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# *Neotropical Primates*

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The black-headed uacari, *Cacajao melanocephalus ouakary*.

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# CONTRASTES Y SIMILITUDES EN EL USO DE RECURSOS Y PATRÓN GENERAL DE ACTIVIDADES EN TROPAS DE MONOS AULLADORES (*ALOUATTA PALLIATA*) EN FRAGMENTOS DE SELVA EN LOS TUXTLAS, MÉXICO.

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## Resumen

La fragmentación y aislamiento del hábitat natural de los primates silvestres por la actividad humana tiene un impacto importante sobre el comportamiento alimenticio y los patrones de actividad general de monos aulladores. La variaciones en estos comportamientos pueden representar ajustes por parte de los aulladores a condiciones ambientales cambiantes. Sin embargo, la información disponible en la literatura acerca de estos efectos es escasa. En este trabajo reportamos las preferencias alimenticias de tropas de monos aulladores (*A. palliata*) existiendo en un fragmento pequeño (3 ha), uno mediano (35 ha) y uno grande (250 ha) en la región de Los Tuxtlas, México. Los resultados mostraron una tendencia hacia una dieta más diversa del fragmento pequeño al grande. Una tendencia similar fue observada en cuanto al número de especies arbóreas utilizadas por los aulladores, el cual varió de 6 a 15 a 22. La dieta de la tropa en el fragmento pequeño estuvo dominada por el consumo de hojas (80% del tiempo alimenticio), mientras que en el fragmento mediano y grande el consumo de hojas contribuyó al 44% y 22% del tiempo alimenticio respectivamente. En estos últimos dos sitios los aulladores también consumieron proporciones importantes de frutos y flores. Observamos una tendencia, en la proporción de tiempo invertido por los aulladores en viajar de un lado a otro, a disminuir del fragmento grande al pequeño, sugiriendo limitaciones importantes en los desplazamientos de la tropa dentro de su área de suministro. Nuestro estudio sugiere el uso de una perspectiva a nivel del paisaje en el estudio y conservación de tropas de monos aulladores existiendo en hábitats fragmentados.

**Palabras Clave:** Mono aullador, *Alouatta palliata*, fragmentación, Los Tuxtlas, México

## Abstract

Human induced fragmentation and isolation of the natural habitat may have important effects on the feeding behavior and general activity patterns of howler monkeys. Observed variations in these behavior patterns may represent adjustments made by howler monkeys to changing environmental conditions, but until now little information is available in the literature on such effects. We studied the general feeding preferences and activity patterns of howler monkey troops (*A. palliata*) existing in three forest fragments—one small (3 ha), one medium (35 ha) and one large (250 ha)—in the region of Los Tuxtlas, Mexico. Results showed a general trend toward a more diverse resource base in the diet from the small to the large forest fragments. A similar trend was evident in the number of tree species used, ranging from 6 to 15 to 22. The observed diet of the howler troop in the smallest fragment was dominated by leaves (80% feeding time). In contrast, in the medium and large fragments consumption of leaves accounted for 44% and 22% of their feeding time, respectively, with fruits and flowers accounting for the remaining feeding time. The proportion of time spent traveling decreased from the large to the medium to the small forest fragment, suggesting limitations in troop ranging with decreases in habitat size. Our study suggests the use of a landscape perspective in the study and conservation of howler monkey troops existing in fragmented habitats.

**Key Words:** Howler monkey, *Alouatta palliata*, fragmentation, Los Tuxtlas, Mexico

## Introducción

Los monos aulladores del área Mesoamericana, *Alouatta palliata* y *A. pigra*, no han escapado de la destrucción y fragmentación de su hábitat natural por el hombre, resultando en la extinción local de las especies y en la existencia de poblaciones fragmentadas y aisladas bajo riesgo de extinción (Offerman *et al.*, 1995). Nuestro conocimiento sobre las respuestas de *Alouatta* a la fragmentación y degradación de sus hábitats naturales es aun escasa (Kinzey, 1997). Tal información es indispensable, no solo para enriquecer

nuestros bancos de datos sobre la historia natural y ecología de las especies en el género *Alouatta*, pero también para calibrar la elasticidad ecológica de las especies y generar modelos que eviten la desaparición continuada de estas a nivel local y regional.

La perturbación antropogénica del hábitat natural de los primates Neotropicales debe tener consecuencias importantes sobre los patrones de utilización de recursos alimenticios y sobre las actividades generales de estos. Cambios en estos patrones representan ajustes de tiempo y energía dirigidos al sostenimiento de actividades vitales como crecimiento,



Figura 1. Paisaje fragmentado de la región de Los Tuxtlas, Veracruz, México. Las áreas oscuras son fragmentos de selva. Líneas continuas son arroyos. Áreas en blanco son pastizales. P = fragmento pequeño 3.2 ha, M = fragmento mediano 35 ha, G = fragmento grande 250 ha.

mantenimiento y reproducción y su documentación nos puede decir mucho acerca de la elasticidad adaptativa de las especies a los cambios ambientales. Sin embargo, a pesar de la extensa destrucción y aislamiento de los hábitats naturales de las especies involucradas, la documentación de estas respuestas es aún pobre en la literatura (Bicca-Marques, 1991; Chiarello, 1993; Bicca-Marques y Calegaro-Marques, 1994a, 1994b, 1994c; Galetti y Morellato, 1994; Estrada *et al.*, 1999a).

Con el objeto de contribuir a este vacío de información, en este trabajo reportamos resultados parciales de una investigación de campo dirigida a documentar las variaciones en el comportamiento alimenticio y patrones de actividad generales en tropas de monos aulladores (*Alouatta palliata*) existiendo en un fragmento de selva pequeño (3.2 ha), uno mediano (35 ha) y uno grande (250 ha), localizados en la región de Los Tuxtlas, Veracruz, México.

## Metodología

El trabajo se efectuó en la región de Los Tuxtlas, al sur del estado de Veracruz, México, en la zona en donde se encuentran los terrenos de la Estación de Biología Tropical "Los Tuxtlas" del Instituto de Biología de la Universidad Nacional Autónoma de México, localizada aproximadamente entre los 95° 04'-95° 09' de longitud oeste y a 18° 34'-18° 36' de latitud norte (Fig. 1). El clima en el área de estudio es cálido-húmedo con una precipitación media anual de 4900 mm y una temperatura media anual de 27 °C. Como resultado de la actividad humana una proporción alta de las selvas de esta región han sido fragmentadas en las últimas seis décadas (Estrada y Coates-Estrada, 1996; Estrada *et al.*, 1999). En este tipo de paisajes

han quedado aisladas tropas de aulladores en algunos fragmentos de selva (Estrada *et al.*, 1999b), situación que permite llevar a cabo estudios relacionados a diagnosticar las respuestas de los monos aulladores a la fragmentación de sus hábitats. Así, tres fragmentos de selva ocupados por una tropa de monos aulladores cada uno fueron seleccionados para los propósitos de este trabajo.

El fragmento pequeño, con un área de 3.2 ha y de forma alargada, presenta vegetación selvática residual formada por árboles a los lados de un arroyo. Este sitio está rodeado de pastizales y el fragmento de selva más cercano está a 1.5 km (Fig. 1). En este sitio se encontraba una tropa de *A. palliata* compuesta por dos machos adultos, dos hembras adultas y un infante. El fragmento mediano, con una superficie de 35 ha, también rodeado de pastizales, se localizó a 2 km al oeste del fragmento pequeño y a 0.5 km del fragmento más cercano (Fig. 1). En este sitio estaba presente una tropa de monos aulladores compuesta por tres machos adultos, dos hembras adultas, un juvenil y un infante. El fragmento grande, de 250 ha en extensión, se localiza a unos 5-6 km al sur de los anteriores y también estaba rodeado por pastizales (Fig. 1). Este sitio lo habitaba una tropa de aulladores compuesta por dos machos adultos, cuatro hembras adultas, un juvenil y un infante (Tabla 1).

El registro del comportamiento alimenticio y patrón general de actividades de los aulladores de cada sitio se efectuó durante 5-8 días en cada mes para el periodo Marzo-Julio y para el mes Septiembre de 1999. Las observaciones consistieron en muestreos focales de cada individuo de la tropa, iniciándose estos a las 0600 hrs y terminando a las 1800 hrs. Para cada sujeto se registró el tiempo dedicado a cinco actividades generales: descanso, alimentación, locomoción, interacciones sociales y viaje (movilización sincrónica de los individuos de la tropa a otra área de árboles dentro del fragmento de selva). En el caso de la actividad alimenticia, se marcaron los árboles utilizados y se identificaron a nivel de especie. Así mismo, se desglosó el tiempo invertido en el consumo de hojas (jóvenes y maduras), de frutos (jóvenes y maduros), de flores y de "otros" (peciolos de epífitas, hemiparásitas y bejucos). Los datos resultantes fueron expresados como porcentajes de tiempo registrado en cada actividad.

Tabla 1. Composición por edades y sexo de las tropas de monos aulladores en los fragmentos estudiados. Se indican también las estimaciones de la biomasa animal representada por los aulladores en cada sitio.

	Pequeño (3.2 ha)	Mediano (35 ha)	Grande (250 ha)
Machos adultos	2	3	2
Hembras adultas	2	2	4
Juveniles		1	1
Infantes	1	1	1
<b>Total</b>	<b>5</b>	<b>7</b>	<b>8</b>
<b>Kg/ha</b>	<b>8.0</b>	<b>1.1</b>	<b>0.17</b>

Con el objeto de contar con datos cuantitativos sobre aspectos estructurales de la vegetación de cada sitio, todos los árboles > 25 cm en diámetro a la altura del pecho (dap) fueron censados en cada sitio en seis cuadros de 10 x 10 m. Para cada árbol registrado se identificó la especie, se obtuvo su dap y su altura máxima.

## Resultados

### Patrón general de actividades

Las actividades generales de los monos aulladores en el fragmento pequeño se distribuyeron del siguiente modo: descanso 74.4%, alimentación 24.3%, interacciones sociales 0.6%, locomoción 0.5%, y viaje 0.2%. En el caso de la tropa en el fragmento mediano las proporciones de tiempo dedicadas a estas actividades variaron de la siguiente manera: descanso 78.6%, alimentación 16.4%, interacciones sociales 3.6%, locomoción 0.9% y viaje 0.5%. La distribución de las actividades de los aulladores en el fragmento grande fue como sigue: descanso 69.0%, alimentación 28.0%, viaje 1.5%, interacciones sociales 0.8% y locomoción 0.7% (Tabla 2).

### Uso de recursos alimenticios

En el fragmento pequeño registramos alimentación por los aulladores en 16 árboles de seis especies. Dos de estas especies, *Brosimum alicastrum* y *Ficus tecolutensis* (Moraceae), fueron el foco de alimentación de los aulladores quienes invirtieron el 86.2% alimentándose de las hojas y frutos de estas especies. En el fragmento mediano los aulladores usaron 30 árboles de 15 especies. Entre estas especies sobresalieron *Ficus* spp., *Poulsenia armata*, y *Clarisia biflora* de la Moraceae, *Cecropia obtusifolia* de la Cecropiaceae y *Spondias radolkoferi* de la Anacardiaceae, contribuyendo al 71.1% del tiempo alimenticio registrado. Las especies de la Moraceae contribuyeron al 69.8% de este tiempo. En el sitio grande, los monos usaron 45 árboles de 22 especies como fuente de alimento. Entre estas, *Ficus* sp.9, *Pseudolmedia oxyphyllaria* y *Poulsenia armata* de la Moraceae contribuyeron al 52% del tiempo alimenticio registrado.

En el fragmento pequeño los aulladores invirtieron el 81.9% del tiempo alimenticio registrado en el consumo de hojas jóvenes, 16.2% en el consumo de hojas maduras y 1.1% y 0.8% en el consumo de frutos jóvenes y maduros respectivamente. Los aulladores en el fragmento mediano pasaron el 42.6% de su tiempo alimenticio en el consumo de frutos maduros, 34.2% en el consumo de hojas jóvenes, 10.7% en el consumo de flores y 9.8% en el consumo de hojas maduras. Frutos jóvenes y "otros" contribuyeron al 1.5% y 1.2% del tiempo alimenticio respectivamente. En el sitio grande la tropa de aulladores pasó el 64.7% del tiempo de alimentación consumiendo frutos maduros, 22.5% hojas jóvenes, 7.1% frutos jóvenes, 4.7% y 1.0% hojas maduras.

El censo de la vegetación en los seis cuadros de 10 x 10 m por sitio mostró que a medida que se incrementa el área del fragmento, se incrementa el número árboles registrados, se registra un mayor número de especies y las medidas promedio del dap y alturas son más altos (Tabla 2).

**Tabla 2.** Proporción de tiempo empleado por los aulladores en diferentes actividades generales. También se muestra, para el comportamiento alimenticio, la proporción de tiempo registrado en el consumo de cada partícula alimenticia. Al final de la tabla se muestra el número de árboles y especies arbóreas usadas por los aulladores de cada sitio como fuente de alimento y los resultados del censo de árboles > 25 cm en diámetro a la altura del pecho (dap), en seis cuadros de 10 x 10 m en cada sitio.

	Fragmento de selva		
	Pequeño %	Mediano %	Grande %
Descanso	74.4	78.6	69.0
Alimentación	24.3	16.4	28.0
Locomoción	0.5	0.9	0.7
Interac. Sociales	0.6	3.6	0.8
Viaje	0.2	0.5	1.5
Hojas jóvenes	81.9	34.2	22.5
Hojas maduras	16.2	9.8	1.0
Frutos jóvenes	1.1	1.5	7.1
Frutos maduros	0.8	42.6	64.7
Flores		10.7	4.7
Otros		1.2	
No. árboles usados	16	30	45
No. especies	6	15	22
Censo de árboles			
No. especies contadas	15	22	31
No. árboles contados	28	46	74
Promedio dbh cm	33.5	51.4	71.3
Rango dbh cm	25-70	25-120	25-130
Altura promedio árboles m	15	19	23
Rango alturas m	10-22	15-25	17-24

## Discusión

Los aulladores de los tres fragmentos presentaron similitudes y diferencias evidentes en sus comportamientos generales y patrones de utilización de recursos. En el caso del patrón general de actividades, este fue similar con una predominancia de la actividad descanso sobre las otras, seguida por la actividad alimenticia. Sin embargo, el incremento observado en la proporción de tiempo en la actividad viaje a medida que se incrementa el tamaño del fragmento, hace evidente la restricción espacial de los aulladores a medida que decrece el tamaño del fragmento (Chiarello, 1993; Bicca-Marques y Calegare-Marques, 1994b; Ostro *et al.*, 1999).

En el caso del comportamiento alimenticio, es posible observar, por un lado, una tendencia general hacia un uso de recursos y dieta más diversos del fragmento chico al grande. Por ejemplo, el número de árboles utilizados varió de 16 a 30 a 45 a medida que el área del fragmento se incrementa. Una tendencia similar es evidente en el caso del número de especies arbóreas usadas, el cual varió de 6 a 15 a 22. Por otro lado, mientras que la dieta de los aulladores en el fragmento chico estuvo dominada por el consumo de hojas, en las tropas del fragmento mediano y grande la dieta incluyó proporciones regulares de frutos y flores, como ha sido reportado para grupos de aulladores existiendo en selvas no perturbadas y de mayor extensión (Milton, 1980; Estrada, 1984).

La capacidad de usar hojas como alimento le permite a los monos aulladores afrontar reducciones amplias en el área de vegetación selvática que conforma su hábitat (Estrada y Coates-Estrada, 1993, 1996). Sin embargo la naturaleza efímera de las hojas jóvenes y frutos maduros usados por *Alouatta* como alimento (Milton, 1984), sugiere que esta elasticidad tiene límites y que quizá los aulladores se ven forzados a consumir recursos de menor calidad ó de naturaleza exótica (Bicca-Marques y Calegario-Marques, 1994c). Por ejemplo, nuestros datos indicaron que la proporción de tiempo dedicado al consumo de hojas maduras se incrementó del 1.0% al 9.8% al 16.2% a medida que decrece el área del fragmento. Así mismo, los aulladores en esta situación probablemente presenten problemas de balance nutricional como resultado de una dieta basada predominantemente en el consumo de hojas (Milton, 1984). La predominancia en fragmentos de selva pequeños del árbol pionero *Cecropia obtusifolia*, especie reportada como importante en la dieta de *A. palliata* (Glander, 1979, Milton 1980, Estrada 1984), sugiere una abundancia de recursos (hojas y frutos). Sin embargo, una explotación intensa de esta especie, por falta de otras, podría conducir a una ingestión excesiva de compuestos secundarios, comunes en esta especie arbórea (Garay-Arroyo y Alvarez-Buylla, 1997), con repercusiones negativas sobre el bienestar físico de los aulladores (Estrada *et al.*, 1999).

En fragmentos de selva pequeños las tropas no pueden, a medida que los recursos se extinguen en el tiempo y espacio, incrementar el tamaño de sus áreas de suministro y así expandir sus alternativas dietéticas, situaciones que obligan a las tropas a utilizar recursos alimenticios subóptimos desde el punto de vista nutricional con presiones importantes sobre el estado físico de los individuos (Milton, 1984). Por otro lado, es de esperarse que a medida que disminuye el tamaño del hábitat, exista una mayor carga animal sobre el área disponible. Por ejemplo, una estimación de la biomasa animal representada por los aulladores en cada sitio, varió de 8.0 kg/ha en el fragmento pequeño, a 1.1 kg/ha en el mediano, a 0.17 kg/ha en el grande. Por consiguiente, es muy probable que tropas de *Alouatta* en fragmentos selváticos pequeños y en aquellos que continúan reduciéndose en tamaño, existan bajo condiciones ecológicas subóptimas y de alto estrés ambiental que las ponen en peligro de extinción (Offerman *et al.*, 1995).

Aunado a la falta de espacio y recursos alternativos, la degradación continuada de la vegetación en fragmentos pequeños de selva resulta en una alta mortalidad de árboles (Laurance *et al.*, 1997). Esto, más la extracción de madera ó la expansión de las áreas de pastizal por el hombre a expensas de la selva remanente, sugiere presiones adicionales sobre la supervivencia de tropas de aulladores existiendo en fragmentos de vegetación selvática < 30–50 ha en extensión. Por ejemplo, el censo de los árboles en los cuadros de 10 x 10 m en cada sitio, mostró una tendencia al decremento en el número de árboles, en la diversidad de especies y en el área basal arbórea a medida que disminuye el área del fragmento, cambios que indican un importante pérdida de recursos para los monos aulladores que habitan estos sitios. Es probable que en estos casos las demandas del hábitat sobre la elasticidad ecológica,

fisiológica y conductual de los monos aulladores son tales que, a menos que estos sean transferidos a sitios de mayor extensión, tendrá consecuencias graves para su supervivencia a corto, mediano y largo plazo (Ostro, *et al.*, 1999).

El establecimiento de corredores de vegetación entre fragmentos selváticos aislados podría aliviar estas presiones y añadir conectividad entre las tropas aisladas de monos aulladores. Esto último sería casi tan importante como la necesidad de contar con fuentes alternativas de alimentación ó la oportunidad de diversificar su dieta para asegurar su conservación (Estrada y Coates-Estrada, 1996; Silver *et al.*, 1998).

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## Short Articles

### REPRODUCTIVE SEASONALITY IN THE BELIZEAN BLACK HOWLING MONKEY (*ALOUATTA PIGRA*)

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The synchrony of mating by female primates ("temporal synchrony") and the subsequent synchrony of births varies within and between species and is thought to be a function of resource distribution in time and space as well as other environmental factors such as the risks of predation or infanticide (Nunn, 1999). Primates may exhibit discrete birth seasons, birth peaks, birth "clusters", birth "dips", or females may produce young asynchronously throughout the year (see reviews in Smuts *et al.*, 1986 and Crockett and Rudran, 1987). From a female's perspective, the timing of reproduction is expected to exert a significant influence on lifetime reproductive success if her chances of successful reproduction vary significantly from month to month. In particular, environmental regimes (e.g., food availability or risks of infanticide) may determine probabilities of successful implantation, gestation, lactation, or maternal or infant survival.

The present note presents evidence that Belizean black howling monkeys (*Alouatta pigra*) exhibit a significant peak in births during those months when rainfall is lowest and that this reproductive seasonality may be related to peaks in the abundance of fruit during the period of gestation. Reproductive seasonality has been reported for two other species of *Alouatta* (*A. palliata*: Jones, 1980; Fedigan *et al.*, 1998; and *A. seniculus*: Crockett and Rudran, 1987). Similarities and differences between these reports and the present observations will be dis-

cussed in addition to a consideration of data available on birth patterns for other species of the genus.

The six or seven recognized species of howling monkeys, large, vegetarian, arboreal atelids, are distributed throughout Latin America from northern Argentina to southern Mexico (Crockett and Eisenberg, 1986). Our *ad libitum* observations of marked black howlers were collected at the Community Baboon Sanctuary (CBS), Belize, Central America. The CBS is a managed reserve of >18 sq. mi. 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 >1500 trees are mapped and identified. Black howlers are generally polygynous (single breeding male) with a modal group size of one adult male to several adult females and immatures (Horwich *et al.*, in prep.), although multimale-multifemale (polygynandrous) groups may be found. Groups have been studied by the present research program since 1985, and systematic observations, including marking of animals and collection of morphometric data, have been carried out since the early 1990's.

Horwich (1983) reported opportunistic observations of sexual behavior in *A. pigra*, although reproductive behavior in the species has not been described in systematic detail. Our observations indicate that reproductive parameters in black howlers are similar to those of their congeners. In particular, gestation length appears to be slightly over six months (Brockett, pers. obs.), and interbirth intervals are within the range reported for other *Alouatta* species (Horwich *et al.*, in prep.). Black howler females demonstrate unreliable genital markers during the estrous cycle, similar to *A. seniculus* (Crockett and Eisenberg, 1986), although chemical cues appear to be significant as suggested by male attraction to female genitalia (Horwich, 1983). A male and a female may leave a group

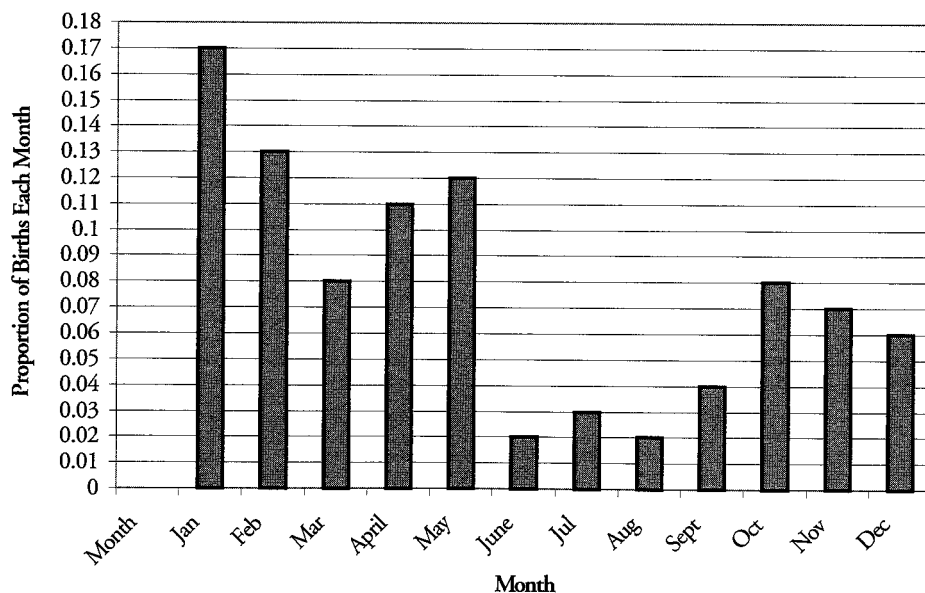


Figure 1. The distribution of black howler births at the CBS (1992-1999). Months with lowest annual rainfall are in black.



together in apparent consort (Brockett, pers. obs.; Horwich, pers. obs.; Jones, pers. obs.) as reported for *A. seniculus* (Crockett and Eisenberg, 1986) and *A. palliata* (Jones, 1995). No data are available for either sex on age of sexual maturity in black howlers.

Figure 1 shows the proportion of births per month at the CBS from 1992–1999 (N = 121). Births differ significantly by month ( $p < 0.001$ ,  $\chi^2 = 36.38$ ,  $df = 11$ ), and births are significantly more likely to occur during the six month period, December through May, which is early dry season through early wet season, (Horwich and Lyon, 1990) than during the remaining six months of the year ( $p < 0.001$ ,  $\chi^2 = 26.5$ ,  $df = 1$ ). Silver (1998, Fig. 2.3) reports an annual peak in fruit from July to December, suggesting that females adjust gestation to this annual period and lactation to the driest months.

There is no simple relationship between birth peaks, seasonality, and food availability within the genus *Alouatta*. Jones (1980) reported a statistically significant peak in births during the dry season at Hacienda la Pacifica (Costa Rica). Her report combined data for two groups, one in riparian habitat and one in deciduous habitat, presumed to be the poorer habitat. All births in the latter habitat were restricted to the dry season (November through April). Recently, Fedigan *et al.* (1998) reported a statistically significant birth peak in Costa Rican deciduous habitat (Santa Rosa National Park) during the dry season. Clarke and Glander (1984), primarily studying mantled howler groups in riparian habitat at Hacienda la Pacifica, reported birth “clusters” without annual patterns and slightly more births during the wet season than the dry season. At Barro Colorado Island, Panama, a semideciduous lowland tropical forest, Carpenter (1934) found that births occurred throughout the year, while at the same site Milton (1982) found some evidence of clustering. In the same species, then, differences have been found within and between habitats with drier sites (Santa Rosa and Hacienda la Pacifica) and wetter sites (riparian and semideciduous) appearing to demonstrate the same trends. Birth peaks in tropical dry forest, in particular, deciduous forest, may be related to the availability of fruit (Frankie *et al.*, 1974). Mantled howlers in these forests may time lactation to coincide with food availability, the opposite pattern than that proposed for black howlers.

Crockett and Rudran (1987) described reproductive seasonality in *A. seniculus*. Reporting results for two habitats (woodland and gallery forest), they suggested a birth peak in woodland habitat during the dry season, as found for *A. palliata* in deciduous habitat. In Crockett and Rudran’s Venezuelan study site, woodland habitat is most likely the poorer for red howlers, similar to deciduous habitat for mantled howlers. Crockett and Rudran (1987) also found a “birth dip” in both habitats during the early wet season (May–July). In Argentina, Zunino and his colleagues reported a birth peak from mid March–mid June for the black-and-gold howling monkey, *A. caraya*, in riparian forest, possibly related to “a slight reduction in rainfall” (Zunino, pers. comm., October, 2000). However, infants are born throughout the year in flooded insular habitats along the Paraná river (Zunino, pers. comm., October, 2000).

Crockett and Rudran (1987) pointed out that howlers might be expected to exhibit less seasonal breeding than other genera due to their broad vegetarian diets and large body size. Nonetheless, as reviewed here, several studies have found reproductive seasonality in *Alouatta*. Additional studies are required to document the extent of birth peaks and reproductive seasonality in howling monkeys and the proximate and ultimate causes of these patterns.

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- 1991; Pinto *et al.*, 1993; Hirsch, 1995; Strier and Fonseca, 1996/1997). For example, density estimates for northern muriquis (*Brachyteles arachnoides hypoxanthus*) and brown howler monkeys (*Alouatta fusca*) are much greater in the 890 ha forest at the Estação Biológica de Caratinga (EBC), in Minas Gerais, than in the nearby, 36,114 ha Parque Estadual de Rio Doce (Hirsch, 1995).

High densities, along with high dietary and habitat overlap among species, are also likely to lead to high frequencies of interspecific encounters, and possibly correspondingly high levels of direct or indirect interspecific competition (Waser, 1987). However, very little is known about how high levels of interspecific competition might affect populations of endangered species (Strier *et al.*, 2000).

In a preliminary investigation, we collected data on the contexts and outcomes of all agonistic interactions observed between northern muriquis, now classified as one of the world's 25 most endangered primates (Conservation International, 2000), and other animals at the EBC. In addition to muriquis and brown howler monkeys, the EBC primate community consists of a third endangered species of primate, the buffy-headed marmoset (*Callithrix flaviceps*), and the more widespread tufted capuchin monkey (*Cebus nigritus*).

Because larger-bodied species tend to "win" in direct contests with smaller-bodied species (Waser, 1987), we predicted that muriquis, which can weigh up to 15 kg (Aguirre, 1971) would be "dominant" in their interactions with other smaller primate species and with other smaller animals. Nonetheless, the fact that the diets of all four species of primates at the EBC overlap to varying degrees led us to predict that differences in the frequency and intensity of interspecific interactions would occur. For example, EBC muriquis and howler monkeys consume many of the same species, and in some cases, patches of fruits, leaves, and flowers (Mendes, 1989; Strier, 1991; Rímoli, 1994). Tufted capuchins are omnivorous, and have been known to prey on a variety of in-

## AGONISTIC ENCOUNTERS BETWEEN MURIQUI, *BRACHYTELES ARACHNOIDES HYPOXANTHUS* (PRIMATES, CEBIDAE), AND OTHER ANIMALS AT THE ESTAÇÃO BIOLÓGICA DE CARATINGA, MINAS GERAIS, BRAZIL

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### Introduction

The Atlantic forest of southeastern Brazil is well-known for high levels of primate species diversity and endemism (Rylands *et al.*, 1995). There are currently 24 primate species and subspecies recognized in the Atlantic forest, with up to five species still found sympatrically in a number of remaining forest tracts (Rylands *et al.*, 1996). Censuses of a number of these primate communities, particularly in the states of Minas Gerais and São Paulo, have consistently estimated higher primate population densities in the small, disturbed forest fragments than in the larger, more pristine ones (Stallings and Robinson,

Table 1. Muriqui behavior during aggressive interactions with other animals at the EBC.

Muriqui behavior*	Howlers		Capuchins		Tayra		Owl		Lizard	
	N	%	N	%	N	%	N	%	N	%
Branch shaking	9	31.0	4	33.3	1	100	1	100	1	100
Teeth-bared	1	3.4	1	8.3	-	-	-	-	1	100
Chase	26	89.0	11	91.7	1	100	1	100	1	100
Vocalize	11	37.0	11	91.7	1	100	1	100	1	100

\*Percentages for each species may exceed 100% because muriqui behaviors are not mutually exclusive.

Table 2. Contexts of agonistic interactions between muriquis and other animals at the EBC.

Muriqui activity*	Howlers		Capuchins		Tayra		Owl		Lizard	
	N	%	N	%	N	%	N	%	N	%
Traveling	7	24.1	3	25.0	-	-	-	-	-	-
Resting	3	10.3	7	58.3	1	100	1	100	1	100
Feeding	16	55.2	4	33.3	-	-	-	-	-	-
Playing infants	5	17.2	1	8.3	-	-	-	-	-	-

\*Percentages for each species may exceed 100% because muriqui behaviors are not mutually exclusive.

sects and vertebrates including lizards, bats, squirrels, young coatis, and even small primates such as owl and titi monkeys where they occur sympatrically (Freese, 1981; Fedigan, 1990; Galetti, 1990), but they also exploit many of the same fruit, flower, and nectar sources as miquis (Torres de Assumpção, 1983). Similarly, although buffy-headed marmosets rely heavily on invertebrates and gum (Ferrari, 1988), their diet overlaps with miquis in certain fruit and nectar species (Ferrari and Strier, 1992).

There are few data on miquis predators (Olmos, 1994), and there are few large carnivores or raptors at the EBC (Strier, 1986; Hirsch, 1995). However, Printes *et al.* (1996) describe two possible predations on miquis infants at the EBC, one involving a tayra ("irara", *Eira barbara*) and the other a large hawk (*Leptodon cayanensis*, Accipitridae). Thus, at least some of the miquis' interspecific interactions might involve predators with the potential to impact miquis population size and viability.

## Methods

From January to July 1999, one group of miquis was observed on a near-daily basis as part of a long-term study on the EBC population (Strier, 1999). All 59 members in the study group during this period were individually recognizable and thoroughly habituated to the presence of trained observers. Behavioral data on agonistic interactions between miquis and other species were recorded whenever observed. For each interaction, the species, context of the encounter (food or feeding site, traveling, resting site), and behavior exhibited by all species involved were noted. Behavioral categories included chases, alarm vocalizations, branch-shaking, and teeth-baring displays, as described by other authors (Strier, 1986; 1999; Petroni, 1993; Galetti, 1996). Agonistic interactions were considered to be of "low intensity" if threats, such as branch shaking or vocalizations, were limited in duration, and of "high intensity" when one or both species engaged in prolonged threats or vocalizations, or when chases or bared-teeth displays were involved.

## Results

A total of 44 interactions were observed between miquis and other animals during this seven-month study period. Of these, 65.9% involved howler monkeys and 27.3% involved capuchins. Single interactions between miquis and a tegu lizard ("teíú", *Tupinambis* sp.), a tawny-browed owl ("corujão mateiro", *Pulsatrix koeniswaldina*), and a tayra (2.3% each) were also observed.

As expected based on body size, miquis "won" all agonistic encounters with other species, which inevitably terminated the interaction by leaving the vicinity. However, there were striking differences in the intensity and contexts of interspecific interactions (Table 1). Miquis interactions with howler monkeys were generally brief and of low intensity, consistent with those described previously at the EBC (Strier, 1986; Mendes, 1989) and elsewhere (Petroni, 1993). The

slightest threat from one or more miquis made the howlers run away, even though more than half of their encounters occurred in food patches (Table 2). Capuchin monkeys, by contrast, often vocalized (75%), broke branches (41.7%), and bared their teeth (33.3%), evoking much higher intensity interactions with miquis. Nonetheless, all of these encounters ended when the capuchins moved away from the miquis.

Miquis interactions with nonprimates also differed in intensity. When they encountered the tegu lizard, the miquis were spread out resting in low branches or feeding on ferns on the ground. The lizard's sudden appearance elicited threats, but no alarm calls. Similarly, when an owl landed less than 5 m away from a resting adult female, she was clearly startled. Her alarms seemed to have a similar effect on the owl, which immediately took flight, but no other miquis resting nearby participated in the interaction. When the tayra approached, however, one miquis gave an alarm call and immediately all infants present ran to their mothers. Three adult males and one adult female that were resting in the vicinity responded to the alarm call by moving rapidly toward the tayra while vocalizing loudly, at which point the tayra ran away.

## Discussion

The frequency of agonistic encounters between miquis and howler monkeys is probably a consequence of the high density of both species in this forest (Mendes, 1989; Hirsch, 1995; Strier and Mendes, in prep.). The high percentage (55.2%) of interactions that occurred in food patches is consistent with high dietary overlap. However, the fact that both species occur at such high densities suggests that neither is yet suffering from the effects of either direct or indirect feeding competition (Waser, 1987).

More than half (58.3%) of all agonistic interactions between miquis and capuchins occurred when capuchins moved into an area where the miquis were resting. This is consistent with the high degree of overlap noted in their home ranges (Torres de Assumpção, 1983, Strier, 1986; Petroni, 1993). However, more detailed data on capuchin diets at the EBC are needed to evaluate the level of potential feeding competition (Rímoli, in prep.).

The fact that miquis interactions with capuchin monkeys were more intense than with howler monkeys could be a consequence of the higher levels of aggression capuchins display. However, although capuchins are known to prey on infants of smaller primates (Fedigan, 1990; Galetti, 1990), it is also possible that they may pose a threat to solitary infant miquis.

Many primates display aggressive behavior and alarm calls in response to the presence of predators (Cheney and Wrangham, 1987). The miquis' alarm and threatening reaction to the tayra in this study was consistent with their response described in a prior suspected predation event (Printes *et al.*, 1996). In contrast, the lack of alarm in response to the lizard is consistent with the lack of real or perceived threat.

The fact that miquis never fled from encounters with other species is likely to be a consequence of larger body size, and thus a reflection of dominance over the three other primate species in this community. This dominance should minimize the risks of losing direct contests over food with other species. However, we cannot yet evaluate the possible effects of indirect feeding competition from howler monkeys, or even capuchins, at this site. Studies focusing exclusively on interspecific interactions, and in particular on the potential indirect effects of interspecific feeding competition, are merited at sites like the EBC, where multiple sympatric species, including those which are endangered, may occur at high densities.

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## Methods

### Study sites

The COUNAMI site, a lowland Neotropical rainforest (53°15'W, 5°20'N), is located in the north of French Guiana, approximately 50 km from the Atlantic Ocean (Fig. 1). The dominant tree families include: Lecythidaceae (22% of trees with DBH > 7.5 cm), Caesalpiniaceae (12%), Chrysobalanaceae (11%), and Sapotaceae (6%) (Teillier, unpub. data). Interviews with local hunters suggest that only the first 3 km of the forest, which can be accessed by cars, motorcycles, and/or boats, are regularly hunted. Two areas were sampled, one facing high hunting pressure ("CH+", at one to 3 km from the track serving the forest), and the other facing low hunting pressure ("CH-", four to 7 km from the track). The sites chosen were far from rivers or possible access by boat. The study area of Trinité (TNR, Fig. 1) is located in the northern part of the natural reserve (53°13'N, 4°43'W), in a lowland forest. Botanical surveys in this area are presently ongoing.

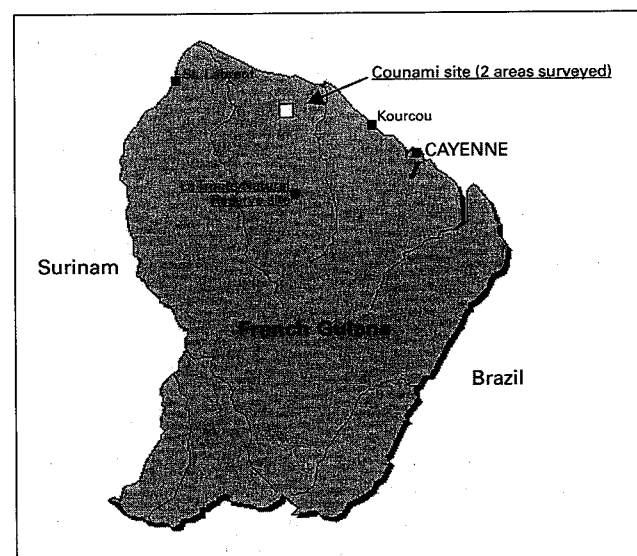


Figure 1. Site location of COUNAMI and La Trinité Natural Reserve, French Guiana.

## HUNTING IMPACT ON NEOTROPICAL PRIMATES: A PRELIMINARY CASE STUDY IN FRENCH GUIANA

Benoît de Thoisy  
David Massemin  
Maël Dewynter

### Introduction

Rainforest still covers more than 90% of French Guiana, affording this territory a rather favorable status compared with many Neotropical countries (Whitmore, 1997). Forest wildlife may nonetheless be locally threatened by uncontrolled agriculture, habitat fragmentation from roads, tracks, a hydroelectric dam, logging, legal and illegal gold mining, and hunting. Still, no conservation and natural resource management policies exist, and the impact of human disturbance is only a recent concern (Granjon *et al.*, 1996; Vié, 1998; Cosson *et al.*, 1999). Effects of hunting on mammal communities have not yet been evaluated, although it is one of the major threats to a significant part of French Guianan wildlife (de Thoisy and Vié, 1998).

As part of a multidisciplinary program on the impact of logging in a traditionally used rainforest (hunting, non-ligneous resource use), the COUNAMI forest was surveyed to evaluate large bird and mammal abundances, in both heavily and lightly hunted areas. Abundances were also recorded in the Trinité Natural Reserve, an area lightly hunted in the past but which has now been effectively protected for four years.

### Sampling procedures

Line transects (Brockelman and Ali, 1987; Peres, 1999; de Thoisy, 2000) at the COUNAMI sites were conducted in May and June (rainy season), and from September to November (dry season), 1998. The areas CH+ and CH- were covered by 93.5 km and 91.5 km of transect, respectively. In November 1999, 93.2 km of the TNR site were sampled and species abundance was expressed as number of groups per 10 km, with the addition of mean group size. Densities were calculated using Leopold's method, the mean of perpendicular sighting distances is used for estimation of the strip width (de Thoisy, in press). Crude biomasses (mean species weight \* density, in kg.km<sup>-2</sup>) were determined using the weights given in Robinson and Redford (1986).

## Results

Six primate species were noted to occur in the three areas surveyed: red howler monkeys *Alouatta seniculus*, black spider monkeys *Ateles paniscus*, brown capuchins *Cebus apella*, wedge-capped capuchins *C. olivaceus*, white-face sakis *Pithecia pithecia*, and red-handed tamarins *Saguinus midas*. The wedge-capped capuchin, however, was not observed during the transect period at the Trinité site. Abundance, mean group size, density and biomass from the three sites are given in Table 1. Data from the two study periods at Counami are considered together.

At the Counami sites, total density and biomass were respectively 40% and 60% lower in the area facing the heavier hunting pressure, the howler and the brown capuchin monkeys accounting for most of the variation (Fig. 2). At the Trinité site densities and biomasses were intermediate, but species contribution differs by the relative importance of the spider monkey. Contribution of the three largest species to the total primate density, i.e., spider and howler monkeys, and brown capuchins, decreases with the hunting pressure, from 73% (TNR site) to 47% (CH+ site). The contribution of these three species to the total biomass follows the same trend, decreasing from 94% (TNR) to 82% (CH+). Group size is not significantly affected by hunting pressure, except for *C. apella* at Counami (Table 1). Hunting pressure also affects species behavior. In capuchins, howler and spider monkeys, much more frequent vocalizations, alarm calls, and less cryptic behaviors were observed in the less disturbed areas (TNR and CH-, vs. CH+).

## Discussion

Primate populations in French Guiana remain poorly documented except at l'Arataye (Guillot *et al.*, 1984), les Nouragues (Julliot and Sabatier, 1993; Simmen *et al.*, 1998), Petit Saut (Vié, 1998), and Counami and Trinité (de Thoisy, 2000), and even the distributional limits of the common squirrel monkey, *Saimiri sciureus*, and the bearded saki, *Chiropotes satanas* are still unknown (Norconk *et al.*, 1996).

The Counami forest is hunted by Indians, Creoles (intermixed population descended from slaves), and Hmongs originating from Laos. Typically, peccaries, deer, tapir, large rodents, large birds, and primates are hunted (de Thoisy, unpubl. data).

Among the primates, capuchins are a prime target for most hunters, and the brown capuchin is also commonly taken as a pet. Impacts on populations may nonetheless be difficult to assess. *Cebus olivaceus* has a naturally patchy distribution (Norconk *et al.*, 1996), and *C. apella* is able to support a certain harvest level by hunters (Baal *et al.*, 1988). The meat from larger primates, *Ateles* and *Alouatta*, is more widely appreciated but hunting impacts may vary locally.

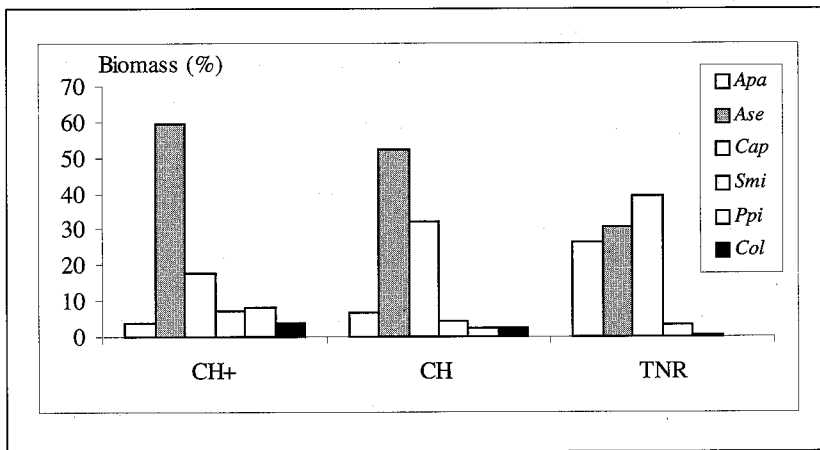
As reported for other Amazonian sites (Freese *et al.*, 1982; Johns, 1986; Bodmer *et al.*, 1988; Sussman and Phillips-Conroy, 1995; Peres, 1997a), our preliminary data suggest that hunting pressure in French Guiana has a major impact on primate communities. Species equilibrium, eco-ethological patterns (Johns, 1986), reproductive rates (Peres, 1990) and populations of the larger species, *Alouatta*, *Ateles* and *Cebus*, appear to be affected. Our surveys also indicate that population density and biomass also vary naturally, perhaps due to changes in floristic composition and differing spatial and temporal food resource availability. *Cebus olivaceus*, for example, is very rare in the northern part of the undisturbed La Trinité Natural Reserve, but more abundant than *C. apella* in the Les Nouragues Natural Reserve, 100 km away (Simmen *et al.*, 1998). Howler density was also low in the area surveyed at La Trinité, about 60% less than at Les Nouragues (Simmen *et al.*, 1998). Independent of hunting pressure, foliage quality is a predominant factor explaining species abundance (Queiroz, 1995; Peres, 1997b; Simmen *et al.*, 1998). Density and biomass contributions of each species to the total community should limit the bias of habitat quality, and could be considered a better indicator to assess hunting impact, than crude abundances data. With an apparent disappearance of *Ateles paniscus*, and drastic decrease of capuchins, howlers, and other species (de Thoisy, 2000), the situation at the Counami sites may reflect the accessibility to forest areas by roads, tracks and rivers, villages, timber and gold mining sites.

Until very recently, conservation policy in French Guiana has been more passive than active (Norconk *et al.*, 1996). Wildlife management is limited to the protection of some species and remains poorly enforced. Among the primates present in the study areas, the spider monkey and the saki are fully protected while other species can be hunted, but their commercial use is forbidden. Habitat protection is also only a recent concern; the two natural reserves of pristine

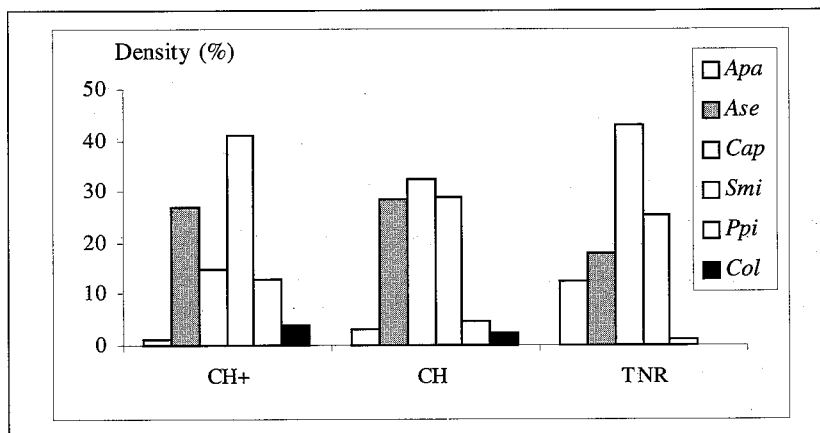
**Table 1.** Abundance, density and biomass of primates in 3 sites in French Guiana, facing a high hunting pressure (CH+), a low hunting pressure (CH-), and in a Natural Reserve (TNR).

Species (mean weight)	Groups / 10 km (group size)			Density (ind./km <sup>2</sup> )			Crude biomass (kg)		
	CH+	CH-	TNR	CH+	CH-	TNR	CH+	CH-	TNR
<i>Ateles paniscus</i> (7.8 kg)	0.1 (3)	0.5 (2.5)	0.7 (2.7)	0.5	2.2	5.5	3.9	16.8	42.9
<i>Alouatta seniculus</i> (6.2 kg)	0.7 (5.7)	1.5 (5.6)	0.9 (4.5)	10.5	21.5	8	65.1	133.3	50
<i>Cebus apella</i> (3.4 kg)	0.4 (5.4)	0.9 (11.3)	0.9 (7.8)	5.7	24.4	19	19.4	83	64.5
<i>Cebus olivaceus</i> (2.9 kg)	0.1 (4.5)	0.1 (6)	n.d	1.4	1.9	n.d	4.1	5.5	n.d
<i>Pithecia pithecia</i> (1.8 kg)	0.4 (3)	0.3 (2.7)	0.1	5	3.5	0.4	9	6.3	0.7
<i>Saguinus midas</i> (0.5 kg)	1 (5.5)	1.4 (5)	1.2 (3.2)	16.2	21.8	11.3	8.1	10.9	5.6
<b>Total:</b>				39.3	75.3	44.2	109.6	255.8	163.7

a



b



**Figure 2a and 2b.** Contribution of the different species to the total density and biomass of primates in the three sites. CH+: high hunting pressure, CH-: low hunting pressure, TNR: la Trinité Natural Reserve. *Ase*: *Alouatta seniculus*, *Apa*: *Ateles paniscus*, *Cap*: *Cebus apella*, *Col*: *Cebus olivaceus*, *Ppi*: *Pithecia pithecia*, *Smi*: *Saguinus midas*.

forests, Les Nouragues and La Trinité, were created in 1995 and 1996, respectively. The National Park project, in the southern third of the country, is developing very slowly and is still not fully accepted by local communities and authorities. Alternatively, it should be noted that a natural park, with sustainable development objectives, has just been created in the north of the country.

Our preliminary conclusions reflect those of Mittermeier (1991) for the primate community of Surinam. At the moment, taking into account the entire country of French Guiana, primates do not appear to be threatened by hunting, although dramatic depletions in some species may occur locally. Further surveys are urgently needed in order to: (i) obtain practical ecological data of species distributions and densities in both pristine and hunted habitats; (ii) assess the impact of human activities and (iii) evaluate the sustainability of current hunting levels. Involving local people

in wildlife management programs would be beneficial for species conservation, and implementing an active, enforceable conservation policy for one of the largest remaining pristine neotropical rainforests is imperative.

### Acknowledgments

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## CULTURAL PRACTICES BENEFITTING PRIMATE CONSERVATION AMONG THE GUAJÁ OF EASTERN AMAZONIA

Loretta Cormier

### Introduction

The negative effects of human activities such as habitat destruction, the pet trade, and medical research on Neotropical primate populations have been well documented (Aquino and Encarnación, 1994; Chiarello, 1993; Hershkovitz, 1972; Mittermeier, 1987; Mittermeier *et al.*, 1978; Rylands *et al.*, 1997). However, insufficient attention is given to indigenous cultural practices that may benefit primate conservation. Primate hunting, particularly using indigenous methods, does not always threaten primate populations. Hunting pressure often becomes a serious problem only when it is combined with widespread deforestation (Lizarralde, 1997; Mittermeier and Coimbra-Filho, 1977), or when hunting moves from traditional subsistence activities to a commercial basis, such as with the African bushmeat crisis (Hutchins, 1999; Rose, 1996).

The research here explored the role of monkeys in the culture of the Guajá Indians on the Caru Indigenous Reserve in Maranhão, Brazil. Seven species occur there: the red-handed howler (*Alouatta belzebul*), the black-bearded saki (*Chiropotes satanas*), the brown capuchin (*Cebus*



apella), the Ka'apor capuchin (*Cebus olivaceus kaapori*), the owl monkey (*Aotus fulvatus*), the squirrel monkey (*Saimiri sciureus*), and the black-handed tamarin (*Saguinus niger*). Monkeys were found to be a key food source for the Guajá, largely determining the trekking behavior of these foraging people. However, it was also found that the Guajá consider monkeys kept as pets to be nearly human, even to the extent of incorporating them into their kinship system. Although anthropomorphization and consumption of monkeys would seem to be contradictory, these dual roles were found to be compatible with the symbolic cannibalistic beliefs of the Guajá religion. Preservation of the Guajá indigenous reserves is essential not only for the survival of their culture, but also for endemic species, including the endangered *Chiropotes satanas satanas* and the recently discovered *Cebus olivaceus kaapori* (Queiroz, 1992).

## Methods

The importance of monkeys in the Guajá diet was assessed through daily random spot checks of Guajá activities (including eating) during wet and dry seasons with 111 sampling days and 110 individuals. Random spot checks in cultural anthropology typically involve making daily rounds of a group with one observation of each individual per day. The importance of ethnobotanical knowledge of plants eaten by monkeys was assessed through plant collecting trips with multiple informants to gather information regarding plant names and uses. A total of 275 morpho-species were distinguished. The social and religious roles of monkeys in the Guajá culture were also assessed through interviews and participant observation among the people over a period of 15 months in 1996–1997. A total of 90 pet monkeys were kept as pets by the Guajá during the research period. In addition to qualitative observations, limited focal animal samples of the pet monkeys were conducted (61 individuals, 130 hours) in order to obtain measurable data regarding the nature of Guajá-monkey interactions, as well as the consequences to the animals being kept as pets (also see Cormier, 2000).

## Results

### Ecology

Heavy seasonal reliance on monkeys as food was found and was also demonstrated in Guajá trekking patterns and ethnobotanical knowledge. Random spot checks revealed significant seasonal differences in the animal types utilized in the wet and dry seasons ( $p < .001$ ). Monkeys were the most frequently eaten animal in the wet season (30.92%) while fish were the most frequently eaten type in the dry season (44.37%). The hunting of monkeys in the wet season was associated with increased trekking, while when fishing in the dry season, they were more sedentary. Random spot checks demonstrated significant seasonal differences in trekking ( $p < 0.001$ ), with individuals camping away from the

village almost five times more frequently in the wet season than in the dry season.

The dietary importance of monkeys was also reflected in Guajá ethnobotanical knowledge. Of the 275 morpho-species identified, 43.64% were described as plants eaten by monkeys. Guajá knowledge of plants eaten by monkeys far exceeded the number of plants they used for food themselves (14.91%). Knowledge of plants, and particularly fruiting trees eaten by monkeys, can be considered an important hunting strategy.

### Kinship

Orphaned monkeys whose mothers were killed for food are returned to the village and cared for by a Guajá woman. These pet monkeys are given a nearly human status, are addressed as kin, and function to a degree as surrogate children. Like infant Guajá children, the monkeys stay in constant physical contact with the "mother," and are breast-fed, bathed, played with, sung to, and even eat pre-masticated foods directly from the women's mouths.

Monkeys also serve as a form of body art. Nurturing surrogate monkey children projects an image of female fertility, the ideal of feminine attractiveness in the culture. The ability of the monkey to function in this role is predicated on the physical and behavioral similarities of infant monkeys to infant human children. Maturation changes, however, make it impossible for monkeys to sustain the role of a dependent child. Focal animal samples revealed significant differences ( $p < 0.001$ ) in the amount of time primate infants, juveniles, and adults spent in contact with the Guajá. Older monkeys eventually began to display aberrant and often aggressive behaviors, and were consequently tied up much of the time. Unfortunately, such social isolation only compounds the abnormal behaviors.

### Cosmology

The seeming incongruity of monkeys serving as surrogate children while also being the preferred food can be understood through the symbolic endocannibalism (eating of kin) in the Guajá religion. The two key principles involved are the extension of kin relations to forest species and the recurrent theme of "like eats like" in their spiritual beliefs. According to the Guajá creation myth, monkeys were at one time human, and thus, all forest monkeys are considered to be either consanguineal or affinal kin. Monkeys are the preferred game source because they are considered to be most like humans. All forms of plant and animal life are believed to be endowed with a spiritual as well as a physical nature. Thus, consumption is not merely an act of predation, but is sacred. Eating another releases the physical body and sends the spirit to the eternal sky home. Relations of consumption are a form of reciprocity with one form of life giving the gift of divinization to another form of life. For example, the squirrel monkey is believed to be spiritually kin to the mariawa palm (*Bactris setosa*) which it also eats, and thus divinizes, just as the Guajá divinize their monkey kin when they eat them. In addition, the Guajá believe they also receive help in hunting from monkey divinities during their *karawara* spirit possession ritual.

## Conclusions

Guajá cultural survival as well as the survival of endemic primate species in the region is extremely threatened. The situation has escalated since 1985 with construction of the Carajás railway through the middle of their territory to mine iron. Guajá reserves are highly contested from agribusiness, loggers, and *posseiros* (illegal Brazilian squatters) systematically encroaching into their habitat, creating subsequent deforestation and development.

Conservation of the indigenous reserves is of particular importance for the endangered *Chiropotes satanas satanas* and the recently identified *Cebus olivaceus kaapori*, whose habitat is restricted to the traditional territory of the Guajá people. The hunting of monkeys for food in itself, particularly using indigenous methods, is often not the real threat to monkey populations. Hunting pressure more often arises in the wake of deforestation when monkey populations are reduced and restricted to circumscribed patches which may then allow a species to be hunted out entirely. The fates of the Guajá people and the local monkeys are intertwined. Preservation of the indigenous reserves of the Guajá for traditional hunting also provides primates a refuge from habitat destruction.

## Acknowledgments

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## HABITAT FRAGMENTATION AND PARASITISM IN HOWLER MONKEYS (*ALOUATTA CARAYA*)

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## Introduction

Comparative studies of ecto- and endoparasitism affecting howler monkeys (*Alouatta caraya*) in relation to the fragmentation of their habitat are unknown for Argentina. Translocation of fauna is potentially dangerous for both the translocated and resident populations, which may lack resistance when confronted with new species of parasites. In order to better manage the translocation of species and to help solve conservation issues, it is important to understand the effects of parasitism. Here we report observations on the fragmentation of habitat and parasitism in populations of *Alouatta caraya*.

## Methods

### Habitats

Three study sites were chosen in northeastern Argentina. The first was a severely fragmented and degraded semideciduous forest (SF) in the basin of the Río Riachuelo, San Cayetano (Corrientes province) (27°30'S, 58°41'W).

The second was a flooded forest (FY) recently fragmented by the lake formed by the Yaciretá dam in Ituzaingó (Corrientes) (27°28'S, 56°44'W). The third was a flooded forest (FF) on the island of Brasilera (Chaco province) (27°20'S, 58°40'W). This last forest was considered a control because there is almost no human activity and it is not severely fragmented. These sites are within the Chaqueña and Paranaense Biogeographic Provinces (Cabrera and Willink, 1973).

#### Parasitological analysis

A total of 44 animals were sampled, 21 (48%) from SF, 9 (20%) that were rescued from FY before the dam completion, and 14 (32%) from FF. The howlers were captured using anesthetic darts. Each was inspected systematically, fur and all natural orifices, for all visible arthropods and tissue samples were taken from cutaneous lesions and other areas suspected of acari infestation. The samples were preserved in Railliet and Henry's solution for systematic classification and the acari were cleaned in Amman's lactophenol (Amato *et al.*, 1991) for identification. The faecal analyses were carried out using flotation (modified Ritchie's method), and by simple sedimentation (Weitz *et al.*, 1992). Trematode, cestode and nematode eggs were identified using a light microscope. Vegetative forms of protozoa were determined by using the method of Thienpont *et al.* (1979).

#### Results

The highest occurrence of parasitism was observed in San Cayetano (SF): 57% of the howlers sampled. Eight species

of parasites were recorded, four of which were not found in the other groups (Table 1). The monkeys captured in Yaciretá (FY) showed 44.4% infestation, with four species of parasites, and only a single species was present in the Brasilera (FF) group. In this control area, only 7.14% of the specimens sampled had parasites, with a single species (Table 2).

#### Discussion

The most frequent endoparasitosis and the only one identified in all three sites was berteliosis (De Negri, 1985). Psoroptidosis (Fain, 1963; O'Connors, 1988) and oxyurosis and strongyloidosis were detected only in the fragmented habitats. The howlers also showed louse infections, protozoosis, trematodosis and nematodosis in the severely fragmented habitats SF and FY.

The results indicate that infestation indexes are directly related to the area and degree of fragmentation of forest available to the howlers. The group size and density were considerably smaller in the severely fragmented forest at San Cayetano but similar at Yaciretá and Isla Brasilera. Although sample sizes were small, especially for Yaciretá, the high degree of parasite infestation at San Cayetano may reflect, or be associated with, the behavioral and ecological disruption caused by fragmentation (Ojeda and Mares, 1984). Fewer trees in smaller forest fragments indicate less food, and the monkeys in these areas tend to spend a longer time in each tree (Kowalewski and Zunino, 1999), increasing their exposure to infection and reinfection from parasites (Freeland 1976, 1980; Gilbert, 1994). Small forest fragments with insufficient food also forces the monkeys

Table 1. Parasites found in the three study sites.

San Cayetano (SF)	Yaciretá (FY)	Isla Brasilera (FF)
<b>Ectoparasites</b>		
<i>Pedicinus(Pediculus) mjobergi</i>		
<i>Cebalges gaudi</i>	<i>Cebalges gaudi</i>	
<b>Endoparasites</b>		
Protozoa (unidentified ameba)		
Trematoda (eggs) Unidentified		
<i>Bertiella mucronata</i> (eggs)	<i>Bertiella mucronata</i> (eggs)	<i>Bertiella mucronata</i> (eggs)
Nematoda (eggs) Unidentified		
Oxyuridae (eggs)	Oxyuridae (eggs)	
<i>Strongyloides</i> sp. (eggs)	<i>Strongyloides</i> sp. (eggs)	

Table 2. Study sites, number of samples and degrees of parasitism.

	San Cayetano (SF)	Yaciretá (FY)	Isla Brasilera (FF)
N	21	9	14
% infested	57	44.4	7.14
Number of parasite species	8	4	1
Density (monkeys/ha) <sup>1</sup>	0.9	2-3	2-3
Group size <sup>1</sup>	5	10	12
Home range (ha) <sup>1</sup>	-8	-4	-4
Habitat fragmented <sup>1</sup>	YES	YES (recent)	NO

<sup>1</sup> Brown and Zunino (1994); Zunino *et al.* (1995).

to go to the ground to travel between forest patches, also increasing the probability of infestation. The effects of fragmentation on parasite loads and rate of infection should be considered in the management (especially reintroduction and translocation) of species such as *Alouatta caraya* in Argentina.

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## A STUDY OF SPIDER MONKEYS (*ATELES GEOFFROYI VELLEROSUS*) IN THE FOREST OF THE CRATER OF SANTA MARTA, VERACRUZ, MÉXICO

Gilberto Silva-López  
Joaquín Jiménez-Huerta

Although studies at Sierra de Santa Marta, Veracruz, Mexico, have documented the situation of primates inhabiting the forest fragments of the slopes of the mountainous massif (e.g., Benítez-Rodríguez, 1989; Silva-López, 1987; Silva-López and García-Orduña, 1984; Silva-López *et al.*, 1986, 1988, 1993), little is known of the primate groups inhabiting the crater of Santa Marta. Santa Marta is an extinct volcano located to the south of the Los Tuxtlas region, and harboring one of Veracruz's larger continuous tracts of tropical rainforest. Los Tuxtlas, including Sierra de Santa Marta, was recently decreed a Biosphere Reserve by the Federal Executive (23 November, 1998) (Enrique Portilla Ochoa, pers. comm.), which was endorsed and supported by the several studies conducted throughout the years on its rich fauna and flora (Andrle, 1964; Rappole and Warner, 1980; González Ch. *et al.*, 1987; González Soriano *et al.*, 1997). Based on this study and on recent visits made by Domingo Canales Espinosa (pers. comm.), it can be safely assumed that no major changes have occurred to the vegetation of the crater in the 4–5 years since the original survey.

The walls and bottom of the crater are covered by high evergreen rainforest, and encompass an area of approximately 5,000 ha. According to Mario Vázquez Torres (unpubl. data; see also Benítez-Rodríguez *et al.*, 1992), vegetation in both the forest and the forest fragments of the Sierra's eastern slopes is very similar in structure and species composition, with *Pseudolmedia oxyphyllaria*, *Guarea glabra*, *Cymbopetalum penduliflorum*, *Inga* spp., *Sapium lateriflorum*, *Brosimum alicastrum*, *Dendropanax arboreus*, *Ficus* sp., *Rheedia edulis*, *Terminalia amazonia*, and *Nectandra ambigens* among the dominant species. Due to the steep slopes of the crater walls

(>60° in some places), we restricted our study area to the bottom, which has a width of 40 to 130 m, and an altitude of 700m. The Río Tecuanapa crosses the bottom of the crater (average width of 25 m). Protected by the crater's walls and stimulated by the continuous formation of clouds in the upper portions of the Sierra (approximately 1,500 m above sea level), rainfall indices are higher in the bottom of the crater (Andrle, 1964).

Benítez-Rodríguez *et al.* (1992) made the first assessment of spider monkeys in the area. They set up, and repeatedly walked, two transects (an area of approximately 26.96 ha) and recorded information from both, which were then combined to obtain the following results: Sixty-eight individuals were tallied during the survey, including 30 adult males and 33 adult females (a sex ratio of 1:1.1). Mean foraging party size was 3.33 (range of 1–7 individuals/party). Based solely on the transect area, it was possible to estimate a very high density of 2.52 individuals/ha. However, taking into account the entire area covered by forest in the crater, density was estimated to be 0.01 individuals/ha or 1/100 ha.

On the basis of this preliminary study, we established a third transect in the same area. This time, 24 monkeys were individually recognized, and included a total of four adult males (AM), 13 adult females (AF), one immature male (IM), and six immature females (IF). Mean foraging party size was four, and mean party composition was 0.67 AM, 2.17 AF, 0.17 IM, and 1.0 IF. The AM-AF ratio was 1:3.25, while the IM-IF ratio was 1:6.0. The adult-infant ratio was fixed at 1:0.41 and the number of infants per reproductive female was estimated to be 0.5. A raw density estimate obtained from the transect area was low (0.66 individuals/ha) when compared to the previous study, but I believe no conclusions should be made on this result due to the small number of censuses made over the same census route ( $n = 19$ ). Group fission was common. The most commonly observed subgroups were males traveling with females and young (50%), solitary females with an infant (33.3%), and adult males and females (16.7%). Solitary males were never recorded in the crater, as have been occasionally observed in forest fragments of the slopes of the Sierra (Silva-López, 1995). Howler monkeys (*Alouatta palliata mexicana*) were commonly heard in both studies, but no attempt was made to find them.

The results differ in some aspects from those of Silva-López *et al.* (1995) for the forest fragments of the Sierra's eastern slopes. For example, group size recorded in the fragments was larger, ranging from 2 to 16 individuals and with a mean of 5.7 individuals/group ( $SD \pm 3.5$ ,  $n = 17$ ). The proportion of adult and immature males was more conspicuous in the fragments, where average group composition was 1.71 AM, 2.6 AF, 1.33 IM, and 1.63 IF. The previously reported female-biased ratio (Chapman *et al.*, 1989), which was observed in the crater's second study, was also recorded in the fragments. There the bias was in the adults (1:1.34,  $n = 17$ ) and the immatures (average of 1:1.5,  $n = 17$ ), and was in accordance with the male-female ratios reported at sites with

a high habitat productivity (Chapman *et al.*, 1989). The ratio was higher, however, in the crater, where figures were 1:3.25 (AM-AF) and 1:6.0 (IM-IF). Likewise, in the fragments, adults were present in a higher proportion than immatures (average of 1:0.44,  $n = 17$ ). The data shows the relationship was more consistent with respect to the overall adult female-immature ratio (1:0.76), than with the adult male-immature ratio (1:1.03), suggesting that there tend to be more immatures than adult males in any given group. This result was consistent with the records at the crater, where the AM-I was 1:1.75. As Silva-López (1995) observed, group fission was not common in the fragments, except for groups of 10 or more individuals.

These results suggest that spider monkey group characteristics are different in varying environmental situations. The nature of the factors influencing this difference needs to be examined looking at various factors (e.g., availability of food, size of the available habitat, activity patterns, group size, and age-sex characteristics of individuals in a group) before more conclusive remarks can be made.

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## SYMPATRY AND NEW LOCALITY FOR *ALOUATTA BELZEBUL DISCOLOR* AND *ALOUATTA SENICULUS* IN THE SOUTHERN AMAZON

Líliam P. Pinto  
Eleonore Z. F. Setz

In September 1999, when beginning a research project on *Alouatta* ecology at Paranaíta, northern Mato Grosso, Brazil, we discovered two distinct howler species, *Alouatta belzebul discolor* and *Alouatta seniculus*, living in neighboring and partially overlapping home ranges. The study site (9°34.197 S; 56°19.381 W; Fig. 1), located on the left bank of the Rio Santa Helena, a tributary of the Rio Teles Pires, comprises part of the legally conserved vegetation of the Fazenda Universal cattle ranch, and is contiguous with the protected vegetation of neighboring ranches, forming approximately 10,000 ha of continuous forest. The regional climate is type AW1 (Köppen), tropical rainy with a marked dry season, with a mean annual temperature of 26°C. The dry season is from May to August. In some years total rainfall surpasses 2,800 mm (Empaer, 1999).

*A. belzebul discolor* occurs south of the Amazon River in the states of Maranhão, Pará e Mato Grosso (Hill, 1962). At

Pavanaita, we are studying activity pattern, diet and use of space. The study group has seven individuals, all with pelage characteristics typical for the species (Emmons and Feer, 1990): one adult male, three adult females, two juvenile females and one infant male.

*A. seniculus* is widespread north of the Amazon river which bends southwestward to the Rio Guaporé basin (Hill, 1962; Setz, 1991) and the only previous record from the north of the state of Mato Grosso, is at Aripuanã, on both banks of Aripuanã River (Ayres, 1981). The *A. seniculus* group observed had five individuals: one adult male, two adult females, one sub-adult female and one juvenile male. During a period of 140 days between September and May 1999, we observed the *A. seniculus* group on four occasions at the edge of the *A. belzebul discolor* group's home range. Twice in October 1999, agonistic interactions occurred when both groups attempted to use the same feeding tree. The encounters were accompanied by agitated vocalizations during 34 and 10 minutes respectively, once in the morning (starting at 9:30 am) and another in late afternoon (starting at 6:15 pm), by the adult males of both groups. In both events the adult male *A. belzebul discolor* actively pursued *A. seniculus* group members.

We observed four other *A. seniculus* groups in forest contiguous with the study area, and also found a dead adult male, which will be deposited in the Museu de Zoologia of the Universidade de São Paulo. It was not possible to obtain a specimen of *A. belzebul discolor*, but based on geographical distribution and pelage characteristics of the group members, R. Gregorin (pers. comm.) confirmed the species' identification. As is apparently the case with other primate species (see Hershkovitz, 1977), we expected that the Rio Teles Pires would present a natural barrier to *Alouatta* dispersal, and that *A. belzebul discolor* would occur only on its right (east) bank. However, this river has numerous islands, and some animals might cross the river in periods of marked dryness.

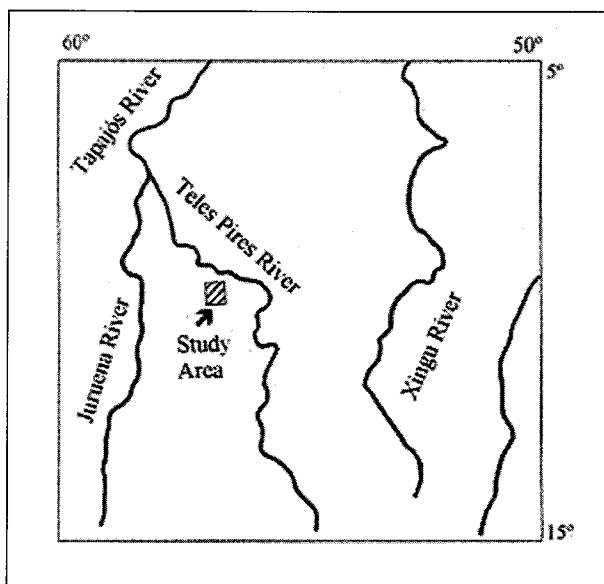


Figura 1. Location of the study area, in southern Amazon, Brazil.

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*Mata do Crasto*, municipality of Santa Luzia do Itanhy, state of Sergipe. About 900 ha in size, this is one of the most important areas of remnant Atlantic forest in the state of Sergipe. Although still relatively well preserved when compared to other forest fragments, the Mata do Crasto is threatened. It has no status as a protected area, and its continued existence depends on the goodwill and good sense of the few major landowners in the region. Illegal logging is frequent, and regional development programs related to promoting tourism include paving roads around and even in some parts of the forest. This is the largest forest fragment in the state, and perhaps has the largest existing population of *C. coimbrai*. I have consistently seen groups in this forest over the last nine years, but the risk of them disappearing is real.

*Mata do Dira*, municipalities of Itaporanga and Laranjeiras, state of Sergipe. Covering more than 800 ha, the Dira forests were, until very recently, one of the most important in the northern part of the state. However, squatters and Agrarian reform settlement schemes for the landless, deforestation, and the creation of pasture for cattle ranching have destroyed a good part of the forests in this municipality. Currently the forest is degraded, especially due to forest fires in recent years as well as human use and exploitation. Selective logging has opened up many clearings, which are very slow to regenerate.

*Matas do Conde*, municipalities of Conde and Jandatira, state of Bahia. I heard titi monkeys vocalizing in this forest in August 1996, which supports Kobayashi and Langguth's (1999) indication that they occur in northern Bahia. The majority of the forest fragments which support populations of *C. coimbrai* there are surrounded by *Pinus* and *Eucalyptus* plantations, and are along the perimeter of the Environmental Protection Area (APA) of the North Bahian Coast. However, they are undoubtedly threatened by selective logging, hunting, and land speculation.

*Callicebus* can be found in highly disturbed forests, in dense, young, and older, secondary growth, but it is evident that populations have been decreasing drastically over the years, mainly through forest loss and hunting and, more recently, with increasing tourism, the establishment of numerous settlement schemes throughout its range, and the lack of any environmental awareness programs in the region. The status of this species is obviously critical. They do not occur in any protected areas, the creation of which is a vital first step for the conservation of the titis and their forests.

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## NEW LOCALITIES FOR COIMBRA-FILHO'S TITI MONKEY, *CALLICEBUS COIMBRAI*, IN NORTH-EAST BRAZIL

Marcelo Cardoso de Sousa

*Callicebus coimbrai* was described in 1999 by Kobayashi and Langguth, based on differences in the skull, dental morphology and pelage when compared to the other Atlantic forest titis. Five specimens were examined for description, all of them from the Atlantic forest in the state of Sergipe, between the Rio São Francisco and Rio Real, in Pacatuba, Maruim and Cristinápolis. However, the limits of its geographic range have yet to be defined. Here I report on two new localities in Sergipe, and one in the extreme north of the state of Bahia.

## DISTRIBUTION OF BROWN CAPUCHIN MONKEYS (*CEBUS APELLA*) IN VENEZUELA: A PIECE OF THE PUZZLE

Salvador Boher-Bentti  
Gerardo A. Cordero-Rodríguez

The distribution of the brown capuchin monkey (*Cebus apella*) in South America is widely documented (Husson, 1978; Eisenberg, 1989; Emmons and Feer, 1990). It ranges from northern Argentina throughout the Guyanas, southern Colombia, and southern Venezuela, inhabiting a broad variety of forest types. The habitats and distribution of *Cebus apella* in Venezuela are known from the works of Handley (1976), Rudran and Eisenberg (1982) and Bodini and Pérez-Hernández (1987). According to Bodini and Pérez-Hernández (1987), *Cebus apella* is represented by two subspecies, *C. a. apella* (Linnaeus, 1758) and *C. a. margaritae* Hollister, 1914. The first is restricted to the state of Amazonas where it is found along both banks of the upper Río Orinoco, whereas the latter is restricted to Margarita Island highlands, approximately 38 km from the state of Sucre, northeastern Venezuela. The disjunct distribution of the brown capuchin monkey is puzzling and not yet explained. It is likely that man introduced this monkey to Margarita Island (Rudran and Eisenberg, 1982; Eisenberg, 1989; Linares, 1998). A recent sighting of *Cebus apella* in eastern Venezuela suggests that fieldwork should be

conducted in the south and east to gather information on its presence from northern Guyana throughout northeastern Bolívar State, the Río Orinoco delta and the highlands of the state of Sucre. In this paper we report new findings on the distribution of the brown capuchin monkey in Venezuela.

On May 23, 1993, a survey was conducted by law enforcing officials of the Venezuelan Wildlife Service under the command of Chief Game Warden S. Boher-Bentti along Caño (stream) Matico to and from Curiapo village (8°35'N, 60°02'W). Curiapo is in the southeastern part of the Río Orinoco delta, approximately 120 km SE Tucupita (Fig. 1). The mean annual temperature in the area is 26 °C. and the yearly rainfall is over 2000 mm. According to Holdridge Life Zones (Ewel *et al.*, 1976), the vegetation of the area is a tropical humid forest.

While travelling along Matico stream, we sighted two brown capuchin monkeys that were foraging in a patch of "moriche" palm trees (*Mauritia flexuosa*) at 16:50 hours. At that time, we were stationed at the mouth of the Jamatuba Stream, approximately 45 minutes from S Curiapo village. According to the indigenous field guide, *Cebus apella* is locally known as "Nakú-Jabu" in the language of the Warao People. Its presence in the Río Orinoco delta is a new record for Venezuela and an extension of the species' range.

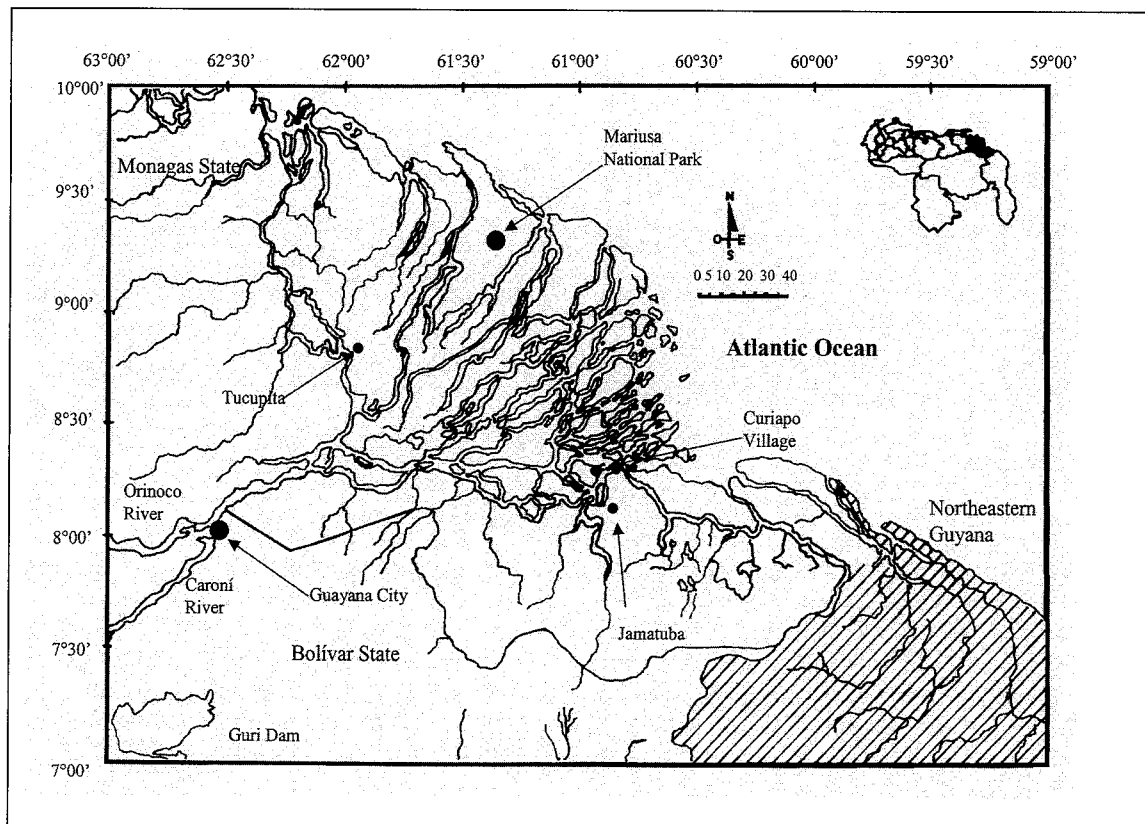


Figure 1. Map of Delta Amacuro State showing the Orinoco River Delta and the Curiapo village sighting site, northeastern Venezuela.



In Guyana, *Cebus apella* is found along both banks of middle Essequibo River and the River Cuyuni (Map 6.11 p.248 in Eisenberg, 1989). The latter locations are close to the coastal belt of Guyana and are approximately 300 km SE of Curiapo. Lowland forests are found in the Orinoco delta and north-eastern Bolivar State (Huber and Frame, 1989), whereas seasonal evergreen forests are found in the northeastern coastal belt of Guyana (Lindeman and Mori, 1989). This continuous forest belt suggests that *Cebus apella* might be present from northern Guyana to the Orinoco delta. The habitat types found along this belt harbor similar conditions to the delta region (V. González, pers. comm. 2000), supporting the conjecture of a continuous distribution for *Cebus apella*. We are planning a field trip to the Orinoco delta to conduct a wildlife survey, looking particularly for the brown capuchin monkey, in the near future.

**Acknowledgments:** We greatly appreciate the field assistance provided by Game Warden Giuseppe Cagnino, Venezuelan National Guard Corporal Rafael González and our Warao field guide Juan José Salcedo. Dr. Valois González (Instituto de Zoología Tropical, Central University of Venezuela) kindly shared with us his personal experiences, knowledge and expertise on the vegetation of northeastern South America. Drs. Roberta Bodini and Juhani Ojasti from the Instituto de Zoología Tropical kindly read the manuscript and provided valuable suggestions.

**Salvador Boher-Bentti and Gerardo A. Cordero-Rodríguez,** Instituto de Zoología Tropical, Facultad de Ciencias, Universidad Central de Venezuela, Apartado de Correo 47058, Caracas 1041-A, Venezuela.

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## A NEW LOCALITY FOR THE MASKED TITI MONKEY, *CALLICEBUS PERSONATUS NIGRIFRONS*, IN A PROTECTED AREA IN MINAS GERAIS, BRAZIL

Marcelo Ferreira de Vasconcelos  
André Hirsch

The masked titi monkey (*Callicebus personatus*), a species threatened in Brazil (Fonseca *et al.*, 1994; Lins *et al.*, 1997; Machado *et al.*, 1998), is restricted to the Brazilian Atlantic forest, including the states of Sergipe, Bahia, Espírito Santo, Minas Gerais, Rio de Janeiro, and São Paulo (Rylands, 1994, 1998). A proposed conservation strategy for the species in Minas Gerais state is to survey protected areas for unknown populations (Rylands, 1998). This paper reports a new locality for *C. personatus nigrifrons* in a protected area in Minas Gerais state.

Field work was conducted at the Reserva Particular do Patrimônio Natural do Caraça (RPPN Caraça) (20°05'S, 43°28'W), municipalities of Catas Altas and Santa Bárbara, state of Minas Gerais, southeastern Brazil. The Caraça Reserve is 11,233 ha, ranging in elevation from 850 to 2,072 m above sea level (Zico, 1990). Native vegetation inside the reserve includes montane Atlantic forest in the lowest parts and near water, and 'campo rupestre' and high altitude grassland ('campos de altitude') in the highest and rocky regions. There are small patches of pasture in some areas in the reserve.

Since 1996, groups of *C. personatus nigrifrons* have been recorded at RPPN Caraça, at altitudes between 850 and 1,450 m. These forests have trees varying in height from 4 to 17 m. Generally, groups of two to five individuals can be observed foraging in the middle and upper strata of the forest (Fig. 1). In April 1996 one individual was observed eating fruits from a Melastomataceae tree.

Besides the observations from the RPPN Caraça, we found groups of three to four individuals at Fazenda Bocaina (19°58'S, 42°57'W), municipality of Santa Bárbara, located at the base of the Serra do Caraça, 4 km from the reserve. Fazenda Bocaina has areas of second growth forest at altitudes between 750 and 900 m above sea level. These forests are connected with those of the RPPN Caraça. Unfortunately, every year, many forested areas adjacent to RPPN Caraça, are cut due to mining and



Figure 1. A masked titi monkey, *Callicebus personatus nigrifrons*, in a montane forest in the Reserva Particular do Patrimônio Natural do Caraça. Photo by M. F. Vasconcelos.

logging, and lost through fires. These forests should be protected for their role as corridors.

*Acknowledgments:* M. F. Vasconcelos is grateful to the Brazil Higher Education Authority (CAPES), World Wide Fund for Nature (WWF) and USAID for financial support during his Master's course.

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## RECORDS OF HOWLERS (*ALOUATTA*) ON THE AZUERO PENINSULA AND CANAL ZONE OF PANAMA

Noel Rowe

Panama has two species of howler monkeys (Groves, 1992): the mantled howler (*Alouatta palliata aequatorialis*) and the Coiba Island howler (*A. coibensis*). The latter has two subspecies *A. c. coibensis*, found on Coiba Island, and *A. c. trabeata*, on the Azuero Peninsula. Although the mantled howler has been studied quite thoroughly in Panama on Barro Colorado Island, the last report published in the lit-

erature about *A. coibensis* was in 1987 (Froehlich and Froehlich, 1987). Here I report on some observations of howler monkeys during a survey from 8-28 January, 1998, on the Azuero Peninsula and the Canal Zone of Panama. Although it was our intention to visit Coiba Island as well, the permits required and the logistics involved proved too difficult for this short survey. Howler groups were located by their loud territorial calls. The number of individuals per troop was noted, photographs were taken and, when possible, age and gender of the individuals in the troop were also recorded.

#### Azuero Peninsula (*Alouatta coibensis trabeata*)

Although there are no population estimates for any of the primates of the Azuero Peninsula, the howler monkeys are the most easily seen, and are presumably the most common. INRENARE, which is in charge of managing the protected areas of Panama, has a distinct presence on the Azuero Peninsula. We were told of the efforts of one man on the eastern side of the Peninsula near Las Tablas who was campaigning to stop the hunting of howlers. The troop we saw next to the road may well owe its existence to this man's work.

January 8, 1998. During a trip to the INRENARE Las Tablas office, on the road to Tonosi (7°40'N, 80°20'W). One lone male seen who was vocalizing. Later, a troop of six was seen, also vocalizing, and comprised of two males, two females (one with an infant), and two juveniles. We were quite close to the troop. They did not flee, and continued howling for at least 20 minutes.

January 10-12, 1998. Five different troops of howlers were recorded while traveling from the INRENARE station at Punta Restinga in Cerra Hoya National Park (7°15'N, 80°55'W). One troop remained for three days in large trees along a stream near the road to Punta Restinga, where cattle are kept. Troop of eight was seen consisting of two males, one female with infant, two adults of unknown sex, and three juveniles.

January 13, 1998. Saw one troop of four in a small remnant forest by Señor Sanchez's house at Punta Restinga. The forest was isolated by open pasture. The troop consisted of one male, one female with an infant, and two juveniles.

January 13, 1998. One troop of howlers was heard on the steep hill on the left side of the Rio Mata Prio (7°15'N, 80°52'W). We took a boat from Punta Restinga to this valley and met the farmer who works this area of Cerra Hoya National Park. He walks or rides 3-4 hours from his village to spend a week or so in the Park each month. He reported seeing capuchins and spider monkeys only occasionally. He informed that he hunted peccaries with dogs.

#### Chorcha Plateau (*Alouatta palliata aequatorialis*)

The Chorcha plateau located near the town of Chorchita (8°23'N, 82°10'W). The forest on the plateau itself has been

cleared for agriculture, but there is still good forest on the steep slopes which are below the plateau.

January 14, 1998. Two howlers were seen climbing trees, close to dusk.

January 15, 1998. Three troops of howlers were heard from the road that goes up to the plateau. Two troops were seen. One troop of at least seven, included two males, one subadult male, two females (one with an infant), and two juveniles. A second troop intermixed with the first as it left a fruiting tree and the juveniles played together. This second troop had at least nine members; two males, two females, and five unidentified subadults or juveniles. Four white-throated capuchins, *Cebus capucinus*, were also seen.

#### Fortuna (*Alouatta palliata aequatorialis*)

Fortuna is on the Caribbean side of the continental divide to the west of the road to Isla Grande (8°50'N, 82°10'W).

January 21, 1998. One troop was seen and heard near to a stream to the west of Willie Mazu Eco Ranch. Four individuals were identified: one male, one female, and two juveniles.

#### Achiote Road, Canal Zone (*Alouatta palliata aequatorialis*)

Achiote Road is a protected forest in the west side of the canal zone south of Fort Sherman (9°15'N, 79°55'W) and had the largest numbers of howler troops seen on this survey. All of the troops observed appeared to have a range of ages, from infants to adults, and appeared to be thriving, except for evidence of botfly infestations in some individuals.

January 24, 1998. Eight troops of howlers were seen or heard from the road.

January 25, 1998. Three troops were seen, one with at least 10 individuals, including three females with infants. A second troop had 11+ individuals, including three females with infants. Seven troops were heard but not seen.

January 26, 1998. Two troops were seen. The first contained more than 12 individuals. Eleven individuals were counted in the second troop, which included a very young infant. One juvenile in this troop had a white band of fur toward the end of its tail. A further three troops were heard.

#### Conservation

Cerra Hoya National Park has a patrol house at Punta Restinga in which two guards are usually present. Each has a motorbike, and a horse shares the grounds around the house. We were told that arrests for tree cutting in the park were about to be made three days after our departure. The park is reasonably intact, but there are still farmers who have prior legal use of pastureland within the park boundaries. Hunting of peccaries and probably other species is still going on. The park itself was difficult

to survey due to its steepness and the lack of trails leading to the interior, although it is quite likely that there were more trails than our guide knew of, because he was new to the area. Efforts should be made to establish a base for further biological research to study this forest, which has a number of little known and endemic bird and mammal species.

Besides the Azuero Peninsula, there appear to be only a few areas on the Pacific side of Panama, west of the canal zone all the way to David, with suitable forest for primates. The one exception is the Plateau near the town of Chorita, which has several troops of howlers living in the forest that grows on the steep slopes. Efforts should be made to legally protect this valuable forest, which is also home to white-throated capuchin monkeys (*Cebus capucinus*).

*Acknowledgments:* I thank Oswaldo Jordan and Darien Martinez from The Panama Audubon Society and Havier Gonzalez, Carlos Ortega, and Nicolis Ramos from INRENARE, who helped plan, and participated in the survey of the Azuero Peninsula. I am grateful to INRENARE for permission to visit Cerra Hoya, and Señor Sanchez and his son who took us in their boat to Rio Mata Prio. Special thanks to Wilberto Martinez who was our guide for the Fortuna and Canal Zone portion of the survey.

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## News

### IUCN SPECIES SURVIVAL COMMISSION PETER SCOTT AWARDS FOR CONSERVATION MERIT

In honor of the late Sir Peter Scott, who served as chairman of the SSC from 1963 to 1967 and who is considered to be one of the fathers of conservation, the Peter Scott Award for Conservation Merit was given to three remarkable individuals, during the Second World Conservation Congress, Amman, Jordan, October 2000. Under Sir Peter Scott's leadership, the SSC developed into the largest of the six volunteer commissions of the IUCN and now incorporates the expertise of some 7,000 scientists, researchers and conservation practitioners throughout the world. Based on their dedication, persistence, commit-

ment and achievements in conservation the recipients of the award were, Peter Jackson, Marshall Murphee, and William Conway, all of whom have served the conservation community for many years and are each recognized as leading figures in the preservation of nature.

Peter Jackson, Chair of the SSC Cat Specialist Group, is best known for his conservation efforts in India on the critically endangered tiger. Among his many accomplishments, he served as the Director of Information for World Wildlife Fund International, and has published several books including, *Wild Cats: Status Survey and Conservation Action Plan* and *Riding the Tiger: Tiger Conservation in Human-Dominated Landscapes*. In 1997 he was made an officer of the Order of the Golden Ark by Prince Bernhard of the Netherlands and was recently presented with the Salim Ali International Award for his work in conservation and ornithology in India by the Bombay Natural History Society.

Professor Marshall W. Murphee, Chair of the Sustainable Use of Wild Species Specialist Group, is noted for his work in the social sciences, particularly for his innovative thinking on integrating conservation issues and the human component. During the late 80's Marshall became Chairman of the Parks and Wildlife Board of Zimbabwe, the highest council on wildlife matters in the country, and in 1992 and 1994 he became part of the Zimbabwe delegation to CITES. His influence in sustainable use is far reaching, and as Director of the Center for Applied Social Sciences (CASS) at the University of Zimbabwe, he raised significant funding to empower CASS to develop a major applied socio-economic research programme. Truly a conservation leader who believes in "conservation with a human face", Marshall is a champion of sustainable wildlife use.

Dr. William G. Conway, former President of the Wildlife Conservation Society in New York, profoundly impacted conservation through his activities in conservation biology, wildlife propagation, the role of zoological parks, and ornithology. Serving as President of the Society since 1967, he altered the roles of both European zoological institutions and North American zoological parks and aquariums. Having persuaded the conservation community that effective conservation requires scientific knowledge and field research, he is responsible for creating an institution that participates in conservation activities in over 300 sites worldwide. A leader, writer and spokesman for conservation for over 40 years, William has written more than 200 articles and has supported many SSC Specialist Groups including those working on curassows, primates, peccaries, reptiles, crocodiles, freshwater turtles and sustainable use.

For more information on these remarkable individuals and/or the Peter Scott Award for Conservation Merit, please contact: Sue Mainka, Head IUCN Species Programme, e-mail: <SAM@hq.iucn.org> or Anna Knee, Communications Officer, Species Survival Commission, e-mail: <alk@iucn.org>.

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## COURSE ON PRIMATE BEHAVIOR AND ECOLOGY— FLORIDA STATE UNIVERSITY

A Primate Behavior and Ecology Program will be held from 21 June – 22 July, 2001, at the Primate Refuge and Sanctuary of Panama, sponsored by Florida State University. It is a 4-week, 7-semester hour Primate Behavior and Ecology Program. As a part of the training, students will conduct directed research projects on the endangered Panamanian tamarin (*Saguinus geoffroyi*) and live at the Primate Refuge and Sanctuary of Panama. The Program runs from 21 June to 22 July 2001, but the application deadline is not yet closed. The Program runs again from June 21 to July 22, 2002, the deadline for application is mid-January 2002. Contact: Iris Broekema, e-mail: <irisbroekema@hotmail.com>, or Nancy Smith, e-mail: <nsmith@mailers.fsu.edu>. Web page: <http://www.fsu.edu/~cppanama/ipsp/program.htm>.

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## WISCONSIN REGIONAL PRIMATE RESEARCH CENTER

In August, 2000, the Wisconsin Regional Primate Research Center (WRPRC) was awarded a grant to co-ordinate both information services among the Regional Primate Research Centers (RPRCs) and outreach to the international primatological community.

A consortium of RPRC Libraries has been formed to coordinate grant activities. An RPRC Staff Services Menu has been developed to provide staff with centralized Web access to a wide range of research support tools and services. The menu includes links to services at the various RPRCs.

Initial development of a document delivery program is completed. Yerkes will be the initial test site, although all Centers will be phased in. Centers with libraries will have document requests routed to those libraries; others will be provided access to this service through Wisconsin. This service is intended to complement, not replace, existing document delivery services at the RPRCs.

The PrimateLit database has been moved to the University of Wisconsin and is developing a new platform. Literature analysis and indexing will be provided by the Primate Information Center at the Washington RPRC. An electronic version of Current Primate References has been developed. Major support for the database will be provided by the National Center for Research Resources, with the Wisconsin and Washington Centers supplementing. Release is projected for late this spring.

Primate Info Net, a major Web resource for electronic primatology information, has been enhanced by fact sheets about the primates, as well as links to sites on primates as animal models and to government documents, such as the Chimpanzee Health Improvement, Maintenance, and Protection Act.

A Web resource page, which addresses the benefits of primates in biomedical research, is in development.

Three educational projects underway are: 1) development of a collection of images of primates in art and illustration (with Stephen Nash, SUNY-Stony Brook); 2) a teaching set on field work with nonhuman primates (print and Web versions) and; 3) a grant-supported upgrade of the Callicam technology—a camera and Web site about the Common Marmoset which is accessible from classrooms worldwide.

If you have any comments or questions about progress on the grant, please contact Larry Jacobsen, Library and Information Services, Wisconsin RPRC, Univ. of Wisconsin, Madison, WI 53715 [e-mail: jacobsen@primate.wisc.edu]; or see <www.primate.wisc.edu/pin/>.

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## THE CHAPALA ECOLOGY STATION (CES), MEXICO

Located on the shore of Mexico's largest natural lake, Lago de Chapala, at the foot of the mountain range making up the southwestern boundary of the Mesa Central, the Chapala Ecology Station (CES) is ideal for ecological study and instruction. Montane coniferous forest, desert scrubland, tropical rainforest, large and small lakes, salt lakes, reservoirs, rivers, marshes, and thermal springs are easily accessible from the station and within a days drive, the alpine forests of Nevado de Colima, the Pacific Ocean at Barra de Navidad, and the Universidad Autónoma de Guadalajara's marine science/aquaculture laboratory. The station provides classes and facilities for both students and researchers wishing to study in the area. A professional team of ecologists teach the courses and field lectures are provided in both English and Spanish. For more information, contact Laura Davalos, Tel: (254) 710 2911, e-mail: <laura\_davalos-lind@baylor.edu> or see the web site: <www.Baylor.edu/~ces>.

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## RAINFOREST RESEARCH GRANTS

Grants are now available for researchers working in southwestern Peru. The grants support ongoing research at the Tambopata Research Center (TRC) or Posada Amazonas Lodge (PAL), facilities operated by Rainforest Expeditions. Graduate students or researchers of tropical biology or environmental studies are encouraged to apply. Preference is given to those with interests on large vertebrates or ecotourism. For further information contact: Donald J. Brightsmith, Duke University Department of Zoology, e-mail: <djb4@duke.edu>.

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## BIODIVERSITY SUPPORT PROGRAM (BSP)

Supported by the Nature Conservancy and the World Resources Institute, the Biodiversity Support program is an online site which highlights information gathered from 12 years of BSP

research on biodiversity conservation. The site includes an electronic library of BSP publications and can be subscribed to free of charge at <[www.bsponline.org](http://www.bsponline.org)>.

## Primate Societies

### ASP CONSERVATION AWARD WINNERS FOR 2000

The American Society of Primatologists (ASP) gave the following Conservation Awards (small grants of \$500–1500 each) in 2000: Matthew Banks - Lemur fauna of Littoral Forest, Tolagnaro (Fort Dauphin) Region, southeastern Madagascar; Mukesh Chalise - Survey of Assamese monkeys in Langtang National Park, Nepal; Anwaruddin Choudhury - Survey of non-human primates in West Kameng District (26°50'–27°50'N, 92°00'–92°50'E), Arunachal Pradesh, India; Ekpenyong Effiong - Community-based conservation education and awareness campaign programme in the proposed Afi Mountain Wild Life Sanctuary in Cross River state of Nigeria; Joel Gathua - Monitoring the demographic status of the Angolan colobus (*Colobus angolensis palliatus*) in the Shimba Hills Reserve, coastal Kenya; Entang Iskandar - Population survey of Javan gibbon (*Hyllobates moloch*) at the Ujung Kulon National Park, West Java, Indonesia; Mugambi Karere - Ecological study and conservation strategy for De Brazza's monkeys (*Cercopithecus neglectus*) in Kenya; Erwin Palacios - Primate conservation in the lower Caquetá and Apaporis Rivers through educational activities; Tania Saj - The Boabeng-Fiema Primate Research Project: The potential role of sacred groves in the conservation of West African monkeys; Janette Wallis - Monitoring the behavioral ecology and viability of forest fragment chimpanzees, Masindi District, Uganda.

For information on these small grants please contact: Dr. Randall C. Kyes, Chair, ASP Conservation Committee, Regional Primate Research Center, University of Washington, Box 357330, Seattle, WA 98195 USA, Tel: (206) 543-3025, Fax: (206) 685-0305, e-mail: <[rkyes@u.washington.edu](mailto:rkyes@u.washington.edu)>. Website: <[www.asp.org/Conservation/ConsGrantApp2000.html](http://www.asp.org/Conservation/ConsGrantApp2000.html)>.

### PRIMATE SOCIETY OF GREAT BRITAIN (PSGB) WEBSITE

The Primate Society of Great Britain's website can be accessed at: <<http://www.psgb.org>>. The site has been redesigned so it should be a little easier to get around. It contains information about the society and the various meetings (twice yearly) organized by the Society. There are also new application forms for the PSGB conservation grants and other bits of information.

**Bill Sellers**, Editor of *Primate Eye* and the PSGB website, Department of Biomedical Sciences (Anatomy), University of Edinburgh, Hugh Robson Bldg, George Square, Edinburgh EH8 9XD, UK, Tel: (0)131-650-3110 Fax: UK (0)131-650-6545, e-mail: <[Bill.Sellers@ed.ac.uk](mailto:Bill.Sellers@ed.ac.uk)>.

### PSGB – PRIMATE EYE FIELD STUDIES SUPPLEMENT

Number 72 of *Primate Eye*, published by The Primate Society of Great Britain (PSGB) brings with it the millennium edition of the *Primate Field Studies Guide*, published as a supplement. It contains details on 186 projects, spanning 47 countries across Africa, Madagascar, Asia and the Americas. For the first time the collection and presentation of this information has been carried out in conjunction with the Wisconsin Regional Primate Research Center (WRPRC) who make available an electronic version of the database on their website: <<http://www/primare.wisc.edu/pin/idp/index.html>>. The listing was compiled by Guy Cowlshaw, Institute of Zoology, Zoological Society of London, UK, and the supplement includes an editorial by him which analyzes the geographic and taxonomic distributions of the projects, as well as by subject components, and duration. There is also a short presentation by David J. Chivers, who began the *Field Studies Supplement* in 1974 and was the editor from then until 1991.

Fifty-two field studies were listed for the Americas, the same number as for Asia, while 62 were listed for Africa and 20 for Madagascar. The breakdown for each country in the Americas is as follows: Argentina-5; Belize-2; Bolivia-1; Brazil-17; Colombia-4; Costa Rica-6; French Guiana-3; Mexico-6; Nicaragua-1; Panama-1; Peru-2; Puerto Rico-1; Suriname-1; Trinidad-1; and Venezuela-1.

The supplement is available from the PSGB Treasurer, Dr. Charlie Evans, Dept. of Biological Sciences, Glasgow Caledonian University, Cowcaddens Road, Glasgow G4 0BA, Scotland, UK, e-mail: <[csev@gcal.ac.uk](mailto:csev@gcal.ac.uk)>. The price is £5.00 (+postage). For membership of the PSGB, please write to Dr. Russell Hill, Membership Secretary, School of Biological Sciences, Nicholson Building, University of Liverpool, Liverpool L69 3BX, UK.

**Guy Cowlshaw**, Institute of Zoology, Zoological Society of London, Regent's Park, London NW1 4RY, England, UK. E-mail: <[guy.cowlshaw@ioz.ac.uk](mailto:guy.cowlshaw@ioz.ac.uk)>.

## Recent Publications

### A RED LIST FOR THE STATE OF RIO DE JANEIRO, BRAZIL

*A Fauna Ameaçada de Extinção do Estado do Rio de Janeiro*, compiled by Helena de Godoy Bergallo, Carlos Frederico Duarte da Rocha, Maria Alice dos Santos Alves and Monique van Sluys. 2000, 168pp. Editora da Universidade do Estado do Rio de Janeiro (EDUERJ), Rio de Janeiro. ISBN 85 85881-92 5. The Red List of threatened animals for the state

of Rio de Janeiro, Brazil. Chapter 10 (pages 125–135) dealing with the mammals, was compiled by Helena de Godoy Bergallo, Lena Geise, Cibele Rodrigues Bonvicino, Rui Cerqueira, Paula S. D'Andrea, Carlos Eduardo Esberárd, Fernando A. S. Fernandez, Carlos Eduardo Grelle, Adriano Peracchi, Salvatore Siciliano and Sérgio Maia Vaz. The following species of primates were listed: *Callithrix aurita* (Vulnerable), *Leontopithecus rosalia* (Endangered), *Brachyteles arachnoides* (Critically Endangered), *Callicebus personatus* (Vulnerable), and *Alouatta guariba* (= *fusca*) (Presumed Threatened). Of the primates occurring in the state of Rio de Janeiro, only the capuchin monkey, *Cebus nigrinus* was not listed as threatened. Overall, of 176 mammals considered for the state, 43 (24.4%) are listed as threatened, and a further 34 (19.3%) as presumed threatened. Available from: Editora da Universidade do Estado do Rio de Janeiro (EDUERJ), Rua São Francisco Xavier 524, Maracanã, Rio de Janeiro 2.0550-013, Rio de Janeiro, Brazil, Tel/Fax: +(0)21 587 7788, 587 7789.

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### GUIA DE FINANCIADORES—ONDE OBTER DINHEIRO PARA FINANCIAR PROJETOS

Uma boa notícia para as pessoas e instituições que desenvolvem ou pretendem desenvolver projetos nas mais diversas áreas, como saúde, social, educação, desenvolvimento, meio ambiente, agricultura, arte, cultura, direitos humanos, e pesquisa. Foi lançada a nova versão do *Guia de Financiadores*, um catálogo que traz informações básicas e atualizadas sobre 114 instituições que financiam projetos no Brasil ou na América Latina e que tem se revelado de grande auxílio para a obtenção de recursos financeiros. O *Guia* é uma ferramenta prática, de estrutura simples, onde as informações são apresentadas de forma sucinta e descrevem para cada instituição a área de financiamento, os valores financiados, as formas de contato, endereços postais e eletrônicos, *home-pages*, além de outras informações adicionais.

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### MUSEU DE BIOLOGIA MELLO LEITÃO-BRASIL

No ano de 1949, o naturalista Augusto Ruschi fundou o Museu de Biologia Professor Mello Leitão, na cidade de Santa Teresa, Espírito Santo, Brasil. Iniciou naquele ano a edição do *Boletim do Museu*, e de 1949 a 1985 foram impressos 390 títulos, dentro de séries de Biologia, Zoologia, Botânica, Proteção à Natureza, Antropologia, Divulgação e Geologia. O último número do *Boletim* foi publicado em 1985, ano anterior ao seu falecimento. Após a reestruturação do Museu, em 1992, as sete séries foram fundidas passando o periódico a se chamar *Boletim do Museu de Biologia Mello Leitão – Nova Série*. Desde então a publicação passou a publicar contribuições para a biologia que não se restringem a trabalhos realizados no Museu, mas que em geral são de autoria de pesquisadores vinculados ao Museu. Em 1996, o Conselho Científico do Museu foi instituído, e assumiu a função de Conselho Editorial do *Boletim*, que vem sendo publicado semestralmente.

No ano de 1999, por ocasião de cinquentenário do Museu foi editado um volume especial comemorativo, com artigos de membros do Conselho Científico e de pesquisadores vinculados que tem colaborado com o Museu nos últimos anos, especialmente aqueles oriundos do projeto “Biodiversidade da Mata Atlântica no Estado do Espírito Santo”. Assim foi publicado a “Edição Comemorativa dos 50 Anos do Museu”, números 11 e 12, junho de 2000. A publicação prestou homenagem também a Augusto Ruschi, pela sua iniciativa de criar um periódico que tem dado uma relevante contribuição à biologia e conservação da biodiversidade no Brasil.

*Conteúdo:* A Estação Biológica de Santa Lucia, Santa Teresa, Espírito Santo - S. L. Mendes & M. da P. Padovan, pp.7–34; Espécies vegetais descritas a partir de espécimes coletados na Reserva Florestal de Linhares, Espírito Santo, Brasil - P. Germano Filho, A. L. Peixoto & R. M. de Jesus, pp.35–48; Células piramidais apicais dos tegumentos do óvulo em Velloziaceae e suas relações filogenéticas - N. L. de Menezes & N. M. de Castro, pp.49–56; Recursos de Bromeliaceae utilizados por beija-flores e borboletas em Mata Atlântica no Sudeste do Brasil - I. G. Varassin & M. Sazima, pp.57–70; Diversidade de Lepidoptera em Santa Teresa, Espírito Santo - K. S. Brown, Jr. & A. V. L. Freitas, pp.71–116; Perfil da fauna de himenópteros parasitóides (Insecta, Hymenoptera) em uma área de Mata Atlântica da Reserva Biológica de Duas Bocas, Cariacica, Brasil - C. O. Azevedo & H. S. Santos, pp.117–126; Studies on Neotropical Protoneuridae. 10. *Forcepsioneura lucia* sp.n. from the Parque Estadual Rola Moça, Minas Gerais, Brazil (Odonata, Zygoptera) - Â. B. M. Machado, pp.127–134; Ecology of *Leptagrion perlongum* Calvert, 1909: A bromeliad-dweller odonate species - P. de Marco Júnior & K. S. Furieri, pp.135–148; Composição da avifauna da Estação Biológica de Santa Lúcia, Santa Teresa - ES - J. E. Simon,

pp.149–170; Descrição do comportamento de corte do dançarino-de-coroa-vermelha, *Machaeropterus regulus* (Aves, Pipridae) - M. L. da Silva, G. Baudet, T. Sigrist & J. Vielliard, pp. 171–188; Reintrodução do tucano-de-bico-preto (*Rhampastos vitellinus ariel* Vigors, 1826) no Parque Nacional da Tijuca (Rio de Janeiro - RJ) e notas sobre sua distribuição geográfica - A. F. Coimbra-Filho, pp.189–200; Non-volant mammals of the Estação Biológica de Santa Lúcia and adjacent areas of Santa Teresa, Espírito Santo, Brazil - M. Passamani, S. L. Mendes & A. G. Chiarello, pp.201–214; Análise da comunidade de marsupiais em Mata Atlântica de Santa Teresa, Espírito Santo - M. Passamani, pp.215–228; Influência da caça ilegal sobre mamíferos e aves das matas de tabuleiro do norte do estado do Espírito Santo - A. G. Chiarello, pp.229–247. Available from: Biblioteca, Museu de Biologia Mello Leitão, Avenida José Ruschi 4, 29650-000 Santa Teresa, Espírito Santo, Brasil.

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### CONSERVATION BIOLOGY-SPECIAL SECTION ON HABITAT DISTURBANCE

The December 2000 issue, Vol. 14(6), of *Conservation Biology*, the Journal of the Society for Conservation Biology, has a special section with 12 articles devoted to the theme "Habitat Disturbance and Tropical Rainforest Mammals", put together by the Guest Editor Alfredo D. Cuarón of the Departamento de Ecología de los Recursos Naturales, Instituto de Ecología, Universidad Nacional Autónoma de México, Michoacán, México. It includes the following papers: A global perspective on habitat disturbance and tropical rainforest mammals, A. D. Cuarón, pp.1574–1579; Monitoring mammal populations in Costa Rican protected areas under differing hunting restrictions, E. Carrillo, G. Wong and A. D. Cuarón, pp.1580–1591; Habitat mosaic, wildlife availability, and hunting in the tropical forest of Calakmul, Mexico, A. Escamilla, M. Sanvicente, M. Sosa and C. Galindo-Leal, pp.1592–1601; Bushmeat markets on Bioko Island as a measure of hunting pressure, J. E. Fa, J. E. Garcia Yuste and Ramon Castelo, pp.1602–1613; Roads, development, and conservation in the Congo basin, D. Wilkie, E. Shae, F. Rotberg, G. Morelli and P. Auzel, pp.1614–1622; Influence of timber extraction routes on Central African small-mammal communities, forest structure, and tree diversity, J. R. Malcom and J. C. Ray, pp.1623–1638; Effects of habitat disturbance and protected areas on mammals of Peninsular Malaysia, R. K. Laidlaw, pp.1639–1648; Density and population size of mammals in remnants of Brazilian Atlantic forest, A. G. Chiarello, pp.1649–1657; Effects of human colonization on the abundance and diversity of mammals in eastern Brazilian Amazonia, M. A. Lopes and S. F. Ferrari, pp.1658–1665; Bat diversity and abundance as indicators of disturbance in Neotropical rainforests, R. A. Medellín, M. Equiha and M. A. Amin, pp.1666–1675; Effects of land-cover changes on mammals in a Neotropical region: A modeling approach, A. D. Cuarón,

pp.1676–1692; Bat and bird-generated seed rains at isolated trees in pastures in tropical rainforest, J. Galindo-González, S. Guevara and V. J. Sosa, pp.1693–1703.

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### BOOKS

*Classification of Mammals*, by Malcolm C. McKenna and Susan K. Bell, 2000, 631pp. Columbia University Press, New York. ISBN 0 231 11013 8 (paper), 0 231 11012 X (cloth). Price: US\$50.00 (paperback); US\$175.00 (cloth). This is the first comprehensive classification to appear in more than 50 years. Since George Gaylord Simpson's 1945 classification, the paleontological record has been greatly expanded, the timescale recalibrated, and much debate and progress concerning the theoretical underpinnings of systemization has occurred. McKenna and Bell have constructed a completely updated hierarchical system that reflects the genealogy of the Mammalia. Available from: Columbia University Press, Order Department, 136 South Broadway, Irvington, NY 210533, USA, Tel: (800) 944 8648 or (914) 591 9111, or Columbia University Press, c/o John Wiley and Sons, Ltd., 1 Oldlands Way, Bognor Regis, West Sussex PO22 9SA, England, UK, Tel (1243) 779 777, e-mail: <customer@wiley.co.uk>. Web site: <Columbia.edu/cu/cup>.

*Primate Ecology and Social Structure, Volume 2: New World Monkeys*, by Robert W. Sussman, Department of Anthropology, Washington University, St. Louis. 2000, 207pp. Pearson Custom Publishing, Boston. Price: \$35.95 (+\$5.50 shipping). ISBN: 0536602654. This is the second of a three volume set. The first was *Volume 1: Lorises, Lemurs and Tarsiers*. After an introductory chapter with an overview of New World monkeys and their evolution, the remainder review the literature on each of the following taxa: Callitrichidae, including marmosets, tamarins, and Goeldi's monkey (Chapter 2); Cebidae, including squirrel monkeys, capuchins, night monkeys, and titi monkeys (Chapter 3); and Atelidae, including spider monkeys, woolly monkeys, woolly spider monkeys, howler monkeys, sakis, bearded sakis, and uakaris (Chapter 4). To facilitate comparison, the general organization of each of the review chapters is similar. For each, there are reviews on habitat and locomotion, diet, activity cycles, predation, social structure and organization, reproduction, and ranging behavior. In Chapter 5, each of these topics are compared among all of the taxa, examining patterns that emerge, and discussing the conservation status of New World monkeys and some of the problems for their future preservation. Volume 3 of this se-



ries will cover the Old World monkeys and apes. *Available from:* Pearson Custom Publishing, 160 Gould Street, Needham Heights, MA 02494 1-800-428-4466 (Toll free), Fax: 1-781-455-1707; e-mail: <PCP@pearsoncustom.com>, URL: <www.pearsoncustom.com>.

*Mammalian Social Learning: Comparative and Ecological Perspectives*, edited by Hilary Box and Kathleen Gibson, 1999, 438pp, Cambridge University Press, Cambridge, UK. ISBN 0 521 63263 3 (Hardback). Price: £60.00. *Symposia of the Zoological Society of London*, 72. Social behaviour commonly refers to the social transfer of information and skill among individuals. It encompasses a wide range of behaviours that include where and how to obtain food, how to interact with members of one's own social group, and how to identify and respond appropriately to predators. The behaviour of experienced individuals provides natural sources of information by which inexperienced individuals may learn about the opportunities and hazards of their environment, enabling them to develop and modify their own behaviour accordingly. Historically, scientific interest in social learning has been markedly biased in both theoretical considerations and the range of species that have been studied - especially in nature. Hence, social learning has never been adequately represented in the literature in behavioural biology and the whole area is still under subscribed despite a recent upsurge of interest. There is little or no information for the majority of species. In fact biologists, and especially field biologists, have rarely considered their animals from social learning perspectives. Many of the contributors to this groundbreaking volume are field workers. Moreover, their contributions cover a wide diversity of taxa that vary greatly in ecological strategies, social systems, and in mental and sensorimotor skills. The book aims to increase the database of comparative information in two ways. First, in providing new information on species that have not been previously discussed or have been very little discussed in this domain, and second in providing additional information for animals that are much more familiar in a social learning context. Humans are placed firmly within a comparative mammalian framework, and for the first time there are discussions of social learning abilities in prehistoric hominoids whose brain size and technological capacities were intermediate between those of modern humans and great apes. *Contents:* Part 1: New Perspectives in Studies of Social Learning. 1. The myth of peculiar primates - T. Rowell; 2. New directions in the study of primate learning - B. J. King; 3. Temperament and socially mediated learning among primates - H. O. Box; 4. Evolutionary biology of skill and information transfer - R. M. Sibly. Part 2. Social Learning Among Species of Terrestrial Herbivores: 5. Social learning in marsupials - K. Higginbottom & K. R. Gibson; 6. The social context for learning and behavioural development among wild African elephants - P. C. Lee and C. J. Moss; 7. Comparative social learning among arctic herbivores: The caribou, muskox and arctic hare - D. R. Klein; 8. Transmission of olfactory information from mother to young in the European rabbit - R. Hudson, B. Schaal & Á Bilkó; 9. Social transfer of information in domestic animals - D. M. Broom. Part 3. Rats, Bats and Naked Mole Rats: Animals with Information Centres: 10. Exploring

the dynamics of social transmission with rats - K. N. Laland; 11. Social influences on foraging in bats - G. S. Wilkinson & J. W. Boughman; 12. Social transmission of information in a eusocial rodent, the naked mole rat (*Heterocephalus glaber*). Part 4. Social Learning Among Species of Terrestrial Carnivores: 13. Opportunities for social learning in bears - B. K. Gilbert; 14. Watch with mother: A review of social learning in the Felidae - A. C. Kitchener; 15. Social learning in canids: An ecological perspective - J. A. J. Nel. Part 5. Dolphins and Whales: Communication and Foraging in Aquatic Environments: 16. Social learning in cetaceans: Hunting, hearing and hierarchies - J. R. Beran and S. L. Heinlich; Origins and implications of vocal learning in bottlenose dolphins - V. M. Janik. Part 6. The Great Ape - Human Adaptation: Culture and the Cognitive Niche: 18. Cognition in great ape ecology: Skill-learning ability opens up foraging opportunities - R. W. Byrne; 19. Social transmission of facts and skills in the human species: Neural mechanisms - K. R. Gibson; 20. Cultural learning in hominids: A behavioural ecological approach - S. J. Shennan & J. Steele; 21. Imitation and cultural change: A view from the Stone Age, with specific reference to the manufacture of handaxes - S. Mitken. Concluding Remarks - H. O. Box & K. R. Gibson. *Available from:* UK and Ireland - UK Sales Department, Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, UK, e-mail: <information@cup.cam.ac.uk>, web site: <www.cup.cam.ac.uk>, or North and Central America - Cambridge University Press North American Branch, 40 West 20<sup>th</sup> Street, New York, NY 10011-4211, US, e-mail: <information@cup.org>, or South America and Hispanic Caribbean - Cambridge University Press South American Branch, Av. Paulista 807, Conj. 1218, 01311-915 São Paulo, SP, Brazil, e-mail: <cupbra@mandic.com.br>, web site: <www.cup.cam.ac.uk/brazil>.

*Flora da Reserva Ducke*, by José E. L. da S. Ribeiro, Michael J.G. Hopkins, Alberto Vicentini, *et. al.*, 1999, 86 pp, INPA, Manaus. A extremely well illustrated botanical guide to the Reserva Ducke, a terra-firma forest adjacent to Manaus, in the Amazon basin. The guide is an excellent tool for both students and researchers working in the area. Written in Portuguese, the book includes a useful introduction, complete with a densely illustrated glossary of vegetative characters such as cut stems, leaf domatia, glands and galls. Available in Europe from Kew Gardens, London (books@rbgkew.org.uk) for £25; in the US from <http:www.balough.com/kew/kew.html> for US\$50; and in Brazil through SAPECA, Sociedade para Pesquisas e Conservação de Amazônia, Projeto Flora da Reserva Ducke <pfrd@buriti.com.br> for R\$50.

*All That Glitters is Not Gold: Balancing Conservation and Development in Venezuela's Frontier Forests*, by M. Miranda, A. Blanco-Urbe, L. Hernández, J. Orhoa and E. Yevena, 1998, 60pp, ISBN: 1569732515 (English) or 1569732523 (Spanish). Price US\$20. This book outlines the frontier forest found in Venezuela's Guayana region, south of the Orinoco River. This area is home to 75% of the countries plant species yet is being devastated by ongoing extractive activities such as gold and diamond mining, logging, oil exploration, and highway

construction. Presently the government has a five-year plan for further development and this book analyzes these plans, taking into account the realities of current forest resources used and possible environmental and social implications of increased extraction. Available from the World Resources publications, 1709 New York Avenue, N.W., Washington, DC 20006, USA.

*Natural Conflict Resolution*, edited by Filippo Aureli and Frans B. M. de Waal, 2000, 391pp, ISBN 0 520216717 (cloth), price US\$65 or ISBN 0 520223462 (paperback), price US\$24.95. A group of fifty two authors, including the worlds leading experts on human and animal behavior, review evidence from various disciplines on natural conflict resolution. This book addresses the cultural, ecological, cognitive, emotional, and moral perspectives of resolution and provides a tool to establish conflict resolution as a field of systematic research. Contents include: an introduction, history, controlling aggression, repairing the damage, triadic affairs, ecological and cultural contexts, a conclusion, and appendixes. Available from California Princeton Fulfillment Services, 1445 Lower Ferry Rd., Ewing, NJ 08618, USA, Tel: (800) 777 4726, Fax: (800) 999 1958 or e-mail: <orders@cpfs.pupress.princeton.edu>.

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## ABSTRACTS

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- Aureli, F. Managing conflict in group-living primates, p.362.
- Dixson, A. Primate comparative anatomy and the evolution of reproduction, p.359.
- Dunbar, R. The evolution of the social brain, p.359.
- Martin, R., Soligo, C., Tavare, S., Will, O. and Marshall, C. New light on the dates of primate origins and divergence, p.358.
- Pryce, C. The primate mother-infant relationship: Causes and consequences, p. 360.
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- Visalberghi, E. and Addessi, E. Learning what to eat: The role of social influences in capuchins, p.363.

## Meetings

**Primate Evolutionary Genetics**, 19–20 May, 2001, San Diego, California. Hosted by the American Genetic Association. Contact: Registration and updated program information can be found at <http://lifesciences.asu.edu/aga>. For questions and/or assistance contact: Ms. Susan Hansen, e-mail: [shansen@sandiegozoo.org](mailto:shansen@sandiegozoo.org). Pre-registration is \$90.00, non-member (\$80.00 for AGA members); \$75.00 students and postdocs (\$70.00 for AGA members who are students/postdocs). Registration includes a reception on the evening of May 18th and banquet at the World-Famous San Diego Zoo the evening of the 20th. The symposium will be held at the Town & Country Resort and Convention Center, 500 Hotel Circle North, San Diego, California (619-291-7131). A special room rate of \$99.00 per night plus tax has been arranged for the conference.

**XXV Congresso Brasileiro de Zoológicos e VI Encontro Internacional de Zoológicos**, 20–25 de maio de 2001, Brasília, DF, Brasil. O tema central é "Conservação". Informações: Comissão Organizadora do Congresso, a/c Raul Gonzales Acosta, Fundação Pólo Ecológico de Brasília, Avenida das Nações, Via L-4 Sul, 70610-100 Brasília, DF, Brasil, Tel: +55 61 9966 0092, Fax: +55 61 346 4611, e-mails: [funpeb1@zoo.df.gov.br](mailto:funpeb1@zoo.df.gov.br), [funpeb2@zoo.df.gov.br](mailto:funpeb2@zoo.df.gov.br).

**Congress-Primatology of The New World**, 13–15 June, 2001, Centro Cultural Gimnasio Moderno, Bogotá, Colombia. Sponsor: Centro de Primatología Araguatos. Four sessions: Biology and Ecology; Medicine; Use and Conserva-

tion; Management and Keeping. Deadline for call for papers and posters-March 21, 2000. Contact: Victoria Pereira, Calle 96 No. 22-08, Bogotá, Colombia. Tel/Fax: 57-1-2573691, Web site: <http://www.araguatos.org>, E-mail: [info@araguatos.org](mailto:info@araguatos.org).

**38th Annual Meeting of The Animal Behavior Society**, 14–20 July, 2001, Oregon State University, Corvallis Oregon. Symposia include "Behavioral genetics for the next decade" and "Detecting and measuring mating preferences", and invited paper sessions on the "Song System" and "Aggression and group organization in animal societies". There will also be a Poster session on "Educating in animal behavior". Key-note speaker will be Dr. Harry Greene, and there will be Fellows lectures by Dr. Ellen Ketterson and Dr. Eliot Brenowitz. Contact: Online through <http://www.animalbehavior.org/ABS/Program/index.html>.

**Association for Tropical Biology Annual Meeting**, 15–18 July 2001, Bangalore, India. The theme of the meeting will be the International Conference on Tropical Ecosystems: Structure, Diversity and Human Welfare and will address three major areas of concern: 1. Global change and tropical forests, 2. The structure, diversity and function of tropical ecosystems, and 3. Biodiversity hotspots. For more information visit the web site of the Ashoka Trust for Research in Ecology and the Environment (ATREE) at <http://www.atree.org>.

**6th International Congress of Vertebrate Morphology**, 21–26 July, 2001, Jena, Germany. For details about the congress contact Dr. J. Matthias Starck at the Institute of Systematic Zoology and Evolutionary Biology, Friedrich-Schiller-University, Erbertstrasse 1, D-07743 Jena, Germany. E-mail: [icvm-6@pan.zoo.uni-jena.de](mailto:icvm-6@pan.zoo.uni-jena.de), Home Page: [www.zoo.uni-jena.de/icvm-6.html](http://www.zoo.uni-jena.de/icvm-6.html).

**The First International Conference on Distance Sampling-Estimating Wildlife Abundance for Ecology, Management and Conservation**, 30 July–3 August, 2001, St. Andrews, Scotland. Details from: Rhona Rodger, Tel: + 44 (0) 1334 463 228 or e-mail: [rhona@dcs.st-and.ac.uk](mailto:rhona@dcs.st-and.ac.uk), Home Page <http://www.ruwpa.st-and.ac.uk/icods/>.

**The Animal Behavior Society Annual Meeting-Comparisons between Primates and Cetaceans**, 5–9 August, 2001, Atlanta, Georgia, USA. Details may be obtained from the web site: <http://www.animalbehavior.org/ABS/Program>.

**8th International Theriological Congress**, 12–17 August, 2001, Sun City, South Africa. Contacts: ITC 2001 c/o Event Dynamics, PO Box 98009, Sloane Park, 2152 Johannesburg, South Africa. Tel: +27 11 706 5010, e-mail: [dana@eventdynamics.co.za](mailto:dana@eventdynamics.co.za). Web Page: <http://www.eventdynamics.co.za/itc>.

**XIII Curso Intensivo Internacional de Manejo Diversificado de Bosques Naturales Tropicales**, 20 Agosto–21 Setiembre 2001, CATIE, Turrialba, Costa Rica. Informes: CATIE 7170,

Turrialba, Costa Rica, Tel: (506) 556-2703; Fax: (506) 556-7730 <<http://www.catie.ac.cr>>, e-mail: <[dquiros@catie.ac.cr](mailto:dquiros@catie.ac.cr)> or <[capacita@catie.ac.cr](mailto:capacita@catie.ac.cr)>.

**Annual Conference of the American Association of Zoo Veterinarians**, 18–23 September, 2001, Orlando, Florida. For more information on the scientific program: Ray Wack, Program Chairman, Sacramento Zoo, 3930 West Land Park Drive, Sacramento, CA 95822-1123, USA, Tel: 916 264 5887, e-mail: <[rwwack@ucdavis.edu](mailto:rwwack@ucdavis.edu)>. Conference or membership information: Wilbur Amand, Executive Director/AAZV, 6 North Pennell Road, Media, PA 19063, Tel: 610 892 4812, Fax: 610 892 4813, e-mail: <[aazv@aol.com](mailto:aazv@aol.com)>.

**24<sup>th</sup> Annual Meeting of the American Society of Primatologists**, 8–11 August 2001, Armstrong Atlantic State University, Savannah, Georgia. Symposia and workshop deadline: 15 March, 2001. Individual abstracts deadline: 1 April, 2001. Contact: Dr. Tammie Bettinger, ASP Program Chair, Cleveland Metroparks Zoo, 3900 Wildlife Way, Cleveland, OH 44109, USA, Tel: (216) 635 3314, Fax: (216) 661 3312, e-mail: <[tlb@clevelandmetroparks.com](mailto:tlb@clevelandmetroparks.com)>. Web site: <[www.asp.org/asp2001/](http://www.asp.org/asp2001/)>.

**IV Congreso de la Asociación Primatológica Española**, 26–27 September, 2001 Madrid, Spain, Salón de Actos. Facultad de Psicología, Universidad Autónoma de Madrid, Cantoblanco 28049, Madrid, Spain. For more information, contact: Dr. Susana Sánchez Rodríguez, Dpto. Psicología Biológica y de la Salud Fac. de Psicología, UAM, 28049 Madrid, e-mail: <[susana.sanchez@uam.](mailto:susana.sanchez@uam.)> Tel: 34.91.3978748 / 3975351, Fax: 34.91 3975215, Web site: <<http://www.uam.es/ape>>.

**Brazil's International Conference on The Human Dimensions of Global Change**, 6–8 October, 2001. The 2001 Open Meeting of the Human Dimensions of Global Environmental Change Research Community will be held in Rio de Janeiro, Brazil on 6 to 8 October 2001. Following three successful meetings held at Duke University (USA) in 1995, the International Institute for Applied Systems Analysis (Austria) in 1997, and Shonan Village (Japan) in 1999, the human dimensions research community will meet for the first time in the Southern Hemisphere. Particular emphasis will be placed on research reports that include a regional or "place-based" perspective and that make a linkage between natural and social sciences, as well as among local, regional and global scales. Plenary themes of the meeting will address the challenges of integration in human dimensions research across disciplines, across hemispheres, and across the science-policy interface. The Open Meeting is being organized by the Brazilian Academy of Sciences, the Inter-American Institute for Global Change Research (IAI), the International Human Dimensions Programme on Global Environmental Change (IHDP), and CIESIN. Information about the meeting, including instructions for the submission of abstracts, will be made available at the website <<http://sedac.ciesin.org/openmeeting/>>.

**V Congreso Latinoamericano de Ecología**, 15–19 de Octubre de 2001, Facultad de Ciencias Agrarias, Universidad Nacional de Jujuy, San Salvador de Jujuy, Argentina. La fecha límite de presentación de los resúmenes es el 30 de abril de 2001. Organiza: Facultad de Ciencias Agrarias, Alberdi No. 47, (4600) San Salvador de Jujuy, Argentina, Tel: 54 0388 4221550, 54 0388 4221553, Fax: 54 0388 4221547, e-mail: <[vcclae@fca.unju.edu.ar](mailto:vcclae@fca.unju.edu.ar)>. Web site: <[www.fca.unju.edu.ar](http://www.fca.unju.edu.ar)>.

**V Congreso de la Sociedad Mesoamericana para la Biología y la Conservación (SMBC)**, 15–19 de Octubre de 2001, El Salvador. La Sociedad Mesoamericana para la Biología y la Conservación – SMBC, es una organización internacional no lucrativa cuyo objetivo es contribuir con la promoción de la biología y la conservación de la naturaleza, nace en 1996 como iniciativa de un grupo de profesionales de cinco países, interesados en fomentar la comunicación entre conservacionistas e investigadores trabajando en la región mesoamericana. Ésta ha crecido y evolucionado mucho desde su fundación. Para más información sobre la sociedad visite: <<http://ccb.stanford.edu/mesoamericana/>>. La SMBC organiza cada año el mayor congreso científico-conservacionista regional, este congreso constituye una oportunidad regional única, permitiendo la difusión de avances científicos y conservacionistas, estimula la producción de nuevas ideas, promueve la interacción entre actores, tanto mesoamericanos como extranjeros trabajando en la región, permite a los profesionales conocer sobre la realidad de cada país, da oportunidad para la formación de nuevos valores, y nos abre las puertas al mundo, como una región de gran interés para la conservación global y decidida a construir su desarrollo sobre bases sostenibles. Hasta la fecha se han realizado cuatro congresos, en Honduras (1997), Nicaragua (1998), Guatemala (1999), y Panamá (2000). En octubre 2001 corresponde a El Salvador el honor de albergar tan importante evento y desde ya les invita a participar. Se invita a todos los interesados en presentar ponencias y/o organizar simposia mandar sus propuestas a: Eunice Echeverría: <[eecheverria@hotmail.com](mailto:eecheverria@hotmail.com)> o Roberto Rivera: <[rrbiosis@es.com.sv](mailto:rrbiosis@es.com.sv)> con copia a: <[mesoamerica2001@yahoo.com.mx](mailto:mesoamerica2001@yahoo.com.mx)>. Fecha límite para propuestas de simposia: 5 de marzo 2001. Fecha límite para ponencias: 31 de Mayo de 2001. Para más información sobre el congreso visite: <[http://geocities.com/smbc\\_elsalvador\\_2001/](http://geocities.com/smbc_elsalvador_2001/)>, esta página se estará actualizando periódicamente para mantenerles informados.

**5<sup>th</sup> International Conference on Environmental Enrichment**, 4–9 November 2001, Taronga Park Zoo, Sydney, Australia. The theme is "Making Enrichment a 21<sup>st</sup> Century Priority". For information: Margaret Hawkins, 51EE Conference Coordinator, Taronga Zoo, PO Box 20, Mosman, NSW 2088, Australia, Tel: +61 2 9978 4615, Fax: +61 2 9978 4613, e-mail: <[mhawkins@zoo.nsw.gov.au](mailto:mhawkins@zoo.nsw.gov.au)>. Web site: <[www.zoo.nsw.gov.au](http://www.zoo.nsw.gov.au)>.

**V Congresso Brasileiro de Ecologia do Brasil**, 4-9 November, 2001, Porto Alegre, Rio Grande do Sul, Brasil. O tema é "Ambiente x Sociedade". Entidade promotora: Sociedade de

Ecologia do Brasil. Apoio: Universidade Federal do Rio Grande do Sul, Instituto de Biociências, Centro de Ecologia e Departamentos de Ecologia, Zoologia e Botânica. Contatos e correspondência: Organização de Congresso, Rua João Abott, 44- cj.402, 90460-150 Porto Alegre, RS, Brasil, Tel/Fax: + 55 51 333 8737, e-mail: <nossaequipe@nosequipe.com.br>. Homepage: www.ecologia/ufrgs.br.

**IV Simposio Internacional de Desarrollo Sustentable en los Andes. La Estrategia Andina para el Siglo XXI**, 25 de noviembre al 2 de diciembre, 2001. Facultad de Ciencias, Instituto de Ciencias Ambientales y Ecológicas (ICAE), Universidad de Los Andes, Merida. Informes: Maximina Monasterio o Rigoberto Andressen, e-mail: <amamrd@ciens.ula.v>.

**Committing to Conservation Conference**, 28 November-2 December, 2001, Melbourne, Florida, USA. This will be the fourth Zoos and Aquariums: Committing to Conservation Conference. The goal is to bring together field researchers and zoo personnel to promote a greater involvement of zoos and aquariums supporting *in situ* work. There will be a mixture of sessions, panel discussions and round tables with a special emphasis on audience participation and problem solving. The registration fee is US\$ 175.00 and includes sessions, some meals and social events. For more information contact: Beth Armstrong, Tel: 321-454-6285, e-mail: <elynn57@aol.com> or Margot McKnight, Tel: 321-254-9453, ext. 23, e-mail: <margo@brevardzoo.org>.

**3<sup>rd</sup> Göttinger Freilandtage: Sexual Selection in Primates**, 11-14 December, 2001, hosted by the German Primate Center (DPZ), Göttingen, Germany. Invited speakers will summarize and evaluate recent empirical and theoretical work dealing with causes, mechanisms and consequences of sexual selection in primates, including humans. In addition, it is hoped to identify general principles through comparison with other mammals. Oral (15 min) and poster contributions. Deadline for submission of abstracts is 1 August, 2001. Guests must also register in advance by October 1, 2001. Additional details are available from Peter Kappeler, e-mail: <pkappel@gwdg.de>, and the web site: <[http://www.dpz.gwdg.de/voe\\_page/GFT2001/freiland01C.htm](http://www.dpz.gwdg.de/voe_page/GFT2001/freiland01C.htm)>.

## 2002

**American Association for the Advancement of Science**, 14-19 February, 2002, annual meeting. The program will include various environmental issues, including: Achieving health in a connected world, connecting diverse disciplines, visualizing the earth, communicating across boundaries, environmental and biological diversity in a connected world, cultural and social diversity in a changing world, and science and sustainability in a global economy. For more information contact: Kathryn Papp, Senior Program Officer, Program on Ecology and Human Needs, International Directorate, AAAS, 1200 New York Avenue, NW, Washington, DC, 20005, USA, Tel: (202) 326 6427, Fax: (202) 289 4958 or see: <[www.aaas.org/meetings/2002/proposed\\_tracks](http://www.aaas.org/meetings/2002/proposed_tracks)>.

**Cambridge Conservation Conference**, 25-27 March, 2002, Cambridge, UK. For additional information contact: Dr. Andrew Balmford, Conservation Biology Group, Department of Zoology, University of Cambridge, Downing St., Cambridge CB2 3EJ, UK, Tel/Fax: + 01223 331770, e-mail: <apb12@hermes.cam.ac.uk>.

**American Society of Primatologists**, 1-4 June, 2002, Oklahoma City, OK, USA. For more information contact: Janette Wallis, Department of Psychiatry and Behavioral Sciences, University of Oklahoma Health Sciences Center, P. O. Box 26901, Oklahoma City, OK 73190, USA, Tel: 405-271-5251 ext. 47612, Fax: 405-271-3808, e-mail: <jamette-wallis@ouhsc.edu>.

**3rd International Canopy Conference**, June, 2002, Cairns, Australia. Sponsored by the Queensland Government of Australia and the Smithsonian Institution, the conference theme is "Science, Policy and Utilisation" and is intended to bring together scientists, environmental managers and policy makers concerned with the discovery and sustainable use of forests around the world. Contact Eileen Domagala, e-mail: <Eileen.Domagala@premiers.qld.gov.au> for further information or look on the web site: <<http://www.premiers.qld.gov.au/whatsnew.htm>>.

**Ecological Society of America 87<sup>th</sup> Annual Meeting joint with the Ecological Society of Mexico**, 4-8 August, 2002, Arizona, USA. Details from: ESA, 1707 H St., NW, Suite 400, Washington, DC 20006, USA. Tel: + (202) 833 8773 or Fax: + (202)833 8775. E-mail: <esahq@eas.org>.

**XIX<sup>th</sup> Congress of the International Primatological Society**, 4-9 August, 2002, Beijing, China. Organized by the Mammalogical Society of China and the Institute of Zoology, Chinese Academy of Sciences. The main themes of the Congress will focus on the progress and prospects of primatology and the conservation of non-human-primates. The first deadline is for symposium and workshop titles, to be submitted by 31 August, 2001. *Contact address*: Prof. Fuwen Wei, Secretary General, 19<sup>th</sup> Congress of the International Primatological Society, c/o Institute of Zoology, Chinese Academy of Sciences, 19 Zhongguancun Lu, Haidian, Beijing 100080, China, Fax: (86-10) 82627388, e-mail: <IPS\_Beijing@panda.ioz.ac.cn>. Home page: <<http://www.ips.ioz.ac.cn>>.

**Annual Meetings of the IUCN/SSC Conservation Breeding Specialists Group (CBSG)** 10-13 August, 2002, **The World Zoo Organization (WZO)**, 13-17 August 2002, and **The International Association of Zoo Educators (IZE)**, 17-22 August, 2002, Hofburg Palace, Redoutensäle, Vienna. Hosted by the Schoenbrunn Zoo. For more information: Austropa Interconvention, Conference Office, Friedrichstrasse 7, A-1010 Vienna, Austria, Fax: +43 1 315 56 50, e-mail: <austropa.congress@verkehrsruero.at>.

# Notes to Contributors

## Scope

The journal/newsletter aims to provide a basis for conservation information relating to the primates of the neotropics. We welcome texts on any aspect of primate conservation, including articles, thesis abstracts, news items, recent events, recent publications, primatological society information and suchlike.

## Submissions

Please send all English and Portuguese contributions to: Jennifer Pervola, Conservation International, Center for Applied Biodiversity Science, 1919 M. St. NW, Suite 600, Washington, DC 20036, Tel: 202 912-1000, Fax: 202 912-0772, e-mail: <j.pervola@conservation.org>, and all Spanish contributions to: Ernesto Rodríguez-Luna Instituto de Neuroetología, Universidad Veracruzana, Apartado Postal 566, Xalapa 91000 Veracruz, México. Tel: 281 8-77-30, Fax: 281 8-77-30, 8-63-52, e-mail: <saraguat@speedy.coacade.uv.mx>

## Contributions

Manuscripts can be in English, Spanish or Portuguese, and should be double-spaced and accompanied by the text on diskette for PC compatible text-editors (MS-Word, WordPerfect, Excel, and Access), and/or e-mailed to <j.pervola@conservation.org>. (English, Portuguese) or <saraguat@speedy.coacade.uv.mx> (Spanish) Hard copies should be supplied for all figures (illustrations and maps) and tables. The full name and address for each author should be included. Please avoid abbreviations and acronyms without the name in full. Authors whose first language is not English, please have texts carefully reviewed by a native English speaker.

**Articles.** Each issue of *Neotropical Primates* will include up to three full articles, limited to the following topics: Taxonomy, Systematics, Genetics (when relevant for systematics), Biogeography, Ecology and Conservation. Texts for full articles should not exceed about 20 pages in length (1.5 spaced, and including the references). Please include an abstract in English, and (optional) one in Portuguese or Spanish. Tables and illustrations should be limited to six, excepting only the cases where they are fundamental for the text (as in species descriptions, for example). Full articles will be sent out for peer-review.

**Short articles.** These are reviewed only by the editors. A broader range of topics are encouraged, including such as behavioral research, in the interests of informing on general research activities which contribute to our understanding of platyrrhines. We encourage reports on projects and conservation and research programs (who, what, where, when, why etc.) and most particularly information on geographical distributions, locality records, and protected areas and the primates which occur in them. Texts should not exceed 10 pages in length (1.5 spaced, including the references).

**Figures and maps.** Articles can include small black-and-white photographs, high quality figures, and high quality maps and tables. Please keep these to a minimum. We stress the importance of providing maps which are **publishable**.

**News items.** Please send us information on projects, field sites, courses, recent publications, awards, events, activities of Primate Societies, etc.

## References

Examples of house style can be found throughout this journal. Please refer to these examples when citing references throughout the text.

### Journal article

Stallings, J. D. and Mittermeier, R. A. 1983. The black-tailed marmoset (*Callithrix argentata melanura*) recorded from Paraguay. *Am. J. Primatol.* 4: 159-163.

### Chapter in book

Brockelman, W. Y. and Ali, R. 1987. Methods of surveying and sampling forest primate populations. In: *Primate Conservation in the Tropical Rain Forest*, C. W. Marsh and R. A. Mittermeier (eds.), pp. 23-62. Alan R. Liss, New York.

### Book

Napier, P. H. 1976. *Catalogue of Primates in the British Museum (Natural History). Part 1: Families Callitrichidae and Cebidae*. British Museum (Natural History), London.

### Thesis/Dissertation

Wallace, R. B. 1998. The behavioural ecology of black spider monkeys in north-eastern Bolivia. Doctoral thesis, University of Liverpool, Liverpool, UK.

### Report

Muckenhirn, N. A., Mortensen, B. K., Vessey, S., Frazer, C. E. O. and Singh, B. 1975. Report on a primate survey in Guyana. Unpublished report, Pan American Health Organization, Washington, DC.

*Neotropical Primates* is produced in collaboration with Conservation International, Center for Applied Biodiversity Science, 1919 M. St. NW, Suite 600, Washington, DC 20036, USA

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