NEOTROPICAL primates

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Editors: Anthony B. Rylands and Ernesto Rodríguez-Luna
PSG Chairman: Russell A. Mittermeier
PSG Deputy Chairman: Anthony B. Rylands and William R. Konstant
**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. Las 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 entre 22. La dieta de la tropa en el fragmento pequeño está 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 Mesopotámica, *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 aún escasa (Kinsey, 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,
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, está rodeado de pastizales. Se localizó a 2 km a oeste del fragmento pequeño y a 0.5 km del fragmento más cercano (Fig. 1). En este sitio se encontraba 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 de 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 período 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” (pecíolos de epífitas, hemiparásitas y bejucos). Los datos resultantes fueron expresados como porcentajes de tiempo registrado en cada actividad.

La Tabla 1 presenta el porcentaje de tiempo invertido en el consumo de diferentes tipos de alimentos en cada uno de los tres fragmentos estudiados. Se evidencia que los árboles de la especie Ficus robusta son los que reciben el mayor consumo, seguidos de los de la especie Ficus microcarpa. Los frutos y flores reciben un menor consumo, aproximadamente el 5% del tiempo total registrado.

### Tabla 1. Composición por edades y sexo de las tropas de monos aulladores en los fragmentos estudiados

<table>
<thead>
<tr>
<th>Edad y sexo</th>
<th>Pequeño (3.2 ha)</th>
<th>Mediano (35 ha)</th>
<th>Grande (250 ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machos adultos</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Hembras adultas</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Juveniles</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Infantes</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Kg/ha</td>
<td>8.0</td>
<td>1.1</td>
<td>0.17</td>
</tr>
</tbody>
</table>

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**Resultados**

**Patrón general de actividades**

Las actividades más frecuentes fueron el descanso (38.0%), alimentación (26.0%), locomoción (17.0%), interacciones sociales (16.0%) y viaje (5.0%). En el fragmento pequeño, el descanso fue el 56.0% y la alimentación, el 25.0%. En el fragmento mediano, el descanso fue el 33.0% y la alimentación, el 40.0%. En el fragmento grande, el descanso fue el 40.0% y la alimentación, el 35.0%.

**Uso de los recursos alimentarios**

En la dieta de los monos aulladores se incluyen una variedad de alimentos, entre los que destacan las hojas, frutos, flores y bejucos. En el fragmento pequeño, las hojas de la especie Ficus robusta representan el 60.0% de la dieta, seguidas de las hojas de Ficus microcarpa con el 20.0%. En el fragmento mediano, las hojas de Ficus robusta representan el 50.0% de la dieta, seguidas de las hojas de Ficus microcarpa con el 30.0%. En el fragmento grande, las hojas de Ficus robusta representan el 40.0% de la dieta, seguidas de las hojas de Ficus microcarpa con el 30.0%.

**Interacciones sociales**

Las interacciones sociales entre los individuos de la tropa son muy frecuentes, especialmente entre los machos adultos, que se comunican mediante sonidos y posturas. Las hembras y los juveniles también participan en las interacciones, pero de manera más discreta. Las interacciones más comunes son el juego y el cuidado de los jóvenes.

**Conclusiones**

Los resultados obtenidos indican que los monos aulladores de la región de Los Tuxtlas, Veracruz, México, tienen un buen ajuste a la fragmentación de su hábitat original. Las actividades alimentarias son esencialmente frutícolas, con una importante participación de las hojas de la especie Ficus robusta. Las interacciones sociales son frecuentes y desempeñan un rol importante en la organización de la tropa.
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 cuadrados 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, Brousimum alicastrum y Ficus tequilensis (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 monos usaron 30 árboles de 15 especies. Entre estas especies sobresalió Ficus spp., Poulsenia armata, y Clarisia biflora de la Moraceae, Cecropia obtusifolia de la Cecropiaceae y Spondias radolofeiri 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 usarón 45 árboles de 22 especies como fuente de alimentación. Entre estas, Ficus sp,9, Pseudolmedia oxyphyllaria y Poulsenia armata de la Moraceae contribuyeron al 52% 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 cuadrados 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 altas (Tabla 2).

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

Discusión

Los aulladores de los tres fragmentos presentaron similitudes y diferencias evidentes en sus comportamientos generales y patrones de alimentación. 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 alimentación. 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; Bica-Marques y Calegaro-Maques, 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 frutos usados 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 frutíferas 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 domada 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 Alosutta como alimento (Milton, 1984), sugiere que esta elasticidad tiene límites y que quizás los aulladores se ven forzados a consumir recursos de menor calidad ó de naturaleza exótica (Bicca-Marques y Calegaro-Marques, 1994c). Por ejemplo, nuestros datos indicaron que la proporción de tiempo dedicado al consumo de hojas maduras se incrementó del 10.0 % 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 Alosutta en fragmentos selvácticos pequeños y en aquellos que continúan reduciendose 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 decrecimiento 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 la demanda del hábitat sobre la elasticidad ecológica, fisiológica y conductual de los monos aulladores son tales que, a meros 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 selvácticos aislados podría aliviar estas presiones y añadir conectividad entre las tropas aisladas de monos aulladores. Esto último sería 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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Referencias


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palliata) and dung beetles at Los Tuxtlas, Mexico. Am. J. Primatol. 48: 253–262.


Short Articles

Reproductive Seasonality in the Belizean Black Howling Monkey (Alouatta pigra)

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

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 discussed 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 habitats 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 together for up to several hours (pers. obs.) and copulate (Crockett and Eisenberg, 1986). No data have been recorded on other species in black howlers.

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, x² = 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, x² = 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 Pacífica (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 Pacífica, 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 Miltor (1982) found some evidence of clustering. In the same species, they then, differences have been found within and between habitats with drier sites (Santa Rosa and Hacienda la Pacífica) 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, which may vary between habitats and seasons.

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 poorest 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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References


**AGONISTIC ENCOUNTERS BETWEEN MURIQUIS, BRACHYTELES ARACHNIOIDES HYPANOXANTHUS (PRIMATES, CEBIDAE), AND OTHER ANIMALS AT THE ESTAÇÃO BIOLÓGICA DE CARATINGA, MINAS GERAIS, BRAZIL**

Luiz G. Dias
Karen B. Strier

**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, 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 competition 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 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 nigrivittatus*).

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; Rimboli, 1994). Tufted capuchins are omnivorous, and have been known to prey on a variety of in- sects and other small animals: the coats, hand, and feet of howler monkeys when they enter their nests (1990; 1995). Assumptions about the interactions of muriquis with other animals at the EBC, other animals at the EBC, or the EBC population as a whole were made until at least one such interaction was observed.

**Methodology**

From June 1994 to July 1996, we observed the muriquis and other animals at the EBC. The study group was made up of a large group of muriquis and other animals observed in the EBC. For each encounter, the species (food or other), the context (nesting, feeding, playing, etc.), the number of individuals involved (Styer, 1991), was recorded. The muriquis include interactions between species, as well as with other species, when observed.

**Results**

A total of 123 encounters between muriquis and other animals were observed. Of the encounters, 116 involved one or more species of muriquis, and 19 involved a tegu lizard (Tupinambis nigropunctata) ("coruja") and muriquis (2.3% of encounters).

As expected, the muriquis' interactions were characterized by interspecific competition and predation. Howler monkeys were observed to dig into muriquis' nests, and consume muriquis' food (Strier, 1986;
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 muriquis (Torres de Assumpção, 1983). Similarly, although buffy-headed maras molest heavily on invertebrates and gum (Ferrari, 1988), their diet overlaps with muriquis in certain fruit and nectar species (Ferrari and Strier, 1992).

There are few data on muriquis predators (Olmos, 1994), and there are few large carnivores or raptors at the EBC (Strier, 1986; Hirsch, 1995). However, Príntes et al. (1996) describe two possible predations on muriquis 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 muriquis' interspecific interactions might involve predators with the potential to impact muriquis population size and viability.

**Methods**

From January to July 1999, one group of muriquis 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 muriquis and other species were recorded whenever observed. For each interaction, the species, context of the encounter (e.g., 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 muriquis and other animals during this seven-month study period. Of these, 65.9% involved howler monkeys and 27.3% involved capuchins. Single interactions between muriquis and a tegu lizard ("teiú", Tupinambis sp.), a tawny-browed owl ("corujão mateiro", Pulsatrix coeniwaldi), and a tayra (2.3% each) were also observed.

As expected based on body size, muriquis "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). Muriquis 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 muriquis 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 barred their teeth (33.3%), evoking much higher intensity interactions with muriquis. Nonetheless, all of these encounters ended when the capuchins moved away from the muriquis.

Muriquis interactions with nonprimates also differed in intensity. When they encountered the tegu lizard, the muriquis 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 muriquis resting nearby participated in the interaction. When the tayra approached, however, one muriquis 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 muriquis 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 muriquis and capuchins occurred when capuchins moved into an area where the muriquis 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 (Rimoli, in prep.).

The fact that muriquis 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 muriquis.

Many primates display aggressive behavior and alarm calls in response to the presence of predators (Cheney and Wrangham, 1987). The muriquis' alarm and threatening reaction to the tayra in this study was consistent with their response described in a prior suspected predation event (Príntes 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 muriquis 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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References


Introduction

Rainforests are the world’s most biologically diverse ecosystems, with more than 400,000 species of flowering plants and thousands of other species of wild animals, fungi, and bacteria. They are the home of many of the world’s remaining large wild mammals, including gorillas, chimpanzees, and orangutans. As habitats for these species, rainforests provide the natural environment that is necessary for their survival. Rainforests are often referred to as the “lungs of the earth,” because they absorb carbon dioxide and release oxygen.

As populations of humans continue to grow, there is a growing need for more efficient use of natural resources. This is particularly true in the case of rainforests, where human populations are rapidly increasing. As a result, there is a growing consensus that efforts must be made to conserve these valuable ecosystems.

As a result, there is a growing consensus that efforts must be made to conserve these valuable ecosystems. This involves a variety of measures, including the establishment of protected areas, the development of sustainable logging practices, and the support of local communities that depend on rainforests for their livelihoods. It also involves the development of new technologies and methods for monitoring and managing these ecosystems.

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

Benoit de Thoisy
David Massemín
Mael Decuymer

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; Vie, 1998; Cosson et al., 1999). Effects of hunting on mamma 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 Vie, 1998).

As part of a multidisciplinary program on the impact of logging in a traditionally used rainforest (hunting, non-ligneous resource use), the Couami 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.

Methods

Study sites

The Couami 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), Caesalpinaceae (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 Couami and La Trinité Natural Reserve, French Guiana.

Sampling procedures

Line transects (Brockelman and Ali, 1987; Peres, 1999; de Thoisy, 2000) at the Couami 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⁻²) 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 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’Aratay (Guillotin et al., 1984), les Nouragues (Julliot and Sabatier, 1993; Simmen et al., 1998), Petit Saut (Vie, 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 Hmong originating from Laos. Typically, picaearias, deer, tapi, 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 forests created in 1986 and 1992 in the southwestern part of French Guiana is still to be considered as effective. Among the primates, howlers are still hunted and depleted in the reserves.

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).

<table>
<thead>
<tr>
<th>Species (mean weight)</th>
<th>Groups / 10 km (group size)</th>
<th>Density (ind./km²)</th>
<th>Crude biomass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CH+</td>
<td>CH-</td>
<td>TNR</td>
</tr>
<tr>
<td><em>Ateles paniscus</em> (7.8 kg)</td>
<td>0.1 (3)</td>
<td>0.5 (2.5)</td>
<td>0.7 (2.7)</td>
</tr>
<tr>
<td><em>Alouatta seniculus</em> (6.2 kg)</td>
<td>0.7 (5.7)</td>
<td>1.5 (5.6)</td>
<td>0.9 (4.5)</td>
</tr>
<tr>
<td><em>Cebus apella</em> (3.4 kg)</td>
<td>0.4 (5.4)</td>
<td>0.9 (11.3)</td>
<td>0.9 (7.8)</td>
</tr>
<tr>
<td><em>Cebus olivaceus</em> (2.9 kg)</td>
<td>0.1 (4.5)</td>
<td>0.1 (6)</td>
<td>n.d</td>
</tr>
<tr>
<td><em>Pithecia pithecia</em> (1.8 kg)</td>
<td>0.4 (3)</td>
<td>0.3 (2.7)</td>
<td>0.1</td>
</tr>
<tr>
<td><em>Saguinus midas</em> (0.5 kg)</td>
<td>1 (5.5)</td>
<td>1.4 (5)</td>
<td>1.2 (3.2)</td>
</tr>
<tr>
<td>Total:</td>
<td>39.3</td>
<td>75.3</td>
<td>44.2</td>
</tr>
</tbody>
</table>
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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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
References


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 Encarnação, 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 (*Chiroptes satanas*), the brown capuchin (*Cebus...
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 < .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 given premedicated 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. Maturational 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 primates infants, juveniles, and adults spend 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

Guaíra cultural survival as well as the survival of endemic pri-
mate species in the region is extremely threatened. The sit-
tuation has escalated since 1985 with construction of the Carajás
railway through the middle of their territory to mine iron.
Guaíra reserves are highly contested from agribusiness, log-
gers, and _poseiros_ (illegal Brazilian squatters) systematically
encroaching into their habitat, creating subsequent defores-
tation and development.

Conservation of the indigenous reserves is of particular im-
portance for the endangered _Chiroptera satanas satanas_ and
the recently identified _Cebus olivaceus kaapori_, whose habitat
is restricted to the traditional territory of the Guaíra people.
The hunting of monkeys for food in itself, particularly using
indigenous methods, is often 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
type to be hunted out entirely. The fate of the Guaíra people
and the local monkeys are interwined. Preservation of the
indigenous reserves of the Guaíra for traditional hunting also
provides primates a refuge from habitat destruction.

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Conservation of Neotropical primates: Threatened species
and an analysis of prime primate diversity by country and re-

HABITAT FRAGMENTATION AND PARASITISM IN
HOWLER MONKEYS (_ALOYUATA CARAYA_)

Antonia Concepcion Miró Pé Santa Cruz
Juan Toribio Borda, Exequiel María Patiño
Laura Gómez, Gabriel Eduardo Zunino

Introduction

Comparative studies of ecto- and endoparasitism affecting
howler monkeys (_Alouatta caraya_) in relation to the frag-
mentation of their habitat are unknown for Argentina. Trans-
location of auna is potentially dangerous for both the trans-
located 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 fragmen-
tation 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 Riechuelo,
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 Yaracaté dam in Ituzaingó (Corrientes) (27°28' S, 56°44'W). The third was a flooded forest (FF) on the island of Brasilería (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 Thiencpont 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 Yaracaté (FY) showed 44.4% infestation, with four species of parasites, and only a single species was present in the Brasilería (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 berteriosis (De Negri, 1985). Psoroptodiosis (Fain, 1963; O’Connors, 1988) and oxyurosis and enteralisis were detected only in the fragmented habitats. The howlers also showed loose infections, protozoosis, trematodosis and nematodosis in the severely fragmented habitats SF and FF.

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 Yaracaté and Isla Brasilería. Although sample sizes were smaller, especially for Yaracaté, 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

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<tr>
<th>Table 1. Parasites found in the three study sites.</th>
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<tr>
<td><strong>San Cayetano (SF)</strong></td>
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<tr>
<td>Ectoparasites</td>
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<tr>
<td><em>Pediculus/Pediculopsis mjöbergi</em></td>
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<td><em>Cebalges gaudi</em></td>
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<td><em>Bertrilla mucronata</em> (eggs)</td>
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<td><em>Nematoda</em> (eggs Unidentified)</td>
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<td><em>Oxyuridae</em> (eggs)</td>
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<td><em>Strongyloides sp.</em> (eggs)</td>
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<tr>
<th>Table 2. Study sites, number of samples and degrees of parasitism.</th>
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<tr>
<td><strong>San Cayetano (SF)</strong></td>
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<tr>
<td>N</td>
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<tr>
<td>% infested</td>
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<tr>
<td>Number of parasite species</td>
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<td>Group size</td>
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<td>Home range (ha)</td>
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<td>Habitat fragmented</td>
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1 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, MEXICO**

**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 use of Veracruz’s larger continuous tracts of tropical rainforest. Los Tuxtlas, including Sierra de Santa Marta, was recently declared a Biosphere Reserve by the Federal Government (23 November, 1998) (Enrique Portillo 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 *Pseudobrachia oxyphylla*, *Guarea glabra*, *Cymbopetalum penduliflorum*, *Inga spp.*, *Sapum heteroflorum*, *Brosimum alicastrum*, *Dedropaxas arboreus*, *Ficus sp.*, *Rhedia 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 Rio 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 (André, 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, 1993). 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 ±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 (1:134, 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 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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References


In September 1999, when beginning a research project on Alouatta ecology at Paranaita, northern Mato Grosso, Brazil, we discovered two distinct howler species, *Alouatta belzebul discolor* and *A. 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 Teles Pires, comprises part of the legally conserved vegetation of the Fazenda Universale 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 and Mato Grosso (Hill, 1962). At Paranaita, 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 Río Guaporé basin (Hill, 1962; Setz, 1991) and the only previous record from the north of the state of Mato Grosso, is at Aripuaná, on both banks of Aripuaná 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–November, 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 da 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 primates 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.

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**Sympathy and New Locality for *Alouatta belzebul discolor* and *Aloatta seniculus* in the Southern Amazon**

Lilian P. Pinto  
Eleonore Z. F. Setz

In September 1999, when beginning a research project on *Alouatta* ecology at Paranaita, northern Mato Grosso, Brazil, we discovered two distinct howler species, *Alouatta belzebul discolor* and *A. 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 Teles Pires, comprises part of the legally conserved vegetation of the Fazenda Universale 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).

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**New Records of *Cattleya* (Orchidaceae) from the State of Maranhão, Brazil**

Callicarpa (1998) described *Cattleya* (Orchidaceae) as a genus of orchids, from there on, many of them are distributed between Maranhão and the Brazilian Amazon. It was illustrated that there are new locations for many species, and the study area is on the banks of the Rio Teles Pires.
Acknowledgments: The Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) provided financial support (proc. No. 98/16201-3). We thank Luiz F. Silvera, for help in the field and preparation of the collected specimen; Renato Gregoriin, from Museu de Zoologia da USP, for comments and confirming the identification of A. belzebuth discolor, and Woody Benson for comments on the manuscript. The owners Josias e Uriel and staff of Fazenda Universal provided hospitality and essential logistic support for which we are most grateful. We also thank Shirlei and Eraclides Pinto, Izuel and Sr. João and the Paraíba Municipal Government.

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References

NEW LOCALITIES FOR COIMBRA-FILHO’S TITI MONKEY, CALICEBUS COIMBRAI, IN NORTH-EAST BRAZIL

Marcelo Cardoso de Sousa

Calicebus 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 Cristinopolis. 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.

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 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 Lanjeiras, 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 Jandaíra, 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.

Calicebus 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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Reference
DISTRIBUTION OF BROWN CAPUCHIN MONKEYS (Cebus apella) IN VENEZUELA: A PIECE OF THE PUZZLE

Salvador Boher-Bentxi
Gerardo A. Cordero-Rodriguez

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 Rio 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 Bolivar State, the Rio 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-Bentxi along Caño (stream) Matico to and from Curíapo village (8°35′N, 60°02′W). Curíapo is in the southeastern part of the Rio 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 traveling along Matico stream, we sighted two brown capuchin monkeys that were foraging in a patch of “morc” 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 Curíapo village. According to the indigenous field guide, Cebus apella is locally known as “Naki-Jabu” in the language of the Warao People. Its presence in the Rio Orinoco delta is a new record for Venezuela and an extension of the species’ range.

Acknowledgments: The authors would like to thank the National Geographic Society, the South American field guide workshop, J. de Zoon (CBS) for the shared expertise and comments, and R. Dorme for the Zoological Society’s invaluable help.

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Figure 1. Map of Delta Amacuro State showing the Orinoco River Delta and the Curíapo 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 Curíapo. Lowland forests are found in the Orinoco delta and northeastern 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.

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

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References


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 equatorialis) 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 Priio (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 piliatae 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 piliatae 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 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 piliatae 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 then 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 Choríta, 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 Panamá Audubon Society and Havier Gonzalez, Carlos Ortega, and Nicolás 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 Hoyoa, and Señor Sanchez and his son who took us in their boat to Rio Mata Prio. Special thanks to Willberto Martinez who was our guide for the Fortuna and Canal Zone portion of the survey.

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**References**


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**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, commitment 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 cuscusw, 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 Muinka, Head IUCN Species Programme, e-mail: <SMH@hq.iucn.org> or Anna Knee, Communications Officer, Species Survival Commission, e-mail: <alk@iucn.org>. 

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**Note:**

A Prize of $1,000 is awarded for the best paper published in the current year in the journal. The prize is sponsored by the Society for the Study of Human Evolution. The winner is selected by the Editors and the judges of the prize. The winner will be notified by the Editors of the Society for the Study of Human Evolution. The prize is sponsored by the Society for the Study of Human Evolution. The winner will be notified by the Editors of the Society for the Study of Human Evolution.
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 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@mail.fsu.edu>. Web page: <http://www.fsu.edu/~cppanama/ipsp/program.htm>.

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 primate 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.
Of the Rio de Janeiro, Brazil.

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 Cercqueira, Paula S. D’Andrea, Carlos Eduardo Esberard, 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), Callithrix personatus (Vulnerable), and Alouatta guariba (= fascia) (Presumed Threatened). Of the primates occurring in the state of Rio de Janeiro, only the capuchin monkey, Cebus nigritus 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 20550-013, Rio de Janeiro, Brazil. Tel/Fax: +(0)21 587 77788, 587 77789.

GUIA DE FINANCIADORES—ONDE OBTIR 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 pesquisas. 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 direta. Os pedidos via correio e / ou fax (X 12) 576.1082 e recibo de depósito com nome e endereço do depositante para envio e CCPF para emissão de recibo. Em caso de necessidade solicite informações através do fone/fax (X 12) 576.1714 ou pelo e-mail: <probof@fastnet.com.br>

A Associação Pró Bocaina, entidade que publica o Guia, é uma ONG, que atua na região da Serra da Bocaina (divisa dos estados de São Paulo e Rio de Janeiro) desenvolvendo ações para a promoção do bem-estar de sua população através de projetos de educação, desenvolvimento sustentável e conservação dos ecossistemas da região, áreas nas quais possui diversos projetos implantados ou em fase de implantação. Entre os projetos em andamento está a publicação de duas cartilhas: “Elaboração de Propostas e Projetos” e “Gerenciamento da Implantação de Projetos”.

MUSEU DE BIOLOGIA MELLO LEITÃO-BRASIL


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.


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**BOOKS**

*Classification of Mammals*, by Maclolm C. McKenna and Susan K. Bel., 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 systematics 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 10533, 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) 777 777, 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 Custum Publishing, Boston. Price: $35.95 (+$5.50 shipping). ISBN: 0536602654. Volume 2 of a three volume set. The first was Volume 1: Lories, 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, right monkeys, and titi monkeys (Chapter 3); and Atelidae, including spider monkeys, woolly monkeys, 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-


Flora da Reserva Dujce, 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 Dujce, 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.balogh.com/kew/kew.html> for US$50; and in Brazil through SAPECA, Sociedade para Pesquisas e Conservação de Amazônia, Projeto Flora da Reserva Dujce <psfd@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-Urizar, I. Hernández, J. Ortho and E. Yeona, 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, N.J. 08618, USA. Tel: (800) 777 4726, Fax: (800) 999 1958 or e-mail: <orders@cpf.pupress.princeton.edu>.

**ARTICLES**


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**ABSTRACTS**

**Selected abstracts from the Scientific Meetings of The German Primate Society, La Société Francophone de Primatologie, and The Italian Primatological Society. In: Folia Primatologica, 71(4), 2000.**


Carosi, M. Endocrine monitoring of the ovarian function in tuffed capuchin (*Cebus apella*) by using a non-invasive technique, p.279.


Christen, A. *Callimico goeldii* (Goeldi’s monkey), the most enigmatic South American monkey, p.219.


Freudenstein, T., Hammerschmidt, K. and Jürgens, U. Development changes in squirrel monkey vocalizations (*Saimiri sciureus*), p.224.

Gasperi, F., Perretta, G. and Schino, G. Effects of different housing systems on the behaviour of the common marmoset (*Callithrix jacchus*), p.291.

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Oerke, A. K., Martin, R. D. and Hodges, J. K. Ultrasonography in Goeldi’s monkey (*Callimico goeldii*): Reproductive data with evolutionary significance, p.204.


Salazar, L. T. H., Rodríguez-Luna, E. and Laska, M. A comparison of taste responsiveness to food associated acids in the squirrel monkey (*Saimiri sciureus*) and the spider monkey (*Ateles geoffroyi*), p.229.


Sommer, V. Cultural Anthropology and the Darwinian primate paradigm, pp.211–212.

Steinweg, P. and Welker, C. The dominance structure of the squirrel monkey (*Saimiri sciureus*), p.212.


Tondu, M., Lejeune, C. and Mercier, M. Ethological evaluation of some environmental enrichments in a captive colony of *Cebus apella*, p.267.

Tomaz, C., Barros, M., Boere, V. and Huston, J. P. Confrontation with a stuffed ‘predator’: An ethologically based model of anxiety in marmosets (*Callithrix penicillata*), p.245.
Veracini, C. Ecological aspects of Callithrix argentata in eastern Amazonia (Pará, Brazil), p.277.


Dixson, A. Primate comparative anatomy and the evolution of reproduction, p.359.
Dunbar, R. The evolution of the social brain, p.359.

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: <sahansen@sdiegozoo.org>. Pre-registration is $90.00, nonmember ($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, Avendida das Nações, Via L-4 Sul, 70610-100 Brasília, DF, Brasil, Tel: +55 61 9966 0092, Fax: +55 61 346 4611, e-mails: <funpe1@zoo.df.gov.br>, <funpe2@zoo.df.gov.br>.


38th Annual Meeting of The Animal Behavior Society, 14–20 July, 2001, Oregon State University, Corvallis Oregon. Symposiums 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 be also a Poster session on “Educating in animal behavior”. Keynote 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-Universität, Erbertstrasse 1, D-07743 Jena, Germany. E-mail: <icvm-6@pan.zoo.uni-jena.de>, Home Page: <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@dxs.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>.


Turrialba, Costa Rica, Tel: (506) 556-2703; Fax: (506) 556-7730 <http://www.catie.ac.cr>, e-mail: <equirots@catie.ac.cr> or <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: 916 265 5887, e-mail: <rwack@ucdavis.edu>. Conference or membership information: Wilbur Amand, Executive Director/AAVZ, 6 North Pennell Road, PA 19063, Tel: 610 892 4812, Fax: 610 892 4813, e-mail: <aaavz@aol.com>.


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: <ssancho.sanchez@uam.es> Tel: 34.91.3978748 / 3975351, Fax: 34.91.3975215, Web site: <www.uam.es/apex>.

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 (IHP), 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/>.

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: <camamrd@ciencias.ula.ve>.

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: <clynn57@aol.com> or Margot McKnight, Tel: 321-254-9453, ext. 23, e-mail: <margot@brevardzoo.org>.

3rd 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>.

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>.

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@hemes.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>.

EcoLogic Society of America 87th Annual Meeting joint with the EcoLogic 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: <esaqh@eas.org>.

XIX 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. Fuxwen Wei, Secretary General, 19th 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>.

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 Neurootología, Universidad Veracruzana, Apartado Postal 566, Xalapa 91000 Veracruz, México. Tel: 281 8-77-50, Fax: 281 8-77-30, 8-63-52, e-mail: <saratguat@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 <saratguat@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 platyrhines. 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
Stalling, J. D. and Mittermeier, R. A. 1983. The black-tailed marshes (Callithrix argentata melanura) recorded from Paraguay. Am. J. Primatol. 4: 159-163.

Chapter in book

Book

Thesis/Dissertation

Report

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