallace**, Wildlife Conservation Society, 185th Street and Southern Boulevard, Bronx, New York, 10460, U.S.A. *Address correspondence to*: Wendy R. Townsend, Casilla 6266, Santa Cruz, Bolivia. E-mail: <wendyt@caoba.entelnet.bo>.

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A Northeastern Extension of the Distribution of *Aotus infulatus* in Maranhão, Brazil

José de Sousa e Silva Júnior
Marcus E. B. Fernandes

Introduction

The night monkeys (*Aotus* Humboldt, 1811) are predominantly Amazonian in their distribution, although they also extend into Central America and south into Paraguay and Argentina (Hershkovitz, 1983). A number of recent studies have adjusted the geographic distributions as indicated by Hershkovitz (1983) (for example, Aquino and Encarnación, 1988; Timm, 1988; Pieckzarca, 1993; Brooks, 1993, in Brooks, 1996; Ford, 1994; Silva Jr. *et al.*, 1995; Rodríguez-Luna *et al.*, 1996). Silva Jr. *et al.* (1995) reported the occurrence of *A. infulatus* Kuhl, 1820 on the islands of Caviana and Marajó,

and north of the Amazon estuary in a small area of southeastern Amapá. According to Hershkovitz (1983), the range of *A. infulatus* is restricted in the east by the Rios Gurupí and Tocantins, and although Silva Jr. *et al.* (1992) and Lopes (1993) recorded its occurrence east of the Rio Gurupí, the range limits as given by Hershkovitz (1983) have been maintained in the recent literature (see, for example, Ford, 1994; Emmons and Feer, 1997; Eisenberg and Redford, 1999). Here we report on a study examining new localities for, and the habitats occupied by, *A. infulatus* in the easternmost part of the range of the genus in the state of Maranhão, confirming its occurrence east as far the Rio Parnaíba.

Material and Methods

A number of expeditions have been carried out since 1989 in order to examine the range limits of *A. infulatus* in the state of Maranhão. Specimens were collected and further evidence was obtained through direct observation (sightings and vocalizations), interviews and from animals kept as pets. The specimens collected were compared with museum specimens at the Museu Paraense Emílio Goeldi (MPEG), Belém, the National Museum of the Federal University of Rio de Janeiro (MNRJ), and the Zoology Museum of the University of São Paulo (MZUSP). All the field specimens collected were deposited in the scientific collection of the MPEG. The localities were plotted on Hershkovitz's map (Hershkovitz, 1983, Fig. 2, p.214) (see Fig. 1).

Results and Discussion

Table 1 summarizes the information obtained in this study, including the localities visited, the habitats in which the specimens were registered, and the nature of each record. The state of Maranhão covers a mosaic of biomes resulting from the transition from Amazonia rain forest to the bush savanna (*Cerrado*) of central Brazil, and the dry thorn scrub and deciduous forest (*Caatinga*) of the northeast. *A. infulatus* was registered in 20 new localities, all east of the Rios Tocantins and Gurupí. These localities are spread through the following five landscapes in Maranhão: Amazonia, Zona dos Cocais (*Orbignya* palm tree forest), coastal areas, *Cerrado*, and the transition zone eastward (between Amazonia, *Cerrado* and *Caatinga* biomes). In Amazonian forest, *A. infulatus* was registered in a few degraded *terra firme* forests mixed with patches of *igapó* (flooded forest). In the Zona dos Cocais records indicated the presence of *A. infulatus* in disturbed forest patches, locally called "*capoeira alta*", as well as in the extensive

Table 1. Field data on the occurrence of *Aotus* and habitat in the states of Maranhão and Piauí, Brazil.

Locality	Landscape	Habitat	Record Type
1. Jurema, Amarante	Amazonia	Secondary forest	Specimen collected; interviews
2. Near to Grajaú	Amazonia	Secondary forest vocalizations, and pets	Direct observation:sightings,
3. Fazenda MAPISA, Buriticupu	Amazonia	Secondary forest and vocalizations	Direct observation: sightings
4. Near to Santa Luzia	Amazonia	Secondary forest vocalizations and pet.	Direct observation:
5. Near to Arame	Amazonia	Secondary forest	Interviews
6. Santa Maria, Alcântara	Coastal area	Mangrove/*Capoeira*/Secondary forest	Interviews
7. Canelatiua, Alcântara	Coastal area	Mangrove/*Capoeira*/Secondary forest interviews	Direct observarion: sightings;
8. São José das Verdades, Bacabal	Zona dos Cocais	*Babaçual-Capoeira*/Secondary forest *Orbignya* sleeping trees	Interviews: local extinction and
9. Near to Lago Verde	Zona dos Cocais	*Babaçual/Capoeira* trees	Interviews: *Orbignya* sleeping
10. Morada Nova,Vitória do Mearim	Zona dos Cocais	*Babaçual*/Secondary forest	Direct observation: vocalizations; interviews: *Orbignya* sleeping trees
11. Pedra Preta, Lago da Pedra	Amazonia	Secondary forest	Specimens collection; interviews
12. Eight localities near to Bacabal (both banks of the Rio Mearim)	Zona dos Cocais	*Babaçual/Capoeira*/Secondary forest	Interviews: local extinction
13. Near by São Luís Gonzaga	Zona dos Cocais	*Babaçual*/Secondary forest	Interviews
14. Near by Coroatá	Zona dos Cocais	*Babaçual/Capoeira* and vocalizations	Direct observation: sightings
15. Nova Guiné, São Mateus	Zona dos Cocais	*Babaçual/Capoeira*	Interviews
16. Lago Verde, right bank of the Rio Mearim, São Mateus	Zona dos Cocais	*Babaçual/Capoeira*/Gallery forest	Interviews: local extinction
17. Palmeiral, Matões	Zona dos Cocais	*Babaçual*/Secondary forest	Direct observation: sightings, vocalizations and sleeping trees
18. São Miguel, Caxias	Transition zone	*Cerradão/Caatinga/Babaçual*	Specimens collected; direct observation: sightings and vocalizations; interviews: *Orbignya* sleeping trees
19. Brejinho, Caxias	Transition zone	*Cerradão/Caatinga/Babaçual*	Interviews
20. Estiva, Alto Parnaíba	Cerrado	*Cerrado*/Gallery forest	Interviews
Localities in the state of Piauí: David Caldas, Novo Nilo, União, and Santa Rita	Transition zone		Not present - Interviews

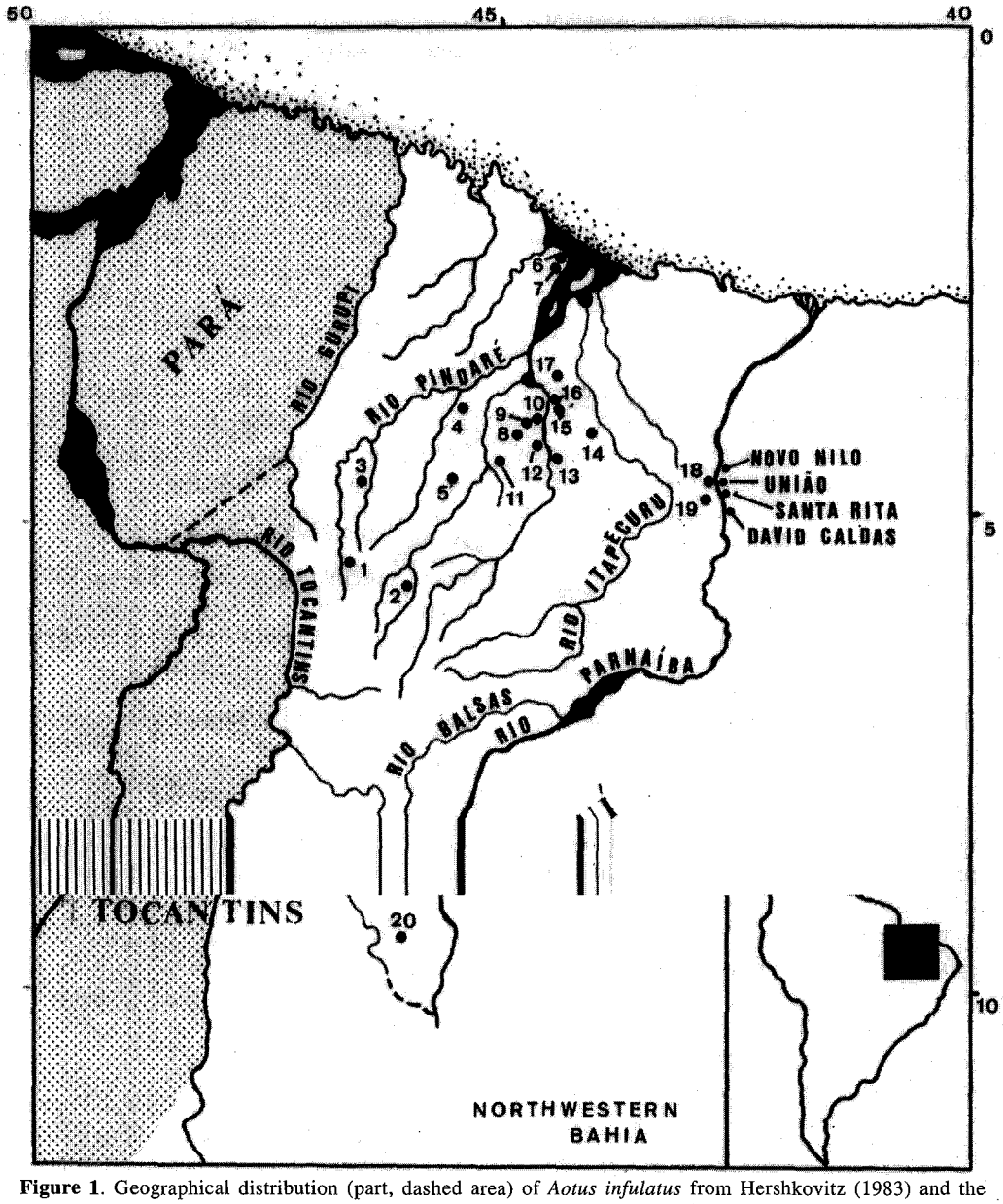

Figure 1. Geographical distribution (part, dashed area) of *Aotus infulatus* from Hershkovitz (1983) and the new localities in the state of Maranhão: 1. Jurema, municipality of Amarante, about 05°28'S, 46°34'W; 2. Near to Grajaú, about 05°49'S, 46°08'W; 3. Fazenda MAPISA, municipality of Buriticupu, about 04°36'S, 46°30'W; 4. Near to Santa Luzia, Rio Zutiua, about 03°53'S, 45°28'W; 5. Near to Arame, about 04°42'S, 45°55'W; 6. Santa Maria, municipality of Alcântara, 02°25'S, 44°39'W; 7. Canelatiua, municipality of Alcântara, 02°28'S, 44°43'W; 8. São José das Verdades, municipality of Bacabal, about 04°57'S, 44°28'W; 9. Near to Lago Verde, about 04°04'S, 44°45'W; 10. Morada Nova, left bank of the Rio Ipixuna-Açu, municipality of Vitória do Mearim, near to 03°28'S, 44°53'W; 11. Pedra Preta, municipality of Lago da Pedra, 04°26'S, 45°00'W; 12. Eight localities on both banks of the Rio Mearim, near to Bacabal, around 04°12'S, 44°47'W; 13. Near to São Luís Gonzaga, right bank of the Rio Mearim, 04°22'S, 44°34'W; 14. Near to Coroatá, 04°08'S, 44°08'W; 15. Nova Guiné, municipality of São Mateus, about 04°01'S, 44°27'W; 16. Lago Verde, right bank of the Rio Mearim, municipality of São Mateus, near to 04°01'S, 44°27'W; 17. Palmeiral, municipality of Matões, about 03°40'S, 44°27'W; 18. São Miguel, left bank of the Rio Parnaíba (opposite to União, State of Piauí), municipality of Caxias, 04°39'S, 43°36'W; 19. Brejinho, near to the left bank of the Rio Parnaíba, municipality of Caxias, 04°49'S, 42°26'W; 20. Estiva, municipality of Alto Parnaíba, 09°28'S, 46°03'W.

areas of *Orbignya* sp. palm trees locally referred to as *babaçual*. These palms are used by night monkeys as sleeping trees. The coastal area is dominated by red mangroves (*Rhizophora* sp.), adjacent to tall secondary growth (*Capoeira alta*). Night monkeys can be found throughout these contiguous areas along the coastline. *Cerrado* is the dominant vegetation in the south of the state. Information collected in the municipality of Alto Parnaíba strongly suggested the occurrence of *A. infulatus* only on the left bank of the river. Finally, there is a transition zone in the east of the state of Maranhão, dominated by mosaics and transitions of *Cerrado* forest (*cerradão*), gallery forest, *babaçual*, and *caatinga*, as well as associations of some local palm trees such as *Orbignya* and *Copernicia*. *A. infulatus* was collected in the *cerradão*, near to a patch of *Orbignya* forest. Direct observations (sightings and vocalizations), to-

gether with information from local people, showed that *A. infulatus* forages in all these environments with the exception of *caatinga*. Local people also emphasized the use of *Orbignya* as sleeping trees. All the information obtained in São Miguel and Brejinho, as well as in four other localities on the right bank of the Rio Parnaíba, state of Piauí (David Caldas, Novo Nilo, União, and Santa Rita), indicated that *A. infulatus* was restricted to the left bank of the river in the state of Maranhão.

Conclusions

The results showed that the geographical distribution of *A. infulatus* extends east to the left bank of the Rio Parnaíba, and hence including all of the state of Maranhão. Although the distribution may not be continuous in this part of Maranhão, the night monkeys were found in many different forest types. The only exceptions were severely degraded areas such as the region nearby the city of Bacabal.

Although the Rio Parnaíba evidently delimits the geographical distribution of *A. infulatus* in the east of its range (and that of the genus), it has features which would indicate that it is not an efficient barrier (see Ayres and Clutton-Brock, 1992). It is a meandering, slow, white-water river, with a high sediment load, and is not a natural barrier for any other primate species. *Callithrix jacchus*, for example, a smaller species than *A. infulatus*, occurs on both banks of the Rio Parnaíba (Silva Jr., unpublished data), and it is reasonable to suppose that enclave populations of *A. infulatus* may occur on the right bank, as has been recorded for other night monkeys by Hershkovitz (1983). Further investigation may also extend the eastern limits of the range of *A. infulatus* toward the northwest of the state of Bahia. This possibility is suggested by a museum specimen (MNRJ-3904), collected by R.M. Gilmore from "north-west Bahia" which has to date been considered to be of mistaken origin. With the range extension described here, the geographical distribution of *A. infulatus* has the largest range of the genus *Aotus*.

Rylands *et al.* (1995) consider *A. infulatus* to be a common species without any risk of extinction. However, there is no information on its biology and ecology from areas outside the Amazon. This study showed that *A. infulatus* uses previously unrecorded environments, such as the meso-habitats described as part of the Zona dos Cocais, coastal area, and the transition zone from eastern Maranhão. Further research is needed to study the ecology of these night monkeys, vital for future conservation programs in a region which has suffered widespread deforestation and degradation of its natural environments.

Specimens Collected and Examined

Specimens collected and material examined at the Museu Paraense Emílio Goeldi (MPEG), Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ), and Museu de Zoologia da Universidade de São Paulo (MZUSP): *Aotus infulatus*: **AMAPÁ**: Carmo do Macacoari, municipality of Itaubal (MPEG-22522, 22523, 24035); **PARÁ**: Ponta de Pedras, Marajó Island (MPEG-8875, 8876, 8877); Arari Lake, Marajó Island (MPEG-99, 100); Fazenda Santana, Caviana Island, municipality of Chaves (MPEG-23058, 23059, 24130, 24131, 24132); Maiandeua Island, municipality of Maracanã (MNRJ-23102); Nova Timboteua (MNRJ-24840, 24841); Vila Brabo, right bank of Rio Tocantins (MPEG-12177, 12178); Cocal, right bank of Rio Tocantins (MPEG-11851); Timbozal, left bank of Rio Tocantins (MPEG-11852, 11853); Sítio Calandrinho, left bank of the Rio Tocantins (MPEG-8869, 8870); Saúde, left bank of the Rio Tocantins (MPEG-12179); Conceição do Araguaia (MPEG-1321); **MARANHÃO**: Jurema, municipality of Amarante (MPEG-23036); Pedra Preta, municipality of Lago da Pedra (MPEG-23037); São Miguel, right bank of Rio Parnaíba, municipality of Caxias (MPEG-24123, 24124, and field number CZ-1420); **BAHIA**: northwestern Bahia (MNRJ-3904).

Acknowledgments

We are grateful to Mariana Moncassin Vale for help in the determination of the geographical coordinates of some localities, and to Diego Astúa de Moraes for reviewing this paper.

José de Sousa e Silva Júnior, Departamento de Zoologia, Museu Paraense Emílio Goeldi, Caixa Postal 399, 66040-170 Belém, Pará, Brazil, and **Marcus Emanuel Barroncas Fernandes**, Departamento de Oceanografia e Limnologia, Universidade Federal do Maranhão, Praça Gonçalves Dias 21, Centro, 65020-240 São Luís, Maranhão, Brazil. *Current address of first author*: Laboratório de Vertebrados, Departamentos de Ecologia e de Genética, CCS, Universidade Federal do Rio de Janeiro, Caixa Postal 68020, 21941-970 Rio de Janeiro, Rio de Janeiro, Brazil. E-mail: <cazuza@biologia.ufrj.br>.

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Patrones de Actividad de *Alouatta palliata* en un Fragmento de Selva en Los Tuxtlas, México

Teresita de Jesús Ortíz Martínez
Saúl Juan Solano
Alejandro Estrada
Rosamond Coates-Estrada

En México, la selva húmedo tropical de la región de Los Tuxtlas resguarda la distribución geográfica más septentrional del género *Alouatta* en el Continente Americano representado por la especie *A. palliata* (*v.* Estrada y Coates-Estrada, 1984). Desdichadamente gran parte del hábitat de esta especie ha sido destruido o fragmentado por el hombre como parte del proceso de conversión de la selva a pastizales y, en menor medida, a monocultivos (Estrada y Coates-Estrada, 1996). Nuestro conocimiento sobre el comportamiento y ecología de *Alouatta* bajo condiciones de fragmentación y aislamiento del hábitat en el Neotrópico es aún escaso. Tal información es indispensable para generar modelos de conservación que eviten la desaparición continuada de representantes de las especies de interés.

Los patrones de actividad diurnos de monos aulladores (*Alouatta* spp.) y la relación que éstos guardan con las condiciones de su hábitat ha sido motivo de estudio en diferentes partes del Neotrópico (Serio-Silva, 1992; Bicca-Marques y Calegaro-Marquez, 1994; Stoner, 1996). Los monos aulladores se han caracterizado por presentar patrones de baja actividad, descansando más de la mitad de su tiempo diurno, lo cual se atribuye a la necesidad de procesar grandes cantidades de fibra vegetal como

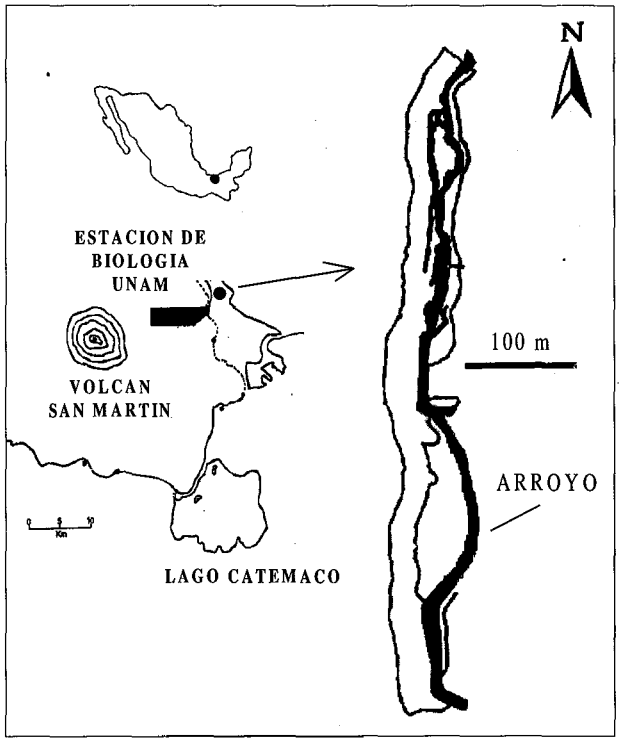

Figura. 1. Ubicación de la zona de estudio y del fragmento habitado por la tropa de monos aulladores. Note la forma alargada y angosta del sitio.

resultado de una dieta rica en hojas (Milton, 1980). Las variaciones en los patrones de actividad de este primate parecen estar relacionados con el grado de dispersión en el tiempo y espacio del recurso alimentario (Crockett y Eisenberg, 1987; Serio-Silva, 1992), con su densidad y con variables abióticas como el clima (Chivers, 1969, Glander, 1979); así como también con la edad y sexo de los aulladores (Bicca-Marques y Calegaro-Marques, 1994). La perturbación antropogénica de los hábitats naturales de este primate también tiene una influencia importante sobre la estrategia de asignación de tiempo y energía a las diferentes actividades vitales (crecimiento, mantenimiento y reproducción), pero hasta el momento existe poca información al respecto. Así, este trabajo presenta información sobre el patrón de actividad general para un

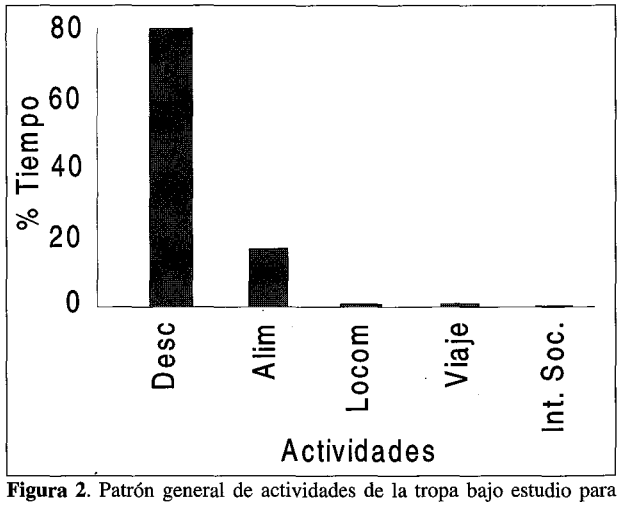

Figura 2. Patrón general de actividades de la tropa bajo estudio para el ciclo anual reportado.

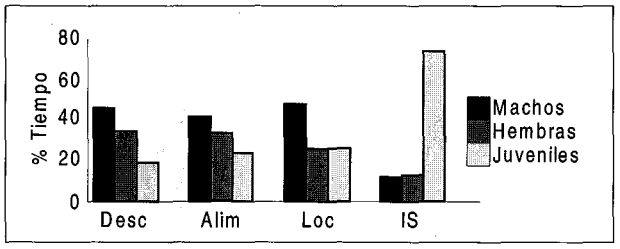

Figura 3. Patrón general de actividades para las clases de edad y sexo en la tropa estudiada.

ciclo anual de una tropa de *A. palliata* existiendo en un fragmento de selva aislado.

Metodología

Este estudio se llevó a cabo en la región de Los Tuxtlas, ubicada al sureste del estado de Veracruz, en México y localizada geográficamente entre los 95°03' y 95°08' de longitud Oeste y 18°28' y 18°38' de latitud Norte (Fig. 1). La precipitación y temperatura medias anuales son 4900 mm y 27°C respectivamente. En esta región se encuentra ubicada la Estación de Biología "Los Tuxtlas" del Instituto de Biología de la Universidad Nacional Autónoma de México. En las inmediaciones existen constelaciones de fragmentos de selva aislados unos de otros por distancias variables. El estudio se realizó en uno de estos fragmentos con una extensión de 3.6 ha y de forma alargada y angosta (Fig. 1). El fragmento formaba parte de un corredor semicontinuo de vegetación selvática ubicado en los bordes de un arroyo y estaba habitado por una tropa de *A. palliata* compuesta por dos machos adultos, dos hembras adultas, un juvenil y dos infantes.

Las observaciones del comportamiento de los aulladores se efectuaron durante 10 días en cada mes del ciclo anual. En cada día se dedicó una hora de observación a cada individuo entre las 06:00 y las 18:00 horas. Para cada sujeto se registró el tiempo dedicado a cada una de cinco actividades generales: descanso, alimentación, locomoción, interacciones sociales y viaje (este último definido como movimientos >20 m del árbol base). Los resultados fueron expresados como porcentajes del tiempo total registrado y/o tasas de tiempo por hora de observación (Ortiz-Martínez, 1997).

Para conocer el patrón de dispersión en el espacio de las especies arbóreas usadas por *Alouatta* como fuente de alimento se calculó el índice de dispersión de Morisita (Brower y Zar, 1981, donde: 0 = uniforme, 1 = azar, >1 = agregado) para aquellas plantas con un d.a.p > 25 cm. El patrón de dispersión temporal del recurso se obtuvo a partir de registros fenológicos mensuales en estas especies, anotando la presencia de hojas y frutos e indicando su estado de madurez. Para estos datos también se calculó el índice de Morisita como un índice de dispersión temporal.

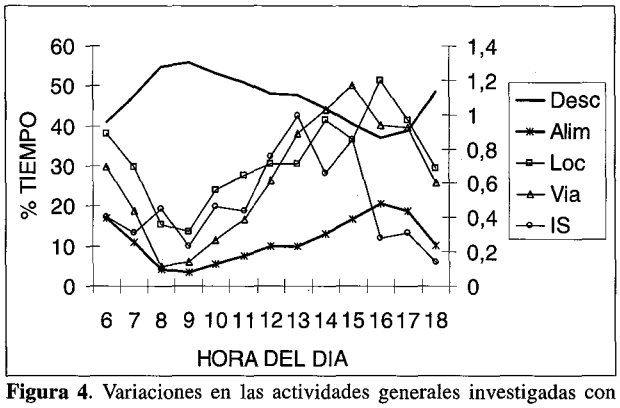

Figura 4. Variaciones en las actividades generales investigadas con relación al periodo diurno de actividad.

Resultados

El 80% del tiempo registrado en el ciclo anual para las cinco actividades generales fue aportado por la actividad de descanso (47.8 min/hr) y el 17% lo contribuyó la actividad de alimentación (10.3 min/hr). Las tres actividades restantes contribuyeron al 3% del tiempo de registro (Fig. 2).

En cuanto a las clases de edad y sexo representadas en el grupo, los machos adultos presentaron las mayores tasas (minutos/hora de registro) en actividades como descanso, locomoción y alimentación. Las hembras adultas tuvieron las tasas más altas en la actividad de viaje seguidas de las actividades de descanso y alimentación. Las tasas de ocurrencia de "interacciones sociales" fueron significativamente más bajas para los adultos de ambos sexos, pero tuvieron valores de 76 registros/hora de observación para los juveniles (la mayor parte se trató de registros de juego social) (Fig. 3).

El patrón diurno general de actividades mostró un patrón biomodal para las actividades de descanso y alimentación con una fuerte manifestación de esta última conducta temprano en la mañana y en la tarde; las otras tres actividades generales presentaron sus mayores niveles hacia el segmento vespertino del periodo diurno (Fig. 4).

La tasa media mensual de la actividad descanso estuvo relacionada positivamente con la temperatura máxima media mensual (r_s = 0.74, $p<0.05$) presentando la tasa de ocurrencia más alta (53 min/hora de observación) en Mayo, cuando la temperatura máxima media mensual fue de 39°C. La tasa media mensual de la actividad alimentación estuvo negativamente relacionada a la temperatura máxima (r_s = -0.52, p = 0.03) y a la temperatura mínima (r_s = -0.80, p=0.001) media mensuales. Las actividades locomoción y alimentación estuvieron asociadas negativamente con la temperatura máxima media mensual (r_s = -0.67, $p<0.05$ y r_s = -0.82, $p<0.05$ respectivamente).

El censo de la vegetación en el sitio de estudio indicó la presencia de 536 árboles de las especies usadas por los aulladores como fuente de alimento y el cálculo del índice de dispersión de Morisita (Id) indicó que el 26% de las especies presentaron un patrón agregado, el 11% un patrón al azar y el 63% un patrón uniforme. Las especies arbóreas que presentaron un patrón espacial agregado contribuyeron al 29% del tiempo de alimentación registrado, las especies con un patrón espacial al azar contribuyeron al 61% y las especies con un patrón espacial uniforme al 10%. Solamente el porcentaje de tiempo dedicado a la actividad

viaje estuvo correlacionado con los valores del índice de dispersión de Morisita ($r_s = 0.75$, $p = 0.002$).

Las tasas mensuales de locomoción y viaje tuvieron correlación negativa ($r_s = -0.59$, $p = 0.02$) y positiva ($r_s = 0.51$, $p = 0.04$) respectivamente con el número de especies que presentaban hojas jóvenes en los registros fenológicos mensuales. Las tasas mensuales medias de actividades como descanso y alimentación estuvieron asociadas negativamente ($r_s = -0.52$, $p=0.01$) y positivamente ($r_s = 0.48$, $p = 0.03$) respectivamente a los valores mensuales del Indice de Sorensen, calculado para medir el traslape intermensual en el uso de especies arbóreas como fuente de alimento. Las tasas medias mensuales de locomoción y viaje estuvieron negativamente asociadas a los valores máximos del índice de dispersión temporal (Morisita) ($r_s = -0.63$, $p = 0.01$ y $r_s = -0.77$, $p = 0.001$, respectivamente).

Discusión

Los períodos largos de inactividad de los aulladores funcionan como un mecanismo regulador que les permite enfrentar la presión de abastecer sus requerimientos energéticos a partir de una dieta alta en follaje y/o baja en energía rápidamente digerible (Milton *et al.*, 1979). La tropa bajo estudio consumió hojas en un 57% del tiempo total de registro en alimentación al año, enfatizando las tendencias folívoras de la especie (Juan, 1997). La predominancia de la actividad de descanso en el patrón de actividad de la tropa es consistente con lo reportado previamente para especies del género (Kinzey, 1997). Es decir, un modo de vida conservador de energía. Sin embargo, este patrón de actividad no sólo es el resultado de la necesidad de conservar energía por razones alimenticias. La elasticidad etológica de *Alouatta* es tal que variaciones extremas en la temperatura ambiental provocan la manifestación de conductas conservadoras de energía, como lo sugieren las correlaciones positivas entre la actividad descanso y los incrementos y decrementos en la temperatura ambiental.

Los machos adultos registraron tasas altas en la actividad de locomoción como resultado de movimientos de monitoreo de los alrededores, debido a la presencia de agentes externos (humanos, bovinos, porcinos y perros) en el sitio o en sus bordes. Los registros diurnos indicaron una mayor actividad general de los individuos de la tropa en el segmento vespertino que en el periodo diurno afectando las actividades de alimentación, locomoción e interacciones sociales y coincidiendo con decrementos en la temperatura ambiental.

La dispersión espacial uniforme de la mayor parte de las especies arbóreas usadas como recurso alimentario por el grupo puede ser un efecto de la perturbación del fragmento de selva. A lo anterior puede atribuirse la ausencia de correlaciones significativas entre la dispersión espacial del recurso alimentario y actividades como descanso, alimentación y locomoción.

Las variaciones mensuales registradas en la disponibilidad de hojas jóvenes tuvieron una influencia sobre la actividad de los aulladores, quienes respondieron a una mayor sincronía en las diferentes especies arbóreas utilizadas como fuente de alimento con actividades de búsqueda (viaje). Una vez detectado el recurso, la conducta de los aulladores se volvió más estacionaria concentrándose éstos en la cosecha de las hojas jóvenes. Igualmente, en ciertas épocas del ciclo anual una mayor sincronía intermensual (indicada por el Indice de Sorensen) entre estas especies promovió una mayor actividad alimentaria en la tropa y decrementos importantes en la actividad descanso.

Las características físicas del fragmento de selva habitado por el grupo de estudio son poco favorables para su conservación a largo plazo. El tamaño pequeño de su área, su forma alargada y angosta, y con ello una superficie de borde grande, favorecen el deterioro ecológico de este hábitat aislado (Offerman *et al.*, 1995). En estas circunstancias existe una penetración de vientos al interior del fragmento causando, si son de alta velocidad, el derrumbe de árboles, especialmente de aquellos que se encuentran en la pendiente del terreno. El tránsito y pastoreo continuo de bovinos y porcinos impide la regeneración del hábitat a través del banco de plántulas. Así, la tendencia a largo plazo son cambios importantes en la estructura de la vegetación y de los recursos para los aulladores. Por otro lado, la carga animal que representan los aulladores sobre las hojas y los frutos podría estar muy por arriba de aquella reportada para condiciones normales. Por ejemplo, mientras que la carga de Alouatta en selvas amplias (>500 ha) y no perturbadas es de 1.28 kg por hectárea (Estrada y Coates-Estrada, 1996), en el sitio de estudio se estimó en 8.7 kg por hectárea (Juan, 1997).

La mayor penetración de vientos y exposición a la radiación solar en el interior del fragmento también sugiere que los monos aulladores están sujetos a condiciones extremas de temperatura y humedad que posiblemente se alejan mucho de aquellas condiciones microclimáticas que predominan en hábitats más extensos en donde la densidad y continuidad de la vegetación en el dosel les ofrece una mayor protección. La tendencia manifestada por los monos aulladores estudiados a concentrar la mayor parte de sus actividades en la tarde podría estar determinado, en buena parte, por condiciones microclimáticas extremas en las porciones más tempranas del día. La predominancia de la actividad de descanso en la tropa estudiada sería así el resultado no sólo de la necesidad de conservar energía para procesar materia vegetal rica en fibra, sino también para enfrentarse a las fuertes variaciones observadas en las temperaturas máximas (25°C - 43°C) y mínimas (10°C - 24°C menos los valores 10°C<20°C asociados a intensa precipitación y vientos de 30-50 km/h) en el sitio de estudio. Esto es consistente con las correlaciones positivas descritas entre la tasa de descanso y las variaciones en las temperaturas máxima y mínima, así como las correlaciones negativas entre las tasas de locomoción y alimentación con estos parámetros climáticos. Esto sugiere que las demandas del hábitat sobre la elasticidad ecológica, fisiológica y conductual de los monos aulladores son tales que energía

que posiblemente podría dedicarse a actividades vitales como crecimiento y reproducción está siendo concentrada en actividades de mantenimiento. Tal situación sugiere deterioro en el bienestar físico de los individuos, con consecuencias graves para su supervivencia a corto, mediano y largo plazo. Por ejemplo, durante el periodo de 12 meses que duró el estudio la tropa creció hasta tener nueve individuos, pero el 40% de éstos (entre adultos, juveniles e infantes) perecieron durante el ciclo anual siguiente.

La conservación de tropas de *Alouatta* que existien en fragmentos aislados de vegetación selvática en los paisajes Neotropicales es una tarea compleja que demanda un conocimiento fino y preciso de los requerimientos de espacio y alimento de estos primates y de la dinámica de la vegetación bajo condiciones de aislamiento y perturbación antropogénica continuada. En esta tarea no sólo es importante el restablecimiento de la conexión biótica entre segmentos aislados de las poblaciones originales de *Alouatta*, sino que es de importancia equivalente la generación de modelos de manejo de la tierra que detengan el deterioro ecológico de los fragmentos de selvas que, cada vez más a menudo, conforman el hábitat de estos primates (Estrada y Coates-Estrada 1996). Un escenario posible podría ser el establecimiento de cultivos arbolados en los bordes del fragmento con el fin de atenuar los efectos negativos de borde sobre la vegetación y los primates (Brown 1991, Offerman *et al.*, 1995, Estrada y Coates-Estrada, 1996). Tal modelo involucra importantes beneficios para la retención de suelo y su fertilidad y también económicos para los pobladores humanos (Estrada *et al.*, 1997).

Agradecimientos

Se agradece el apoyo del Scott Fund for Neotropical Research del Lincoln Park Zoological Society de Chicago, del Sistema Nacional de Investigadores a través de una beca de Asistente de Investigador asignada por el Dr. A. Estrada y a la Universidad Nacional Autónoma de México por apoyos generales y logísticos.

Teresita de Jesús Ortíz Martínez, Saúl Juan Solano, Facultad de Biología, Universidad Veracruzana, **Alejandro Estrada** y **Rosamond Coates-Estrada**, Estación de Biología Tropical "Los Tuxtlas", Instituto de Biología, Universidad Nacional Autónoma de México, Apartado Postal 176, San Andrés Tuxtla, Veracruz, México.

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Preliminary Study of the Effects of Ecotourism and Human Traffic on the Howling Behavior of Red Howler Monkeys, *Alouatta seniculus*, in Ecuadorian Amazonia

Stella de la Torre
Charles T. Snowdon
Monserrat Bejarano

Introduction

Ecotourism has been proposed as an alternative form of sustainable use in protected areas (Yu-Douglas *et al.*, 1997). However, very little has been done to determine the impact of this activity on these habitats and on the animal populations, especially in Neotropical rain forests. A possible effect of the noise caused by tourism-related activities (e.g., motor engines and human voices) on the vocal communication and other behaviors of animals has been suggested by Payne and McVay (1971) and Edington and Edington (1986). Arboreal primates in Neotropical rain forests, where visibility is poor, are highly dependent on vocal communication (Marler, 1965; Seyfarth, 1987). Among these Neotropical primates, howler monkeys are well known for their vocal behavior (Whitehead, 1987; Neville *et al.*, 1988). The dawn choruses of howling involve ritualized aggression in the males' defense of the females and infants of their groups, and are used also as location cues among groups (Chivers, 1969; Sekulic, 1982). To evaluate the effects of tourism-related activities on the howling behavior of red howler monkeys, *Alouatta seniculus*, we carried out morning censuses of dawn choruses at two sites which differed in the amount of tourism and motor boats in the Cuyabeno Reserve in northeastern Ecuador.

Study Area and Methods

The Cuyabeno Reserve is a protected area of tropical rain forest located in northeastern Ecuador. The annual mean precipitation is about 3,000 mm and two seasons can be distinguished: the rainy season (March-August) with more than 250 mm of monthly rainfall, and the dry season (September-February) with less than 250 mm of monthly rainfall (de la Torre *et al.*, 1995). The high faunal diversity of this area, which includes ten primate species (de la Torre *et al.*, 1995), has attracted considerable tourism along the rivers of the Cuyabeno Reserve. In 1992, there were about 10 tourist agencies working in the Reserve. Today there are 20, and most of them use motor boats in all stages of their itineraries.

Two sites were selected to carry out the study. The first was the Laguna Grande, approximately 95 ha, in the Cuyabeno basin, located between 0°2'N-0°3'S and 76°11'W-76°15'W (Ron, 1995). In the rainy season, water levels reach 5 m in the deepest parts; while in the dry season, water levels gradually drop and the lake may dry out completely from December through February. The area is consistently visited by 17 tourist agencies that use motor boats on almost every trip. The second site was the Zancudococha, black-water, lake approximately 100 km south-east of La Hormiga Island, and larger than the Laguna Grande, covering an area of about 150 ha, although both are similar in shape. The water levels in the Zancudococha lake reach 5 m in the deepest part in the rainy season but drop to about 4 m in the dry season (Vallejo, 1995). This lake was visited by just one tourist agency and thus supported much less tourism compared to the Laguna Grande. In addition, motor boats were not permitted at Zancudococha.

Morning censuses of howling groups in the lake areas were carried out for two consecutive days in the rainy season at the Laguna Grande (May, 1997) and 2 consecutive days in the rainy season at Zancudococha (July, 1997). The censuses were carried out only in the rainy season (the season with the highest number of tourists in both areas) to obtain data when the highest tourism pressure occurred in an area; we also tried to control for seasonal differences between the habitats of the two lakes (since the Zancudocha lake does not dry out); and, finally, it was logistically easier to go to the middle of Laguna Grande during the rainy season than during the dry season. Censuses were carried out only on days with no rain and minimal wind.

All the censuses were carried out from a fixed point considered to be the center of the lake. Each census began at 0500 and lasted two hours. The direction and distance from the center of the lake of the howling groups were recorded. The direction of calls was recorded with a compass (accuracy 5°) and the distance was estimated, by ear, in three categories: far, middle and close. Since the roars of a howling group can be heard at a distance of about 2 km (pers. obs.), we considered that a group estimated to be far away was at two or more kilometers from the lake center; a group howling at a medium distance was at about 1 km from the lake center; and a group close to the lake was at about 400 m in Laguna Grande, or 600 m in Zancudococha, from the lake center (equivalent to the approximate radius of each lake). The distance estimates were confirmed by periodical observations of some of the howler groups in areas around both lakes at varying distances from the shore, ranging from groups observed close to the lakeside (0-50 m) to groups observed far away (approximately 1.5 km).

The howling monkey groups in each lake were well identified from the first census by their direction and distance. Since all of the groups howled more than once in each census, the direction of each group was the average of the group directions' in a census. The distance estimates did not vary within and between censuses for any of the groups. The average direction and distance from the estimated center (corresponding to the fixed center point in the field censuses) was plotted on a map for all groups; once plotted, its distance to the closest lake shore was recorded. Mann-Whitney non-parametric tests were used to compare the estimates of group distances from the shores between the two lakes.

Results and Discussion

Nine groups of howler monkeys were recorded during the censuses at the Laguna Grande and eight groups at Zancudococha. The estimated mean distance of the howling groups was significantly different between the two lakes (Mann-Whitney $Z = -2.08$; $p = 0.037$); groups at Laguna Grande howled further from the shores (mean = 839 m ±

103), than did groups at Zancudococha (mean = 478 m ± 129).

The fact that howler monkey groups howled closer to the shore in the lake with no motor boats suggests a possible effect of the noise of motor boats on the calling behavior of this species. The sound frequency of the roars of red howler monkeys is centered on 500-700 Hz (Whitehead, 1995), and thus greatly overlaps with the frequency of the noise of outboard engines for which most of the sound energy is below 1 kHz (pers. obs.). The shores of the Laguna Grande and Zancudococha have similar forest types, with areas of non-flooded *terra firme* forest and flooded forests (*igapó*) (Pires and Prance, 1985; Ron, 1995; Vallejo, 1995). Although it is not possible to entirely exclude differences in the habitat quality between the two lake shores that may influence the spatial distribution of the howler monkey groups, it would seem likely that those at the Laguna Grande were howling further from the shores to avoid the negative sound interference with the motor noise, or that howler monkey groups that were closer to the shores at the Laguna Grande howled less, not only to avoid sound interference with motor noise but to avoid being detected by humans. Given the importance of howling behavior to these monkeys, changes in the vocal behavior and/or the spatial distribution of the groups would predictably have long-term negative effects on their reproductive performance (Chivers, 1969; Sekulic, 1982; Neville *et al.*, 1988).

These data suggest an impact of tourism-related activities on the vocal behavior of the howler monkeys and are complementary to data obtained on pygmy marmosets (*Cebuella pygmaea*) in the Cuyabeno Reserve that also point to a negative effect of human activities, including tourism, on their behavior. Groups of pygmy marmosets living in areas with intense tourism and human traffic showed lower rates of social play and used less the lower strata of the forests than groups of marmosets living in areas with reduced tourism and traffic. These behavioral changes appeared to be an effort of the marmosets to avoid contact with humans and were possibly related to differences in the reproductive performance of the groups (de la Torre *et al.*, submitted). It has been assumed that primates habituate to human presence without any special effort (Griffith and van Schaik, 1993), but we believe our findings challenge this assumption and that more studies monitoring the effect of ecotourism and human traffic in Neotropical rain forests are required to minimize the potential environmental damage of these human activities and to improve the current conservation policies in protected areas.

Acknowledgments

We are greatly indebted to the following persons and institutions: Daniel Payaguaje, Lucía de la Torre, Xavier Burbano and Stephan Amend from PROFORS (Forestry Program for the Province of Sucumbíos), Lcdo. Luis Borbor, Director of the Cuyabeno Reserve and all the park guardians, for their most valuable support during the field work. Anthony Rylands, Lisa Naughton, Karen Strier, Adrian Treves, Cristina Lázaro-Perea and Mariano Sironi provided useful comments on the manuscript. INEFAN (Ecuadorian Institute of Forestry and Wildlife), permitted us to conduct the research in the Cuyabeno Reserve. Most of the tourist agencies that work in the Reserve helped us logistically at some point in our study, we are especially thankful to Transturi that greatly facilitated our work at Zancudococha. This research was supported by the Grant 5806-96 from the National Geographic Society, with additional support from the Milwaukee Zoological Society, the Tinker-Nave Fund, the University of Wisconsin Davis Fund and the Latin American Studies Program in American Universities, LASPAU.

Stella de la Torre, Department of Zoology, University of Wisconsin, Madison, WI 53706, USA, **Charles T. Snowdon**, Department of Psychology, 1202 West Johnson Street, University of Wisconsin, Madison, WI 53706, USA, and **Monserrat Bejarano**, Departamento de Biología, Pontificia Universidad Católica del Ecuador, Quito, Ecuador.

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Disappearance of Infants Following Male Takeovers in the Belizean Black Howler Monkey (*Alouatta pigra*)

Robin C. Brockett
Robert H. Horwich
Clara B. Jones

Organisms are expected to employ self-interested tactics and strategies to maximize lifetime probabilities of survival and reproductive success (Trivers, 1985). Behavior programs may differ significantly between the sexes, since selection is thought to operate on the relative parental investment in offspring by males, on the one hand, and females, on the other (Trivers, 1972). Some researchers (e.g., Sugiyama, 1967; Hausfater and Hrdy, 1984) have argued that males may gain a reproductive advantage by killing infants likely to have been sired by non-kin ("infanticide"). This "sexual selection hypothesis" suggests that infanticide shortens a female's interbirth interval through the cessation of lactation and subsequent return of ovarian cycling. Infanticidal males are thought to gain a reproductive advantage by impregnating the dead infant's mother.

Dixson (1998, Table 4.4, p.68) summarizes 48 cases of infanticide *observed directly* in 13 primate species. Paleotropical species account for 42 of the 48 (88%) cases, and the Hanuman langer (*Presbytis entellus*) accounts for 21 of them (50%). The bias in this database favoring Old World primates, and *P. entellus* in particular, may reflect sampling error resulting from differential time-investment by researchers. Supporting this idea is the observation that infanticide has been reported most commonly in terrestrial or semi-terrestrial species for which visibility is less of a deterrent to observation.

Infanticide has been reported for four species of *Alouatta* (*A. seniculus*, the red howler monkey: Rudran [1979], Sekulic [1983]; *A. caraya*, the black and brown howler monkey: Zunino *et al.* [1986], Rumiz [1940]; *A. fusca*, the brown howler monkey: Galetti *et al.* [1994]; and *A. palliata*, the mantled howler monkey: Clarke [1981, 1983]). The first three species exhibit polygynous mating systems (after Dixson, 1998) while *A. palliata* groups vary from polygynous to multimale-multifemale (see Crockett and Eisenberg, 1987). Clarke's (1981, 1983) study groups exhibited multimale-multifemale social organization, and infanticide was associated with turnovers in the male hierarchy. Infanticide typically occurs in polygynous (harem or age-graded) or multimale-multifemale mating systems (Dixon, 1988).

We conducted *ad libitum* observations of marked *A. pigra* at the Community Baboon Sanctuary (CBS), Belize. The CBS is a managed reserve formed in 1985 by cooperative agreement among private landowners (Horwich, 1990). Located at 17°33'N, 88°35'W, the CBS is a mosaic of small farms, pastures, and tropical moist forest fragments including riparian habitat along the Belize River (see Horwich and Lyon, 1990). The study area is composed of mapped trails, and >1000 trees have been mapped and identified. Black howlers are generally polygynous with a modal group size of one adult male to several adult females and immatures (Ostro *et al.*, 1999), although multimale groups may be found. Studies of demography, ecology, social organization and behavior are in their early stages (e.g., Horwich, 1983; Silver *et al.*, 1998; Ostro *et al.*, 1999).

As part of a broader study, five incidents of infant disappearance associated with male takeovers were observed (Table 1). These data suggest several topics for further research. First, similar to findings for langurs (*Presbytis* spp.) (Sommer, 1994), there appears to be a male bias in the sex of infants which disappeared. It would be interesting to obtain larger sample sizes in order to evaluate the sex ratios of infants killed, since an offspring's "value" will differ according to its sex and, possibly, the condition of the mother (see Hrdy, 1987). It is possible that infanticide generally occurs in response to some threshold of benefits to costs to the potential victimizer and that the "value" of the po-

Table 1. Observations of infant disappearances at the Community Baboon Sanctuary, Belize. All observations recorded by RCB.

Dates of Takeover	Troop	Male(s) displaced	Displacing male	Mother of infant	Post-takeover copulation observed
2 Feb. - 20 Feb. 1995	Roxie	BBLT , UM	BWB	BBLT	yes[1]
				BBRT	no[1]
				W	
27 Feb. - 30 Mar. 1995	Baizar	O	BBLT	ORT	no[2]
15 Feb. - Mar. 1997	Robin	WLT	Baizar	LLT	yes

[1]BBRT gave birth to a male offspring on 13 October 1995 and BBLT to a male offspring on 1 December 1995.
[2]Copulation attempt observed.

tential victim affects this tradeoff. Some infants may be of such low "value" that they are not worth killing. Alternatively, in some conditions, the costs of infanticide may be prohibitively high. These ideas are supported by the observation that infant disappearance was not observed in association with all male takeovers.

Second, female W died of an intestinal obstruction shortly after the takeover. Although we cannot verify that she was injured during aggressive encounters between displacing and displaced males, it is important to stress that male-male aggression has potential costs (sometimes unexpected) for males that may outweigh the benefits in some conditions.

Third, male BBLT initiated a successful takeover of Baizar troop after he was displaced from Roxie troop by the male BWB. This observation reinforces the benefits of group membership and suggests an apparent cascade effect since we assume that BBLT would not have left his group without the precipitating events of BWB's takeover.

Fourth, our observations show that a single male can take over a multimale group (Roxie troop). Thus, arguments other than superior fighting ability alone must be sought to explain successful takeover strategies. Takeovers should be studied as components of male reproductive strategies, including the role of females in determining which males lead their groups.

Finally, all of our observations occurred in February or March. While this result may be a function of sampling error, systematic studies have been made on a monthly basis at the CBS since 1992, including several thousand contact hours. February and March are the peak of the dry season when preferred food (new leaves, flowers, and fruit) abundance is low and many deciduous trees lose their mature leaves (see Silver, 1998, especially Figs. 2.2 and 2.3), possibly creating stressful conditions for these folivorous monkeys. Food stress in combination with reduced habitat occasioned by deforestation and resultant fragmentation may increase population density and interaction rates, possibly resulting in increased aggressive competition among males (see Kowalewski *et al.*, 1995) and subsequent takeovers. Further research will test the significance of these results.

Our studies suggest that infanticide may be a significant component of a male's lifetime reproductive strategy. Dixson (1998), however, concludes his discussion of infanticide with the statement, "Infanticide is neither *widespread* nor of *general* importance in the evolution of primate social or sexual behaviour." (p.70, italics in the original). He bases this conclusion in part upon the observation that infanticide has been documented in only 12% of primate species. However, Johnstone and Cant (1999), using an evolutionarily stable strategy model, show that the potential for infanticide alone may influence the partitioning of reproduction within groups, even in situations where individuals cannot discriminate their own from another's offspring. Dixson's (1998) conclusion appears premature, awaiting, as is the fate of all speculations, confirmation or disproof based on future evidence.

Acknowledgements: We are grateful to Dr. K. E. Glander for his assistance in marking the animals. The study was carried out with the support of the National Geographic Society (Grants #5352-94 and #5653-96).

Robin C. Brockett, Zoo Atlanta, Atlanta, Georgia, USA, and Community Conservation Consultants, R.D. 1, Box 96, Gays Mills, Wisconsin 54631, USA, **Robert H. Horwich** Community Conservation Consultants, R.D. 1, Box 96, Gays Mills, Wisconsin 54631, USA, and **Clara B. Jones**, Community Conservation Consultants, and Livingstone College, Department of Psychology, 701 W. Monroe Street, Salisbury, North Carolina 28144, USA.

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News

A New Species of Titi Monkey in Northeast Brazil

A new species of titi monkey, *Callicebus*, has been described from the Atlantic forest along the coast of the state of Sergipe, northeastern Brazil, by Shuji Kobayashi (Chukyo Women's University, Japan) and Alfredo Langguth (Federal University of Paraíba, Brazil). The species has been named *Callicebus coimbrai*, in honor of Adelmar F. Coimbra-Filho, founder and ex-Director of the Rio de Janeiro Primate Center (CPRJ/FEEMA), in recognition of his research and valuable contributions to the biology and conservation of Brazilian primates.

The holotype (an adult female, UFPB1599, in the mammal collection of the Departamento de Sistemática e Ecologia, Universidade Federal da Paraíba) was collected by the authors on 30 January 1994. Two specimens had been shot by a local hunter. The type locality is given as "Proximity of the small village Aragão, in the region of Santana dos Frades about 11.0 km SW of Pacatuba, state of Sergipe, Brazil (GPS 10°32'S, 36°41'W, alt. 90 m)". The locality is south of the Rio São Francisco. The species has been recorded from between the Rio São Francisco and the Rio Real, which marks the southern border of Sergipe. Although believed to be restricted to the south of the Rio São Francisco, the southern limits to its range have not been established. Titi monkeys have been reported from the south of the Rio Real. Oliver and Santos (1991), for example, obtained reports of titi monkeys from the vicinities of Cachoeira do Abadia and Jandaira, in the north-east of the state of Bahia, which may have been *C. coimbrai*. The western limits to its range are also unknown, but *C. coimbrai* is believed to be restricted to the humid coastal Atlantic forest, and titis inland, in drier, more seasonal formations probably belong to the form *barbarabrownae* Hershkovitz 1990 (see Marinho-Filho and Veríssimo, 1997). Further surveys are urgently needed to establish the limits of the range of this titi, which was listed as "Critically Endangered" by Rylands *et al.* (1995, 1997) even before its description, due to its minute distribution and the widespread destruction of the forests of the region.

C. coimbrai is distinguished from other Atlantic forest titi monkeys by its black forehead, crown and ears, and the buffy trunk. It has pale fur along its sidewhiskers and cheeks, and along the back of the head and nape. The hands and feet are blackish, its tail is orange, and there is a zebra-like striped pattern on the anterior half of the back. Kobayashi and Langguth (1999) also describe distinct features of its dental morphology and craniometry.

On the basis of their study of this new species, along with previous craniometric studies by Kobayashi (1995), Kobayashi and Langguth (1999) argue that the titis of the Atlantic forest should be considered species rather than subspecies of *C. personatus*. They list *C. nigrifrons*, *C. personatus*, *C. melanochir*, and *C. barbarabrownae* besides *C. coimbrai*. Accepting this classification, the Atlantic forest has 21 species of primates, 16 (76%) of which are endemic, and 16 considered threatened according to the *1996 IUCN Red List of Threatened Animals* (IUCN, 1996).

Shuji Kobayashi, Department of Asian Studies, Chukyo Women's University, Nadakayama 55, Yokone-cho, Aichi 474-0011, Japan, and **Alfredo Langguth**, Departamento de Sistemática e Ecologia, Universidade Federal da Paraíba, 58059-900 João Pessoa, Paraíba, Brazil.

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The Name of the Weeper or Wedge-Capped Capuchin in the Guianas

The correct scientific name for the weeper capuchin has been, and still is, the cause for some discussion. Two names in current use are *nigrivittatus* Wagner, 1848 (adopted by Cruz Lima, 1945; Hershkovitz, 1949; Cabrera, 1957) and *olivaceus* Schomburgk 1848 (adopted by Tate, 1939, and Husson, 1957, 1978). A third name, *griseus* F. Cuvier 1819, was used by Hill (1960).

Hill (1960) argued that the first name properly given to this capuchin monkey is *Cebus griseus* F. Cuvier 1819, based on a colour plate drawn from a live animal. In a footnote, Hill (1960, p.429) explained that different copies of Cuvier's plate vary in the depth of the colour of the upper parts of the monkey, and that this may have caused the doubts expressed by Hershkovitz (1949) who said that although the head clearly depicts the distinctive wedge-shaped black patch on the crown, the remainder of the body resembles *Cebus albifrons*, the confusion as such making the identity of the animal uncertain and the name invalid. Hill (1960) insisted that the copy of the plate in his possession depicted the animal which Hershkovitz refers to as *nigrivittatus*. There is no preserved type specimen for *C. griseus*, and the type locality was restricted by Hill to French Guiana (1958a in Hill 1960).

Hershkovitz (1949) opted for the name of *Cebus nigrivittatus* Wagner, 1848, although recognising that Schomburgk had described the same animal as *C. olivaceus* in the same year, and that *nigrivittatus* may be a junior synonym if it can be proved that *olivaceus* predates it. Husson (1957, 1978) argued, however, for the name of *Cebus olivaceus* Schomburgk 1848, on the basis that the use of the name *nigrivittatus* is not valid according to the International Rules of Zoological Nomenclature. The problem arises from a taxonomic confusion caused by Von Pusch (1941) who combined the genera *Saimiri* (the squirrel monkeys) and *Cebus*, resulting in two species having the same name of *nigrivittatus*, *Chrysothrix nigrivittatus* Wagner 1846 (now considered a junior synonym of *Saimiri sciureus*) and *Cebus nigrivittatus* Wagner 1848. Regarding both as belonging to the same genus, Von Pusch (1941), correctly under the circumstances, rejected the name *Cebus nigrivittatus* because it was predated by *Chrysothrix nigrivittatus*, the former then being considered a junior secondary homonym. Von Pusch (1941) renamed the capuchin *Cebus capucinus leporinus*. Although now in separate genera, Husson (1957), citing Follett (1955), argued that the International Rules of Zoological Nomenclature do not permit the revalidation of the name, having been, as it was, invalidated before 1951. The International Rules published in 1985 state "A junior secondary homonym replaced before 1961 is permanently invalid" (Article 59b). Hershkovitz (1955), on the other hand, merely referred to *Cebus capucinus leporinus* Von Pusch as a junior synonym of *nigrivittatus*, and argued that the ephemeral, and now discarded, homonymy between the squirrel monkey and the capuchin was unworthy of consideration (Hershkovitz, 1958).

In summary, therefore, *C. griseus* is the earliest name, the validity of which depends on the interpretation of a colour plate, while *C. nigrivittatus* and *C. olivaceus* were names published by separate authors in the same year, with controversy concerning the fact that the former, even if it was published earlier, was invalidated by Von Pusch (1941), and such an invalidation is deemed permanent according to the International Rules of Zoological Nomenclature (1985).

Husson (1957, 1978), Eisenberg (1989), Groves (1993) and Emmons and Feer (1997), and a number of recent authors who have studied this animal in the wild (for example, Fragaszy, 1986; Robinson, 1986, 1988; Miller, 1996, 1998) refer to the Guiana wedge-capped capuchin as *Cebus olivaceus*. A recent study of the chromosomes of a Venezuelan form of this species refers to it as *C. nigrivittatus* (see Martinez *et al.*, 1999). It would seem likely, however, that the correct name may be *C. griseus*! Under any circumstances, a modern taxonomic revision is urgently needed for this species (Bodini, 1989). Hershkovitz (1949) and Hill (1960) are still the best sources of reference for the subspecific variation. Hershkovitz (1949) listed five subspecies which he conditionally regarded as valid: *nigrivittatus* Wagner 1848, from the upper Rio Branco, Brazil (given as a junior synonym of *Cebus apella* by Elliot [1913], and as a junior synonym of *C. griseus leporinus* Von Pusch, 1941 by Hill [1960]); *olivaceus* Schomburgk, 1848, from the southern foot of Monte Roraima, Brazil (given as a junior synonym of *Cebus apella* by Elliot [1913], and as a junior synonym of *C. griseus griseus* by Hill [1960]); *castaneus* I. Geoffroy, 1851 described from Cayenne, French Guiana (listed as a full species by Elliot [1913]; listed by Hill [1960], but considered of doubtful validity); *apiculatus* Elliot, 1907 (listed as a subspecies of *Cebus apella* by Tate [1939], and listed as a junior synonym of *C. griseus griseus* by Hill [1960]), from La Unión, Río Cuara, Venezuela; and *brunneus* Allen 1914 from northern Venezuela (listed by Hill [1960], but also considered of doubtful validity). Hershkovitz (1949) gave the type localities for each of the forms, but unfortu-

nately not the distributional limits. A sixth, undescribed form was mentioned by Bodini and Pérez-Hernández (1987) from central Venezuela, north of the Río Orinoco, and a seventh weeper capuchin, described as a species but probably only subspecifically different (Harada and Ferrari, 1996), was described from the eastern Amazon in the state of Maranhão and eastern part of the state of Pará in 1992: *C. kaapori* Queiroz, 1992. The distribution of this form is now quite well known, occuring east of the lower Rio Tocantins to the right bank of the Rio Pindaré and the lower Rio Mearim (Queiroz, 1992; Ferrari and Lopes, 1996; Silva Jr. and Cerqueira, 1998; Oliveira *et al.*, 1999).

Anthony B. Rylands, Conservation International do Brasil, Avenida Antônio Abrahão Caram 820/302, 31275-000 Belo Horizonte, Minas Gerais, and Departamento de Zoologia, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, 31270-901 Belo Horizonte, Minas Gerais, Brazil.

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SEED DISPERSAL BY TWO SYMPATRIC TAMARIN SPECIES *SAGUINUS MYSTAX* AND *SAGUINUS FUSCICOLLIS*

Christoph Knogge defended his doctoral dissertation "Animal-plant interactions in the Amazonian rain forest: Seed dispersal by two sympatric tamarin species *Saguinus mystax* and *Saguinus fuscicollis* (Callitrichidae, Primates)" at the University of Bielefeld, Germany, in December 1998. The study was supervised by Eckhard W. Heymann (Deutsches Primatenzentrum, Göttingen) and Roland Sossinka (University of Bielefeld), and financed by the Deutsche Forschungsgemeinschaft DFG (German Science Foundation). Copies of the published thesis (ISBN 3-930962-90-X) can be obtained from: Schüling Verlag, Falkenhorst 4, 48155 Münster, Germany, Tel. +49 251 31 15 23, Fax: +49 251 31 15 24, e-mail: <zoo_buch@ms.tlk.com>. Web site: http://www.ms.tlk.com/zoo_buch. The following is a summary of the research.

The aim of the study was to analyse the role of moustached tamarins (*Saguinus mystax*) and saddleback tamarins (*Saguinus fuscicollis*) as seed dispersers. Faecal samples were collected and data obtained on the feeding ecology of a mixed-species group of moustached and saddleback tamarins during a 15-month field study. On the basis of this data, and the results of germination experiments with defecated and control seeds, the potential of the two tamarin species as effective seed dispersers was characterised according to their roles as fruit consumers, seed processors and seed vectors. The data on their feeding ecology and the analyses of their faecal samples showed that, according to the number of dispersed seeds and their species diversity, both tamarin species provide a reliable potential in their function as fruit consumers and seed dispersal agents. Approximately 95% of all faecal samples contained seeds of 88 species from a total of 155 fruit species eaten. The lengths of ingested and defecated seeds were found to vary from 0.6 mm to 2.6 cm. Predominant in the diet of both tamarin species (accounting for *c.*25% of all feeding events) were the seed-pod exudate of *Parkia velutina* (Leguminosae) and the fruits of *Anomospermum grandifolium* (Menispermaceae). Seeds of these species were those dispersed most (*c.*30% of all dispersal events). The seed rain generated by the mixed-species tamarin group over their home range was calculated to amount to 39.088 dispersed seeds/ha/year. The intensity of the inter- and intra-specific competition of seeds or their future seedlings was described on the basis of the number and species composition of seeds in the faecal samples. The two tamarin species are evidently potentially effective as seed dispersers, with an average of 1.4 seeds of 1.2 species per faecal sample. Their role as seed processors was examined by an analysis of gut passage times and the influence of gut passage on the germination of the seeds. The germination experiments showed that, for the vast majority of the plant species tested, neither germination rate nor germination latency were modified by passage through the gut. Gut passage times were determined for each seed species, taking into account the consistency of the surrounding pulp (gelatinous, fibrous or mealy). Seeds with a gelatinous pulp showed shorter passage times. Gut passage time for seeds ingested and defecated on the same day varied from 20 minutes to 8.6 hours. The tamarins dispersed these seeds to distances of up to 709 m, and fulfil as such the requirements for the "escape" and "colonisation" hypothesis. For the majority of seeds, mean distances of 185 m guarantee a dispersal that extends beyond areas of increased mortality within the immediate vicinity of the parent plants. The distribution pattern of the dispersed seeds was characterised by higher densities of faecal samples within quadrats that were used frequently as sleeping sites and within those that included a large number of trees where they rested during the day. Because the tamarins used sleeping trees which were typically relatively isolated, and especially because of their choice of sunny places for resting, the tamarins may be contributing particularly in the deposition of seeds in optimal microhabitats for seedling establishment, and as such may have a crucial effect on the regeneration dynamics of treefall gaps and areas with vegetation in early stages of succession. An example of directed dispersal was documented with seeds from a hemiepiphytic plant (*Asplundia peruviana*) being deposited onto the bark of trunks, necessary for the establishment of the seedlings. The tamarin species were compared in order to document possible consequences of niche separation in their role as seed dispersers. A 68% overlap was found for the seed species being dispersed by the two tamarins. Divergence in the species eaten and dispersed was attributed to differences in the intensity of use of the forest strata. The biological relevance of the slight differences observed in the differing germination behaviour of the dispersed seeds and

in dispersal distances can only be examined with detailed studies of the demography of the plant species involved. A model was developed which included such variables as predation risk, profitability, food choice, and the amount of seeds ingested, to clarify possible mechanisms underlying the efficacy of tamarins as seed dispersers.

Interacciónes entre plantas y animales en la selva de la Amazonia: Dispersión de semillas por dos especies de tamarines sympatricos *Saguinus mystax* y *Saguinus fuscicollis* (Callitrichidae, Primates)

El presente estudio tuvo como finalidad el análisis de la función de los pichicos de barba blanca (*Saguinus mystax*) y los pichicos comunes (*Saguinus fuscicollis*) como dispersores de semillas. Para ello fueron tomados datos sobre la ecología alimenticia de una asociación interespecifica entre los pichicos de barba blanca y los pichicos comunes en un estudio de 15 meses en el noreste del Perú, asi como también fueron continuamente recolectadas muestras de heces. Sobre la base de estos datos y de los resultados de los experimentos comparativos de la germinación de semillas defecadas y controles fue caracterizado el potencial de las dos especies de tamarines como dispersores efectivos de semillas en los tres niveles de su función como frugívoros, procesadores de semillas y vectores de semillas. Los datos de la ecología alimenticia y los análisis de las muestras de heces mostraron que en relación a la cantidad de las semillas dispersadas y a la diversidad de especies, ambas especies de tamarines representan un potencial confiable en su función como frugívoros y como vectores de semillas. Cerca del 95% de todas las muestras de heces contenian semillas de 88 especies de semillas de las en total 155 especies frutales consumidas. La medida longitudinal de las especies de semillas ingeridas estaba en el ambito de entre 0,6 mm a 2,6 cm. Especialmente destaca el gran significado de los exudados de las vainas de *Parkia velutina* y de las frutas de la liana *Anomospermum grandifolium* en la alimentación de ambas especies de tamarines (en total casi el 25% de todos los casos en los que fue ingerido alimento), asi como también como especies de semillas mayormente dispersadas (en total cerca del 30% de todos los actos de dispersión). Para el área de recorrido de la asociación entre las dos especies de tamarines fue calculada una lluvia de semillas de 39,088 semillas dispersadas por hectárea y por año en total. La proporción de la competencia interespecífica e intraespecifica entre las semillas conjuntamente defecadas y las potenciales plantas de semilleros fue descrita sobre la cantidad y la composición de las especies de semillas en las muestras de heces. Las dos especies de tamarines son evidentemente efectivas como dispersores de semillas bajo este aspecto con 1,4 semillas de 1,2 especies por defecación. A través del análisis del tiempo del pasaje intestinal y de las posibles influencias de este en el comportamiento de la germinación de las semillas defecadas se caracterizó a los tamarines en su función como procesores de semillas. En experimentos comparativos de germinación con semillas sin pasaje intestinal se mostró que para la gran mayoría de las especies de semillas dispersadas el pasaje intestinal no tiene efectos negativos ni para el éxito del porcentaje de germinación ni para la latencia de la germinación. Los tiempos típicos del pasaje intestinal de las especies de semillas fueron determinados, entre otros factores, por la consistencia de la pulpa que las recubria, y fluctuaban entre 20 minutos y 8,6 horas en las semillas ingeridas y defecadas el mismo día. Los tamarines pueden ser caracterizados como vectores confiables, ya que satisfacen de acuerdo a las distancias de dispersión (hasta 709 metros) las hipótesis de "Escape" y "Colonización" correspondientementes a las relevantes funciones para el éxito de la dispersión de semillas. Con una distancia de dispersión de 185 m en promedio ellos garantizan la mayor cantidad de semillas en una dispersión más allá de zonas de alta mortalidad en la cercanía inmediata del árbol de origen. El modelo de propagación de las semillas dispersadas por ambas especies de tamarines se mostró a través de alta densidad de las muestras de heces en los cuadrantes a los que recurrian frecuentemente para dormir y en los cuadrantes con gran cantidad de árboles para descansar. Con la utilización de más bien árboles aislados como lugar para dormir, pero en especial la elección predilecta de lugares soleados para fases de descanso, los tamarines pueden contribuir en alto grado, a que las semillas tengan éxito en optimales microhabitats en el establecimiento de germinadores y con ello rindan una contribución decisiva para la dinámica de regeneración de claros y zonas sucesionales. En este contexto se puede documentar también un ejemplo para una dispersión de semillas dirigida de una planta hemiepiphytica (*Asplundia peruviana*) en las necesarias estructuras de las cortezas de otros troncos de árboles para el establecimiento de los germenes. Los resultados fueron expuestos diferenciadamente para ambas especies de tamarines, para poder documentar las posibles consecuencias de la diferenciación de sus nichos ecologicos para el rol como dispersores de semillas. Sólo en los espectros de las especies de semillas dispersadas, que concidian en el 68%, se mostraron diferencias entre las especies de tamarines. Las diferencias tanto en el espectro de las especies consumidas como las dispersadas fueron atribuidas a las diferentes intensidades de utilización de distintas estratas de altura de la selva. Las insignificantes diferencias que se dieron en el comportamiento de los gérmenes de las semillas dispersadas o en las distancias de dispersión, sólo pueden ser discutidas a un nivel de especies de semillas y sobre la base de estudios más detallados sobre su relevancia biológica. Finalmente a partir de los resultados de fondo se desarrollará un modelo que incluya las variables como riesgo de depredación, profitabilidad, elección de alimento y la cantidad de semillas ingeridas para aclarar los posibles mecanismos y las condiciones de marco que subyacen a la eficacia de los tamarines como dispersores de semillas.

Christoph Knogge, Department of Ethology and Ecology, Deutsches Primatenzentrum, Kellnerweg 4, D-37077 Göttingen, Germany. E-mail: <cknogge@gwdg.de>.

Reference

Knogge, C. 1998. Tier-Pflanze Interaktionen im Amazonas-Regenwald: Samenausbreitung durch die sympatrischen Tamarinarten *Saguinus mystax* und *Saguinus fuscicollis* (Callitrichidae, Primates). Doctoral dissertation, University of Bielefeld, Bielefeld, Germany.

The Behavioural Ecology of Black Spider Monkeys in North-eastern Bolivia

Robert Benedict Wallace defended his PhD thesis on the behavioural ecology of the black spider monkey, *Ateles chamek*, in December 1998. His supervisor was Professor Robin Dunbar, Behavioural Ecology and Evolutionary Psychology Group, Department of Biological Sciences, University of Liverpool, UK. The field research was supported by the Wildlife Conservation Society (WCS), New York, through a grant from the Bolivian Sustainable Forestry Project (BOLFOR) financed by USAID and the Bolivian Government. The following is an abstract of his thesis.

This study investigates the behavioural ecology of the black spider monkey, *Ateles chamek*, at a pristine research site within Noel Kempff Mercado National Park, north-eastern Deparment Santa Cruz, Bolivia. This location is close to the southern distributional limits of the genus, and represents an ecotonal position in Neotropical biogeography. It is also characterized by marked seasonality, especially in terms of precipitation. Spider monkeys live in fission-fusion societies; a 'community' of animals splitting into subgroups of varying size and membership depending on local ecological conditions.

A detailed vegetational analysis revealed the presence of five structurally and floristically distinct habitats within the 500 ha study plot at 'Lago Caiman': tall forest, *Sartenejal* (swamp) forest, low vine forest, piedmont (hillside) forest, and *Cerrado* (scrub) forest. These habitats were found on an altitudinal strip running from the Huanchaca escarpment, the dominant geographical feature of the region. Monthly phenological sampling of 1732 plants within randomly distributed 0.1 ha plots revealed that these habitats were also distinct in terms of flowering and fruiting patterns. Habitats peaked in abundance of ripe fruit at differing times of the year, with fruit resources only scarce across the entire study plot during the mid dry season.

Spider monkeys were highly frugivorous concentrating foraging efforts on ripe fleshy fruit resources, all of which were patchily distributed across the community home range. During periods of fruit scarcity the focal community switched to a more folivorous diet and adjusted their activity budget accordingly. Variation in spider monkey subgroup size was also related to fruit resource abundance. Larger subgroups tended to forage in larger fruit resource patches, but sociality was constrained if resources were generally scarce. Furthermore, spider monkey ranging behaviour was influenced by patterns of resource availability. The focal community home range was a linear strip covering 2.34 km^2 and included all of the local habitats. Seasonal variations in habitat use were linked to relative differences in fruit resource abundance, and range use concentrated around local abundances of fleshy fruit resources.

The study demonstrated that the unusually large number of adult males present within the focal community is a response to the elongated shape of the home range and the resulting extensive boundary. Spider monkeys are territorial, and philopatric males co-operate to defend several females whose spatial distribution varies according to resource availability. The studies findings were also interpreted in terms of male mating strategies. Finally, the conservation implications of the findings were discussed with particular reference to selective logging. Keystone fruit resources and local habitat diversity were critical to the long-term future of frugivores in this region and should be considered in sustainable forestry management plans.

La Ecología del Comportamiento del Mono Araña Negro en el noreste de Bolivia

Este estudio investiga la ecología del comportamiento del mono araña, *Ateles chamek*, en un bosque intacto dentro del Parque Nacional Noel Kempff Mercado, en el Noreste del Departamento de Santa Cruz, Bolivia. Esta localidad se encuentra cerca al limite sur de la distribución de este genero de primate, y representa una posición ecotonal en la biogeografía Neotropical. Una marcada estacionalidad, especialmente del punto de vista de la precipitación, también caracteriza a esta zona. Los monos araña negros viven en sociedades de fisión-fusión, en las cuales una "comunidad", dependiendo de las condiciones ecológicas locales, puede dividirse en subgrupos de diferentes tamaños y membresia.

Un análisis de vegetación, dentro del área de estudio de 500 ha, demostró la presencia de cinco hábitats estructuralmente y floristicamente distintos: bosque alto, sartenejal, bosque bajo de lianas, bosque de piedmont, y cerrado. Estos hábitats se encontraron en una franja altitudinal bajando desde la Serranía de Huanchaca, la característica geográfica mas importante de la región. Adicionalmente, un muestreo fenológico mensual de 1732 arboles, dentro de parcelas de 0.1 ha puestas al azar, demostró que estos hábitats también eran diferentes en términos de patrones de producción de flores y frutos. Los distintos hábitats mostraron picos de abundancia de frutos maduros en diferentes épocas del año. Debido a esto solo hubo una escasez de frutos que afectara a todo el sitio de estudio durante plena época seca.

Los monos arañas negros estudiados fueron altamente frugívoros, concentrando sus esfuerzos de forrajeo sobre frutos carnosos maduros. Estos recursos estuvieron distribuidos en forma de parches a través de toda la extensión del rango de la comunidad. Durante épocas de escasez de frutos la comunidad focal se volcó hacia una dieta mas folivora y consecuentemente ajustó su presupuesto de actividades a este cambio dietético. La variación en el tamaño de grupos de monos araña negros

también estuvo relacionada con la abundancia de frutos. Los subgrupos mas grandes prefirieron manchas grandes de frutos y la escasez de alimento actuó en contra de la sociabilidad. Además, los patrones de movimiento de los monos araña fueron influenciados por los patrones de distribución de recursos. El área de acción de la comunidad focal fue una franja linear de 2.34 km² y cubrió todos los diferentes hábitats. Las variaciones estacionales en uso de hábitat estuvieron relacionadas con las diferencias estacionales relativas en abundancia de frutos, y los patrones de movimiento se concentraron alrededor de frutos carnosos maduros localmente abundantes.

Este estudio demuestra que el alto numero de machos adultos presentes dentro de la comunidad focal es una respuesta a la forma alargada del área de acción y de su extensa circunferencia. Los monos arañas negros son territoriales y los machos filopatricos cooperan en la defensa de varias hembras, cuyos patrones de distribución varían de acuerdo a la disponibilidad de recursos. Los resultados de este estudio fueron interpretados en términos de las estrategias de apareamiento de los machos. Finalmente, las implicaciones para la conservación de estos resultados se discuten, con particular énfasis sobre la tala selectiva. Los frutos identificados como "recursos clave" y la diversidad de hábitat local son críticos a la sobrevivencia a largo plazo de los frugívoros en esta región y deberían ser considerados en planes de manejo para el aprovechamiento forestal sostenible.

Robert B. Wallace, Associate Conservation Zoologist, Wildlife Conservation Society (WCS) - Madidi, Casilla 3-35181, San Miguel, La Paz, Bolivia. E-mail: <wcsmadidi@mail.zuper.net>.

Reference

Wallace, R. B. 1998. The Behavioural Ecology of Black Spider Monkeys in North-eastern Bolivia. Ph.D. thesis, University of Liverpool, Liverpool, UK.

CONSERVATION INTERNATIONAL'S RAPID ASSESSMENT PROGRAM - RAP

CONSERVATION INTERNATIONAL

Conservation International, Washington, D. C., launched the Rapid Assessment Program (RAP) in 1990 as a means of generating biological information based on field inventories of areas generally not, or at best very poorly, surveyed; vital to catalyze conservation action. Small RAP teams of leading tropical field biologists, including host country scientists, conduct first-cut assessments of the biological value of selected areas in a short time-period. They provide conservation recommendations to local government agencies, international policy makers, conservationists, and scientists, based on the area's biological diversity, degree of endemism, ecosystem uniqueness, and the risk of extinction on a national and global scale. RAP methodology is not a substitute for more in-depth inventory or monitoring but is designed to provide critical scientific information quickly. RAP methodologies provide a model tool in setting priorities for conservation activity worldwide and help provide countries with the information and technical assistance needed for the development of national biodiversity strategies. Results from RAP surveys are made available on the World Wide Web, and a final report is published within one year of the expedition.

The Rapid Assessment Program includes three components. *Terrestrial RAPs* assess the biological diversity of poorly known terrestrial tropical ecosystems that are at risk. RAP scientists gather information on vegetation structure, birds, mammals, reptiles, amphibians, and insects. *AquaRAPs* provide a first-cut assessment of the biological value of freshwater ecosystems in order to identify priorities and opportunities for conservation. They are carried out by expert teams of scientists who survey fishes, plants, invertebrates, and water quality. *Marine RAPs* generate and disseminate information on coastal and near-shore, shallow-water, marine biodiversity (mainly coral reefs) for conservation purposes. Marine RAP scientists survey marine fishes, corals, and molluscs.

Terrestrial Rapid Assessment Program - Overview

The Terrestrial Rapid Assessment Program (RAP) was created in 1990 in response to the increasing loss of biodiversity in tropical ecosystems. The RAP assembles teams of expert scientists, whose combined knowledge of tropical biodiversity allows them to quickly assess the uniqueness and conservation value of an area and to make recommendations about its management. Major funding for the RAP has been provided by a USAID Cooperative Agreement, The John D. and Catherine T. MacArthur Foundation, and the W. Alton Jones Foundation.

RAP teams consist of experienced, internationally recognized field biologists specializing in plants, birds, mammals, reptiles, amphibians, and insects. RAP team members work closely with host country scientists, exchanging information and methodologies, and training young scientists. Currently there are scientific teams for the South American, Asia-Pacific, and African regions. An integrated approach is used that pulls together information on a variety of taxa to obtain a portrait of the habitat under study. The RAP methodology is not a substitute for more detailed, long-term inventories or monitoring but is designed to provide critical scientific information quickly. Information collected during three to four week RAP expeditions includes data on species diversity, degree of species endemism, special habitat types, threatened species, degree of habitat degradation, and the presence of introduced species.

The RAP works closely with Conservation International's regional and in-country programs to identify areas for which biodiversity information is needed to set conservation priorities or guide management strategies. Immediately after a survey, RAP scientists provide preliminary conservation recommendations to local governmental agencies, environmental groups, and other stakeholders, based on their observations. A final report is published in the *RAP Working*

Papers series within a year after the expedition. RAP surveys have uncovered a multitude of new plant and animal species and have already contributed to the creation of national parks in Bolivia and Peru.

Expeditions of the Rapid Assessment Program (RAP)

Terrestrial RAPs: *South America* - Alto Madidi Region, Bolivia (1990 and 1997); Eastern Dry Forests, Bolivia (1990, 1992); Pando Region, Bolivia (1991); Tucavaca Valley, Bolivia (1994); South-Central Chuquisaca, Bolivia (1995); Parque Nacional Noel Kempff Mercado, Bolivia (1995); Cordillera de la Costa, Ecuador (1991); Cordillera del Condor, Ecuador and Peru (1993); Tambopata-Candamo Reserve Zone, Peru (1992); Pampas del Heath, Peru (1996); Vilcabamba Mountains, Peru (1997 and 1998) and Kanuku Mountain Region, Guyana (1993); *Central America* - Columbia River Forest Reserve, Belize (1992); *Asia-Pacific* - New Ireland, Papua New Guinea (1994); Lakekamu Basin, Papua New Guinea (1996); Irian Jaya, Indonesia (1998); *Africa and Madagascar* - Ankarafantsika, Madagascar (1997); Zahamena - Mantady Corridor, Madagascar (1998); Marahoue National Park, Cote d'Ivoire (1998). *AquaRAPs: South America* - Tahuamanu and Manuripi Rivers, Bolivia (1996); Paraguay River, Paraguay (1977); Rio Negro and headwaters, Pantanal, Brazil (1998). *Marine RAPs*: Rennell Island/Indispensables, Solomon Islands (1993); Milne Bay Province, Papua New Guinea (1997); Northern Palawan Province, Philippines (1998); Togean/Banggai Islands, Central Sulawesi, Indonesia (1998).

RAP Reports Published to Date

1991. A Biological Assessment of the Alto Madidi Region and Adjacent Areas of Northwest Bolivia. May 18-June 15, 1990. *RAP Working Papers, No. 1*, Conservation International, Washington, D. C. 108pp.*

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1994. The Tambopata-Candamo Reserved Zone of Southeastern Perú: A Biological Assessment. *RAP Working Papers No. 6*, Conservation International, Washington, D. C. 184pp.*

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1998. A Rapid Assessment of the Humid Forests of South Central Chuquisaca, Bolivia. *RAP Working Papers, No. 8*, Conservation International, Washington, D. C. 84pp.*

1998. A Biological Assessment of the Lakekamu Basin, Papua New Guinea. *RAP Working Papers, No. 9*, Conservation International, Washington, D. C., Foundation for People and Community Development, Boroko, Papua New Guinea. 187pp. *

1998. A Biological Assessment of Parque Nacional Noel Kempff Mercado, Bolivia. *RAP Working Papers, No. 10*, Conservation International, Washington, D. C., Fundación Amigos de la Naturaleza, Santa Cruz, Bolivia, Missouri Botanical Garden, St. Louis, USA, Museo de Historia Natural Noel Kempff Mercado, Santa Cruz, Bolivia. 372pp.*

1998. A Rapid Biodiversity Assessment of the Coral Reefs of Milne Bay Province, Papua New Guinea. *RAP Working Papers, No. 11*, Conservation International, Washington, D. C. 110pp.

In press. A Rapid Biological Assessment of the Northern Cordillera Vilcabamba, Peru *RAP Working Papers, No. 12*, Conservation International, Washington, D. C.*

*Available through the University of Chicago Press. To order: call 1-800-621-2736; <www.press.uchicago.edu>.

Leeanne Alonso, Director, Rapid Assessment Program, Center for Applied Biodiversity Science, Conservation International, 2501 M Street, Suite 200 Washington, D.C. 20037, USA, Tel: (202) 973-2282, e-mail: <l.alonso@conservation.org>, and **Tim Werner**, Director, Marine Rapid Assessment Program, Center for Applied Biodiversity Science, Conservation International, 2501 M Street, Suite 200, Washington, D.C. 20037, Tel: (202) 973-2217, e-mail: <t.werner@conservation. org>.

IPÊ - A New Conservation Training Center

IPÊ - Instituto de Pesquisas Ecológicas, founded by Claudio Valladares-Padua and Suzana Padua, and based at Nazaré Paulista, São Paulo, Brazil, inaugurated a new Conservation Training Center on 25 September 1999. The Center will promote courses and events in all areas of conservation and management, seeking especially an interdisciplinary approach, balancing theoretical and practical aspects. It will strengthen the partnerships already maintained by IPÊ with Brazilian and international professionals, and conservation and research organizations, including the Wildlife Preservation Trust International, Philadelphia, the Center for Environmental Research and Conservation (CERC) of Columbia University, New York, and the Smithsonian Institution, Washington, D. C. This Center is the result of generous donations and cooperation from the Whitley Animal Protection Trust, Wildlife Preservation Trust Canada, and the Centro de Vivência Nazaré; institutions that recognize the importance of capacity building, the potential of such a Center in Brazil, and the contri-

bution this will make to the conservation of the world's natural resources. For more information: IPÊ - Instituto de Pesquisas Ecológicas, Caixa Postal 47, Nazaré Paulsta, 12960-000 São Paulo, Brazil. Tel/Fax: +11 7861 1327, e-mail: <ipe@ax.ibase.org.br>.

An Alliance to Save the Atlantic Forest

The Atlantic forest stretches along Brazil's coast, extending into northern Argentina and southeastern Paraguay. It shelters an astounding wealth of plant and animal species. In just one hectare (2.47 acres), scientists have found 454 trees species, the world record, and its fauna includes 261 mammals and 260 amphibians; many of them endemic. Its primates include two endemic genera, the lion tamarin, *Leontopithecus*, and the muriqui, *Brachyteles*, and 16 of the 21 primate species of the region are endemic. The Atlantic forest is also Brazil's most populated and developed area, with 60 percent of the country's population. Just 7% of the original forest remains (relatively) intact.

On 9 July 1999, Conservation International and Brazil's largest environmental NGO, the Fundação SOS Mata Atlântica, formed an alliance, with the pledge to combine forces to achieve "Zero Deforestation" and "Zero Species Loss" in the endangered Atlantic forest.

"Two of the most active NGOs in Brazil are now working together in the 'Joint Initiative for the Atlantic Forest'. This alliance will result in a difference in scale in our efforts, multiplying the strength of our programs. The Atlantic Forest is one of the World's top five hotspots for biodiversity. Further loss of the forests and species in this biome is unacceptable", says Roberto Cavalcanti, Director of CI's Brazil Program.

The alliance will allow the two most powerful environmental NGOs in Brazil to combine their resources and efforts to enable a greater and more immediate impact on Atlantic forest conservation. Created in 1986, SOS Mata Atlântica, President Roberto Klabin, has some 25,000 members in Brazil, and has played a major role in raising awareness throughout the country about the importance and plight of the Atlantic forest. Key projects underway include: environmental education; mapping and the evaluation of forest cover and forest loss through the interpretation of satellite images (in collaboration with the National Institute for Space Research - INPE, São José dos Campos, and the Instituto Socioambiental - ISA, São Paulo); the production of seedlings of native species for reforestation; support for protected areas; and the maintenance of data banks on numerous aspects of the socioeconomy and biology of the region.

The Brazil Program of Conservation International was begun in 1988, and has helped put the Atlantic Forest at the top of the international conservation agenda. Emphasis has been given to researching innovative conservation tools, including field-based studies of economic alternatives to deforestation and the development of low-impact ecotourism. CI has also been active in collaborating with the National Biodiversity Program (PRONABIO) of the Brazilian Government in the development of conservation strategies and the identification of priority areas and actions for conservation, including the creation and management of protected areas.

The initiative includes six major programs to promote the protection of the remaining forest of the region. 1) The development and maintenance of the reference center for monitoring the Atlantic forest, with the organization, production and dissemination of up-to-date information on the region and its biodiversity, including the atlas of forest remnants produced regularly by SOS Mata Atlântica. 2) Communication and environmental education. 3) The conservation of public and private protected areas. 4) The conservation of rare, endemic and threatened species. 5) Public policy. 6) Economic alternatives promoting the conservation of natural resources and the forests of the region.

Heloísa de Oliveira, Project and Communications Coordinator, Conservation International do Brasil, Av. Antônio Abrahão Caram 820/302, 31275-000 Belo Horizonte, Minas Gerais, Brazil, e-mail: <h.oliveira@conservation.org.br>, and **Márcia Hirota**, Project Director, SOS Mata Atlântica, Rua Manoel da Nóbrega 456, 04001-001 São Paulo, São Paulo, Brazil, e-mail: <marcia@sosmatatlantica.org.br>.

Curso de Ecologia Quantitativa (Estatística) Aplicada à Biologia da Conservação

O IPÊ - Instituto de Pesquisas Ecológicas realizará, no período de 10 a 19 de novembro de 1999, o "II Curso de Ecologia Quantitativa (Estatística) Aplicada à Biologia da Conservação". *Candidatos*: Profissionais relacionados à conservação já desenvolvendo pesquisa em campo e alunos envolvidos em programas de mestrado e/ou doutorado em áreas afins. *Inscrição e Seleção*: Os interessados deverão enviar para o IPÊ - Instituto de Pesquisas Ecológicas, uma carta de intenções com dados pessoais para contato e uma descrição sucinta do seu projeto de pesquisa, dando maior ênfase na descrição dos dados que deseja analisar durante o curso (máximo 1 página). *Número de vagas*: 16. *Taxa*: Será cobrada de cada participante selecionado uma taxa de R$ 300,00, podendo ser dividida em 3 vezes. *Local*: Nazaré Paulista - São Paulo (a uma hora de São Paulo e Campinas). *Logística*: Os alunos ficarão hospedados no IPÊ, Centro Brasileiro de Biologia da Conservação. Será oferecido café da manhã, almoço e jantar. *Professores*: Dr. Paulo de Marco (Universidade Federal de Viçosa); Adriano Pereira Paglia (MSc, Universidade Federal de Minas Gerais); Daniela Wetzel Gastal (Zootecnista); Daniela Chaves Rezende (Zootecnista). *Conteúdo*: Técnicas não paramétricas e paramétricas usuais; Regressão linear e não linear; Regressão logística;

Análise de dados categóricos; Tópico de ecologia quantitativa (estimativa de riqueza de espécies e análise de comportamento); Análise multivariada. *Prazo para Inscrição*: 28 de outubro de 1999. *Para maiores informações*: Fabiana Prado, e-mail: <pradof@uol.com.br>, ou Luís Henrique de Lima, e-mail: <ipelhlima@uol.com.br>, IPÊ - Instituto de Pesquisas Ecológicas Caixa Postal 47, 12960-000 Nazaré Paulista, São Paulo, Brasil, Tel/Fax: +11 7861 1327. Web site: <http://www.columbia.edu/cu/cerc/ipe.html>.

Laury Cullen Jr., Morro do Diabo State Park - IF/SMA, Caixa Postal 91, 19280-000 Teodoro Sampaio, São Paulo. Brazil, Tel/Fax (018) 282-1944, e-mail: <lcullen@stetnet.com.br>.

Primate Societies

The Australasian Primate Society

The Australasian Primate Society is pleased to announce the launch of the website for the 18th Congress of the International Primatological Society to be held in Adelaide, South Australia 7-12 January, 2001. The address is <www.primates.on.net>. The site contains all the details that you may require if you are thinking of attending the Congress, and why wouldn't you want to enjoy the lifestyle of one of the world's most comfortable cities, at a time of warm days and mild nights, while the northern hemisphere is in the depths of winter. Not only that, but the opportunity to meet some many of the world's primatologists in the one spot. Primatological Nirvana.

Graeme Crook, Chairman, Organizing Committee, PO Box 500, One Tree Hill, SA 5114, Australia, Tel: +61 8 82807670, Fax: +61 8 82807078, e-mail: <APS_Editor@msn.com.au>.

A New Editor for the *American Journal of Primatology*

AJP

Dr. Michael W. Andrews, Southern Oregon University, has been appointed as the editor of the *American Journal of Primatology*. Dr. Andrews replaces Dr. Mike Raleigh, who has served so brilliantly as AJP editor since 1992. Dr. Andrews has been a member and Chair of the American Society of Primatologists (ASP) Publications Committee and was also the Media Reviews Editor of AJP. He is an accomplished scientist with a strong record of peer-reviewed research in primate social development and in computerized assessment of primate cognition and motor performance. The AJP Editor Search Committee, chaired by Dr. Jeffrey French, and including Drs. Suzette Tardif and John Mitani, reflected the broad disciplinary views of anthropology, zoology, and psychology, and included an advisory group of current and/or former journal editors (Drs. Jeanne Altmann, Mike Raleigh, Charles Snowdon).

The new address for *American Journal of Primatology* manuscript submissions: Dr. Michael W. Andrews, Editor, *American Journal of Primatology*, Department of Psychology, Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520, USA. Instructions to authors can be found at: http://www.interscience.wiley.com/jpages/0275-2565/authors.html

Nancy Caine, ASP President, Department of Psychology, California State University, San Marcos, CA 92096, USA, Tel: (691) 750-4145, Fax: (619) 750-4030, e-mail: <ncaine@mailhost1.csusm.edu>, and **Janette Wallis**, Executive Secretary, ASP, Department of Psychiatry & Behavioral Sciences, University of Oklahoma Health Sciences Center, P. O. Box 26901, Oklahoma City, OK 73104-5020, USA, Tel: (405) 271-5251 x 47612; Fax: (405) 271-3808, e-mail: <janette-wallis@ouhsc.edu>.

Recent Publications

Primate Conservation

Number 18, 1998, of the journal of the IUCN/SSC Primate Specialist Group - *Primate Conservation* - has been published. It is edited by Russell A. Mittermeier (Chair PSG, Conservation International) and Anthony B. Rylands (Deputy Chair PSG, Conservation International do Brasil). This issue was produced thanks to the support of the Margot Marsh Biodiversity Foundation, The Los Angeles Zoo, Conservation International, and the Department of Anatomical Sciences of the State University of New York, Stony Brook. It includes a wide range of articles from Africa, Asia and the Neotropics, as well as an analysis of baseline range size distributions in primates. *Contents*: Baseline range size distributions in primates - Clara B. Jones, pp.7-9; Ecological responses of spider monkeys to temporal variation in fruit abundance: The importance of flooded forest as a keystone habitat - Jorge A. Ahumada, Pablo R. Stevenson & Marcela J. Quiñones, pp.10-14; Primates of the tropical forest of the Pacific Coast of Peru: The Tumbes Reserved Zone - Filomeno Encarnación & A. Gaylon Cook, pp.15-20; Some observations on the ecology of *Cacajao calvus ucayalii* in the Peruvian Amazon - Rolando Aquino, pp.21-24; Notes on the distribution and conservation status of spider and howler monkeys in the state of Quintana Roo, Mexico - Alvaro del Campo Parra Lara & Jeffrey P. Jorgensen, pp.25-29; Distribution and status of the primates of Guatemala - Gilberto Silva-López, Johanna Motta-Gill & Alonso I. Sánchez-Hernández, pp.30-41; Dietary choices in *Cebus olivaceus*: A comparison of data from Hato Piñero and Hato Masaguaral - Lynne E. Miller, pp.42-50; The Zanzibar red colobus monkey: Conservation status of an endangered island endemic - Thomas T. Struhsaker & Kirstin S. Siex, pp.51-58; Conservation status of primates in Cameroon - Leonard Usongo, pp. 59-65; Conservation status of primates in the proposed Lobéké Forest Reserve, south-east Cameroon - Leonard Usongo, pp.66-68; Notes

on the dwarf galagos (*Galagoides udzungwensis* and *Galagoides orinus*) in the Udzungwa Mountains, Tanzania - Thomas M. Butynski, Carolyn L. Ehardt & Thomas T. Struhsaker, pp.69-75; A brief report on Yunnan snub-nosed monkeys, *Rhinopithecus bieti*, at Bamei in northern Yunnan Province, China - T. Zhong, L. Xiao, R. C. Kirkpatrick & Y. C. Long, pp.76-80; Current status and conservation strategies of primates in China - Shu-Yi Zhang, pp.81-84; Behaviour of two groups of Hanuman langur (*Semnopithecus entellus*) during a solar eclipse in 1995 at Medinipur, West Bengal, India; A. Murmu, S. Chaudhuri & J. R. B. Alfred, pp. 85-87; The conservation status of two Sulawesian tarsier species: *Tarsius spectrum* and *Tarsius dianae* - Sharon Gursky, pp.88-91. In Brazil, available from: Anthony B. Rylands, Conservation International do Brasil, Avenida Antônio Abrahão Caram 820/302, 31275-000 Belo Horizonte, Minas Gerais, Brazil, Tel/Fax: +55 (0)31 441-1795, e-mail: <a.rylands@conservation.org.br>. Elsewhere, available from Ella Outlaw, Conservation International, 2501 M Street NW, Suite 200, Washington D.C. 20037, USA.

Field Studies at La Macarena, Colombia

Volume 13 (1999) of *Field Studies of Fauna and Flora La Macarena Colombia* has been published. The publication is subtitled "Monbusho International Scientific Research Program Reports" and results from the Japan Colombia Cooperative Field Study based at at the Centro de Las Investigaciones Ecológicas La Macarena (CIEM) in the Parque Nacional Natural Macarena-Tinigua, Meta, Colombia. *Contents*: Social changes within a group of wild black-capped capuchins, VI - K. Izawa, pp.1-6; Face-whitened disease observed in wild woolly monkeys, *Lagothrix lagotricha*, at La Macarena, Colombia - A. Nishimura, pp.7-13; Social changes within a group of red howler monkeys, VII - K. Izawa, pp.15-17; Home ranges and intergroup relations among the wild red howler monkeys - K. Kimura, pp.19-24; A list of animals which fed on fruit of a fig tree - K. Izawa, pp.25-30; Vegetation succession on the floodplain of the Río Duda, Colombian Amazonia - M. Hara, Y. Hirabuki, A. Takehara, C. Barbosa & T. Ohba, pp.31-40; Frugivore-dispersed seedlings of milpeso palm *Oenocarpus bataua* Mart. in the Neotropical rain forest of La Macarena, Colombia - M. Kobayashi, Y. Shimooka & K. Izawa, pp. 41-46.

Volume 12 (1998) was published in Colombia, and includes the following articles: Breeding biology of *Hoploxypterus cayanus* (Charadriidae) at the Río Duda - Iván Jiménez & Carlos Meija, pp.3-7; Locomotion patterns of woolly monkeys (*Lagothrix lagothricha*): Implications of the evolution of suspensory travel on atelines - Pablo R. Stevenson, pp.9-18; Bird species at the CIEM, Tinigua National Park: A partial list II - C. Daniel Cadena, Juan L. Parra, Carlos A. Botero, Germán D. Mejía, Juanita Aldana & Gustavo A. Londoño, pp.19-32; How does the diet of a curassow vary within a week - Iván Jiménez, Juanita Aldana, Daniel Cadena & Jimena Forero, pp.33-40. Copies of Volume 12 available from: Carlos Mejía, Universidad de los Andes, Apdo. Aereo 4976, Bogotá, Colombia. Copies of Volume 13 available from Kosei Izawa (address below).

Kosei Izawa, Miyagi University of Education, Aramaki, Aoba-ku, Sendai 980-0845, Japan.

International Zoo Yearbook

The *International Zoo Yearbook* (Editors Peter J. S. Olney and Fiona A. Fisken) is published by The Zoological Society of London. It is an international forum for the exchange of information amongst zoos. Launched in 1960, the scope and significance of the *Yearbook* has enlarged as zoos realize their unique opportunities for research and data collection as well as their role in the conservation of biodiversity and in increasing public awareness of the need for conservation of species and habitats. The work carried out in zoos is increasingly dependent on coordinated effort and shared results, not only amongst themselves but also with laboratories, conservation centres and similar bodies engaged in the study and preservation of wildlife. The *Yearbook* is both the medium and the reflection of this changing outlook. For zoologists, veterinarians, educationalists and anyone concerned with the care, conservation, biology and behaviour of wild animals it is an indispensable reference and a source book of much data unobtainable elsewhere.

Volume 36 (663pp., 23 plates, 50 figures) has been published recently. As in all the *Yearbooks* published to date, there is a special section, which in this volume is dedicated to Old World Primates. It contains 17 articles relating to husbandry, management and status of Old World primates, including reviews of behavioural studies. Management of gentle lemurs, husbandry and breeding of douc langurs, and the conservation and management of orang-utans are reported, and a practical model of the possible form and content of a husbandry manual, using slender loris as an example, is provided. A review on behavioural studies of guenons, observations on hand modulation of vocalization in siamangs, the behavioural response of a group of western lowland gorillas to the death of the silverback male and the effects of group structure and rearing strategy on personality in chimpanzees are presented. Individual reports are also given on the status of three threatened species, gelada baboon, moloch gibbon and orang-utans. Exhibit design is examined in articles on the redevelopment of a disused enclosure to make it suitable for Sulawesi crested macaques, and a mixed-species exhibit which provides an appropriate social and physical environment for both an arboreal and a terrestrial species, the eastern black-and-white colobus and patas monkeys, respectively. Section 1 ends with articles on environmental enrichment and nutritional management, with special consideration for vitamin D.

Section 2 begins with an innovative paper on the development of key performance indicators as bench-marks for progress in order to improve overall organizational management in zoos. The other 12 articles range from a report on the rearing project for Ladybird spiders to a study on

sex ratios in captive-born ruminants. Reviews on breeding of d'Orbigny's slider turtle, oriental white stork, red and blue lory, North American ungulates and a solitary and highly aggressive fossorial mammal, the blind mole rat, are also included. Food preferences in St. Lucia parrots, management of the Amazon river dolphin and restraint of gazelles are discussed. Hand-rearing techniques for eastern white pelican chicks and a severely dehydrated Rüppell's griffon vulture are described.

Section 3 comprises a list of *Zoos and Aquariums of the World*, an updated list of national zoo associations, the list of vertebrate species bred in captivity in 1995 and 1996, the census of rare animals in captivity as at January 1996 and 1997 and the summary list of authorized international studbooks and registers. A list of taxonomic authorities consulted in the *Yearbook*, author and subject indexes complete the volume.

The Guest Essay for Volume 36, by Lee Durrell and Jeremy Mallinson of the Durrell Wildlife Conservation Trust, discusses how an in-depth institutional review highlighted and stimulated the processes by which a single organization can strengthen its participation in field conservation and the impact of these changes on the role of the institution.

The *International Zoo Yearbook* (ISSN 0074-9664) is available from: The Zoological Society of London, Dept. IZY, Regent's Park, London NW1 4RY. UK, Fax: (0)171 449 6411. The price is £65.00 or US$120.00 (+ postage outside UK at £4.50 or US$9.00). Also available is an offprint of the *List of Zoos and Aquariums of the World*, price £18.50 or US$35.00 (+ postage outside UK at £1.50 or US$3.00).

LEONTOPITHECUS PHVA

The final report from the lion tamarin PHVA Workshop held in Belo Horizonte, Minas Gerais, Brazil, 20-22 May 1997, "Leontopithecus *II, Final Report. The Second Population and Habitat Viability Assessment for Lion Tamarins (*Leontopithecus*)*", compiled by Jonathan D. Ballou, Robert C. Lacy, Devra Kleiman, Anthony Rylands and Susie Ellis (1998), is now available in Portuguese. It was translated by Maria Inês Castro, currently with Conservation Inernational, Washington, DC, but previously a long-standing member of the Golden Lion Tamarin Conservation Program (GLTCP) of the Smithsonian Instutution. Available from: IUCN/SSC Conservation Breeding Specialist Group, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124, USA, Fax; +1 612 432 2757, e-mail: <cbsg@epx.cis.umn.edu>. The price is US$35.00 (checks payable to CBSG on a US Bank, Mastercard and Visa also accepted).

A NEW JOURNAL ON PLANT ECOLOGY, EVOLUTION AND SYSTEMATICS

Gustav Fischer Verlag is publishing a new journal, *Perspectives in Plant Ecology, Evolution and Systematics*. It was launched in 1998 by the Rübel Foundation, a private trust associated with the Geobotanical Institute of the Swiss Federal Institute of Technology. *Scope*: Focus on ecology, evolution and systematics of plants; informed perspective on themes of current interest and debate; up-to-date authoritative reviews; monographs on selected themes of enduring importance; applied and pure science; both specialized and interdisciplinary themes. There are two issues per volume. Volume 1(1), 1998, includes an article by P. E. Hulme (Durham) on post dispersal seed predation and the consequences for plant demography, and volume 1(2) a review by A. Traveset (Palma) on the effects on germination of seed passage through vertebrate frugivore guts, as well as an essay by N. M. Waser and M. V. Price (Riverside, California) on why ecologists need to know about animals! The Editor-in-Chief is Peter J. Edwards, Zürich, Switzerland, and the Managing Editor is Anne Pickhardt, Geobotanisches Institut ETH, Stiftung Rübel, Zürichbergstrasse 38, CH 8044 Zürich, Switzerland, e-mail: <pickhardt@geobot.umnw.ethz.ch>. For more information: <http://www.gfischer.de>.

BOOKS

Primate Behavioral Ecology, by Karen B. Strier, December 1999, 400pp. Allyn and Bacon, Needham, MA. Paperback ISBN 0 205 20019 2. Price: US$36.00. *Primate Behavioral Ecology* is an introduction to the field and its applications to primate conservation. It is designed for courses in primate social behavior, animal behavior, and primate ecology and behavior in Anthropology, Psychology, Biology and Zoology at the sophomore level through graduate level. Like no other on the market, this comprehensive text integrates the basics of evolutionary and ecological approaches to the study of primate behavior with up-to-date coverage of how different primates actually behave. Examples are drawn from the "classic" primate field studies and more recent studies on previously neglected species, illustrating the vast behavioral variation that we now know exists and the gaps in our knowledge that still remain. It integrates contemporary behavioral ecology, evolutionary theory, and conservation concerns as they pertain to primates and provides a broad coverage of primate behavioral diversity. *Chapters*: 1. Introduction to Primate Studies; 2. Traits, Trends and Taxonomy; 3. Primates Past and Present; 4. Evolution and Social Behavior; 5. Evolution and Sex; 6. Food and Females; 7. Female Strategies; 8. Male Strategies; 9. Development Stages; 10. Communication and Cognition; 11. Community Relationships; 12. Conservation. The Bibliography includes approx. 900 references. A must for anyone interested in primate behavior, ecology and conservation. Available from: Allyn and Bacon, 160 Gould Street, Needham, MA 02494, USA, Tel: (781) 433-8472, Fax: (781) 455-1350.

Walker's Primates of the World, by Ronald M. Nowak, November 1999, 272pp., 179 photos. The Johns Hopkins University Press, Baltimore. ISBN 0 8018 6251 5. Price: US$19.95 (paperback). Introduction by PSG Chairman Russell A. Mittermeier, Anthony B. Rylands and William R.

Konstant. A comprehensive guide to the primates, includes scientific and common names, the number and distribution of species, measurements and physical traits, habitat, daily and seasonal activity, population dynamics, home range, social life, reproduction, longevity, and status of threatened species. Recently extinct genera, such as the giant lemurs of Madagascar, are covered in full. Textual summaries present accurate, well-documented descriptions of the physical characteristics and living habits of primates in every part of the world. The introduction discusses the diversity, taxonomy and distributions of primates as well as their distinguishing characteristics, special adaptations and particularly striking features, such as sociality. Also discussed are conservation efforts, past and future, and the factors that are threatening many species with extinction. Available from: The Johns Hopkins University Press, Sales Department, 2715 N. Charles Street, Baltimore, MD 21218-4319, USA, Tel: +1 410 516 3864, Fax: +1 410 516-6998, e-mail: <jpigza@mail.press.jhu.edu>.

Faces in the Forest: The Endangered Muriqui Monkeys of Brazil, by Karen B. Strier, 1999, 138pp. Harvard University Press, Cambridge, Massachusetts. Paperback ISBN 0 674 29008 9. Price:US$16.95. The muriqui is one of the most threatened primate species in the world. Because of deforestation in their natural habitat - the Atlantic coastal forests of southeastern Brazil, the muriquis are confined to less than three percent of their original range. In 1987, there were only a dozen forest fragments known to support a total muriqui population of about 500 but as of 1998, at least 20 forests are known to support at least 1,000. This book traces the natural history of the muriqui from its scientific discovery in 1806 to its current, highly endangered status. Karen Strier provides a case study of this scientifically important primate by balancing field research and ecological issues. Through her accessible presentation, readers gain a broad understanding of primate behavior and tropical conservation. It is reprinted in paperback following the success of the hardback version published in 1992 by Oxford University Press. Included is a new preface which summarizes the ongoing research and conservation efforts for muriquis since then. As pointed out by Stephen Ferrari who reviewed the 1992 edition for the *International Journal of Primatology*, it is a "highly readable mixture of personal anecdotes and serious science that will inevitably be compared with Old World classics such as Jane Goodall's *In the Shadow of Man* and Dian Fossey's *Gorillas in the Mist*." Available from: Harvard University Press, Cambridge, Massachusetts. <www.hup.harvard.edu>.

Mammals of the Neotropics. The Central Neotropics, Volume 3: Ecuador, Peru, Bolívia, Brazil, by John F. Eisenberg and Kent H. Redford, 1999, 609pp. The University of Chicago Press, Chicago. ISBN 0 226 19541 4 (cloth), 0 226 19542 2 (paperback). The 3rd volume in the series. The first two volumes (1989, 1992) dealt with the northern Neotropics (Panama, Colombia, Venezuela and the Guianas), and the southern cone (Chile, Argentina, Uruguay and Paraguay). A remarkable compendium of mammal species and their distributions in central South America, with plates in color and black-and-white by Fiona A. Reid, and excellent essays on various aspects of mammalian geography and prehistory in the Neotropics. *Contents*: Part 1. Mammalian Faunas in the Plio-Pleistocene of Brazil. Isolation and interchange: A deep history of South American mammals - S. David Webb, pp.13-19; Fossil mammals of the Amazon as a portrait of a Pleistocene environment - Alceu Rancy, pp.20-26; Pleistocene mammals of the Cerrado and Caatinga of Brazil, Castor Cartelle, pp.27-46. Part 2. The Contempoary Mammalian Fauna, pp.47-520. Part 3. Biogeography of Land Mammal Faunas. The Galápagos and other South American islands, pp.523-526; Biodiversity reconsidered - John F. Eisenberg, pp.527-548; Macrogeography of Brazilian mammals - Gustavo A. B. da Fonseca, Gisela Hermann and Yuri L. R. Leite, pp.549-563; The structure of nonvolant mammal communities in different Amazonian forest types - Carlos A. Peres, pp.564-581; The contemporary mammalian fauna of South America - John F. Eisenberg, pp.582-591. Appendix, pp.593-597 (some recent taxonomic alterations pertinent to volumes 1 and 2). Indices for scientific and common names. Available from: The University of Chicago Distribution Center, 11030 South Langley Avenue, Chicago, Illinois 60628, USA. Customer Service: (800) 621-2736 (USA & Canada), (773) 568-1550 (International).

Mamiferos de los Bosques Humedos de América Tropical, de Louise Emmons y Francois Feer, 1999. ISBN 99905-801-0-3. La primera guia de campo de estas criaturas altamente diversas y dificiles de describir, ha significado un gran exito desde su publicación inicial en 1990. En esta primera edicion en español completamente revisada y actualizada se destacan: Un total de 315 especies cubiertas en reportes individuales; todos los registros de especies mantenidos desde la primera edición en ingles han sido actualizados; 195 mapas que presentan información actual sobre los rangos de distribución y geografia de cada especie; 29 hermosas laminas a color ilustran mas de 220 especies (incluyendo variantes significativas de color entre machos y hembras o adultos y jovenes). Las dos primeras ediciones en ingles (*Neotropical Rainforest Mammals,* The University of Chicago Press, Chicago) ya fueron un gran exito y son de mucha utilidad tanto en el trabajo diario de zoologos, conservacionistas o autoridades relacionadas con la conservación como para los estudios de miles de estudiantes. La versión en español esta siendo publicada por la Fundación Amigos de la Naturaleza Noel Kempff (FAN), Bolivia. F.A.N. es una institución privada, sin fines de lucro. Su misión es la conservación de la diversidad biológica mediante la protección y el uso sostenible y equitativo de los recursos naturales en Bolivia. En caso que la edición y la venta de este libro dejen beneficios economicos, esta ganancia sera invertida en nuestros proyectos de conservación, sobre todo en otras publicaciones sobre biodiversidad. Precios: Bolivia - u 28 (tapa blanda); u 40 (tapa dura); Centro u Sur América - u 32 (tapa blanda); u 46 (tapa dura); Otros: u 37 (tapa blanda); u 62 (tapa dura). Los pagos pueden ser realizados de la siguiente manera: Con tarjeta de credito

(Visa y Mastercard), favor enviar un fax con su numero de tarjeta, fecha de expiración de su tarjeta y firma; Con cheque girado a nombre de la "Fundación Amigos de la Naturaleza"; Mediante deposito en la cuenta corriente No. 6343-2105 del banco BISA (aplicable solo a clientes de Bolivia); Mediante giro bancario (solicitar información en su respectiva entidad bancaria). Dr. Pierre Ibisch (Dir. Departamento de Ciencias, FAN) y Silvia Añez (Encargada Editorial FAN), Av. Las Americas Calle Bumberque y Agreda No. 1100, Casilla 2241, Santa Cruz de la Sierra, Bolivia, Tel/Fax: (591-03) 329692, 329717, 378382, 378381, e-mail: <Sanez@fan-bo.org>.

Walker's Mammals of the World, by Ronald M. Nowak, 6th Edition in 2 volumes, 2,160pp., 1,550 illustrations. Johns Hopkins University Press, Baltimore. Price: US$99.95 (paperback). A complete account of every genus of mammal in all historical time, the 6th edition is 25% longer than its predecessor. Of the previous generic accounts, 95% have been substantially modified, and there are 80 new ones - among them three remarkable large ungulates recently discovered in the forests of Indochina. New also is a full account of the woolly mammoth, now known to have survived until less than 4,000 years ago. Each section of the book describes one genus and includes facts such as scientific and common names, the number and distribution of species, measurements and physical traits, habitat, locomotion, daily and seasonal activity, population dynamics, home range, social life, reproduction and longevity. Textual summaries present accurate, well documented descriptions of the physical characteristics and living habits of all of the mammals. The names and distributions of all are listed in systematic order. These lists have been cross-checked to ensure coverage of all of the species in the Smithsonian Institution's *Mammal Species of the World*. This edition also records all official classifications of species and subspecies in the *1996 IUCN Red List of Threatened Mammals*. Available from: The Johns Hopkins University Press, Sales Department, 2715 N. Charles Street, Baltimore, MD 21218-4319, USA, Tel: +1 410 516 3864, Fax: +1 410 516-6998. <www.press.jhu.edu>.

New Directions in Lemur Studies, edited by Berthe Rakotosaminanana, Hante Rasaminanana, Jörg U. Ganzhorn, and Steven M. Goodman, 1999. Kluwer Academic/Plenum Publishers, London. ISBN 0 306 46187 0. Proceedings of the XVII Congress of the International Primatological Society, Antananarivo, Madagascar, 10-14 August 1998. *Contents*: Ancient DNA in subfossil lemurs: Methodological challenges and their solutions; Past and present distributions of lemurs in Madagascar; Skeletal morphology and the phylogeny of the Lemuridae: A cladistic analysis; Support preference of two sympatric lemur species: *Propithecus v. verreauxi* and *Eulemur fulvus rufus*; Field metabolic rate and the cost of ranging of the red-tailed sportive lemur (*Lepilemur ruficaudatus*); Metabolic strategy and social behaviour in Lemuridae; Cathemeral activity of red fronted brown lemurs (*Eulemur fulvus rufus*) in the Kirindy Forest / CFPF; Social organization of the fat-tailed dwarf lemur (*Cheirogaleus medius*) in northwestern Madagascar; Demography and floating males in a population of *Cheirogaleus medius*; Influence of social organization patterns on food intake of *Lemur catta* in the Berenty Reserve; The importance of the black lemur (*Eulemur macaco*) for seed dispersal in Lokobe Forest, Nosy Be; Taste discrimination in lemurs and the other primates, and the relationships to distributions of plant allelochemicals in different habitats of Madagascar; Folivory in a small-bodied lemur: The nutrition of the Alaotran gentle lemur (*Hapalemur griseus alaotrensis*); Conservation of the Alaotran gentle lemur: A multidisciplinary approach: Teaching Primatology at the Université de Mahajanga (NW Madagascar); Experiences, results and evaluation of a pilot project: Lemurs as flagships for conservation in Madagascar. Available from: Kluwer Academic/ Plenum Publishers, New Loom House, 101 Back Church Lane, London E1 1LU, UK, Tel: +44 207 264 1913; Fax: +44 207 264 1919.

Environmental Enrichment for Nonhuman Primates Resource Guide, edited by Michael D. Kreger, Coordinator Jean Larson, March 1999. Published by: The United States Department of Agriculture, Agricultural Research Service, National Agricultural Library and The Animal Welfare Information Center, Beltsville, MD. *Contents*: U.S. Laws, Regulations, and Policies for Environmental Enhancement for Nonhuman Primates; Organizations and Websites; Primate Centers and Animal Colonies; Listservs; Product Suppliers; Audiovisuals; Journals and Newsletters; Bibliography (January 1992 through December 1998); General Environmental Enrichment; General Primate Enrichment; Enrichment Plans; Great Apes and Gibbons; Macaques; Marmosets and Tamarins; New World Monkeys; Old World Monkeys; Books and Conference Proceedings; Using training to enhance animal care and welfare (G. Laule); The use of behavioral management techniques to reduce or eliminate abnormal behavior (G. Laule); Environmental enrichment for captive wildlife through the simulation of gum feeding (K. Kelly); Arguments for single-caging of rhesus macaques: are they justified? (V. Reinhardt); Frequently asked questions about safe pair-housing of macaques (V. Reinhardt); The Wisconsin gnawing stick (V. Reinhardt); Appendix A - USDA Final Rule on Environment Enhancement to Promote Psychological Well Being -Section 3.81 (02/15/91 Vol. 56, No. 32, Federal Register, Pages 6426-6505). Available free of charge from: Michael Kreger, Animal Welfare Information Center, National Agricultural Library, 10301 Baltimore Avenue, Beltsville, MD 20705, USA, Fax: 1-301-504-5472, e-mail: <awic@nal.usda.gov>. Please provide full surface mail and e-mail information with your order. This document is also available in electronic form at the following URL: <http://www.nal.usda.gov/awic/pubs/primates/primate.htm>.

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Boinski, S. The social behavior of wild *Saimiri sciureus sciureus* in Suriname, p.94.

Brush, J. A. and Norconk, M. A. Early behavioral development in a wild white-faced saki monkey (*Pithecia pithecia*), p.99.

Carmichael, G. and Winkler, L. Dental morphology of the free-ranging mantled howling monkeys on Isla de Ometepe, Nicaragua, and the Nicaraguan collection at the National Museum of Natural History, p.102.

Clarke, M. R., Zucker, E. L., Crockett, C. M. and Zaldivar, M. Assessment of the howling monkey (*Alouatta palliata*) populaion on Hacienda La Pacifica, pp.108-109.

Collins, A. C. Biogeography and evolution in spider monkeys (*Ateles*), pp.110-111.

Froehlich, J. W., Froehlich, D. J. and Schmiedicke, A. A new genus and species of the diverse New Mexico lemurs, pp.130-131.

Cropp. S. J. and Boinski, S. Phylogenetic relationships among *Saimiri* species based on nuclear and mitochondrial DNA evidence, p.112.

Garber. P. A., Pruetz, J. D., Lavallee, A. and Lavallee, S. A preliminary study of mantled howling monkey (*Alouatta palliata*) ecology and conservation on Isla de Ometepe, p.133.

Goldstein, G. R., Fuentes, A. and Snively, D. Systematic use of video as a data collection and training tool in free-ranging, semi-free-ranging, and captive studies of non-human primates, pp.137-138.

Grafton, B. W., Freudenstein. J. V. and Norconk, M. A. Measuring seed dispersal distance with genetic markers: Preliminary results, p.139.

Hawkins, D. N. and Strier, K. B. Female-female inspections in muriquis (*Brachyteles arachnoides*), p.147.

Hemingway, C. A. and Overdorff, D. J. Food for thought: Evaluating phenological methods as food availability estimates, p.149.

Huettmann, F. Interactions between mantled howling monkeys (*Alouatta palliata*) and neotropical birds in a fragmented forest habitat on Ometepe Island, Nicaragua, p.156.

Masterson, T. J. Cranial dimorphism in *Cebus capucinus*, pp.192-193.

Norconk, M. A., Gleason, T. M. and Harrison, A. L. Feeding rates and social dominance among white-faced saki females, p.212.

Nunn, C. L. The number of males in primate social groups: A comparative test of the socioecological model, p.213.

Panger, M. A. and Wolfe, L. D. The effects of postural regulation on the hand-use patterns of free-ranging white-faced capuchins (*Cebus capucinus*) in Panama, pp.217-218.

Peter, G., Sohn, R. and Winkler, L. Capture, health, and morphological assessment of free-ranging mantled howler monkeys (*Alouatta palliata*) in Nicaragua, p.221.

Power, R. A., Jerome, C. P., Power, M. P., Oftedal, O.T. *et al.* Effects of pregnancy and lactation on parameters of bone metabolism in the common maroset monkey, p.225.

Smith, R. J. Statistical issues with the use of ratios and residuals as measures of of sexual size dimorphism in comparative studies, p.252.

Soligo, C. and Müller, A. E. Body weight trajectories in primate evolution: The evidence from nails and claws, p.255.

Su, D. and Hartwig, W. C. Comparative size at maturity reaction norms in Old and New World monkeys, pp.260-261.

Teaford, M. F., Yamashita, N., Aldridge, K. and Glander, K. E. Food processing in different social groups of *Alouatta palliata*, pp.263-264.

Torgrimson, B. N. Mother and infant interactions and infant and nonmother interactions in mantled howling monkeys, *Alouatta palliata*, from the La Suerte Biological Field Station, Costa Rica and the Ometepe Biological Field Station, Nicaragua, pp.265-266.

Travers, C. D. Activity budget, diet, and patterns of resource utilization of the mantled howling monkey (*Alouatta palliata*) in Ometepe, Nicaragua, p.267.

Van Schaik, C. P. and Deaner, R. O. Distribution and evolution of feeding tool use in primates, p.270.

Winkler, L., Zhang, X. and Ferrell, R. Assessing intragroup genetic variation of free-ranging mantled howling monkeys on the island of Ometepe, Nicaragua, pp.279-280.

Zhang, X., Winkler, L. and Ferrell, R. Extraction of DNA and PCR analysis of DNA from free-ranging howling monkey (*Alouatta palliata*) feces, p.284.

In: *Livro de Resumos, IX Congresso Brasileiro de Primatologia*, Santa Teresa, Espírito Santo, Brazil, 25-30 July 1999 (part).

Ades, C. Lateralidade em primatas neotropicais, p.22.

Affonso, A.G., Ruiz-Miranda, C. R. and Beck, B. Interação ecológica entre micos-leões-dourados reintroduzidos e micos-estrelas introduzidos em fragmentos de Mata Atlântica, RJ - Resultados preliminares, pp.69-70.

Albuquerque, F. S., Arruda, M. F. and Otta, E. Desenvolvimento de *Callithrix Jacchus* nos três primeiros meses de vida, em ambiente natural, p.41.

Alencar, A. I., Sousa. M. B. C., Yamamoto, M. E., França, G. O. and Azevêdo, S. D. Comportamento de dominância e subordinação como indicadores do posto social em fêmeas de *Callithrix jacchus,* p.39.

Alencar, A., Sousa, M. B. C., Yamamoto, M. E., França, G. O. and Azevêdo, S. D. Relação entre os níveis de catação social e autocatação em fêmeas cativas de *Callithrix jacchus*, p.39.

Álvares, S. de A. and Santee, D.P. Avaliação preliminar do repertório vocal de um grupo de micos-estrêla (*Callithrix penicillata*) em ambiente natural, pp.35-36.

Amaral, J. M. J. and De Jong, J. O comportamento de macaco-prego (*Cebus apella*) em uma mata urbana de Ribeirão Preto,

cromossônicos apoiam a colocação de *Callicebus personatus* (Primates: Cebidae) em um grupo próprio, p.78.

Nash, S. D. and Konstant, W. R. The importance of educational materials in primate conservation, pp.22-23.

Oliveira, C. R. de and Ruiz-Miranda, C. R. Efeitos sócio-ecológicos no comportamento de brincadeira do mico-leão dourado (*Leontopithecus rosalia*) selvagem e reintroduzido: Seleção de substrato, vigilância pelos adultos e efeitos de cativeiro, p.42.

Oliveira, E. G. R., Jerusalinsky, L., Liesenfeld, M. V. A., Buss, G., Jardim, M. M. A. and Perotto, M. A. Projeto macacos urbanos: Interação no encontro de um bando de bugio-ruivo (*Alouatta fusca*) com uma fêmea reintroduzida, p.50.

Oliveira, E. M. Uso da trilha do bugio ruivo (*Alouatta fusca*) como ferramenta para educação ambiental, p.73.

Oliveira, L. C., Fernandes, F. A. S., Schittini, G. M. and Passamani, M. Uso de fragmentos muito pequenos de Mata Atlântica pelo mico-leão-dourado, *Leontopithecus rosalia*, p.46.

MEETINGS

Primate Society of Great Britain (PSGB) - Winter Meeting 1999, 1 December 1999, The Zoological Society of London, London. The theme will be "Mating and Social Systems of Old World Monkeys". Suggestions for speakers and offers of posters are very welcome. Please contact: Dr. Caroline Ross or Mairi Macleod, School of Life Sciences, Roehampton Institute London, West Hill, London SW15 3SN, UK, Tel: +44 181 392 3561, Fax: +44 181 392 3527, e-mail: <c.ross@roehampton.ac.uk> or <m.macleod@roehampton. ac. uk>.

Association for the Study of Animal Behaviour Winter Meeting, 2-3 December 1999, Zoological Society of London, London. The theme is "Evolution of Mind". Please contact: Dr. Karen McComb, Experimental Psychology, School of Biological Sciences, University of Sussex, Falmer, Brighton BN1 9QG, UK, Fax; +44 (0)1273 678611, e-mail: <karenm@biols.susx.ac.uk>.

Australasian Primate Society XVIIIth Annual Conference, 3-5 December 1999, Taronga Zoo, Mosman, NSW, Australia. The theme is "Primate Conservation: The Role of Australia in *In Situ* Programs". Sponsored by the Association of Zoo Friends (NSW), Inc. and the Zoological Parks Board of NSW. The keynote speaker will be Russell A. Mittermeier, Chairman IUCN/SSC Primate Specialist Group and President of Conservation International, Washington, D. C. Abstracts deadline: 15th October, 1999. For more information: APS Conference Coordinator, c/- African Mammal Division, Taronga Zoo, PO Box 20, Mosman, NSW 2088, Australia, e-mail: <mfinnigan@zoo.nsw.gov.au>.

Primate Socioecology: The Role of Life Histories, 14-17 December 1999, The German Primate Center (DPZ), Göttingen. An international conference on primate socioecology. The focus of this meeting (2nd "Göttinger Freilandtage") will be on life history variation among primates. Invited speakers will examine causes of variation in life history traits and explore the consequences of this variation for behavioral and reproductive strategies. An additional goal is to better characterize unique aspects of primate life histories and illuminate general principles through comparison with other mammals. Submissions for relevant oral (15 min) and poster contributions are invited. The conference is also open to guests without presentations. The deadline for submission of abstracts wishing to be considered for spoken papers or posters is August 1, 1999. Guests must also register in advance by October 1, 1999. Additional details available from Peter Kappeler, e-mail: <pkappel@gwdg.de>, or the conference secretariat, e-mail: <gft@www.dpz.gwdg.de>, and the conference web site: <http://www.dpz.gwdg.de/freiland.htm>.

2000

XXIII Congresso Brasileiro de Zoologia, 13-18 February 2000, Instituto de Biociências, Universidade Federal do Mato Grosso, Cuiabá, Mato Grosso, Brazil. Theme "Zoologia no III Milênio". Numerous round tables and mini-courses. Sérgio Lucena Mendes (Museu de Biologia Mello Leitão, Santa Teresa, Espírito Santo) will give a mini-course on "The Ecology of Neotropical Primates". Deadline for abstracts: 30th September 1999. For further information: Comissão Organizadora do XXIII CBZ, Departamento de Biologia/Zoologia, Instituto de Biociências, Universidade Federal do Mato Grosso, Av. Fernando Corrêa da Costa, 78060-900 Cuiabá, Mato Grosso, Brazil, Tel/Fax: +55 (0)65 615 8870, e-mail: <cbz2000@cgi.ufmt.br>.

Primate Society of Great Britain (PSGB) - Millenium Meeting, 1 April 2000, Flett Lecture Theatre, British Museum (Natural History), London. The theme of the meeting is "Primates: Our past, their future". It will be a public understanding of science/primatology event, and will be associated with the Natural History Museum's two-week millenium celebration. Speakers will include Mike Bruford (Institute of Zoology), Robin Dunbar (University of Liverpool), John Fleagle (SUNY at Stony Brook), Phyllis Lee (University of Cambridge), and Steve Mithen (University of Reading). For more information, please contact: Dr. Mark Collard, Department of Anthropology, University College London, Gower Street, London WC1E 6BT, UK, Tel: +44 (0)171 380 7842, Fax: +44 (0)171 380 7728, e-mail: <m.collard@ucl.ac.uk>.

2000 Workshop of the European Marmoset Research Group (EMRG), 2-5 April 2000, Paris. Exact venue to be announced. The theme will be "Marmosets and Tamarins in Biological and Biomedical Research". Paper sessions and roundtable discussion sessions will be held on the following topics: Behaviour, Conservation, Ecology, Genetics, Immunology, Laboratory Management, Neurobiology, Pharmacology, Reproductive Biology, Toxicology. Further announcements will be made on the Primate Info Net. For more information, please contact Dr. Christopher Pryce, Behavioural Biology Laboratory, Swiss Federal Institute of Technology, Schorenstrasse 16, CH-8603 Schwerzenbach,

Switzerland, Tel +41 1 825 7386, Tel +41 1 825 7416 (Secretariat), Fax +41 1 825 7417, e-mail pryce@toxi.biol.ethz.ch., or Dr. Christian Schnell <christian.schnell@pharma.Novartis.com>.

Association for the Study of Animal Behaviour General Meeting, 17-19 April 2000, University of Sheffield, UK. Please contact: Dr. M. Siva-Jothy, Department of Animal and Plant Sciences, University of Sheffield, Sheffield S10 2UQ, e-mail: <m.siva-jothy@sheffield.uc.uk>.

International Conference - The Apes: Challenges for the 21st Century, 10-13 May 2000, Brookfield Zoo, Brookfield. Keynote speakers include: David J. Chivers (lesser apes); Carel van Schaik (orangutans); Gay Reinartz (bonobos); Claudia Olejnickzak (gorillas); and Toshishada Nishida (chimpanzees). The plenary speaker is Russell A. Mittermeier (Chair, PSG and Conservation International). Immediately following the Conference, the Lincoln Park Zoo, Chicago, will host the North American Ape Taxon Advisory Group meetings. Information on registration and submission of abstracts: Ape Conference Planning Committee, Brookfield Zoo, Brookfield, Illinois 60513-0719, USA, Tel: 708 485-0263 x 604, Fax: 708 485-3140, e-mail: <apecon@brookfieldzoo.org>.

American Society of Primatologists - 2000 Meeting, 21-24 June, Regal Harvest House, Boulder, Colorado. The web site for the hotel is <www.boulder@regal-hotels.com> (under hotel directory click on boulder) and information regarding the Boulder area can be located at <www.visitorsbureau@chamber.boulder.co.us>. Local Arrangements Chair: Mark Laudenslager.

3rd International Symposium-Workshop on Frugivores and Seed Dispersal: Biodiversity and Conservation Perspectives, 6-11 August, 2000, Hotel Fazenda Fonte Colina Verde, São Pedro, São Paulo, Brazil. Web site: <http://www.unicamp.br/ib/f2000>.

Primate Society of Great Britain (PSGB) - Winter Meeting 2000, 30 November - 1 December 2000, Meeting Rooms of The Zoological Society of London, London, UK. A combined meeting with national primatological groups of the European Federation of Primatology (EFP). A number of pre-conference workshops will be held. For more information: Hilary O. Box, EFP Representative for the PSGB, Department of Psychology, University of Reading, Reading RG6 2AL, England, UK. Fax: +44 1734 316604, e-mail: <h.box@reading.ac.uk>.

2001

XVIIIth Congress of the International Primatological Society, 7-12 January 2001, Adelaide, Australia. Hosted by the Australasian Primate Society, President Mr. John Lemon, Western Plains Zoo, Dubbo, NSW. Theme: "Primates in the New Millenium". Mr. Graeme Crook is Chairman of the Organizing Committee. *Symposia* - Participants wishing to register a symposium title must submit a 200 word abstract by 31 July 1999. E-mail to Carla Litchfield <aclitch@terra.net.au>. Titles of accepted symposia will be published on the webpage from August 1999. *Papers* - An abstract of 100 words is required. E-mail to Carla Litchfield <aclitch@terra.net.au>. Closing date for first call for papers: 31 January 2000. Closing date for second call for papers: 31 May 2000. A final list of papers will be published on the Internet by 30 June 2000. For more information, and to be put onto the Congress Organizer's mailing list, write to: Conventions Worldwide, PO Box 44, Rundle Mall, SA 5000, Australia, Tel: +61 8 8363 0068, Fax: +61 8 8363 0354, e-mail: <satconv@camtech.net.au>, sending your postal address.

Contributions

We would be most grateful if you could send us information on projects, research groups, events (congresses, symposia, and workshops), recent publications, activities of primatological societies and NGOs, news items or opinions of recent events and suchlike. Manuscripts should be double-spaced and accompanied by the text in diskette for PC compatible text-editors (MS-Word, Wordperfect, Wordstar). Articles, not exceeding six pages, can include small black-and-white photographs, high quality figures, and high quality maps, tables and references, but please keep them to a minimum.

Please send contributions to: **Anthony Rylands**, c/o Conservation International do Brasil, Avenida Antônio Abrahão Caram 820/302, 31275-000 Belo Horizonte, Minas Gerais, Brazil, Tel/Fax: +55 (31) 441-1795 or **Ernesto Rodríguez-Luna**, Instituto de Neuroetología, Universidad Veracruzana, Apartado Postal 566, Xalapa, Veracruz 91000, México, Fax: 52 (28) 12-5748.

Liliana Cortés-Ortiz (Universidad Veracruzana) provides invaluable editorial assistance.

Correspondence, messages, and texts can be sent to:

Anthony Rylands
a.rylands@conservation.org.br

Ernesto Rodríguez-Luna
saraguat@speedy.coacade.uv.mx

***Neotropical Primates*, ISSN** 1413-4703. Abreviate title: *Neotrop. primates.*

Neotropical Primates is produced in collaboration with **Conservation International**, 2501 m Street, NW, Suite 200, Washington DC 20037, USA, and **Fundação Biodiversitas**, Av. do Contorno, 9155/11°. andar - Prado, Belo Horizonte 30110-130, Minas Gerais, Brazil.

Design and Composition: Alexandre S. Dinnouti - a.dinnouti@conservation.org.br - **Conservation International do Brasil.**

ISSN 1413-4703

This issue of *Neotropical Primates* was kindly sponsored by the **Margot Marsh Biodiversity Foundation,** 432 Walker Road, Great Falls, Virginia 22066, USA, the **Houston Zoological Gardens Conservation Program**, General Manager Donald G. Olson, 1513 North MacGregor, Houston, Texas 77030, USA Houston, Texas 77030, USA, the **Los Angeles Zoo**, Director Manuel Mollinedo, 5333 Zoo Drive, Los Angeles, California 90027, USA and the **Grupo de Trabalho em Biodiversidade (GTB)**, through the Brazilian National Science Research Council (CNPq), Gustavo A. B. da Fonseca, Coordenador do GTB, c/o Conservation International do Brasil, Avenida Antônio Abrahão Caram 820/302, 31275-000 Belo Horizonte, Minas Gerais, Brazil.

IUCN/SSC

NEOTROPICAL PRIMATES
Anthony Rylands/Ernesto Rodríguez Luna, Editors
Conservation International
Avenida Antônio Abrahão Caram 820/302
31275-000, Belo Horizonte
Minas Gerais, Brazil