Observaciones Preliminares sobre la Dieta de Cacajao calvus ucayalii en el Nor-Oriente Peruano

Rolando Aquino
Filomeno Encarnación

Introducción

De las cuatro subespecies de Cacajao calvus hasta ahora reconocidas (Hershkovitz, 1987), C. c. calvus, es la única, cuya ecología y dinámica poblacional fue estudiada en detalle; las otras especies, entre ellas C. calvus ucayalii, son muy poco conocidas debido a las dificultades que el medio natural presenta para estudiarla. La escasa información sobre C. c. ucayalii está referida a la distribución geográfica y densidad poblacional (Aquino, 1988; Puertas y Bodmer, 1993), conducta y componentes alimenticios (Barteci y Heymann, 1987; Heymann, 1989, 1990), los mismos que derivaron de encuentros circunstanciales durante la ejecución de otros estudios de la fauna silvestre.

El interés científico por la información ecológica referida al taxon, sobre alimentación, también es importante por su relación con conservación, p. ej. la determinación de especies de plantas usadas por C. c. ucayalii, que esta ligados a la economía de subsistencia de los habitantes ribereños de la región amazónica. Estas justificaciones y debido a la escasa información motivaron para realizar intensas exploraciones en los bosques del área de estudio, desde Junio de 1993 a Agosto de 1994 y de Diciembre de 1994 a Mayo de 1995, con la finalidad de recopilar información ecológica. Se presenta un avance sobre de los registros de plantas cuyos frutos y otras partes forman parte de la dieta de C. c. ucayalii en la Amazonia nororiental del Perú.


Area de Estudio

Los estudios fueron ejecutados en la quebrada Blanco, situada al sureste de Iquitos (aprox. 04°23’S y 72°55’O), comprensión de la Reserva Comunal Tamshiyacu-Tahuayo, y los bosques entre Agua Negra y Carolina, cuenca del río Yavari, situado al noreste de Iquitos (4°30’S y 71°43’O), (Fig. 1). El bosque primario en su mayor parte corresponde al denominado “bosque de altura” (Encarnación, 1985, 1993) cuyos árboles alcanzan entre 20 a 30 m. de alto, con algunos emergentes que superan los 40 m. En general el bosque presenta un aspecto alterado, con numerosas trochas y senderos de uso por los cazadores, de modo que la presencia de animales escasa, particularmente en la quebrada Blanco, como consecuencia de la alta presión de caza que también afecta a C. c. ucayalii.

Material y Métodos

En base a las informaciones sobre el bosque hábitat y las visualizaciones directas de alguna manada en anteriores ocasiones, se procedió a la búsqueda y localización de los individuos. El primer paso fue el entrenamiento para reconocer las huellas dejadas por Cacajao en los frutos y semillas por las mordeduras y otras marcas. Luego se procedió a la apertura de transectos paralelos y perpendiculares, sistema de cuadrantes en más de 70 km., cuyas longitudes fluctuaron desde 2.0 a 8.8 km., los que sumados a las trochas antiguas hicieron un total aproximado de 110 km. Luego siguiendo los transectos y trochas, las caminatas fueron a una velocidad lenta de 1.5 km./hora, con pausas y detenciones de 2 a 3 minutos, de modo que en el silencio percibir las vocalizaciones y ruidos ocasionados por los saltos o caída de restos de frutos y ramas o bejucos secos. El hallazgo de frutos y sus restos al pie del árbol, fue registrado y tomado en cuenta, con mayor detalle en los casos de inmaduros, de manera que siguiendo la dirección de los árboles con frutos recién comidos. Una vez que un grupo fue contactado, se procedió al seguimiento sigiloso durante el mayor tiempo posible. Estos tiempos de contactos variaron de escasos 35 minutos a 7.0 horas; solamente en ocasiones se logró el seguimiento desde que salieron de sus árboles de dormir hasta su instalación en otros nuevos árboles al anochecer, cuyos tiempos de actividad fueron de 12.2 horas en Julio y 12.4 horas en Febrero.

Desde el primer encuentro ocurrido en Julio de 1993, cada vez que estos primates se hallaban comiendo en algún árbol, se procedió de manera simultánea, al registro de los frutos comidos, al registro de patrón de actividades, y a la tipificación de bosques que conforman el hábitat. Los restos de frutos caídos al suelo fueron colectados en bolsas de polietileno con anotación de la planta (árboles, arbusto, bejuco) en fructificación y sus características, el estado de madurez o inmadurez, la parte comida y el color del exocarpio. En el campamento, la colecta fue rotulada con una numeración...
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Cont.
correlativa, correspondiente al registro cronológico de la libreta de campo; luego se les añadió alcohol absoluto como preservante. Dicha colecta se halla depositada en la Estación Experimental del Trópico del C.I. Instituto Veterinario de Investigaciones Tropicales y de Altura de la Universidad Nacional Mayor de San Marcos, con sede en Iquitos.

El tratamiento sistemático de las muestras fue por comparación con el material de referencia del Centro de Reproducción y Conservación de Primates no Humanos y del Herbarium Amazonense (AMAZ) de la Universidad Nacional de la Amazonia. En algunos casos fueron útiles las claves y descripciones según Spichiger et al. (1989, 1990).

**Resultados**

*Especies utilizadas en la alimentación*

Durante el período de estudio fue observado y registrado a individuos de *C. c. ucajali* en 171 oportunidades comiendo los frutos de 53 especies de plantas correspondientes a más de 20 familias (Tabla 1). Los taxa con mayor diversidad de especies fueron las sapotáceas con 10, las leguminosas con 5, las apocináceas con 4, las moráceas y lecitidáceas con 3 cada una. Sin embargo, las especies de *Pouteria, Vantanea, Eschweilera, Abuta y Mauritia flexuosa*, fueron los más importantes, tanto por el mayor número de registros como porque fueron constantes, en casi todo el año (Tablas 1 y 3), excepto la última especie citada.

De los frutos registrados, los de unas 20 especies forman parte de la dieta y de la economía de subsistencia de los habitantes ribereños. Entre ellas están *Mauritia flexuosa, Jessenia bataua* y *Couma macrocarpa*; las mismas que también tienen gran demanda y aceptación en los mercados de las ciudades como Iquitos, Requena y Contamana. Sin dudas, la colecta y el comercio de los frutos de *M. flexuosa* es de mucha importancia en el flujo económico de los ribereños, las mismas que imponen la tumba de millares de árboles cada año; derivando en una sobre explotación que origina en algunos casos la extinción local.

**Disponibilidad estratificada de los frutos**

Los frutos de la mayoría de las especies de plantas de la dieta de *C. c. ucajali* se hallan entre 16 a 35 m de alto; solamente los de *Hevea brasiliensis, Jessenia bataua* y *Micrandra spuzzueana* prosperan por debajo de los 15 m (mínimo 7 m), mientras que los árboles emergentes, de *Vantanea* sp. y otra "no determinada", están encima de los 35 m de alto.

**Tamaño y textura de los frutos**

Los frutos comidos variaron en tamaño y textura según la especie. El tamaño de los frutos más pequeños, como *Micropholis* sp. y *Pouroma tomentosa*, alcanzaron medidas hasta 1.1 cm de longitud y 2.0 cm de diámetro; los más grandes, como *Passiflora* spp. y *Chrysophyllum* spp., midieron hasta 8.0 cm de longitud y 6.5 cm de diámetro. No obstante, el tamaño de la mayoría de los frutos se encuentra en el rango medio entre los mencionados (Tabla 1). Por la textura, los frutos fueron clasificados en: a) cáscara delgada y textura suave, b) cáscara gruesa y textura suave, c) cáscara delgada y textura dura y d) cáscara gruesa y textura dura. Del total de especies registradas, 44 presentaron la textura dura, y en la mayoría de los casos, las partes más utilizadas fueron las semillas inmaduras.

**Partes comidas**

Los registros preliminares indican que *C. c. ucajali* se alimenta principalmente del mesocarpo (50.0%) y de las semillas (46.0%) (Tabla 2). El uso de las semillas inmaduras, como *Eschweilera* spp., *Pouteria* spp. y otros, por desgarramiento del mesocarpo de textura dura, son facilitados por los grandes y fuertes caninos de *Cacajao*, claro indicio de la anatomía adaptada para el aprovechamiento de estos tipos de semillas y frutos. De los sabores convencionales establecidos, se infiere que existe una mayor predisposición por los frutos con...
La tabla 3. Registro mensual de frutos y semillas consumidos por C. c. ucatayali durante el período de estudio.

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* En Enero, Setiembre, Noviembre y Diciembre no hubo contacto con grupos de C. c. ucatayali.
** Total mensual de horas de contacto con grupos de C. c. ucatayali.

** Mendes, C. y Ayres, P. (1986): "El bosque de altura"; C. c. ucatayali (100 especies en 2345 registros de alimentación), podría estar relacionado con la diversidad florística distinta entre los bosques de altura y los de várzea, o a la diferente metodología de registro aplicado en este estudio. Pero, no existe diferencias fundamentales en relación a las principales familias que aportan con el mayor número de especies para la dieta alimentaria para ambas subespecies.

De acuerdo con los resultados obtenidos, la dieta alimentaria de C. c. ucatayali mayormente está compuesto por el mesocarpo maduro y dulce, y de semillas inmaduras e insípidas. Ocasionadamente fueron observados mordisqueando yemas y hojas tiernas de plantas epifitas de las familias cicantáceas y bromeliáceas, y flores de bejuco y enredaderas, aún cuando no estamos seguros de su ingestión.

** Variación estacional del consumo

En el "bosque de altura" la producción de frutos ocurre durante todo el año; no obstante, existe una estacionalidad en la fructificación con un mínimo durante la estación seca, es decir entre Junio a Octubre y un mayor pico de producción al final de la estación lluviosa (Norconk, 1986; Castro, 1991; Garber, 1993). En nuestro caso, observamos gran variación en el consumo, de la diversidad de las especies, de plantas consumidas por C. c. ucatayali. Mientras algunas especies como p. ej. Vantanea spp., Eschweilera spp. y Pouteria spp. fueron consumidas durante 5 o 6 meses, el consumo de otras especies fue observado solamente en uno o dos meses. Por otra parte, la mayor diversidad de especies fueron consumidas entre Febrero-Marzo y Julio-Octubre (Tabla 3).

** Discusión

La relativa abundancia de frutos, de diversas especies de plantas, utilizadas por C. c. ucatayali (53 especies en 171 registros de alimentación), comparadas a los registros de Ayres (1986) y Ayres y Johns (1987) para C. c. calvus (100 especies en 2345 registros de alimentación), podría estar relacionada con la diversidad florística distinta entre los bosques de altura y los de várzea, o a la diferente metodología de registro aplicado en este estudio. Pero, no existe diferencias fundamentales en relación a las principales familias que aportan con el mayor número de especies para la dieta alimentaria para ambas subespecies.


Ayres (1986), sostiene que C. c. calvus tiene mayor preferencia por los frutos grandes y de cáscara gruesa con alto contenido energético. Al respecto, en el "bosque de
Adelgazamientos
Este trabajo fue ejecutado con el apoyo económico de la Sra. Suzi Leonard del Detroit Zoo de Michigan, USA, y del Gesellschaft für Primatologie de Göttingen, Germany y Zoologische Gesellschaft für Arten- und Populationsgeschichte de Munich, Germany, a quienes los autores agradecen. También nuestro reconocimiento al Dr. R. Bodmer del Tropical Conservation and Development Program, Universidad de Florida, por su valioso apoyo logístico. Finalmente agradecemos a los guías de campo Juan Huanagua y Yeisson Shahuano, con quienes compartimos grata experiencia durante las actividades de campo.

Rolando Aquino y Filomeno Encarnación, C. I. Instituto Veterinario de Investigaciones Tropicales y de Altura, Universidad Nacional Mayor de San Marcos y Sociedad Peruana de Primatología, Apartado 575, Iquitos, Perú. Email: <encarnac@telematic.com.pe>.

Referencias

Fission-Fusion in the Black-Headed Uacari (Cacajao melanocephalus) in Eastern Colombia
Thomas R. Defler

Introduction
Until recently little has been known about the behavior and ecology of the pithecine species Cacajao melanocephalus, which in Colombia does not seem to be particularly abundant, besides being hunted by various indigenous ethnic groups (Defler, 1991). The Colombian reality has resulted in my suggestion that the Colombian status of the species should be classified as “Vulnerable”, using the IUCN system (Defler, 1996).

Recently Bobbi (1994, 1997, 1998) has begun reporting on his recent study of northern Brazilian populations of this primate, including the surprising observation that at his study site no fission-fusion behavior was observed. I report here on the extreme fission-fusion behavior commonly observed in the Colombian population that I have been observing for several years (Defler, 1989, 1991, in press).

Methods
The term “fission-fusion” in Primatology has most often been used with respect to the primates Pan troglodytes (common chimpanzee) and Ateles spp. (spider monkeys), as discussed by Symington (1988, 1990). These primates travel in subgroups varying in number, according to conditions and decisions made by the individual animals. The subgroups, however, belong to a large clan or group. Symington (1987, 1988, 1990) demonstrated ecological correlates with group size in Ateles chamek, particularly food...
crop size, while this type of grouping was first described in *Pan troglodytes* by Nishida (1968), Wrangham (1977) and Goodall (1986).

I use the term “fission-fusion” for any primate species that is observed in groups which vary greatly in number in the same area being studied. Thus, *Cacajao melanocephalus*, which sometimes is observed as individuals or very small groups and at other times is observed in seemingly cohesive groups of 100 or more, are clearly exhibiting a fission-fusion type of society.

When using the term fission-fusion I do not intimate anything about the nature or make-up of the subgroups, as this is still under study. Nevertheless, it is clear that the larger groups of *Cacajao melanocephalus* are made up of multiple adult males and females with young.

**The Study Site**

I have been observing *Cacajao melanocephalus* ouakary on-and-off for more than seven years near the Estación Biológica Caparú, a site in the Colombian Amazon near the Brazilian border (Defer, 1999). I have accumulated more than 1,800 observation hours (many informal observations beginning as early as 1984 are not included in this count) of the population found around Caparú. The monkeys range around an ancient oxbow lake formed from a meander of the lower Río Apaporis (see Fig. 1).

During this time I have developed a trail system of about 100 km in inland forest and about 20 km in the local *igapó* (black-water inundation forest), which has been used for studies of several other primate species. Both *al azar* and focus animal techniques have been used to monitor basic activities.

**Figure 1.** Location of the Estación Biológica Caparú, lower Río Apaporis, Colombia.

**Figure 2.** The range of group sizes observed for *Cacajao melanocephalus* at the Estación Biológica Caparú, Río Apaporis, Colombia.

The local primate community includes eight species: *Aotus* sp., *Saimiri sciureus*, *Callibeus torquatus*, *Cebus apella*, *Cebus albifrons*, *Cacajao melanocephalus*, *Alouatta seniculus* and *Lagothrix lagothricha*.

**Counting Monkeys**

Several years ago, Díver Pintor of the Colombian National Park System and I discussed the difficulty of counting small primate groups in forest habitat. We compared separate counts to the actual number that had been determined for several groups of several species and concluded that counts in forests are notoriously unreliable (Defer and Pintor, 1985). Most counts in this study were taken from a canoe as group members passed by in typical fashion along the river edge, so the counts represent in most cases a minimum estimate, as some members obviously could have passed by deeper in the forest. Thus, my highest count of 108 animals was a minimum and the group was probably larger. One early observation of 1984 of a very large group within the forest may have actually represented around 200 animals, but no count was attempted at the time.

**Results and Discussion**

I have observed an extremely variable number of uacaris at this site throughout the year, varying from individual animals, which do not seem to be in contact with conspecifics, to cohesive groups of over 100 individuals, which travel in a coordinated fashion for several days both in *igapó* and dry land. Figure 2 gives a break-down of group size estimates.

Groups of around 20-30 are most often noted at Caparú, and I take this to indicate that the number represents the average group size for this site. Nevertheless, the groups of this population both split up and coalesce into large groups of over 100, apparently in response to the available food; the largest counted group was of at least 108 individuals. Small groups of 1-10 are most commonly seen during the season with fewest available fruits (Defer and Defer, 1996; Palacios et al., 1997; S. Defer, in prep.), while the groups surpassing 100 are seen sporadically during the rest of the year and especially during the seasons of greater fruit availability, particularly when *Eschweileria* sp.
(Lecithidaeae) fruits mature in the seasonally flooded forest.

Although *Micrandra spruceana* (Euphorbiaceae) is found at appreciable densities at Caparí, especially on the extensive Pleistocene terrace not far from the igapó, it is not the most important food species for these animals as was reported by Bobbi (1998) for his groups. The *Eschweilleria* species is by far the most consumed fruit of the Caparí population, and I believe that the igapó is important to *Cacajao melanocephalus* at this site because of the widespread occurrence of *Eschweilleria* there.

*Lagothrix lagothricha* at Caparí also exhibits a type of fission-fusion society as first described by Soini (1986) in Pacaya-Samiria, Peru. One study group made up of 22-24 animals most commonly moved in two separate subunits (often in vocal contact) throughout most of the day, only seeming to come together when particularly large food crops were available or at night for sleeping, although it often slept spread out over a large area (Defler, 1996b). This fission behavior is apparently not seen at another Colombian study site on the Río Duda, Tinga National Natural Park, north-western Colombian Amazon (Stevenson et al., 1994). Several types of evidence suggest that Caparí (which is a black-water site) is very infertile, while the Río Duda site (white-water and near the Cordillera Oriental) is relatively more fertile. At any rate, Ardila and Flores (1994) and Peres (1996) give data showing that group dispersion is minimal when most ripe fruit is available, and troops are less cohesive when ripe fruit is at its lowest levels.

Besides *Lagothrix lagothricha* and *C. melanocephalus* varying in specific differences in fragmentation and coalescence have been described for groups of *Saimiri* (see Baldwin and Baldwin, 1972), *Alouatta palliata* (see Glander, 1987), *Brachyteles arachnoides* (see Strier, 1989), *Cebus olivaceus* (see Robinson, 1988), some *Saguinus* spp. (Castro and Soini, 1977), and *Cacajao calvus* (see Ayres, 1986), the most extreme cases of which Kinsey and Cunningham (1994) term "fission-fusion", but which are obviously part of a continuum. *C. melanocephalus* seems to me to represent an extreme example of fragmentation, at least at the Caparí site. Fission-fusion of the type described above may be an ecological tactic of many Neotropical primates, allowing a more efficient and effective foraging mode, according to the circumstances of available food (Kinsey and Cunningham, 1994; Chapman et al., 1991). It is particularly interesting that intraspecific foraging tactics may vary from site to site, and field researchers should be aware of the possibility of these differences and seek to associate the particular tactic with the available resources.

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**USO DE PLANTAS COMO ALIMENTO POR ALOUATTA PALLIATA EN UN FRAGMENTO DE SELVA EN LOS TUXTLAS, MÉXICO**

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

Debido a que las selvas tropicales son ecosistemas altamente sensibles a la perturbación causada por el hombre, un gran número de vertebrados han desaparecido simultáneamente con la pérdida y aislamiento de su hábitat natural (Estrada *et al.*, 1993, 1994, 1997) y aquellos que han logrado sobrevivir a las condiciones de fragmentación de su hábitat, están representados solamente por individuos aislados o unidades de población demasiado pequeñas o de estructura de edades inadecuadas para hacer viable su reproducción a largo plazo (Offerman *et al.*, 1995). Los monos aisladores, *Alouatta palliata*, del sur de México no han escapado de esta alteración resultando en el externinio local de la especie en algunas áreas y en la existencia de poblaciones fragmentadas y aisladas bajo riesgo de extinción. Nuestro conocimiento sobre el comportamiento y ecología de *Alouatta* bajo condiciones de fragmentación del hábitat es escaso (Kinzy, 1997). Tal información es indispensable para calibrar la elasticidad ecológica de las especies y generar modelos que eviten la desaparición continuada de éstas a nivel local y regional. Así, el objetivo de este proyecto fue describir, en un ciclo anual (1995), el uso de plantas como recurso alimenticio por un grupo de monos aisladores viviendo en un fragmento aislado de vegetación selvática en la región de Los Tuxtlas, Veracruz, México.

**Metodología**

El trabajo se efectuó en la región de Los Tuxtlas, al sur del estado de Veracruz, México, en la zona en donde se encuentran los terrenos de la Estación de Biología Tropical «Los Tuxtlas» del Instituto de Biología de la Universidad Nacional Autónoma de México, localizada aproximadamente entre los 95° 04' - 95° 09' de longitud oeste y a 18° 34' - 18° 36' de latitud norte (Fig. 1). El clima en el área de estudio es cálido-húmedo con una precipitación media anual de 4900 mm y una temperatura media anual de 27 °C (Estrada *et al.*, 1985).

En esta región existen constelaciones de fragmentos de selva aislados unos de otros por distancias variables. El sitio de estudio fue uno de estos fragmentos que comprende un área de 3.6 ha en extensión, de forma alargada, y habitado por una trocha de *A. palliata* compuesta por dos machos adultos, dos hembras adultas, dos infantes y un juvenil. Las observaciones del comportamiento alimenticio de los plantas en estos fragmentos de selva aislados.
La Figura 2. Índice de Dominancia para 15 especies arbóreas con valores >1 y usadas como fuente de alimento por la tropa estudiada. En orden jerárquico las siete más dominantes: C. obtusifolia, B. alicastrum, P. armata, F. insipida, F. tecolutensis, S. radaloferi y F. yoponensis.

Aulladores se efectuaron durante 10 días de cada mes del año, dedicando una hora de observación a cada individuo en cada día. Para cada sujeto se registró el tiempo dedicado al consumo de hojas (jóvenes y maduras), de frutos (jóvenes y maduros), de flores y de pecíolos de epífitas, hemipárásitas y bejucos (Juan, 1997). Para las especies usadas por Alouatta en el sitio de estudio se calculó un índice de dominancia determinado a partir de la densidad, distribución y el área basal de los individuos de cada especie (Martínez Ramos, 1980).

**Resultados**

Los aulladores utilizaron como fuente alimenticia 52 especies de plantas representadas por cinco formas de vida: 50% fueron árboles en pie y el 17% correspondió a árboles hemiepipfitos. Una especie epífita y una hemipárásita, representaron cada una el 2% del total de las especies usadas como fuente alimenticia y el 29% representó a especies de bejucos. Los aulladores emplearon el 96% del tiempo registrado alimentándose de partes de árboles en pie y árboles hemiepipfitos, el 3% correspondió a bejucos y el 1% a hemipárásitas y epífitas. Los árboles usados como fuente de alimento presentaron una altura promedio de 19 m (±4.2), con un rango de 9-30 m y un d.a.p. promedio de 0.6 m (±0.4) (rango de 0.2-2.3 m). Especies arbóreas de las familias Moraceae (7 especies), Anacardiaceae (1 especie) y Sapotaceae (1 especie) contribuyeron al 52% de los árboles usados como recurso alimenticio. Cinco especies de la familia Moraceae (Ficus tecolutensis, Brosimum alicastrum, Poulsenia armata, Ficus yoponensis y Cecropia obtusifolia) aportaron el 80% del tiempo total registrado en alimentación.

El censo de la vegetación en el sitio de estudio indicó la presencia de 536 árboles de las especies usadas por los aulladores como fuente de alimento y el Índice de Dominancia (ID) presentó un rango de 0.002 (Ficus padifolia) a 120.4 (C. obtusifolia). El 6% de las especies presentaron un ID alto (>50), el 13% regular (>20-50), el 29% bajo (>1-20) y el 52% muy bajo (<1). Dos especies sobresalieron por haber presentado un ID >100 en esta subcomunidad (Fig. 2).

Los aulladores invirtieron el 57% del tiempo de alimentación registrado en el consumo de hojas, el 38% en frutos, el 1% en flores y el 5% en pecíolos de epífitas, hemipárásitas y bejucos. Las hojas jóvenes contribuyeron al 86% del tiempo dedicado al consumo de hojas y el consumo de frutos maduros aportó el 86% del tiempo registrado en consumo de frutos. La diversidad (H’ Shannon) media mensual en el uso de especies consumidas por Alouatta fue de 1.1 (± 0.17), registrándose el valor más bajo en Julio (0.7) y el más alto en Diciembre (1.4) (Fig. 3). El índice de similitud intermunicipal (Índice de Sorensen) del 0.6 (± 0.1) (Fig. 3). El 17% de las especies fueron usadas por los aulladores en 9 y ≤12 meses, 5% en 5 ≤ y ≤ 8 meses y el 58% en 1 ≤ y ≤ 4 meses. Cuatro especies de la familia Moraceae, B. alicastrum, C. obtusifolia, F. tecolutensis y F. yoponensis, fueron usadas como fuente alimenticia durante cada uno de los 12 meses del año.

El porcentaje de tiempo de alimentación registrado para cada especie de árbol estuvo significativamente relacionado al índice de dominancia (r = 0.47, p<0.05) de cada una y a su densidad (r = 0.34, p<0.05), pero un análisis de correlación parcial demostró la existencia de una relación positiva y significativa (r = 0.48, p<0.05) solamente con el índice de dominancia (densidad r = 0.23, p = 1.0). El número de meses en que las especies arbóreas fueron usadas por los aulladores, estuvo correlacionado (r = 0.54, p<0.0001) con el índice de dominancia de éstas en el sitio de trabajo.

**Discusión**

El uso predominante de especies de la familia Moraceae por la tropa bajo estudio coincide con el hecho de que en hábitats perturbados estas especies se presentan en altas densidades (Julliot y Sabatier, 1993). Algunas especies de los géneros Ficus y Cecropia son características de hábitats secundarios (Alvarez-Buylla y Martínez, 1992). En el sitio de estudio C. obtusifolia fue la especie con los valores más altos de densidad e índice de dominancia y estuvo entre las cinco especies más utilizadas por los aulladores como fuente de hojas y frutos, presentando una dispersión espacial agregada, posiblemente debido a las condiciones de perturbación del sitio y a la característica colonizadora de la especie para espacios abiertos, que se presentan en diferentes puntos del fragmento.

Los datos sugieren que los aulladores pueden persistir por un tiempo en "islas" de vegetación selvática residual mediante el uso de hojas y frutos de especies de la familia Moraceae, como: Ficus, Cecropia y B. alicastrum.

![Figura 3. Indices de diversidad (H') y similitud (Sorensen) en la dieta de los aulladores para los meses del ciclo anual estudiado.](image)
Moraceae como parte principal en su dieta. Algunas de ellas, como C. obtusifolia, F. yoponensis y F. teckolensis fueron utilizadas como fuente de alimento en cada uno de los 12 meses del ciclo anual debido, quizá, a que los individuos de las poblaciones de estos árboles tienden a ser asincrónicos en la producción de frutos y hojas (Estrada y Coates-Estrada, 1985). Las características físicas del sitio de estudio (área pequeña, forma alargada y angosta), ayudan a explicar la ausencia de correlaciones significativas entre la distancia media mensual recorrida por los aulladores y el número de especies usadas como fuente de hojas y/o frutos. El comportamiento fenológico de las plantas fue otro determinante de las variaciones temporales en el uso de especies, ya que solamente el 8% de las especies usadas fueron aprovechadas en cada mes del ciclo anual investigado, lo que sugiere una búsqueda activa en el tiempo y espacio por el recurso alimenticio.

Nuestro estudio mostró el uso de 52 especies de plantas por la troba estudiada. Estudios de una troba de aulladores introducida en una isla lacustre de 8.5 ha dominada por vegetación secundaria a 40 km de la zona de estudio, indican el uso de 28 especies de plantas (Serió-Silva, 1992). Otro estudio de una troba de A. palliata en un fragmento de 10 ha compuesto por vegetación secundaria con algunos elementos arbóreos de la selva original ubicado a 80 km al sur, en la misma región, reporta la utilización de 15 especies de plantas (Jiménez-Huerta, 1992). Estudios de trobas de Alouatta en extensiones de selva más amplias y sin perturbación antigéneica ubicadas a 5 km de nuestro sitio, indican el uso de 27 especies de plantas (Estrada, 1984) como fuente de hojas y/o frutos. La similitud calculada (Índice de Sorensen) entre nuestro estudio y los otros tres a nivel de especies utilizadas fue de 0.22 (9 especies comunes) con la isla, de 0.23 (8 especies comunes) con el fragmento a 80 km y de 0.27 (11 especies comunes) con el estudio de Alouatta en selvas no perturbadas.

Estos cuatro estudios indican por ahora la utilización de 78 especies de plantas por A. palliata en Los Tuxtlas. Tal diversidad de especies es consistente con los hábitos generalistas de especies del género Alouatta (Estrada y Coates-Estrada, 1993), característica que, acoplada a la capacidad de usar hojas como alimento, le permite a estos primates afrontar reducciones amplias en el área de vegetación selvática que conforma su hábitat. Sin embargo, es muy probable que trobas de Alouatta en fragmentos selváticos pequeños, como el estudiado, estén bajo condiciones ecológicas subóptimas que las pongan en peligro de extinción. Por ejemplo, la biomasa por unidad de área para la troba de aulladores en el sitio de estudio se estimó en 8.7 kg/ha que contrasta significativamente con la cifra de 1.28 kg/ha reportada para trobas de A. palliata en selvas más amplias (>500 ha) y poco perturbadas (Estrada y Coates-Estrada, 1996). Tal diferencia sugiere que a pesar de la elasticidad alimenticia detectada para A. palliata en Los Tuxtlas y en otras partes de Neotrópico (Estrada y Coates-Estrada, 1993; Kinsey, 1997), fragmentos de selva como el estudiado posiblemente están, debido a su pequeña área, sujetos a una sobrecarga animal con importantes efectos negativos sobre el bienestar físico y supervivencia de los aulladores. Por ejemplo la relación positiva entre el porcentaje de tiempo alimenticio, el número de meses de utilización y el valor del índice de dominancia para las especies arbóreas en la dieta de la troba estudiada, podría indicar un sobreuso de estos recursos. Además, existen otros mamíferos y aves que hacen uso de los frutos de árboles utilizados por Alouatta en fragmentos como el habitado por la troba bajo estudio, así como insectos (por ejemplo, Atta cephalotes) que usan las hojas de dicho árboles (Estrada et al., 1984; Estrada y Coates-Estrada, 1985; 1986; S.J. obs. pers.).

Por otro lado, entre los efectos de la fragmentación y aislamiento de las selvas, se ha documentado la creación de bordes que modifican el microambiente de los fragmentos de vegetación selvática, incrementando la mortalidad de los árboles y la invasión de especies no selváticas al interior del fragmento (Brown, 1991). Estas modificaciones del medio ambiente físico resultan en cambios en la composición de especies y estructura de la vegetación que altera la disponibilidad del recurso alimenticio para primates como A. palliata, creando condiciones subóptimas de supervivencia.

El efecto neto de las condiciones ecológicas mencionadas anteriormente es una disminución en la cantidad y calidad del alimento potencialmente disponible para los aulladores que existen en fragmentos pequeños de vegetación original. Esto sugiere que es indispensable desarrollar escenarios ecológicos que, a nivel del paisaje, favorezcan la conexión física entre fragmentos aislados de vegetación selvática (Estrada y Coates-Estrada, 1996), atenuando así los efectos negativos de pérdida de área y aislamiento sobre Alouatta y sobre las poblaciones de plantas que les sirven de alimento y de substrato.

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Referencias


GENERAL GUIDELINES FOR STANDARDIZING LINE-TRANSACT SURVEYS OF TROPICAL FOREST PRIMATES

Carlos A. Peres

Line-transect surveys have been widely used over the last three decades to quantify primate population abundance in tropical forests. However, the details of the census methodology applied by different investigators remains highly variable despite a number of reports attempting to standardize primate census techniques (Wilson and Wilson, 1975; Janson and Terborgh, 1980; NRC, 1981; Brockelman and Ali, 1987; Defler and Pinto, 1985; Johns, 1985; Skorupa, 1987; Whitesides et al., 1988). Many of the currently used field procedures, involving site selection, transect preparation, and the way the censuses are carried out across different studies, are therefore not strictly comparable. In addition, manipulation and analysis of census data, as reported in the formal and grey literature, can also diverge considerably. To a large extent, this hinders the level of confidence attributed to primate abundance estimates at a given forest site, and undermines the comparative power of surveys at different sites, whether these are reported in the form of linear detection indices (e.g., group sighting rates/10 km walked) or population density estimates (e.g., ind/km²).

Here I prescribe a set of practical guidelines and recommendations for conducting line-transect surveys of tropical forest primates. Although readers of Neotropical Primates may be primarily interested in primates, the methodology outlined here could be equally applied to a number of large vertebrate taxa amenable to direct observations under similar conditions, provided that their intrinsic detectability and spatial behaviour do not violate some of the basic assumptions of line-transect census theory (see below). These guidelines focus on the practicalities of the actual field procedures of one choice method that is widely used, rather than on the accuracy and pros and cons of different census methods. They are thus intended to complement, rather than replace, a number of other useful discussions of line-transect census methodology (Janson and Terborgh, 1996; Schwartz, 1989). With the aim of the above guidelines, census data are ideally obtained beyond forest borders (Burnham and Overton, 1979) to ensure a consistent program, same-sampled, measures and procedures in the area of interest. In practice, there are a number of other factors which influence the quality and quantity of the results obtained. In fact, the nature and extent of the study area, and the population size and density, which vary considerably among localities and species, are likely to have a substantial effect on the results obtained. The guidelines given here are intended to be general in nature and can be adapted to any research situation. The best way to do this is to consider the guidelines as a working framework within which the researcher can design his or her own study.
and Terborgh, 1980; NRC, 1981; Brockelman and Ali, 1987; Whitesides et al., 1988; Buckland et al., 1993; Greenwood, 1996; Southwell, 1996), which may provide useful field tests of the accuracy of different techniques. The theoretical background of the most current modelling tools for analysing census data are described in detail elsewhere, and are largely beyond the scope of this paper. Buckland and collaborators (1993) provide a detailed treatment on the statistical analysis of distance sampling data used to estimate population densities, which largely superseded its predecessor (Burnham et al., 1980). However, I also provide some common-sense recommendations for enhancing field procedures in order to minimize or prevent some common sampling biases. This is critical because the robustness and accuracy of model estimators are highly dependent on the quality of field data, and no amount of sophistication in post-survey data analysis can correct for some basic flaws in sampling methods.

This set of guidelines results from first-hand experience obtained during a standardized program of 26 diurnal wildlife censuses conducted throughout Brazilian Amazonia over the last 15 years (1984-1998: Peres 1988, 1989a, 1990, 1993a, 1997a, in press a, in press b, Peres and Dolman, in press; C. Peres and H. Nascimento, unpubl. data), each of which lasted approximately one month. Our field procedures have thus been repeatedly tested and “refined to a fine art” over the course of this long-term census program. This condensed set of guidelines is therefore intended to provide a straightforward and workable sampling protocol for both the novice and experienced field investigator who wishes to standardize a census methodology in order to improve its overall efficiency, accuracy, and comparability.

**Sampling Site Selection**

Once the general survey area has been selected, two reasonably long random transects (4-5 km) from the base-camp should be cut, preferably at angles of 135°-180° from one another. With the exception of drive-censuses where transects are laid parallel to one another, it is best if the nearest point along different transects in the same survey area are at least 1 km from one another. If the general census area is intersected by a river, then it may be more appropriate to set up transects on opposite banks of the river. Although transect placement is inherently dependent upon the objectives of the survey, establishing random transects may be preferable in areas of continuous forest. In practice, however, a blind policy of random transects may not be feasible or entirely appropriate because of irregularities in terrain topography, distribution of undesirable landscape features (e.g., river contours; proximity to active households) and, depending on survey objectives, the need to avoid sampling areas or vegetation types which could substantially bias detection probabilities in a habitat mosaic (e.g., forest edges when sampling core-habitat populations; secondary forest patches when sampling primary forest species). Moreover, it may be actually more appropriate to carry out some form of systematic sampling in a small forest fragment (<500 ha), such as through parallel transects which will provide a more even coverage of the survey area and prevent transect lines from crossing one another. Staunch advocates of strictly random sampling, who tend to inherently dislike systematic placement of transects, would compromise their ideal in such small survey area. Here the best policy is to use information gathered in situ and decide transect placement with a strong dose of common sense, for it is impossible to anticipate all circumstances under which a survey will be conducted. However, it is important to carefully consider the survey objectives and all sources of prior information available on the landscape in which the census will be done (e.g., maps; satellite photos; local interviews; reconnaissance walks) before the number, length and orientation of transects are decided.

**Transect Preparation**

Each of our transects at different Amazonian forest sites are usually prepared from scratch within the same day (0630-1630 h) by three trail cutters aided by a fourth person guarding the rear who measures and marks the transect. For a field survey lasting no more than 30 days, including site selection and transect preparation, we find it most cost-efficient to cut two transects of 4.5 km each. In many cases, this extended transect length allows us to get away from portions of the study area more accessible to hunters (e.g., riparian forests) which may be an advantage in hunted areas. Given our time and personnel limitations, a greater effort allocated to transect preparation would be simply ineffective, as it is important to optimize the amount of time cutting transects and carrying out the actual census. Given the average speed at which observers should walk the transects (approx. 1,250 m/h), this line length allows each census walk to be completed within about 3 h 36 min, but in practice this often takes about 4 h because of normal delays following detection events, particularly where the abundance of target species is high. This is compatible with the peak activity periods of most diurnal animals whether census walks are conducted only early in the morning, or repeated in the afternoon from 1400 h onwards.

In order to minimize disturbance of the sampling area, however, we always retain a buffer zone around our base-camp by cutting an additional access trail of 300-500 m before beginning to cut the actual transect. Our transects within undisturbed primary forest are thus cut at a rate of some 500 m/h, depending on manpower and undergrowth conditions, but these are never wider than 1 m, and do not always appear to be meticulously “clean” and well-trodden at the beginning of the survey. Although our transects remain rigorously faithful to the same pre-established compass bearing, which is double-checked by the leading trail-cutter at approximately every 50 m using a Suunto® precision compass, we do not attempt to cut through and overcome every natural obstacle (e.g., a large fallen tree trunk) in order to maintain absolute transect linearity. Slight detours immediately around small patches of dense undergrowth, say around a regenerating tree-fall gap, do not change the overall objectives of the survey, but considerably speed
up the process of transect preparation. It is important however that the leading trail-cutter can make sensible decisions about slight deviations in transect orientation, and resume the original compass bearing immediately on the other side of such obstacles.

Transects should be measured (with the aid of a Hip-Chain® or a 50-m forester’s tape) and marked every 50m, which will facilitate accurate mapping of detection events. Brightly colored vinyl plastic flagging and permanent pens are usually good enough for these purposes, and tape marks are expected to last for at least 12 months provided they are not removed by scurids or destroyed by ants. In the interest of efficiency, this is usually done by a single person walking well behind the last trail-cutter, and using a piece of low-elasticity nylon rope of c. 51 m in length (with knots tied 50 cm from both ends, which can be reversed at every 50-m section along the transect. In the absence of a Hip-Chain, this will prevent the rear person’s need to frequently backtrack along the trail to release the ends of the rope (or tape), which will effectively halve the total distance walked in the process of measuring the entire transect.

Freshly prepared transects should be “laid to rest” (left alone by observers) for at least one whole day, which will allow the disruption created by the trail preparation personnel to normalise, and animals to redistribute themselves in space along the transect area in the total absence of observer disturbance. This is critical because trail cutters may often shout to one another along the transect, and loud human voices can be heard for hundreds of meters and potentially repel a number of game vertebrates, particularly in persistently hunted areas. In our experience, however, transect preparation over a single day’s work is insufficient to condition animals to avoid the transect area, provided that transects are left alone for at least one whole day before census walks are initiated. This routine is also perfectly compatible with surveys based on multiple transects because this will require the field crew to rotate among different survey areas during the initial stage of transect preparation.

Getting Started

Line-transect census theory relies on five basic assumptions (in decreasing order of importance) which must be met for accurate density estimation (Burnham et al., 1980; Buckland et al., 1993): (1) all animals on the transect line must be detected; (2) animals are detected at their initial location, prior to any movement in response to the observer, and are not counted twice; (3) animals of target species move slowly relative to the speed of the observer; (4) distances from the transect are measured accurately; and (5) detections are independent events. It is therefore important to reduce or eliminate systematic observer biases which compromise these assumptions and standardize sampling protocols such as group counts, and estimates of perpendicular distances (see below) and spread of social groups. This should be done even among previously trained observers by jointly carrying out some census walks on the first days of a survey, and attempting to standardize data collection on the basis of non-independent detection events. Observers should practice rapid counts of individuals in a group of the target species before undertaking the survey, and become familiar with other species'

Noted need to say, it is critical that all single observers censusing independently know their animals and are equally proficient at their detection and identification skills. In practice, this often relies on the accurate identification of either subtle watch images and acoustic cues such as alarm-calls, patterns of branch crashes, and other escape maneuvers in diurnal surveys, as well as patterns of eye shine in nocturnal surveys. This becomes a greater challenge in community-wide vertebrate surveys that can include as many as 45 reptiles, birds, and mammal species. In western Amazonian primate communities, this requires considerable background training as species-specific detection cues cannot be learnt overnight by a novice observer unfamiliar with the local fauna. Over the years we have found that teaching censusing protocols to (mostly uneducated but proficient) local hunters is far easier than doing the same to the even the brightest, but inexperienced, student of urban background. In addition, using illiterate but otherwise skilled local field assistants is not generally a problem provided that they can record their data into a handheld micro-cassette recorder, which can be easily operated in the field.

Walking the Transects

Censusing should be avoided during rainy days, particularly from early in the morning, because this affects the ability of observers to detect different animal species (e.g. unfavourable acoustic background dominated by raindrops on the foliage), as well as their intrinsic detectability (e.g. animals often become less active, and “freeze” rather than flee as a behavioural response to the presence of observers). In practice, however, more ephemeral rain showers tend to occur later in the day, and should not entirely compromise the quality of at least some of the census data, provided that observers discontinue census walks during rain and subsequent periods of heavy rainstorms trickling down from the canopy, and resume censusing immediately thereafter. This is particularly appropriate in time-limited surveys in many regions of tropical forests where rainstorms are more likely to occur in the afternoon, thus allowing uninterrupted census walks to be carried out in the morning, which in any event is the best time of day for conduct-

1 Our vertebrate surveys in Amazonia (Peres, in press a), for example, include the following taxa: Callithrix primates (e.g. Callithrix, Saginus), all larger primates (Calllicebus, Saimiri, Pithecia, Chiropotes, Cacajao, Cebus, Alouatta, Lagothrix, and Ateles), squirrels (Microscius and Scisciura spp.), acouchis (Myoprocta), agoutis (Dasypodidae), five species of forest ungulates (collared peccary Tayassu tajacu, white-tipped peccary T. pecari, red brocket deer Mazama americana, gray brocket deer M. gaudouini, and lowland tapir Tapirus terrestris), woodquails (Odontophorus spp.), small tinamous (Crypturellus), large tinamous (Tinamus), trumpeters (Phoebia), common guans Penelope and piping guans Aburria piple, curassows (Crax spp. and Mitu mitu), and tortoises (Geochelone).
ing censuses.

Transact should be walked by single observers at average speeds of approximately 1,250 m/h, from 0630-0645 h to 1030-1045 h in the morning, and 1400 to 1800 h in the afternoon. Brief stops every 100 m are advisable for even the most sensitive observers in order to minimize background noise, particularly where detection cues are primarily acoustic and the leaf litter is dry. A period of 4 h is therefore usually quite sufficient to conduct each one-way census replicate, including the time allocated to observations and data collection. Return walks in the afternoons should be done after 1400 h, following a midday period of approximately 3 h, when observers should remain relatively quiet at the end of the transects. This allows sufficient time for animals to redistribute themselves and overcomes the midday period of reduced activity for a number of target species. However, analysing data from return (afternoon) census walks is problematic for diurnal species retiring to their sleeping sites (or becoming less detectable) before 1700 h, as is often the case with callitrichids (Peres 1989b; 1993b).

In these terms, return census walks may not overlap the entire activity period of different marmoset, tamarin, and lion tamarin species thus potentially underestimating their densities. The trick here is to use those data selectively, and stratify density estimates by time of day, as group counts and PD estimates during return census walks may be perfectly valid data, whereas the overall detection rate may not.

In our surveys, observers are rotated on a daily basis between different transects in order to minimize or cancel out potential observer-dependent biases. This system has worked very well at our survey sites where groups of two and three transect lines have been used simultaneously (by observers with synchronized watches). This also allows observers operating alone to establish a better overall team effort over the course of the survey, and double-check one another's previous efforts by inspecting daily marks left on a plastic tape at the end of the transect.

**Recording Data**

Observers should record date, transect identity, weather conditions, and personnel at the beginning of a census walk, as well as the start and end time of each walk. Upon a detection event, the time, species identity, group size, group spread, sighting location along the transect, and detection cue should be recorded, preferably in the same sequence onto a standardized datasheet which facilitates their entry into an electronic data file. The opportunity to record subsidiary information such as activity, diet, height, age and sex of animals sighted, mixed-species associations, and vegetation features are also important and should not be wasted. As a general policy, observers should remain on the transect line, but in some cases it may be necessary to move away from the transect (for no more than 10 min) and approach the animals to make further observations possible.

If sighting distances (SD) and angles are taken, they should be transformed to perpendicular distances (PD) for analysis because density estimators based on SD (i) require unrealistic assumptions about the detection process that are not required by PD methods (Burnham et al., 1980; Buckland et al., 1993), and (ii) perform poorly relative to those based on PD (Hayes and Buckland, 1983). In practice, it is actually easier to restrict distance estimates to PD by memorizing the exact location where an animal (or a group of animals) was first detected, and then walking to the nearest point along the transect from this location.

Distances to each independent subject should be measured or estimated accurately (these data are referred to as "ungrouped"). If an observer cannot reliably estimate distances accurately, than an optical range finder (c. US$50) or a more expensive pair of survey laser binoculars (US$290-500) should be used. We have recently begun using the latter because of the additional accuracy afforded, despite the added cost. As a general rule, however, it is best if all observers calibrate the accuracy of their distance estimates prior to the actual census by either learning how to pace distances according to their stride length or practicing PD estimates based on repeated trials aided by a range finder or 50-m tape. Distance measurements are particularly critical close to the trackline because the behaviour of model estimators is highly dependent on the frequency distribution of short distances from the line. On the other hand, distance measurement errors for subjects away from the line matter comparatively little from a statistical standpoint because they have lesser consequences on the detection probability function. Extreme departures in PD values are also tolerated by most detection functions, either because (i) the data distribution is often truncated and outliers are eliminated, and (ii) estimates are robust to such departures provided that some 40 animal clusters (spatially independent groups or subgroups) or more are available.

In addition, pay close attention to animals possibly moving away (being flushed) from the trackline before the animal is detected by the observer, but after the observer is detected by the animal (assumptions 1 and 2). The same problem could happen with animals moving towards the observer just prior to detection but this is counter-intuitive for most tropical forest vertebrates and unlikely to happen. Statisticians who frequently handle line-transect data will refer to this as a "g(0) problem". The mathematical term g(0) refers to the probability of detection on the line, which is usually assumed to be greater than at increasing distances from the line. This is critical because most model estimates rest on the assumption that all animals on the trackline are detected (assumption 1), and that the detection probability is independent of the observer's presence (assumption 2). The probability of detecting an animal, given that it happens to be at the line, should therefore be one. Moreover, rounding errors of distance estimates, particularly at short distances from the transect, can be problematic if not required during data analysis by regrouping the PD class intervals or other "smearing" techniques. This is often common because of the observers' natural tendency to round
distance estimates to the nearest multiple of five. It is therefore crucial that enough time (1-2 days) is allowed to practice and standardize distances measurements by independent observers prior to the onset of a survey.

In social species such as primates, the groups (or subgroups) must be considered to be the relevant spatial unit of the population and distances should be measured to the center of the group. Population density then becomes a product of group density times the average group size based on reliable group counts. In practice, however, animals nearest the observer are intrinsically more visible and the point defining the geometric center of the group cannot be easily assessed, particularly in species living in large groups (e.g., in Amazonian primates, Saimiri spp., Cebus albifrons, Cacajao spp., Lagothrix spp.; Peres, 1993; Peres, 1997a). It thus becomes essential to add a correction factor based on group spread or group diameter estimates for every independent sighting, or else the densities of species in large groups, which are intrinsically more detectable, could be severely overestimated (see Janson and Terborgh, 1980; Brockelman and Ali, 1987; Peres 1997a). One other option for species forming extremely large and uncohesive groups, or with a strong tendency to split up into subgroups, is to treat each small party of animals independently and record party size and a PD estimate for every reasonably discrete animal cluster even if they are obviously part of a larger group (and therefore not moving independently). In these cases, sightings of adjacent subgroups may violate the theoretical condition that detection events should be independent (assumption 5), but this is not as serious as cluster-size dependent biases in species forming large, uncohesive groups. Because of the larger sample size, this approach should also result in more robust estimates of overall population density (S. Buckland and K. Burnham, pers. comm.), but which should be similar to those derived from methods based on larger cluster sizes, although cluster density estimates could diverge substantially.

**Sampling Effort**

Our Amazonian surveys usually consist of a cumulative one-way distance on each transect line of at least 75 km. This corresponds to a one-way distance of at least 150 km along two forest transects, or a two-way distance of 300 km for both transects. This usually requires 17 days of census if two independent observers are available to walk both transects simultaneously. In practice, however, even this relatively large census effort may not be sufficient to detect a pre-specified number of objects compatible with a robust density estimate for some rare species. Although the recommended number of independent detection events per species per census should exceed 40, smaller sample sizes can derive robust density estimates if treated carefully. In general, there is no fixed rule about a sufficient sample size, because strip-width estimates are highly dependent on the nature of the distribution of detection distances, and as few as 20 sightings may suffice to derive good density estimates provided that the data distribution is highly favourable (S. Buckland, pers. comm.). In neotropical primate communities, however, even a small sample size of 20 sightings/species may be unrealistic for species occurring in low group densities (e.g., Callimico, Pithecia spp., Lagothrix spp.), even if relatively labour-intensive surveys involving a cumulative distance >300 km are considered. One possibility for strengthening such small sample sizes is to pool the data from different surveys conducted in the same forest type and then stratify the analysis according to survey location (e.g., Peres 1997a). However, I recommend that initially the PD distribution at different sites should be assessed from survey location (e.g., Peres 1997a). However, I recommend that initially the PD distribution at different sites should be examined through analysis of variance, because of possible differences in the understory structure (and detectability) of different forests. An independent measure of understory density at different survey sites would also offer further support for data-pooling procedures. If additional data from independent surveys are simply unavailable, then I recommend that data on sample sizes (number of sightings), sampling effort (distance walked), and confidence intervals (CI) of density estimates should be presented in the final report to extent that dangerously large CIs can be tolerated.

**Data Analysis**

In the 1980s, TRANSACT (Laake et al., 1979) became the most popular comprehensive computer software for analysis of line-transect data from surveys of tropical forest vertebrates. More recently this program has been extended by DISTANCE (Laake et al., 1991; Buckland et al., 1993), which has become well-established and is relatively easy to use, as it is now available for a Windows platform (version 3.5). DISTANCE provides several estimators for computing group (and population) density from either PD or SD and sighting-angle data, and is currently the best available comprehensive software package dedicated for density estimates based on distance data. DISTANCE models the probability density function of the PD data by first selecting a key function and then a series expansion (Buckland et al., 1993), and handles all the necessary computations. An information criterion built into the software facilitates model selection for each grouped or ungrouped PD distribution. The Hazard-rate model with one of a number of mathematical adjustments is often the best density estimator for g(x) “shoulders” resulting from forest primate censuses (Peres 1997a), and performs reasonably well for most other non-primate species.

I hope this rather brief set of guidelines will prove useful in the planning and execution stages of future line-transect surveys of tropical forest vertebrates, which have become important biodiversity conservation assessment tools. This may also serve to stimulate the adoption of a standardized census protocol for further fieldwork in tropical wilderness frontiers, as previously remote primate populations become increasingly accessible to those wielding a pair of binoculars and notebook, rather than a shotgun.

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TAIL-USE IN CAPUCHIN MONKEYS

Dionisios Youlatos

Introduction

Capuchin monkeys, Cebus, are among the most widespread of the platyrrhines (Emmons, 1990). The brown capuchin, C. apella, has the largest geographic range, found east of the Andes from Colombia and Venezuela, south to Paraguay and northern Argentina (Emmons 1990). The white-fronted capuchin, C. albifrons, occurs in the upper Amazon and central Colombia, the white-faced capuchin, C. capucinus, occurs in northern Colombia and Central America, and the weeper capuchin, C. olivaceus ranges from Venezuela east to the Guianas and the north-eastern Brazilian Amazon. C. apella and C. olivaceus are sympatric in French Guiana.

Capuchins, like the large-bodied atelines, have a prehensile tail. Anatomical studies have shown, however, some morphological differences between the tails of Cebus and the atelines, suggesting that this feature has evolved twice in platyrrhines, and also that they may use their tails in different ways (Ankel, 1972; Grand, 1977; German, 1982; Rosenberger, 1983; Lemelin, 1995). There has been only limited quantitative study in tail use in the prehensile-tailed
platyrrhines. Bergeson (1995), studying free-ranging howler, spider, and capuchin monkeys in Costa Rica, found that tail use was closely associated with feeding and foraging activities in all three species, but that capuchins used their tails less than their sympatric atelines. Freese and Oppenheimer (1981) and Janson and Boinski (1992) reported that capuchins also use their tails during climbing down and gap-crossing sequences in locomotion and that they may suspend themselves by their tails during feeding. It would appear, therefore, that the prehensile tail is an adaptation mainly associated with feeding/postural activities, and much less so with locomotion.

Here I report on a study to determine the role and importance of the prehensile tail during locomotion and feeding and foraging postures in the brown capuchin, *Cebus apella*, and the wedge-capped capuchin, *C. olivaceus*.

**Study site, subjects, and methods**

This study was conducted at the 'Station des Nouragues' (4°05'N, 52°40'W) in French Guiana, 100 km south of Cayenne, the French department's capital. This site is characterized by lowland humid forest reserve, with patches of transitional, low, liana and pina palm forests (Zhang, 1995). Annual rainfall varies from 3,000 to 3,250 mm, and the mean annual temperature is 26.1°C. The study site is described in Zhang (1995).

Both *Cebus* species are found in the study area, with their home ranges widely overlapping (Zhang, pers. comm.). Data were collected between July and September 1993, during the transitional and early dry season (rainfall = 356 mm). Although previous studies have shown some differences in support and height use between age-sex classes (Robinson, 1986; Terborgh, 1983; Janson, 1988; Gebo, 1992), the sexes were not distinguished. Focal animal instantaneous sampling was carried out on adult individuals of both species (Altman, 1974). Each focal animal was followed for 15 min. The session was discontinued if the focal animal was lost from view before the end of the 15 minutes.

Locomotor behavior was recorded at 20-second intervals determined by a beep from a stopwatch, and postural behavior was recorded by time bouts (Cant, 1987). A bout ended when one of the recorded variables changed. Total samples sizes for *C. apella* were: 1,218 intervals of locomotion during travel, 219 locomotion intervals during feeding, 174 intervals during foraging, 226 min feeding postural behavior, and 17 min foraging postural behavior. Those for *C. olivaceus* were: 412 intervals of locomotion during travel, 138 locomotion combining feeding and foraging, and 15 min of feeding/foraging postural behavior. G-tests were used for statistical comparison of frequencies and p values of 0.05 or less were considered significant.

The behavioral contexts recorded were travel (moving to and from sleeping trees, as well as between feeding trees), feeding (searching for, acquiring and processing plant foods within a single or adjacent feeding trees) and foraging (animal prey searching and processing). Locomotor modes recorded were: *Quadrupedal walk and run, bipedalism, pronograde clamber, climb up, climb down, bridging, air*.

Postural modes recorded were: *sit, quadrum/tribidal stand, bipedal stand, suspensory*. When the tail was not anchored, I recorded tail free. When the tail was anchored beneath the animal (or above the level of the mid-thoracic region in orthograde postures) I recorded tail below center of gravity (CG). Lastly, when the tail was anchored above the animal (or above the level of the mid-thoracic region in orthograde postures) I recorded tail above CG.

**Locomotor Behavior**

Figure 1 shows the locomotor profiles of both species during travel, feeding, and foraging. In *C. apella*, quadrupedal walk/run was the principal locomotor mode used during travel (Fig. 1). The tail was rarely used (3.6% of the quadrupedal walk/run subsample [n = 307] in *C. apella*), and was kept in a curled-down position. Climbing/clambering (climb up, climb down, and pronograde clambering) was more important during feeding and foraging than during travel (travel vs feed: F = 75.851, p < 0.001, travel vs forage: F = 61.577, p < 0.001). The tail was used frequently in the climb down category (61.5% of the climb down subsample [n = 65] in *C. apella*). It anchored mainly above CG, supporting...
A bout's total locomotion was divided into feeding, foraging, and suspensory behavior, as defined previously for C. olivaceus (Grand, 1984). For each bout, travel, feeding, and foraging times were calculated. Variables were calculated as the mean of the bout values.

Figure 3. Use of the prehensile tail during locomotion. Labels on bars show percentages of use for each context (apella travel n = 1218, apella feeding n = 219, apella foraging n = 174, olivaceus travel n = 412, olivaceus feed/orage n = 138).

Figure 4. Use of the prehensile tail during feeding and foraging postural behavior. Labels on bars show percentages of use for each context (apella feeding n = 226 min, apella foraging n = 17 min, olivaceus feed/orage n = 15 min).

While tail-only hang or tail-2hindlimbs-forelimbs hang were used very rarely. Suspensory postures were adopted not solely for food acquisition but also for processing of mostly soft-food items. The tail was always used in suspension postures.

The prehensile tail was frequently used in feeding postural behavior (apella feed 65.8%, apella forage 54.3%, olivaceus feed/orage 59.2%), mainly anchoring below CG (Fig. 4). No significant difference was found in tail use during feeding postural behavior between the two species (G = 0.685, p = 0.71).

Discussion

Bergeson’s (1995) results from free-ranging sympatric howling, spider, and capuchin monkeys in Costa Rica, showed that capuchins used their tail much less (36.3%) than howlers and spiders (58.3% and 71.3%, respectively). Yoolatos (1994) reported similar results for sympatric howling and spider monkeys in French Guiana, with spider monkeys using their tail in 62% of the locomotor sample, and howling monkeys only 25%. These results are more or less similar to Bergeson’s, showing that there is a tendency for decreasing tail use from spiders to howlers and capuchins.

During locomotion, the tail was used very frequently in irregular modes (for example, climbing down, bridging) occurring on, below, and across slender substrates. In such modes, the tail was anchored mostly above CG suggesting that it supported a significant part of the body weight. Both bridging and climbing down require caution in the choice of different, diverse oriented substrates, and, as the principal body displacement is obliquely or vertically downward, both forelimbs and hind limbs are frequently loaded under tension. The tail grasp brakes the movement, secures body displacement, and offers an additional limb in weight distribution above slender substrates. Grand (1984) qualitatively underlined the importance of such functions for the prehensile tail, and Yoolatos (1993) showed the importance of tail use in bridging behavior in red howlers. These findings would appear to agree with previous qualitative observations and expectations for prehensile tail use (Rosenberger, 1983; Grand, 1977). Cebus may use its prehensile tail in a rather conservative way, and only in critical...
situations within the canopy. Anchoring of the tail above CG during locomotion suggests that the tail must be loaded under tensile and torsional forces. The frequent action of such forces is partly responsible for anatomical features indicating prehensility in **Cebus** tails.

The tail was used very frequently in feeding postures, more often than in locomotion. This suggests a close association between feeding postures and tail use as argued by Thorington (1967) and Rose (1974), and shown quantitatively by Bergeson (1995). In *C. apella*, sitting was the most frequently used feeding posture, as it is among platyrhines and catarrhines (Rose, 1974; Cant, 1986, 1988; Gebo, 1992). By sitting, an animal enlarges its contact surface with the substrate and simultaneously lowers its center of gravity (Grand, 1977). Anchoring the tail below the center of gravity lowers further the position of the center of gravity. The animal’s equilibrium is thereby enhanced by counteracting the destabilizing torques resulting from sitting on narrow substrates (Rose 1974). This biomechanical stability allows capuchins to both acquire and manipulate food items, as in cracking open hard-shelled fruit and nuts (Izawa and Mizzuno, 1977), breaking open branches, and unfurling leaves. Manipulation and processing of hard-shelled fruit is time consuming, which may also justify the exceptionally long sitting bouts of capuchins.

In general, suspensory postures help arboreal primates to expand their feeding and foraging activities within the terminal twigs (Grand, 1972; Janson and Boinski, 1992). In both capuchins, the tail was always used during suspensory postures. However, since tail-only postures are rare and very brief, the tail may help distribute the weight in 3 or 4 limbs in tail-assisted suspensory postures, thus stressing the other limbs less.

In both species, the tail was used to stabilize the animals in either above-branch, or suspensory feeding postures, but not as a supportive fifth limb as in atelines. During locomotion, capuchins seem to use their tails rather conservatively in risky crossings and downward movements, braking, and securing the movement of the body.

**Acknowledgments**

I am particularly indebted to Dr. P. Charles-Dominique and Pr. J.-P. Gasc for permission to work at the Nouragues Research Station, French Guiana. Field research was funded by CNRS-URA 1137, Laboratoire d’Anatomie Comparée, Muséum National d’Histoire Naturelle, Paris, France, and “Action Spécifique Guyane”, Muséum National d’Histoire Naturelle, Paris, France. Drs. J. G. H. Cant, D. Dunbar, J.-P. Gasc, F. Jouffroy, and B. Hallgrimsson kindly provided valuable comments on previous drafts of this report.


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AGGRESSION AND DOMINANCE REVERSAL IN A CAPTIVE ALL-MALE GROUP OF CEBUS APELLA

Antonio Christian de A. Moura

Capuchin monkeys, Cebus, live in multimale-multifemale societies, with a dominant male and a dominant female (Pitelka, 1980; Ishida, 1984; Hongo, 1983). Hierarchies are based mainly on age, size and sex, and older and larger individuals usually have higher rank (Freese and Oppenheimer, 1981). In the brown capuchin monkey, C. apella, the dominance order among males is directly related to age (Izawa, 1980, 1990). Aggressive interactions within the group are rather infrequent (Izawa and Sato, 1997; Izawa, 1980), and dominance reversal events are rare (Robinson and Janson, 1987). However, Santini (1984), studying a captive C. apella group that had been split into three sub-groups, observed aggression among males when the group was re-united. After reunion the males skirmished among themselves in order to attain the alpha position. Byrne et al. (1996) reported on a dominance reversal and aggression among males in a captive C. apella group, but the reasons for the initial fight between the higher-ranking males were unknown. Izawa (1990) related two cases of dominance reversal in a wild group of C. apella. In one case a younger animal was supplanted by an older animal that had entered the group and in the other, reversal occurred between animals of the same age, but one was larger than the other. Moreover, neither of the dominance reversals involved the alpha male. In this note I relate a case of aggression and dominance reversal in a captive all-male group of C. apella apparently due to the increase in size of a juvenile.

The group was composed of three unrelated males: Chico, more than 20 years old, the dominant male; Tadeu, more than eight years old; and Paulinho about five years old, a juvenile-subadult. They were maintained at the Laboratório Tropical de Primatologia (LTP) at the Federal University of Paraíba, in a large wire mesh enclosure (3.8 m x 4.2 m x 2.6 m), containing natural branches and platforms. They received three meals a day. The enclosure was subject to normal environmental and climatic conditions, since the LTP is located in a 5 ha remnant of coastal Atlantic forest. The animals had lived together, for at least two years.

The dominance order in the group was related to age, and the relationships between the group members was generally peaceful. In spite of this, Tadeu occasionally bullied Paulinho, mounting him, and sometimes barring his access to food. On 27 October 1996, there was a fight involving Paulinho, Tadeu and Chico. Paulinho and Chico attacked Tadeu, whose face was injured as a result. It was not possible to determine who started the fight nor who was more aggressive. However, most of Chico's attacks against Tadeu were prevented by the keepers using a hose to direct water at him, and likewise to stop Paulinho's attack. Due to the injuries suffered, Tadeu was isolated for medical treatment. About one week later he returned to the group. After that, on several occasions Tadeu avoided Paulinho, he became frightened of him, and usually screamed when Paulinho approached him. Tadeu, as such, became subordinate to Paulinho. Interestingly, after this event, when a person approached the cage only Chico and Paulinho would go to the netting to "greet" them.

On one occasion, the keepers observed Paulinho blocking Chico's access to food. On 19 May 1997, Paulinho attacked the dominant Chico. The fight was serious, and Chico was wounded on the right hand and suffered a perforation on the right leg and some injuries on the face. Externally Paulinho showed no sign of injury. Following this event Paulinho was isolated and transferred to another facility.

In the two events reported here the severity of aggression was unusual. The C. apella males often use aggressive vocalizations and facial intimidation in agonistic interactions, physical injury is rather infrequent (Santini, 1984); Izawa (1980, p.453), for example, never found any injuries in the animals he studied in wild (but see Byrne et al., 1996).

Although the reasons for the aggression and dominance reversal reported here are unknown, I believe that it was favored by Paulinho increasing his body size. The captive conditions may also have contributed, but hormonal changes due to puberty (increasing testosterone levels) may have been responsible for Paulinho's aggressiveness, and his increase in body size could have made him more self-confident. However, his aggressiveness may be explained merely by a more aggressive personality.

Interesting was the active participation of the alpha male during the first aggressive outbreak. Janson (1984) observed a dominant male intervening to support juveniles, although an older unrelated juvenile was never defended by the alpha male. A primate male's rank may change many times
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A Twin Birth in Cebus xanthosternos (Wied, 1820) (Cebidae, Primates)

Alice Chisnall
Adelmar F. Coimbra-Filho
Anthony B. Rylands
Eduardo C. Nogueira Rubião

Cebus is a very wide ranging genus but the taxonomy of the four to five species recognized today is still poorly understood. The tufted brown capuchin, C. apella, especially has resisted a modern systematic evaluation mainly due to extreme individual variation (Hill 1960; Torres, 1988). For many years, the nominate subspecies has been ascribed to the entire Amazon, although at least four C. apella subspecies were recognized from the Atlantic forest, in Brazil, Paraguay and Argentina (C. a. xanthosternos, C. a. robustus and C. a. nigrivitus) and the central savanna (cerrado) of Brazil (C. a. libidinosus) (Mittermeier et al., 1988, Rylands et al., 1995). Of these, the form xanthosternos formerly occurred in a large area extending from the Rio Jequitinhonha in the south, and throughout the Atlantic forest of the state of Bahia, probably north and inland to the Rio São Francisco (Hill, 1960; Coimbra-Filho et al., 1992a, 1992b). The karyotype of the form xanthosternos is well differentiated from other forms of tufted capuchin (Seuánez et al., 1986; Matayoshi et al., 1987) and Mittermeier et al. (1988) and Rylands et al. (1995) listed it as a full species. Today hunting and habitat loss have resulted in a severe decline in their populations and geographic range, and they are disappearing rapidly even in their last stronghold, the cocoa growing region of southern Bahia (Mittermeier et al., 1982; Coimbra-Filho, 1990; Oliver and Santos, 1991; Coimbra-Filho et al., 1992a, 1992b; Rylands et al., 1993). Its status is recognized as "Critically endangered" by the World Conservation Union (IUCN) (IUCN, 1996).

A small colony of C. xanthosternos was begun at the Rio de Janeiro Primate Center (CPRJ-PEEM) in 1984, in collaboration with the World Wildlife Fund -US (WWF-US) and Wildlife Preservation Trust International (WPTI), and Fauna and Flora International (FFI). Its critical status, and the large number found being maintained as pets in southern Bahia, however, argued for the expansion of this colony and the establishment of breeding colonies for its conservation ex situ elsewhere (Santos and Oliver, 1991; Oliver and Santos, 1991; Santos and Lernould, 1993a). The Brazilian Institute for the Environment (Ibama) established an International Recovery and Management Committee for the species in 1992 (Santos and Lernould, 1993a, 1993b).

The first specimens of C. xanthosternos arrived at CPRJ in 1980, and the first birth was registered in October 1984 (a female CPRJ 596). Two groups were then established and the beginning of the Center’s colony as such. The founder population was comprised of six young and subadult individuals, and 24 births have been registered since then, from two males and ten females between 1984 and 1997. There was a problem with this birth, to a primiparous female (CPRJ 320), as the baby was born without a membranous umbilical chord (Gomat 1991). This was the first single offspring of the colony.

With the increase in the colony's population, the population of Alouatta caraya (v. boliviensis) and Brachyteles arachnoides have also been introduced to the new forest (Callimico gaigei, 1991), P. fusciceps (v. putnami, pers. comm. Israelo Mc Neel), Callimico coquilleti (1991), and Coendu olivaceus (1991). The birth rate is significantly lower than for the brown capuchin, and three twins have been born. A twin birth only one of the babies was apella reported by Knogler (1997). The infants were reported by Knogler (1997). The infants were only sparsely covered in membranous umbilical chord (Gomat 1991). This was the first single offspring of the colony.

The birth rate is significantly lower than for the brown capuchin, and three twins have been born. A twin birth only one of the babies was apella reported by Knogler (1997). The infants were reported by Knogler (1997). The infants were only sparsely covered in membranous umbilical chord (Gomat 1991). This was the first single offspring of the colony.
Table 1. Development of the twin offspring of *Cebus xanthosternos* during the first 20 months.

<table>
<thead>
<tr>
<th>Father</th>
<th>Mother 1084</th>
<th>1739</th>
<th>Twins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>15 years</td>
<td>9 years</td>
<td>12 mo</td>
</tr>
<tr>
<td>Weight (g)</td>
<td>3,900</td>
<td>3,000</td>
<td>1,600</td>
</tr>
<tr>
<td>Total body length (mm)</td>
<td>835</td>
<td>860</td>
<td>760</td>
</tr>
<tr>
<td>Tail length (mm)</td>
<td>460</td>
<td>500</td>
<td>440</td>
</tr>
<tr>
<td>Right foot (mm)</td>
<td>122</td>
<td>120</td>
<td>110</td>
</tr>
<tr>
<td>Ear (mm)</td>
<td>33 x 40</td>
<td>30 x 39</td>
<td>30 x 36</td>
</tr>
<tr>
<td>Upper canine</td>
<td>14</td>
<td>8 mm</td>
<td>7</td>
</tr>
<tr>
<td>Lower canine</td>
<td>11</td>
<td>8 mm</td>
<td>7</td>
</tr>
<tr>
<td>Distance upper canines</td>
<td>30.0</td>
<td>24 mm</td>
<td>17</td>
</tr>
<tr>
<td>Distance lower canines</td>
<td>23</td>
<td>18</td>
<td>21</td>
</tr>
</tbody>
</table>

Source: CPRJ/FEEMA animal register.

Table 1 shows the development of the twin offspring of *Cebus xanthosternos* during the first 20 months. Each twin generally places itself with its head on different sides of the mother, and are only rarely aligned with their heads on the same side. Only around the fifth month did the offspring begin minor escapes away from the mother, with some rare and brief occasions when they were carried by other group members. This only became more frequent when the young were one year old and already being weaned. At 20 months old, they still rode on the mother's back or occasionally grabbed hold of another group member when they felt threatened. The father (CPRJ 474) was never observed to participate in the carrying or socialization of the young, a feature observed in all the *Cebus* births recorded at the Center.

Acknowledgments: The authors are most grateful to Dr. Russell Coffin for his substantial help in financing the maintenance of the *C. xanthosternos* colony, also to Ilmar B. Santos and William L. R. Oliver for their help in setting up the colony (supplying confiscated animals), to Drs. Jean-Marc Lernould (Parc Zoologique et Botanique, Mulhouse-France) and Roland Wirth (Zoological Society for the Conservation Species and Populations) for their help in the construction of the cages, and to Maria Iolita Bampi (Ibama) for her support in the bureaucratic and legislative aspects involved in establishing the colony and who was instrumental in setting up the International Recovery and Management Committee for the species (Edict 111/92, 16 October 1992).


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**News**

**ESTACIÓN BIOLÓGICA CAPARÚ - COLOMBIAN AMAZON**

In 1984, after many years of planning, I established the nucleus of a research station in the Colombian Amazon on the lower Río Apaporis, not far from the Brazilian border. The idea was to pursue long-term studies of primates and other endangered animals, clarifying some of the interactions that these animals have with their plant communities, and training young Colombians in field techniques. The primate community at Caparú is made up of eight species: *Aotus sp., Callithrix torquatus, Saimiri sciureus, Cebus apella, Cebus albifrons, Cacajao melanocephalus, Alouatta seniculus*, and *Lagothrix lagotricha*. My first priority was to begin a study of *Lagothrix lagotricha*, which was common and easy to find in this region, a fact I had first established during a preliminary visit in 1980 (Fig. 1).

The site of the Estación Biológica Caparú (1°05.55'S, 69°30.8'W) is in lowland (200 m) forest in a transition zone between the ancient rocks and soils of the Guyana Biogeographical Province and the Amazonian Biogeographical Province (*sensu* Hernández-Camacho *et al.*, 1991) in a blackwater drainage, thus a site of comparatively low soil fertility. The station itself sits on an ancient Pleistocene river terrace, which has its own particular plant community of lower diversity when compared with the more inland Plio-Pleistocene soils of the typical rolling red clay hills which support the highest diversity of plants in the area (Ibarra *et al.*, 1977; Defler and Defler, 1996). The buildings are 900 m north of Colombia’s largest freshwater Amazonian lake, the 24-km Lago de Taraira, which protects a rich community of endangered species such as the Amazonian manatee (*Trichechus inunguis*), the giant river otter (*Pteronura brasiliensis*), the black cayman (*Melanosuchus niger*), and the pirarucú (*Arapaima gigas*). The greatest source of human disturbance had been hunting and fishing by neighboring Brazilians, which mostly ceased when we began our activities there. This was essentially a forgotten corner of Colombia with little colonization and only occasional hunting and fishing by indigenous people.

Our first Colombian student began her bachelor’s thesis work in 1984, and she has been succeeded by about 10 other thesis students, while we have taught two field courses with the participation of other Colombian biologists (Forero, 1986; Muñoz, 1991; Ardila and Flórez, 1994; Palacios and Rodríguez, 1995; Palacios, 1997; Rodríguez, 1997; Barrios and Mantilla, 1998; Patiño, in progress; Gómez, in progress; Stephen, in progress). Most of the thesis work has been with primates, although there has been work with fishes (Corea, in progress) and giant otter (Botello, in prep.) as well. An independent project of an assistant resulted in a valuable collection of butterflies (Lora, 1991), while an on-going doctoral project from a student from the University of London has made an extremely valuable collection of frogs, lizards and snakes (with 1 or 2 new herp species to be described) (Stephen, in prep.).

Sara Bennett-Defler has worked with the avifauna (Bennett-Defler, 1994; Bennett-Defler and Defler, 1997) as well as completing a four and one-half year phenological study of the major plant communities (Bennett-Defler, in progress). I have concentrated on woolly monkeys (*Lagothrix lagotricha*) and black-headed uacari (*Cacajao melanocephalus*), as well as primate conservation, for the past few years (Defler, 1989a, 1989b, 1989c, 1990, 1991, 1994a, 1994b, 1995a, 1995b, 1996a, 1996b, in press; Hernández-Camacho and Defler, 1989; Palacios *et al.*, 1997), and had recently begun studying *Saguinus inustus*, although problems on the lower Apaporis have made the resolution of some of the research a rather difficult problem.

For several years we worked with the Colombian National Parks for the declaration of the entire region of the lower Apaporis river as a National Park (Defler *et al.*, 1991), until the project was opposed by the Indian community upriver, which wanted to annex the land into their own Indian Reserve. In June 1998 all of the land of the lower Apaporis, including the Estación Biológica Caparú was declared part of the more than 1,000,000 ha Yaiqogú-Apaporis Indian Reserve. In a meeting with the Association of Captains of Yaiqogú-Apaporis (ACTIYA) in May, several NGOs and government conservation organizations signed an agreement with ACTIYA to develop environmental zoning for the lower
Apaporis which would define an Indigenous Faunistic Reserve where hunting activities would be strictly controlled and the area of the station and Taraira Lake would be managed as a nature preserve. Funds for this joint project are currently being sought.

Since 1984 we have occasionally received orphaned monkeys representing species of this area, and these we have raised by hand in a free-ranging state. Subtle behaviors of these tame animals have become part of our knowledge of these species’ repertoire (Defler, in press). We have also been able to collect other interesting data from these monkeys such as woolly monkey blood pressure and the estrus cycle of Callitriche tarsusi. Some details of the process of reintroduction for some of these species have become clear (Defler and Defler, in press).

Presently we are attempting to identify funds to help in basic upkeep of the station. The Fundación Natura has become part of the alliance along with the Corporación Regional del Desarrollo Sostenible del Norte y Oriente de Amazonia (C.D.A.A.) (in charge of natural resources for this part of the Amazonia), the Instituto Amazónico de Investigaciones de la Universidad Nacional de Colombia (IMANI) and Conservation Internacional de Colombia in attempting to strengthen Caparí in the face of its present adversity.

The Fundación Natura has joined forces with IMANI for the administration of the Estación Biológica Caparí for the future with the hope that research, education and conservation can be strengthened in such a way that the region and nation benefit from our activities.

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1997 EUROPEAN REGIONAL STUDBOOK FOR THE
SPIDER MONKEYS ATELES SSP. AND AN EEP FOR
ATELES FUSCICEPS ROBUSTUS

The third edition of the European Endangered Species Pro-
gram (EEP) studybook on spider monkeys subspecies, Ateles
ssp., has been published by the Doué la Fontaine Zoological
Park. It was compiled by Sophie Durlot, eco-ethologist,
and supervised by M. Pierre Gay, Director of the Doué Zoo
(France). M. Pierre Gay is the Ateles ssp. Studybook keeper
and EEP coordinator for Ateles fusciceps robustus. This
edition presents information on Ateles biology and status in
the wild, and provides historical and current surveys of the
captive populations. Data on births, deaths, and trans-
actions during the year 1996 are given for each spider mon-
key subspecies: Ateles belzebuth belzebuth, Ateles
belzebuth chamek, Ateles belzebuth hybridos, Ateles
geoffroyi (all ssp.), Ateles fusciceps robustus, Ateles
paniscus and Ateles hybrids. For each of them, the situa-
tion in Europe and in the other regions (Australia, North
America, South Africa) are summarized along with the rec-
ommendations of transfers proposed at the annual EEP
congress held in Berlin, Germany, 2-3 September, 1998.

Demographic and genetic analyses of the Ateles fusciceps
robustus captive population are presented. This subspe-
cies is classified as “Endangered” following the Mace-Lande
criteria. It can be found from Panama to the west coast of
Ecuador. The European captive population began in 1964
with several imports from Colombia and Panama up to 1980.
The first animal born in captivity was a female registered in
1967. The population today has reached 136 (50.83.3)
individuals in 34 institutions and 128 (45.80.3) of these animals
are in 25 EEP participating institutions. The sex ratio is 1.80.
but both sexes are distributed fairly evenly over the vari-
ous age classes. Males show a higher fecundity rate than
females during their life span; they begin reproducing ear-
lier. The EEP population average lambda value (the rate of
population change per year) over the last 10 years is 1.025,
including imports and exports. This shows, along with the
other demographic parameters, that the captive population
is growing in the European region. There are 28 founders
(18 are alive and still reproducing) and 13 potential
founders. These founders have formed genetic lines with
descendants distributed through the participating institu-
tions. Recommendations of transfers are based on the in-
breeding coefficients and optimization of poorly represented
genetic lines. Applying this breeding policy for all captive
populations reduces risks of inbreeding and the loss of wild
genomes.

Sophie Durlot, 04 rue Jean-Baptiste Tubi, 78500 Noisy-le-
Roi, France, e-mail: <Sophie.Durlot@wanadoo.fr>, and
Pierre Gay, Parc Zoologique de Doué la Fontaine, route de
Cholet, 49700 Doué la Fontaine, France.

References
the Spider Monkeys, Ateles ssp., Ateles fusciceps
robustus E.E.P. Number 3, 115 pp. Doué la Fontaine Zo-
ological Park, France. Data through 31 December 1997.
Gay, P. 1995. European Regional Studbook for the Spider
monkeys Ateles ssp., Ateles fusciceps robustus E.E.P.
Number 2, 94pp. Doué la Fontaine Zoological Park,
France. Data as of 31 December 1995.

SOUTH AMERICAN ATELES REGIONAL STUDBOOK FOR
NORTH AMERICA - 1997

Kristi Newland of the Memphis Zoo and Aquarium has
published the second historical listing and the 1997 stud-
book (data current through 31 December 1997) for the South
American Ateles in captivity in North and Central America
and the Caribbean (including Canada, United States,
Mexico, Trinidad, Bermuda, Belize, Cuba, and Panama).
Following an introduction, including descriptions of the
species and aspects of their captive care, biology, habitats
and distributions, historical listings are given for Ateles
belzebuth (subspecies not identified), A. b. belzebuth, A. b.
chamek, A. b. hybridos, A. b. marginatus, A. paniscus, A.
fusciceps (subspecies not identified) and A. f. robustus.
According to the records available, *A. f. fusciceps* has never been held in captivity in the North American region. Age pyramids and summaries of fecundity and mortality are given for each.

No living *A. b. marginatus* were registered, and only five (3.02) were recorded in the historical listing. The living captive populations for some other *Ateles* are minimal. An adult male *A. belzebuth* hybrid lives in the Ralph Mitchell Zoo, Independence, KS. The International Animal Exchange, Farmdale, MI, maintains a female *A. b. belzebuth* and Bramble Park Zoo, Watertown, SD, a female. Thirteen *A. b. chamek* (4.6.3) are maintained in three institutions, International Animal Exchange, the Gladys Porter Zoo, Brownsville, TX, and NBJ Park, Bulverde, TX. Twenty-eight *A. b. hybridus* (10.18.0) were living in 12 institutions, the largest collection (2.7.0) being in the Zoological Society of Trinidad and Tobago, Port of Spain, Trinidad. Six *A. fusciceps* (subspecies undetermined) (1.3.2.) are included in the historical listing but no live animals were registered. Relatively large numbers (292) of *A. f. robustus* have been kept in captivity in the North American region (104.160.28). On 31st December 1997, the studbook recorded a population of 125 (44.74.7) in 33 institutions, the largest collection being in the Sedgwick County Zoo, Wichita, KS. A total of 169 *A. paniscus* (59.69.41) were included in the historical listing, but today there are very few in captivity in the region: just five animals (2.3.0) in four institutions. The large numbers recorded in the past may be a result of misidentification; black spider monkeys in general were liable to be identified as *A. paniscus*, and many were perhaps *A. f. robustus* or the, also all-black, form *chamek*, previously considered a subspecies of *paniscus*.

The appendices include information on a program for karyotyping the entire living spider monkey collection in the North American region, taking into consideration the fact that pelage variability can sometimes make species/subspecies identification difficult. For information on this program, contact: Dr. Jean Dubach, Brookfield Zoo, Brookfield, Illinois 60513, USA, Tel: 708 485 0263 x 502, Fax: 708 485 3532. For copies of the studbook, please write to Kristi Newland, Memphis Zoo and Aquarium, at the address below. A special appeal is made to zoo and breeding institutions which are maintaining spider monkeys but which have not been included in this AZA register to contact Kristi Newland, Official Studbook Keeper and Population Manager for South American spider monkeys for the AZA/WCMC.

Krissti Newland, Memphis Zoo and Aquarium, 2000 Galleyway, Memphis, TN 38112, USA, Tel: 901 725 3400 x 3119, Fax: 901 725 9305. E-mail: <knewland@memphiszoo.org>.

Reference

### Nacimiento de Gemelos de *Saguinus labiatus* Observado en su Hábitat Natural

Dos gemelos estaban naciendo en un grupo de *Saguinus labiatus* que se observan con parte de un estudio comparativo de *Callimico goeldii*, *Saguinus labiatus* y *Saguinus fuscicollis*. El estudio es conducido en Bolivia en el Departamento Pando, en la provincia Nicolas Suarez, el Municipio de Bolpebra, 2 km noroeste del Río Tahuamanu y 63 km suroeste de la ciudad de Cobija.

El grupo de cinco individuos de *S. labiatus* estaba siendo seguido el día 10 de noviembre, 1998. Observaciones de el grupo empezó a las 07:10 de la mañana. A las 08:35 los dos machos y una embra estaban descansando juntos, como de pronto los dos machos se alejaron. A las 08:40 la embra estaba observada solita en un arbol a la altura de aproximadamente 25 m. Ella estaba en una posición sentada agachada invirtiendo la salida del primer bebé. El bebé nació y ella lo tubo por menos de un minuto en sus manos lamienandolo. Después el bebé subió encima de la espalda de su madre. Luego, ella se traslado a un gajo aproximadamente 5 m mas bajo en el mismo arbol. Ella primero estaba observada en cuatro pies pero después volvió en un posición sentada agachada de nuevo. A las 08:51 el segundo bebé nacio. El segundo bebé inmediatamente subió encima de la espalda de su madre. A las 08:54 un otro animal vinó cerca de la madre y miró los bebés. Despues tres mas animales regresaron y a las 08:55 la madre salió con ellos con los bebés encima de su espalda. La madre estaba seguida por dos machos, y ellos querian cargar los bebés pero ella no permitía.

A las 11:07 un bebé cayó al suelo de 6 m de altura cuando la madre estaba saltando de un arbol a otro. Todos los miembros del grupo empezaron a alarmaarse con la caida del bebé y miraron el suelo. Seis minutos despues un macho bajó al suelo y recogió el bebé encima de su espalda y subió en los arboles. Por las siguientes horas el grupo viajó lentamente y paraba frecuentemente en bejucales densos en los arboles a la altura 15 m hasta 25 m. A las 14:30 ellos estaban escondidos y no era posible por mas observaciones por el día. Por los siguientes días el grupo estaba seguido con muchas dificultades porque ellos descansaban casi siempre en vegetación densas y altas. Durante esos días los bebés estaban cargados avesos juntos encima de un adulto y otros oportunidades separadas encima de dos animales. Este grupo será observado por los siguientes cuatro meses para mirar el desarrollo de los bebés.

### Birth of *Saguinus labiatus* Twins Observed in Their Natural Habitat

Twin infants were born into a group of *S. labiatus* which are being observed as part of a comparative study of *S. labiatus*, *S. fuscicollis* and *Callimico goeldii*. The study is being conducted in the Department of the Pando, in north-west Bolivia, 2 km north of the Río Tahuamanu and 63 km south-east of the city of Cobija.

A group of five *S. labiatus* were followed and the group began climbing the tree and sitting with the infants. The infant was seen in a tree and was carried by the mother who was sitting on the tree. The mother returned to the ground and approached with two infants. Both approached them to the ground. At 08:35 two of the group members joined and began small jumps and were in the trees. The group was in trees hidden in the branches. On the 11:07 an infant fell from 6 m to the ground. The mother was jumping from one tree to another. All the group members were alarmed and watched the fall. After six minutes a male jumped to the ground and picked up the infant and jumped back to the tree. In the following hours the group traveled slowly and stopped frequently in dense thickets in the trees at a height of 15 m to 25 m. At 14:30 they were hidden and not possible for further observations for the day. For the following days the group was followed with many difficulties because they rested most of the time in dense thickets and tall vegetation. During these days the babies were held by the adults in the trees and other opportunities were observed for two animals. This group will be observed for the next four months to see the development of the babies.
A group of five individuals of *Saimirius labiatus* was being followed on November 10, 1998. Observations of the group began at 07:10 am. At 08:35 two males and one female were resting together, but the males left the female soon after. At 08:40 the female was observed resting alone in a tree at a height of about 25 m. She was in a crouched sitting position examining the birth of the first infant. After the infant was born, the mother held it in her hands licking it for less than a minute, and it then climbed onto her back. The mother then moved to a branch 5 m lower in the same tree. She was now seen standing on four feet, but then returned to a crouched sitting position. At 08:51 the second infant was born. It immediately climbed onto its mother’s back. At 08:54 another tamarin approached her and looked at the infants. Three other group members then approached, and at 08:55 the mother left with them with the two infants on her back. She was followed by two males. Both attempted to carry the infants, but she did not allow them to. At 11:07 one infant fell to the ground from a height of 6 m when the mother leapt between two trees. All the group members began to alarm call at the infant’s fall, and began scanning the ground. Six minutes later a male descended to the ground, retrieved the baby onto its back, and went back up into the trees. For the following hours the group travelled slowly and rested mostly in dense lianas in trees at heights of 15 to 25 m. At 14:30 the group was hidden, and no more observations were possible for that day. On the following four days the group was followed with difficulty as they continued to rest frequently high up in dense vegetation. During these days the infants were sometimes carried together, but on other occasions separately by two different adults. Observations will continue for a further four months to observe the development of the twins.

**Ediljo Nacimiento Bezerra**, Correo Central, Cobiija, Departamento Pando, Bolivia, and Leila M. Porter, Doctoral Program in Anthropological Sciences, Department of Anthropology, State University of New York (SUNY), Stony Brook 11794, USA.

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**NEW WORLD PRIMATES OF THE ARGENTINEAN MUSEUM OF NATURAL SCIENCES “BERNARDINO RIVADAVIA”, BUENOS AIRES**

The Argentinean Museum of Natural Sciences (MACN) was founded in December 1823 (Gonzalez, 1980). We registered 555 primate specimens under different preservation conditions. This report is the result of the revision of the New World Primate collection composed of 405 specimens, belonging to three families, following Ford (1986):

- **Cebidae** (64% of the total Platyrhine collection), with the following species (number of specimens in brackets): *Cebus* sp. (6); *Cebus apella* (31); *C. a. paraguayanus* (69), *C. a. nigritus* (26), *C. a. pallidus* (5), *C. a. ibidinosus* (1), *Saimiri* sp. (13), *Saimiri boliviensis* (6), *Aotus* sp. (39), *Aotus azarae* (21), *Calliebus* sp. (29), *Calliebus donacophilus* (6), *Atelidae* (26%), *Pithecia* sp. (2), *Alouatta* sp. (14), *A. caraya* (60), *A. fisca* (10), *A. seniculus* (3), *Ateles* sp. (6), *A. geoffroyi* (3), *Brachyteles arachnoides* (1), *Lagothrix* sp. (5), *Callitrichidae* (10%), *Callithrix* sp. (20), *C. melanura* (5), *C. jacchus* (5), *Leontopithecus* sp. (3), *L. rosalia* (2), *Saimiri* sp. (1).

Our work with each specimen included detailed observation, evaluation of its preservation status, comparison of the information on the specimen label and that registered in the catalogue, and the inclusion of all relevant information in a computerized database. Regarding the composition of the collection, 31% of the specimens have both skull and skin preserved; 24% only the skin, and 45% is represented solely by the skull. There are also 15 specimens in alcohol, including: 10 *Cebus* sp., 1 *Aotus* sp., 3 *Saimiri* sp., and 1 *Callithrix* sp. Unfortunately, this wet collection is in very poor condition which, added to the lack of information about their procedence, makes it the least valuable part of the platyrhine collection. Twelve skulls that are currently on loan outside the museum, have not been analyzed. They are: 2 *Ateles* sp., 2 *Lagothrix* sp., 2 *Aotus* sp., 3 *Calliebus* sp. and 3 *Leontopithecus* sp.

A total of 79% of the specimens were collected by Museum members and associated collectors; 5% came from exchange with other Latinamerican museums; 1% has its origins in a number of zoos; and the remaining 15% come from unknown collectors. There are no primate type specimens in the collection. Based on this study, we hope to highlight the value of this Museum, housing the largest and most important platyrhine reference collection in Argentina.

**Acknowledgements:** We are grateful to the Mammal Division of the Argentinean Museum of Natural Sciences, and especially to Drs Martha Piantanida and Gabriel Zunino and Lic. Olga Vaccaro for providing the access to the collection and for useful comments on this report.


**References**


A Working Group for the Pied Tamarin, *Saguinus bicolor*

The Brazilian Institute for the Environment and Renewable Natural Resources (Ibama) has established a special, international consultative working group for the conservation and management of the pied tamarin, *Saguinus bicolor* (Edict No. 1588, 29th December 1998). The coordinator is Dr. Andrew Baker, Curator of Primates and Small Mammals of the Zoological Society of Philadelphia, and the substitute coordinator is Alcides Pissinatti, Director of the Rio de Janeiro Primate Center (CPRJ/FEEMA). The members of the group include besides: Maria Iolita Bampi, Head of the Department of Wildlife, Ibama; Leobert E. M. de Boer, Apenheul Primate Park; Rosmarie de Carvalho Mamede, Department of Wildlife, Ibama; Anthony B. Rylands, IUCN/ SSC Primate Specialist Group and Conservation International do Brasil; and Rosana S. Subirá, University of Brasilia; as well as a representative of the Brazilian Society of Zoological Gardens (SZB). The stated aim of the group is to “set up strategies for research, management and protection of *S. b. bicolor* in order to establish a genetically self-sustaining population”.

This Working Group arose from a recommendation arising from a meeting (1st Meeting for the Establishment of Measures for the Recovery and Management of *Saguinus bicolor*), held in the Botanical Garden, Rio de Janeiro, 11 June 1997, presided by Maria Iolita Bampi, representing Ibama. The research conducted so far on its distribution and ecology was reviewed by Silvia Egler and Rosana Subirá, and Alcides Pissinatti (Brazil), Andrew Baker (USA) and Leobert E. M. de Boer (Europe) reported on the status of the species in captivity. In Brazil, the first colony was formed at the Rio de Janeiro Primate Center (CPRJ) from four wild born founders received in 1980 (1) and 1985 (3), one of which is still alive. Further founders were obtained in 1993 (1) and 1996 (11). Breeding was very successful, and in June 1997 a further nine Brazilian zoos and breeding facilities were also participating in the breeding program. The population in the US was begun with six tamarins sent by the CPRJ to the Philadelphia Zoological Garden in 1993. By the end of 1995 there were about 25 individuals in four zoos in the US and Canada. The European population arose from three colonies, at the Jersey Wildlife Preservation Trust (received animals from the CPRJ), the Mulhouse Zoo, France, and at the University of Bielefeld, Germany. In June 1997, the European population was estimated at 35-40 animals. Andrew J. Baker is the International Studbook Keeper.


The Species Survival Commission (SSC) Species Information Service (SIS)

Since 1994, SSC has, through its volunteer network and guided by its Strategic Plan, been developing a Species Information Service (SIS). A Working Group of SSC volunteers, led by the Lagomorph Specialist Group Chair Andrew Smith and Steering Committee member Luigi Boitani, has examined the capacity and information needs of the volunteer network to participate in SIS and has analyzed in detail SSC’s current services to the conservation community and how these products and analyses could be enhanced through SIS.

The proposed program envisions a world-wide Species Information Service (SIS) that is easily accessible to the conservation and development communities (scientists, natural resource managers, educators, decisionmakers, and donors). Thousand of species conservation experts throughout the world will have the capacity to equitably, proactively, and effectively contribute to the conservation of biodiversity with quality information provided to the conservation and decision-making processes. The network will be a decentralized means of sharing information that can be accessed by users interested in information at different geographical scales (global, regional, national, and subnational), and that is flexible so as to be adaptable to the user’s needs.

A single (one-size-fits-all) system to suit the capabilities and expectations of all Specialist Groups is neither possible nor desirable, thus, planning has incorporated a flexible approach to the architecture of the SIS. The modular data management system ensures minimum requirements and is adaptable toward the needs of individual Specialist Groups. The modular system sets standards to facilitate data exchanges while allowing Specialist Groups to build in components that meet particular requirements relevant to the taxa under their purview. Particular attention in the development process is also being given to aspects of quality assurance and the protection of intellectual property rights of data owners.

At present, a full-prototype SIS modular software package has been developed and provided to Specialist Groups for review. A small planning group met in March to execute a logical framework analysis, a process that helped to clarify SIS development and implementation activities, SIS partners, and SIS audiences. Included among the agreed activities are software revisions based on the aforementioned review, a workshop to test and analyze this second version, and distribution of the working release version. SIS will be supported by a small Secretariat unit, which will be responsible for providing training and other capacity-building activities to Specialist Groups, links to BCIS, and assistance in the development of SIS information products. The principal outcomes of the planning meeting were a detailed program plan and funding proposal. Staff and Working

Page 30 

Group of Specialists for the Conservation of Endangered Species (SCS) 

Links to the Conservation of Endangered Species (BCIS)

Concurrent development of plans for the development of a Species Information Service (SIS) is making it possible for the SCS to develop a network of experts to share information and experience on a wide variety of species and their strong scientific, biological, and conservation attributes. The information was obtained from the International Association for Biological Information (IABIN) and the System of Biological Information (SBI) coordinate by the BCIS.

BCIS provides an international information system that facilitates the sharing of data on endangered species held by various organizations. The metadata has been developed and is being used by the pilot project of the Norwegian Red List (NOR/RødList). The BCIS will be able to select key leaders and resources from globally through the network to contribute to the development of information system. The project is based on the use of systematic and scientific information, including the development of software tools for REGA (a central database for recording...
Group members are now beginning active fundraising to enable SIS implementation.

**Links to the Biodiversity Conservation Information System (BCIS)**

Concurrently, the relationship between SIS and BCIS is developing in two ways: 1) data management and custodianship polices and guidelines are being developed in tandem to ensure complementarity between SIS and other BCIS members; 2) BCIS is emerging as a forum for linking SCS's species conservation objectives to the ecosystem, protected areas, and legal conservation objectives of the BCIS members, thus increasing the member's collective influence on a wide range of policy fora. The complementary strengths and diversity of the BCIS members are proving to be a strong force in the conservation and development communities, as evidenced by the advisory services BCIS is increasingly providing to intergovernmental and other information management initiatives. For example, BCIS participates in the Informal Advisory Committee of the Convention on Biological Diversity's Clearinghouse Mechanism, and in the regional workshops designed to guide development of the Clearinghouse Mechanism. BCIS representatives are also involved in planning processes for two regional biodiversity information management initiatives: 1) the Inter-American Biodiversity Information net-work (IABIN); and 2) the Regional Biodiversity Information System of the SADC (Southern African Development Community) countries.

BCIS members are now in the process of building a metadatabase that will point to the multitude of data and information resources held by members. The SSC Secretariat has completed an initial survey of the many data sets held throughout the SSC network to be included in the metadatabase. Updates and revisions will be ongoing. Three pilot projects, funded in part by the initial grant from the Norwegian Agency for International Cooperation (NORAD), have been agreed upon. SSC and the World Commission on Protected Areas (WCPA) are taking the lead on a project to analyze the relationship between globally threatened bird and mammal species and protected areas. This project will test the principles of SIS and will contribute to SIS development. Wetlands International is leading a pilot project to develop a global resource of information about wetlands, and TRAFFIC is leading the development of a BCIS-wide information resource on threatened plants used for medicinal purposes. SSC will play an active role in all three of these projects.

In February 1998, BCIS welcomed its twelfth member: the International Species Information System (ISIS). ISIS is a network of 500 zoos and aquariums from 54 countries that record and share detailed specimen information on more than one million specimens (living and dead) of 7,000 vertebrate species. ISIS develops and supports several PC-based software packages (ARKS, SPARKS, MedARKS and REGASP) that assist in *ex situ* management and recordkeeping.

The BCIS Secretariat has developed a discussion paper, *Data Policy and Procedures Manual*, which is available on the BCIS Web site and has generated considerable interest. The Data Policy provides the coordination mechanism to more effectively integrate activities of data collectors, data managers, and information providers that participate in a distributed data and information network like BCIS and SIS. It describes an infrastructure and sets of standards, guidelines, and procedures that will be necessary to improve the effectiveness of data management and the creation and dissemination of data and information in support of conservation-related sustainable development and other environmental issues. The Data Custodianship and Access discussion paper has been posted to the custodianship policy that will help ensure equity and provide for network cohesion.

For more information about BCIS and its Members, visit the Web site at www.biodiversity.org or contact Susan Tressler for a copy of the BCIS Information Packet (tressler@igc.apc.org, c/o Chicago Zoological Society, Brookfield IL 60513, USA). For more information about the Species Information Service, contact Mariano Gimenez Dixon at IUCN headquarters (<mgdl@hq.iucn.org>). From *Species*, Newsletter of the IUCN Species Survival Commission, (30): 7-8, June 1998.

Luigi Boitani, Mariano Gimenez-Dixon, Andrew Smith and Susan Tressler, Species Survival Commission (SSC), The World Conservation Union (IUCN), Rue Mauerney 28, CH-1196 Gland, Switzerland.

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**LEVANTAMIENTO DO MURIQUI (BRACHYTELES ARACHNOIDES) NO ESTADO DO RIO DE JANEIRO**

A caça e os intensos desmatamentos ocorridos na floresta Atlântica foram as principais causas que levaram ao maior primata representante deste ecossistema, o muriqui ou mono-carvoeiro (*Brachyteles arachnoides*), entrar em perigo de extinção. Há mais de 30 anos, quando o pesquisador Álvaro Coutinho Aguirre realizou o primeiro levantamento das populações de muriquís em toda sua área zoogeográfica, verificou que havia pouquíssimos indivíduos vivendo nas serras do Rio de Janeiro. Desde então, o que se tem observado é uma contínua destruição e aumento da pressão antrópica principalmente nas áreas onde Aguirre constatou a presença do muriqui no Rio de Janeiro. Assim, o "Projeto Muriqui-Rio" têm como objetivos principais realizar um levantamento das populações remanescentes do muriqui para verificar se o mesmo ainda vive no estado do Rio de Janeiro, e ao mesmo tempo, coletar dados que poderiam contribuir para um entendimento da taxonomia da espécie neste estado, pois como foi assumido recentemente, existem duas subespécies de muriqui, *Brachyteles arachnoides arachnoides* e *Brachyteles arachnoides hypoxanthus*. A primeira ocorre no estado de São Paulo e a segunda mais ao norte nos estados de Espírito Santo e Minas Gerais. Como as áreas onde vivem as

Vania Limeira, Coordenadora e Responsável Técnica, Projeto Muriqui-Rio, Rua Honório de Barro, 20/607 Flamengo, 22250-120 Rio de Janeiro, Rio de Janeiro, Brasil, e-mail: <vlimeira@rio.nutecnet.com.br>.


In the budget year 1997-1998, The Leakey Foundation, celebrating its 30th anniversary, provided 61 grants for research in Cultural Anthropology, Primatology, chemical dating and Geology, fossil recovery, Genetics, Morphology, and Prehistory. The following grants were awarded for primatological research: Jozef Dupain - Socio-ecology of the fission-fusion society of Pan paniscus in the Democratic Republic of Congo; Eduardo Fernandez-Duque-Cathemerality in owl monkeys (Aotus azarae) de Formosa, Argentina; Michelle Goldsmith and Craig Stanford - Behavioral ecology of sympatric mountain gorillas and chimpanzees in the Bwindi-Impenetrable Forest, Uganda; Victoria Gutierrez-Diego - The use and function of cheek pouches in yellow baboons (Papio cynocephalus) in Mikumi National Park, Tanzania; Marc Hauser and Richard Wrangham - Long term study of inter-community aggression in chimpanzees (Uganda); Craig Kirkpatrick - Ecological and nutritional correlates to group size in Rhinopithecus roxellana; Chelsea Kostrub - The social organization and behavior of golden mantled tamarins (Saguinus tripartitus) in eastern Ecuador; Charles Menzel - The knowledge base of chimpanzee communication; Michelle Merrill - Orangutan cultures? Tool use, social transmission and population differences; Leila Porter - Comparative study of Callimico goeldii and Saguinus fuscicolis in Bolivia. Three awards were given for genetic research on non-human primates: Babette Fahey - Genetic differentiation among East African chimpanzee (Pan troglodytes schweinfurthii) communities (Uganda); Anne Yoder - Phylogeny and evolution of mitochondrial DNA in the extinct primates; Sarah Zehr - Nuclear and mitochondrial phylogeny of the lesser apes (Hylabates). Grants for morphological research included, amongst others: Frederick Grine - Dental microwear analysis of South African fossil cercopithecoid diets; Carol Macleod - The anatomy and function of the cerebellum in extant primates; John Polk - The influence of body proportion and body size on primate quadrupedal locomotion; Andrea Taylor - Ontogeny and function of maxillomandibular form in the African apes; Susannah Thorpe - Climbing and bipedalism in Sumatran Orangutans; Implications for early hominid bipedalism; Patricia Vinyard - Postcranial variation in hominoids and Papio; Implications for fossil hominids; Karen Weinstein - Skeletal responses to high altitude and cold stress in modern humans and macaques.

For more information: The L. S. B. Leakey Foundation, P. O. Box 29346, Presidio Building 1002A, O’Reilly Avenue, San Francisco, CA 94129, USA, Tel: 415 561 4646, Fax: 415 561 4647, e-mail: <info@leakeyfoundation.org>. Web site: <www.leakeyfoundation.org>.

PRIMATE CONSERVATION INCORPORATED - CALL FOR GRANT PROPOSALS

Primate Conservation, Incorporated (PCI) is a non-profit foundation which funds field research that supports conservation programs for wild populations of primates. Priority is given to projects that study, in their natural habitat, the least known and most endangered species. The involvement of citizens from the country in which the primates are found is a plus. The intent is to provide support for original research that can be used to formulate and to implement conservation plans for the species studied. Eligibility: Private Conservation, Inc. will grant seed monies or provide matching grants for graduate students, qualified conservationists and primatologists to study rare and endangered primates and their conservation in their natural habitat. Grants have averaged approximately $2,200, with a maximum grant of $5,000. We do not support conferences, travel to scientific meetings, legal actions, tuitions or salaries at institutions, and overhead costs. Selection Criteria: Proposals are evaluated on a competitive basis. Applications are screened by outside reviewers and the Board of Directors of PCI. All appropriate projects will be considered, but the regions of current interest are Asia and west Africa. Application Procedure: Grants applicants should write for application materials. Please submit five copies of our standard cover sheet and your proposal. Proposals are to be submitted typed, double spaced, in English. Deadlines: Please note the following changes in the deadlines for grant applications. All applications for consideration must be at PCI on 20 September for the Fall granting period or 10 February for the Spring. In fairness to other applicants please do not ask for exceptions to these deadlines. Awards will be given May 15 and December 15. For an application or more information please contact Noel Rowe or Abigail Bar-

AMERICAN PRIMATE SOCIETY AWARD

The L. S. B. Leakey Foundation presents the American Primate Society Award to an American citizen or permanent resident for an outstanding scientific contribution to the study of non-human primates. The award consists of $1,000 with expenses paid to attend the American Society for Mammalogy meetings. The present award is sponsored by the American Society of Mammalogists. The winner is announced at the annual meeting of the American Society for Mammalogy. FAX: <kbraa@maxwell.lsu.edu>.
AMERICAN SOCIETY OF MAMMALLOGISTS - LATIN AMERICAN FELLOWSHIP 1999

The Latin American Fellowship was established by the American Society of Mammalogists (ASM) to promote the support of mammalian field research by Latin Americans in Latin America. Eligible students must be citizens of Latin American countries (excluding Puerto Rico), and enrolled in a graduate program in either a Latin American or North American University. The award is US$1,000. Proposed projects must be primarily field-oriented with a research emphasis in the areas of mammalian natural history, conservation, ecology, systematics, wildlife biology, biogeography or behavior. These areas of research in mammalogy shall be considered equally important by the selection committee. The awardee will be announced at the annual meeting of the ASM (the awardee does not need to be present).

Deadline for applications is 15 May 1999. Application information is available from: Dr. Janet K. Braun, Oklahoma Museum of Natural History, 1335 Asp Avenue, University of Oklahoma, Norman, OK 73019, USA, Tel: (405) 325 2828, Fax: (405) 325 7699, e-mail: jkbraun@ou.edu. The original and two copies of the form must be accompanied by two letters of recommendation from people familiar with the applicant's scientific background and current academic program, one of them must be the graduate advisor. It is the responsibility of the applicant to ensure that the letters are received by the Chairman of the Committee by the deadline. Applications and letters can be sent by ordinary mail, fax, or e-mail. However, if sent by e-mail, the application must contain all the information requested on the form and the project description must be limited to one printed page.

FLORIDA STATE UNIVERSITY-PANAMA'S PRIMATE BEHAVIOR AND ECOCOMMUNITY PROGRAM

Florida State University-Panama is offering a 4-week 7-semester hour Primate Behavior and Ecocommunity Program this summer from June 14 to July 12, 1999. As a part of the training, students will conduct directed research projects on the endangered Panamanian tamarin (Saguinus geoffroyi) and live at the International Primate Sanctuary of Panama. The primate sanctuary is located on the Atlantic side of Panama in the Tiger Islands, the tops of mountains flooded by the creation of the Panama Canal. Dennis R. Rasmussen, Director of the International Primate Sanctuary, and a member of the permanent faculty of the FSU-Panama branch, will be leading the program and teaching the courses. For more information Web Site: <http://www.fsu.edu/~cppanama/psp/Program.htm>.
Comunidades de primatas neotropiais: A história da primatologia no Brasil; Estratégias reprodutivas de primatas neotropiais; A biogeografia dos primatas da Amazônia; A biogeografia dos primatas da Mata Atlântica; Evolução da comunicação em primatas neotropiais; Desafios no estudo do comportamento - os primatas como modelo; Avanços nos estudos do comportamento social de caliçalíquidos; Avanços nos estudos do comportamento social de cebidos; Ecologia alimentar em primatas neotropiais; Ética e legislação em pesquisas com primatas; A genética e a conservação de primatas; 4) Mini-cursos - Sistemática e biogeografia de primatas; Técnicas de estudo do comportamento de primatas; Manejo de primatas em causário; Comportamento social de caliçalíquidos; Bioacústica de primatas; Biologia da conservação de primatas. **Comissão Coordenadora:** Alcides Pisaniatti, Sérgio L. Mendes, Patricia Izart, Cristina Santos, Adriana Rípoli, José Rípoli. Informações: Sérgio L. Mendes, Museu de Biologia Prof. Mello Leitão, 29650-000 Santa Teresa, Espírito Santo, Tel/Fax: (027) 259-1182, e-mail: <colibri@tropical.com.br>. Home page da SBPr: <http://www.sbp.org.br>.

**EUROPEAN MARMOSET RESEARCH GROUP**

The 5th Winter Workshop of the European Marmoset Research Group (EMRG) was held in Paris 14-16 December 1998. The EMRG sponsors these meeting to increase understanding of the usefulness of common marmosets in biomedical research and to bring together investigators in basic and applied research in academic, pharmaceutical and contract research institutions. The theme of the December 1998 meeting was Marmosets in Biomedicine and as Models for Human Disease, and focused on (1) the immune system and its pathology in common marmosets, (2) particular biomedical applications in which the common marmoset is proving to be a key research model, including multiple sclerosis, ischaemic stroke, Parkinson’s disease and osteoporosis, and (3) common marmoset biology and the development of husbandry and research methods. The relatively large amount of time allotted to discussion of issues raised is becoming a valued hallmark of these gatherings.


For further information on the activities of the ERMG, please contact: Dr. Christopher Pryce, President, EMRG, Behavioural Biology Laboratory, Swiss Federal Institute of Technology, Schorenstrasse 16, CH-8603 Schwenzenbach Switzerland, Tel +41 1 825 7386, +41 1 825 7416 (Secretariat), Fax +41 1 825 7417, email: pryce@toxi.bio.ethz.ch

David H. Abbott, Physiological Ethology Research Group, Department of Obstetrics and Gynecology, Wisconsin Regional Primate Research Center, 1220 Capitol Court, Madison, Wisconsin 53715-1299, USA.

**BIODIVERSIDADE DO ESTADO DE SÃO PAULO - BIOTASP**

Foram publicados os dois primeiros volumes da série *Biodiversidade do Estado de São Paulo, Brasil: Síntese do Conhecimento ao Final de Séc. XX*. A publicação desta serie, que traz um diagnóstico do conhecimento acumulado sobre a biota paulista e a infra-estrutura do estado para conservação *in situ* e *ex situ* da biodiversidade, representa a concretização de um dos grandes objetivos do Grupo de Coordenação do BIOTASP, além de ser um compromisso assumido no workshop de Serra Negra, São Paulo, 30 de julho - 2 de agosto de 1997. A série é composta por sete volumes, abrangendo de microorganismos e vírus a mamíferos e anfíbios, está sendo publicada pela Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), São Paulo, a medida que os volumes ficam prontos. Os volumes que estão sendo lançados são *Volume 2 - Fungos Macroscópicos & Plantas*, editado por Carlos E. de M. Bicudo e George M. Shepherd, e *Volume 6 - Vertebrados*, editado por Ricardo M. Castro. O *Volume 2* - *Fungos Macroscópicos & Plantas*, editado por Carlos E. de M. Bicudo e George M. Shepherd.
- Invertebrados Marinhos e o Volume 4 - Invertebrados de Água Doce serão publicados no futuro próximo. Os volumes 1 (Microrganismos e Vírus), 5 (Invertebrados Terrestres) e 7 (Infra-estrutura para Conservação da Biodiversidade) já foram encaminhados a FAPESP com a solicitação de recursos para a publicação. Os interessados poderão adquirir os livros, preço R$17,00 cada, através da homepage do BIODISP no endereço <www.bdt.org.br/bdt/biotasp/livros>.

Books

Flórida de las Reservas Biológicas de Iquitos, Peru: Allpahuayo-Mishana, Explorano Camp, Explorana Lodge, by Rodolfo Vásquez Martínez, edited by Agustín Rudas Lleras and Charlotte M. Taylor, and supported by the John D. and Catherine T. MacArthur Foundation, 1046pp., 1997. Missouri Botanical Garden, Missouri. ISBN 0915279487. Price US$85.00. PSG member Eckhard W. Heymann reports that "this is a most valuable book. We used it for plant identification during our last trip to our field site...". Available from: Missouri Botanical Garden Press, 4344 Shaw Boulevard, St. Louis, MO, 63110, USA, Tel: (314) 577-9534, Fax (314) 577-9591, e-mail: <mngpress@mobot.org>. For more information visit web site: <www.mobot.org/mobot/research/scipub/florida.html>.

The Genus Inga - Botany, by T. D. Pennington, x + 844pp, 1997. The Royal Botanic Gardens, Kew, ISBN 1 9003347 12 1. Price £69.00 (incl.p&p). The genus Inga (Leguminosae: Mimosoideae) is a large group of forest trees restricted to tropical America. This monograph accounts for 258 species. It includes chapters on morphology, wood and bark anatomy, cytology, non-protein amino acid chemistry, flavonoid chemistry, variation, relationships and distribution, and uses. The systematic section includes a conspectus of the genus, regional keys to species, and species descriptions with full synonymy. Nearly all species are illustrated and mapped, and information is presented on distribution and ecology, field characters, and species relationships. There is a full list of exsiccatea and indices to scientific and vernacular names. Obviously an extremely important reference for field primatologists. Also published by the Royal Botanic Gardens: El Género Inga en el Perú: Morfología, Distribución y Usos, by C. Rey nel and T. D. Pennington, illustrations by Rosemary Wise, 1997, £27.00 (+ p&p); El Género Inga en el Ecuador: Morfología y Distribución y Usos, by T. D. Pennington and N. Revelo, £27.00 (+ p&p); and The Genus Inga: Utilization, by T. D. Pennington. Available from: Mail Order Department, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, England, UK. Payments not in sterling attract a £10.00 surcharge.

Saudade do Matão: Relembrando a História da Conservação da Natureza no Brasil, by Teresa Urban, 1998, 371pp. John D. and Catherine T. MacArthur Foundation, Fundação O Boticário de Proteção à Natureza, Editora da Universidade Federal do Paraná, Curitiba. ISBN 85 7335 28 8. In Portuguese. Preface by Miguel Seređiuk Milano. A beautifully produced book which documents the early days (1960s and 1970s) of nature conservation in Brazil. It begins with a brief history of the development of a conservation awareness in the country, including chapters on the first naturalists explorers, the destruction of Brazil's natural ecosystems, the development of a conservation legislation, and the principal institutions involved. It then centers on the remarkable and, without exaggeration, heroic roles played by Paulo Nogueira Neto, Adelmar Faria Coimbra-Filho, Ibsen de Gusmão Câmara, Alceo Magnanini, Maria Tereza Jorge Padua and Wanderlait Duarte de Barros. There are short biographies of each, and the subsequent chapters reproduce verbatim their memories and opinions (excepting Wanderlait Duarte de Barros, deceased) in the form of discussions between them of some key aspects and institutions, and important events, including the creation of the first protected areas, the institutions involved in conservation (governmental and non-governmental), the formulation and consequences of the Forest Code (1965) and the Faunal Protection Law (1967), the role of the Brazilian Forestry Development Institute (IBDF), the development of the parks system, the impact of Stockholm 1972, the activities of the first conservation NGO - the Brazilian Foundation for the Conservation of Nature (FBCN), some aspects of species conservation, the role of the Secretariat of the Environment created in 1973 and the Brazilian Institute for the Environment (IBAMA) created in 1989, and finally the Earth Summit, Rio de Janeiro 1992. Available from: Editora da Universidade Federal do Paraná, Centro Político, Jardim das Américas, Caixa Postal 19.029, 81531-990 Curitiba, Paraná, Brazil, Tel: 267 5973, 361 3380.


ARTICLES


**Meetings**


Deadline for proposals of one-half day workshops, symposium, and special poster session proposals: 30 June 1998.

Workshops, symposia, and special poster sessions should focus on topics of wildlife science, management, sustainable development, education and outreach, and laws and policy within the broad theme of the Congress. Each day will begin with a morning plenary session followed by related concurrent sessions, symposia and workshops in the afternoon. Themes for the five-day congress are (1) Sustainable Development and Wildlife Conservation; (2) Landscape Linkages: Ecosystem Science and Management; (3) Issues in Wildlife-Human Conflicts; (4) Education, Outreach, and Human Dimensions in Wildlife Conservation; and (5) Techniques for Monitoring Wildlife Populations. Symposia, and, where appropriate, workshop presentations will be considered for publication in a Congress proceedings; organizers will be required to provide an initial edit and evaluation of submitted papers. The proceedings will be published in English; oral presentations will be in English or possibly Hungarian depending on the availability of translators. More information on preparing proposals for workshops, symposia, and special poster sessions can be found in the March-April 1998 issue of *The Wildlife* and on The Wildlife Society website [http://www.wildlife.org/index.html], or guidelines may be requested from Co-Chair of the Program Committee, W. Daniel Edge at his e-mail address. Deadline for submission of papers and posters: 15 October 1998. Electronic (e-mail or internet form) submissions are preferred. Electronic submissions of contributed papers and posters should be sent to the Program Co-Chair at the e-mail address below. Please, no telephone inquiries related to abstract submission or acceptance. Direct all other inquiries to The Wildlife Society office at Tel: (301) 897-9770, Fax: (301) 550-2471, e-mail: <tws@wildlife.org>.

III Congress of the Mesoamerican Society for Biology and Conservation, 4-9 July 1999, Guatemala City, Guatemala.

The objective of the congress is to “Promote the exchange of information and progress in the field of conservation biology.” Activities include keynote lectures, open paper sessions, symposia and workshops on specific topics or projects, poster and audiovisual sessions, roundtable discussions of topics related to the Society’s mission, ecotourism trips (during the weekend of 10-12 July), and cultural activities that will demonstrate the cultural richness of the country. Field trips are scheduled to visit Biotopo del Quetzal, Manchon Guamuchal, Reserva Natural Monticarlo, Biotopo Choco Machacas, Reserva de Biosfera Sierra de Las Minas-Albores, and Parque Nacional Tikal.

Papers on any topic related to biology or conservation are welcome, but are especially sought if they match one of six general themes for the congress: (1) Ecology of fragmentation of the tropical landscape; (2) Studies for the selection and conservation of priority areas; (3) Genetics and conservation (taxonomy, phylogenetics, population structure, applied biotechnology, wildlife); (4) Agro-ecology, integration of agrosystems with wild species; (5) Integration of indigenous knowledge and community participation in the conservation of natural resources; and (6) Land use and planning. The program and information on accommodation, registration, and deadlines, can be found in the Society’s webpage [http://ccb.stanford.edu/mesoamericana/CONGRESO.htm]. Deadline for abstracts: 31 March 1999, but extensions will be considered. Information: Mercedes Barrios (Congress Coordinator), Universidad de San Carlos de Guatemala, or Pilar Negreros (Scientific Program Coordinator), Universidad del Valle de Guatemala, or Ana Carolina Rosales Zamora, Country Representative for Guatemala of the Sociedad Mesoamerican for la Biologia y la Conservacion, Avenida La Reforma 63 zona 10, Guatemala. C.P. 01010. Tel: (502) 334-6064. Fax: (502) 334-7664, e-mail: <cecpm@usac.edu.gt>. You may also contact the Society’s US representative: Mark Bonta, Louisiana State University, Tel: (504) 383-1073, e-mail: <mbonta@ibm.net>.

2nd IUPAC International Conference on Biodiversity, 11-15 July 1999, Federal University of Minas Gerais, Belo Horizonte, Minas Gerais, Brazil. Organized by the International Union of Pure and Applied Biochemistry (IUPAC) and the Federal University of Minas Gerais. The Conference program will include plenary and invited lectures as well as poster presentations on the latest developments on biodiversity research in the fields of ecology, molecular genetics, chemical ecology, structural biology of signal

**IX Congresso Brasileiro de Primatologia, 25-30 July 1999, Museu de Biologia Mello Leitão, Santa Teresa, Espírito Santo, Brazil.** The theme of the congress is "Primate Conservation - Perspectives for the 21st Century". For further information, please contact: Sérgio Lucena Mendes, Museu de Biologia Mello Leitão, Avenida José Ruschi 4, 29650-000 Santa Teresa, Espírito Santo, Brazil, Tel: (027) 259-1182, Fax: (027) 259-1182, e-mail: <meneses@sigma.tropical.com.br>.

**22nd Annual Meeting of the American Society of Primatologists, 12-16 August 1999, Fairmont Hotel, New Orleans, Louisiana, USA.** Hosted by the College of Liberal Arts and Sciences and the Regional Primate Research Center of Tulane University. Abstracts must be sent to the Chair of the Program Committee by 1 February 1999. Contact information: Program Chair, Dr. Mollie Bloomsmith, TECHLabs, Zoo Atlanta, 800 Cherokee Ave., S.E., Atlanta, Georgia 30315, USA, Tel: (404) 624 5990, Fax: (404) 627-7514, e-mail: <mbloomsmith@mindspin.com>. Local Arrangements Chair: Dr. Margaret Clarke, Department of Anthropology, Tulane University, 1021 Audubon Street, New Orleans, LA 70118, Tel: (504) 865-5336, Fax: (504) 865-5338, e-mail: mrcarke@mailhost.tcs.tulane.edu. ASP website: <http://www.asp.org>.

**6th Congress of the Gesellschaft für Primatologie (GFP), 18-22 August, 1999, Universiteitscentrum De Uithof, Utrecht, The Netherlands.** It will be hosted by the Projectgroep Ethologie & Socio-ecologie, Utrecht University. Invited speakers will focus on "Perspectives in Primatology." The program committee invites individuals to present perspectives on their scientific work in any field of primatology. Abstracts must be sent to the program committee no later than 1 June, 1999. For more information contact Annet Louwese, Liesbeth Sterck or Jan van Hooff at: GFP, Projectgroep Ethologie & Socio-ecologie, Pb 80.086, 3508 TB Utrecht, NL, Tel: +31-(0)-30-2535401, Fax: +31-(0)-30-2521105, e-mail: <Kongr.GP@Bio.UU.Nl>. All information, including deadlines, fees, registration form etc. may also be obtained via the society's web page: http://www.dpz.gwgd.de/gfp utrecht99.htm.

**4th International Conference on Environmental Enrichment, 29 August - 3 September, 1999, Edinburgh, Scotland, UK.** Abstracts deadline: 31 March, 1999. Contact: In Conference Limited, 10B Broughton Street Lane, Edinburgh EH1 3LY, Scotland, UK Fax: +44 131 556 9638, e-mail: <incoference@cabineinet.co.uk>.

**Asociación Mexicana de Primatología - Simposio Nacional, 6-9 Septiembre de 1999, Catemaco, Veracruz, México.** Tema general "Investigación y Conservación de Primates Neotropicales". Mayor información: Dr. Jorge Martínez, Depto. de Filosofía, UAM-Iztapalapa, Apdo. Postal 55-536, 09340 México, D.F. Tel: (5) 724 4785, Fax: (5) 724 4778, e-mail: amp@xanum uam.mx.

**III Congresso da Associação Primatológica Española (APE), 20-22 September 1999, Universidad Autónoma de Barcelona, Spain. Inaugural lecture to be given by Professor Adrian A. Kortlandt: "Protohominid behaviour in primates". Plenary lectures include: Montse Garcia "Aplicación de los estudios citogenéticos en primates a la patología genética humana"; Dr. R. Stanyon "Evolución genética y especiación en primates"; Dr. J. Sabater Pi "La cultura en los primates no humanos"; Dr. Turbón "Adaptación y comportamiento de los primeros homínidos". Contact: Secretaría del Departamento de Biología Celular e Fisiología, Facultad de Ciencias, Universidad Autónoma de Barcelona, 08193 Barcelona, Spain, Fax: 93 581 2295. E-mail: <jveya@psi.ub.es>.

**IV Congresso de Manejo de Fauna Amazonica, 4 al 8 de octubre de 1999, Asunción, Paraguay.** Este importante evento, iniciado en 1992, resume en breves días los resultados de todos los esfuerzos aplicados en pos de la conservación de la fauna de toda la región amazónica. En esta oportunidad se fortalecerá la pluriparticipación, la discusión de estrategias y la elaboración de planes de acción apuntando a una conservación protagonizada por los pobladores rurales, beneficiarios directos de un uso sostenible del recurso faunístico. La organización de este evento es el resultado de un esfuerzo conjunto entre la Oficina CITES-Py, la Gobernación del Departamento Central y la organizacion ambientalista Fundacion Moises Bertoni para la Conservación de la Naturaleza. Misión: Trabajar en forma pluriparticipativa y en acción coordinada para la optimización de las políticas de uso, técnicas y estrategias de manejo de la vida silvestre amazónica para fomentar el desarrollo socio-económico sostenible y la conservación de la naturaleza. Los trabajos serán recibidos hasta el 1 de marzo de 1999. Se podrán enviar por correo electrónico, o en impresión en papel blanco tamaño carta con una copia archivada en discoette. Únicamente se recibirán los siguientes formatos: WP5.1, Microsoft Word 6.0 o textos en ASCII (DOS IBM). Invitación a eventos: La comisión organizadora desearía recibir propuestas para la organización de simposios, talleres, cursos, mesas redondas y otras reuniones relacionadas a la temática propuesta para el Congreso. Los interesados en organizar o en participar de algunos de estos eventos pueden comunicarse con el Comité Organizador. Inscripciones: Hasta el 31 de marzo de 1999, estudiantes: USS30, profesionales: USS60; Hasta el 30 de setiembre de 1999, estudiantes: USS50, profesionales: USS100; Inscripciones tardías (durante el Congreso),
Contributions

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

Please send contributions to: ANTHONY RYLANDS, c/o Conservation International do Brasil, Avenida Antônio Abrahão Caram 820/302, 31275-000 Belo Horizonte, Minas Gerais, Brazil, Tel/Fax: +55 (31) 441-1795 or ERNESTO RODRIGUEZ-LUNA, Parque de La Flora y Fauna Silvestre Tropical, Instituto de Neuroetología, Universidad Veracruzana, Apartado Postal 566, Xalapa, Veracruz 91000, México, Fax: 52 (28) 12-5748.

LILLIANA CORTÉS-ORTIZ (Universidad Veracruzana) provides invaluable editorial assistance.

Correspondence, messages, and texts can be sent to: ANTHONY RYLANDS a.rylands@conservation.org.br

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