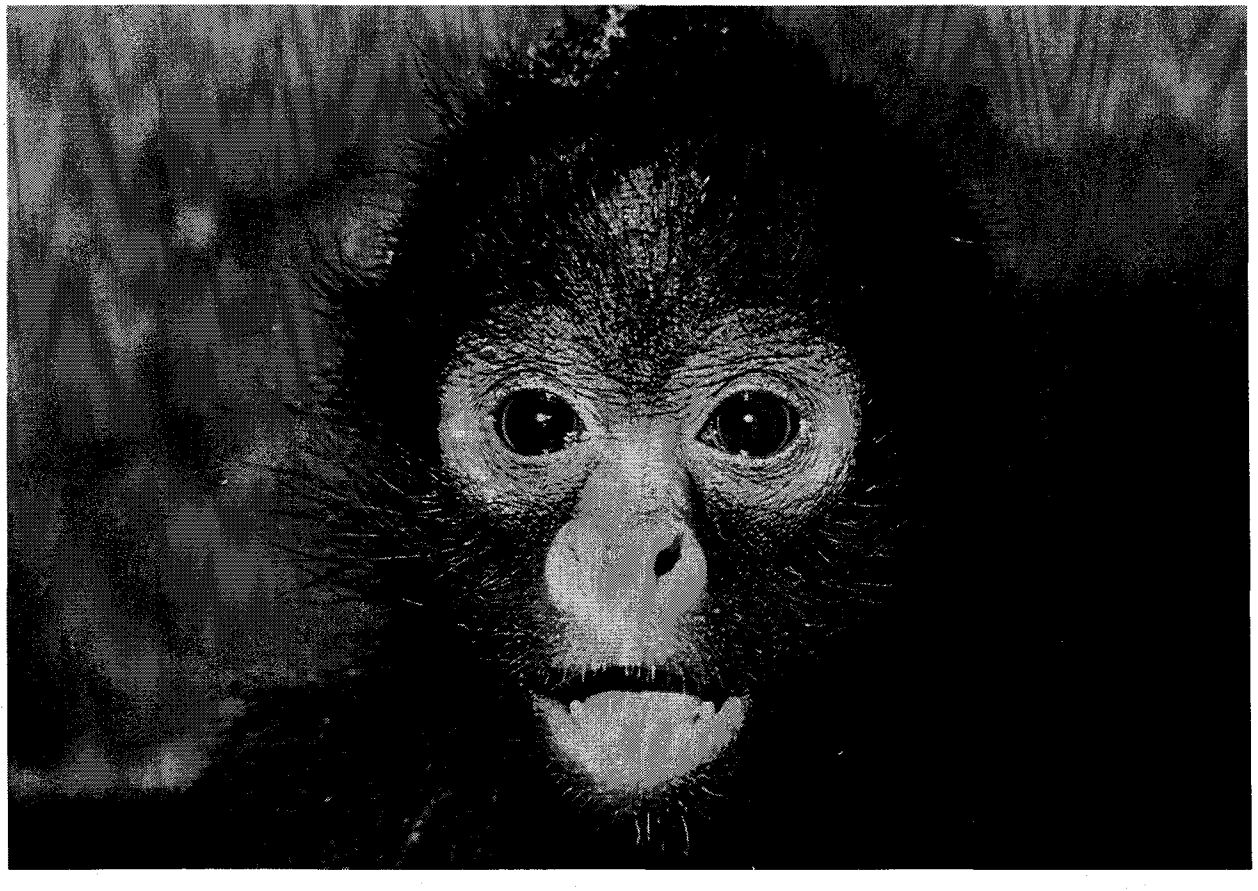
ISSN 1413-4703

NEOTROPICAL PRIMATES

VOLUME 7, NUMBER 1
March, 1999

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



CONSERVATION INTERNATIONAL

SPECIES SURVIVAL COMMISSION

FUNDAÇÃO BIODIVERSITAS

Articles

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 (Bartecki 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 eto-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 Yavarí, 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 Metodos

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 arboles 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.

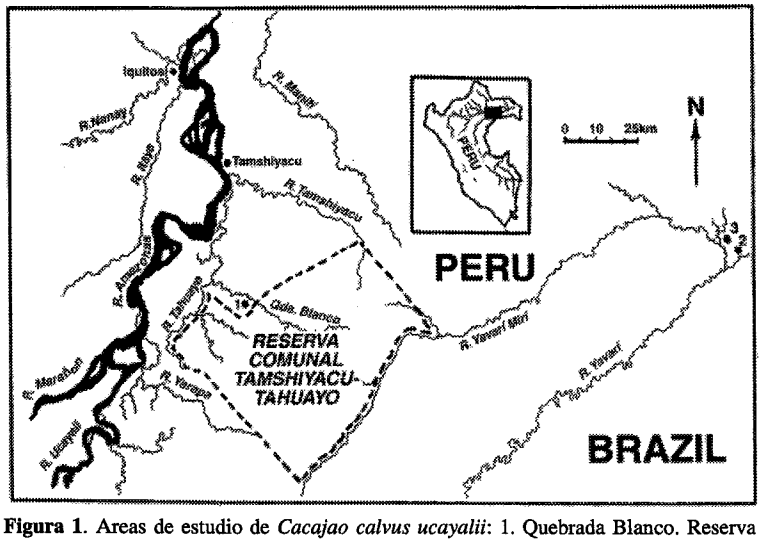


Figura 1. Areas de estudio de *Cacajao calvus ucayalii*: 1. Quebrada Blanco. Reserva Comunal Tamshiyacu-Tahuayo. 2. Agua Negra, río Yavarí. 3. Carolina, río Yavarí-Mirí.

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 (árbol, 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

Cover photograph by Russell A. Mittermeier: A juvenile Guiana spider monkey, *Ateles paniscus.*

Tabla 1. Especies de plantas en la dieta de *C. calvus ucayalii* en el nor-oriente peruano.

Especie	N° registro	Parte comida M	S	A	Textura	Tamaño (cm) Long. x Grosor
Apocynaceae						
*Couma macrocarpa**	5	1m	5		a	4.0 x 4.2 (n = 3)
Lacmelea sp.	2	2i			b	4.1 x 4.0 (n = 4)
Parahancornia sp.*	8	1m	5		c	4.7 x 5.5 (n = 3)
Rhigospira sp.*	3	1m	5		c	6.5 x 5.3 (n = 2)
Arecaceae						
*Jessenia bataua**	3	3i			c	2.1 x 1.4 (n = 6)
*Mauritia flexuosa**	12	3i			c	3.9 x 2.5 (n = 12)
Cecropiaceae						
Pourouma tomentosa	1	1m			a	1.9 x 0.8 (n = 10)
Chrysobalanaceae						
Licania micrantha	2		3i		c	1.8 x 1.1 (n = 8)
Cyclantaceae						
No identificado	1	1m			a	1.5 x 1.7 (n = 8)
Euphorbiaceae						
Hevea brasiliensis	1		4m		c	6.5 x 5.7 (n = 1)
Micrandra spruceana	1		4i		a	1.7 x 1.5 (n = 5)
Gnetaceae						
Gnetum sp. 1	4	1m			c	2.1 x 0.5 (n = 4)
Gnetum sp. 2	2	1m			c	3.0 x 1.3 (n = 3)
Humiriaceae						
Vantanea sp.	4	4i			c	6.3 x 4.5 (n = 5)
Vantanea spichigeri	10	4i			c	5.9 x 3.2 (n = 12)
Vantanea tuberculata	4		4i		d	5.8 x 5.1 (n = 5)
Icacinaceae						
No identificado	2		3i		d	1.5 x 1.8 (n = 2)
Lecythidaceae						
Eschweilera sp.	2		3i		d	4.1 x 3.2 (n = 5)
Eschweilera corrugata	5		4i		d	3.8 x 3.4 (n = 6)
Eschweilera chartaceae	8		4i		d	4.3 x 3.9 (n = 11)
Leguminosae						
Inga sp. 1*	2		5	1m	c	8.1 x 0.1 (n = 6)
Inga sp. 2*	3		5	1m	c	20.2 x 2.5 (n = 2)
Parkia multijuga	2	1m	5		c	30.0 x 4.8 (n = 3)
*Hymenaea courbaril**	3	1m			c	4.4 x 2.1 (n = 3)
*Hymenaea oblongifolia**	4	1m			c	3.4 x 2.1 (n = 7)
Loganiaceae						
Strychnos sp.	2	1m			c	2.3 x 2.1 (n = 6)
Meliaceae						
Guarea sp.	1		4i		d	2.4 x 2.3 (n = 4)
Menispermaceae						
Abuta grandifolia	6	1m			c	2.7 x 1.9 (n = 15)
Abuta sp.	8	1m			c	1.5 x 0.5 (n = 9)
Moraceae						
Clarisia biflora	2		4i		c	1.6 x 1.4 (n = 9)
Brosimum rubescens	7		3i		c	1.5 x 1.5 (n = 7)
Myristicaceae						
Iryanthera sp.	2		4i		c	1.9 x 2.1 (n = 6)
Iryanthera tricornis	1		4i		c	1.5 x 2.5 (n = 3)
Myrtaceae						
Calycorectes sp.	4	1m			a	1.6 x 1.0 (n = 6)
Passifloraceae						
Passiflora sp. 1*	3	1m			b	6.8 x 5.5 (n = 3)
Passiflora sp. 2*	1	1m			b	8.8 x 5.5 (n = 2)
Rhizophoraceae						
Sterigmapetalum sp.	1		4i		c	1.9 x 0.9 (n = 4)
Sapindaceae						
Paullinia sp.	2		4i		c	4.0 x 0.9 (n = 4)
Sapotaceae						
Chrysophyllum sp. 1	4	1m			d	7.2 x 6.2 (n = 3)
Chrysophyllum sp. 2	2		4i		d	6.0 x 5.1 (n = 4)
Ecclinusa sp. 1*	4	1m	4i		d	3.9 x 3.8 (n = 7)
Ecclinusa sp. 2*	6	1m	4i		c	3.6 x 3.5 (n = 9)
Micropholis sp.	3	1m			a	1.3 x 1.4 (n = 8)
*Pouteria sessilis**	2	1m	4i		d	3.0 x 3.9 (n = 4)
*Pouteria sanguinolenta**	6		4i		d	5.1 x 4.2 (n = 6)
Pouteria sp. 1*	3	1m	4i		d	5.1 x 2.7 (n = 6)
Pouteria sp. 2*	4	1m	4i		d	5.2 x 4.2 (n = 4)

Cont.

Tabla 1. Cont.

Pouteria sp. 3*	4		4i	d	2.8 x 2.4 (n = 8)
Violaceae					
Leonia sp. 1	1	1m		c	2.3 x 2.2 (n = 2)
Leonia sp. 2	1	1m		c	2.6 x 2.2 (n = 2)
No determinado 1	2	1m		c	7.3 x 6.9 (n = 3)
No determinado 2	3		3i	a	1.6 x 1.6 (n = 5)
No determinado 3	2		2i	d	1.9 x 2.3 (n = 5)

M: Mesocarpio. S: semilla. A: arilo; m: maduro. i: inmaduro; 1: dulce. 2: ácido. 3: astringente. 4: insípido. 5: engullido y eliminado en las heces; 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. * Utilizada por los habitantes ribereños en la dieta alimenticia.

Tabla 2. Sabores y estado de las partes u órganos de los frutos comidos por *C. c. ucayalii* en las áreas de estudio.

Partes	No. de especies	Partes	No. de especies
Mesocarpio dulce	24	Mesocarpio maduro	23
Mesocarpio astringente	2	Mesocarpio inmaduro	5
Mesocarpio insípido	2	Arilo maduro	2
Arilo dulce	2	Semilla inmadura	2
Semilla ácida	2	Semilla madura	22
Semillas astringente	6	Semilla madura./inmadura	1
Semilla insípida	18		
Total:	56	**Total**	55

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. ucayalii* 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. ucayalii* se hallan entre 16 a 35 m de alto; solamente los de *Hevea brasiliensis*, *Jessenia bataua* y *Micrandra spruceana* 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 *Pourouma 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. ucayalii* se alimenta principalmente del mesocarpio (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 mesocarpio 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

Tabla 3. Registro mensual de frutos y semillas consumidos por *C. c. ucayalii* durante el período de estudio.

Especies	Período de consumo*							
	F	M	A	M	J	J	A	O
	12.3	16	1.1	1.6	3.6	32	17	11.6**
Abuta spp.	x	x	x			x		x
Brosimum rubescens								x
Calycorectes sp.					x	x		
Chrysophyllum spp.		x						x
Clarisia biflora								x
Couma macrocarpa		x		x	x			
Ecclinusa spp.	x	x			x			x
Eschweilera spp.	x	x			x	x		x
Gnetum sp.	x					x		
Guarea sp.								x
Hevea brasiliensis								x
Hymenaea spp.	x							x
Icacinaceae	x							
Inga spp.					x			x
Iryanthera spp.	x				x			
Jessenia bataua					x	x		
Lacmellea sp.	x							
Licania micrantha						x		
Leonia spp.						x		
Mauritia flexuosa					x	x		
Micrandra spruceana		x						
Micropholis spp.		x						
Parahancornia sp.	x					x		
Parkia multijuga					x	x		
Passiflora spp.	x	x						
Paullinia sp.								
Pourouma tomentosa	x							
Pouteria spp.	x	x			x	x		x
Rhigospira sp.						x		
Sterigmapetalum obovatum					x	x		
Strychnos spp.						x		x
Vantanea spp.	x	x	x			x		x

* En Enero, Setiembre, Noviembre y Diciembre no hubo contacto con grupos de *C. c. ucayalii.*

** Total mensual de horas de contacto con grupos de *C. c. ucayalii.*

mesocarpio maduro y dulce, y de semillas inmaduras e insípidas. Ocasionalmente fueron observados mordisqueando yemas y hojas tiernas de plantas epífitas de las familias ciclantáceas y bromeliáceas, y flores de bejucos 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. ucayalii.* 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. ucayalii* (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.

De acuerdo con los resultados obtenidos, la dieta alimentaria de *C. c. ucayalii* mayormente está compuesto por el mesocarpio maduro y dulce y de semillas inmaduras e insípidas, correspondientes a frutos de tamaño mediano y grande con cáscara y textura gruesa y dura. Estos hallazgos coinciden con los resultados de Ayres (1986) para *C. c. calvus*, Bartecki y Heymann (1987) y Heymann (1989) para *C. c. ucayalii* y Da Cunha y Barnett (1990) para *C. melanocephalus ouakary.* El consumo de semillas, de *Eschweilera* spp., *Pouteria* spp. y de otras, previo desgarramiento del mesocarpio de textura dura, son facilitados por los grandes y fuertes caninos como ocurre en *Cebus* y *Chiropotes* (Kinzey and Norconk, 1990). Esa forma de consumo es el indicador de una adecuada adaptación para el aprovechamiento de este tipo de frutos.

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

altura", *C. c. ucayalii*, se suministra esos nutrientes de los frutos de *Mauritia flexuosa* y *Jessenia bataua*, particularmente entre los meses de Junio a Agosto, coincidente con la estación de escasez de otros frutos.

Agradecimientos

Este trabajo fue ejecutado con el apoyo económico de la Srta. Suzi Leonard del Detroit Zoo de Michigan, USA, y del Gesellschaft für Primatologie de Göttingen, Germany y Zoologische Gesellschaft fur Arten-und Populationsschutz 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 Huanaquiri y Jeissen Shahuano, con quienes compartimos gratas experiencias 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. E-mail: <encarna@telematic.com.pe>.

Referencias

Aquino, R. 1988. Preliminary survey on the population densities of *Cacajao calvus ucayalii*. *Primate Conservation* (9): 24-26.

Ayres, J. M. 1986. The conservation status of the white uakari. *Primate Conservation* (7): 22-26.

Ayres, J. M. y Johns, A. D. 1987. Conservation of white uakaries in Amazonian varzea. *Oryx* 21(2): 74-80.

Bartecki, U. y Heymann, E. W. 1987. Sightings of red uakaris, *Cacajao calvus rubicundus*, at the Río Blanco, Peruvian Amazonia. *Primate Conservation* (8): 34-36.

Castro, R. 1991. Behavioral ecology of two coexisting tamarin species (*Saguinus fuscicollis nigrifrons* and *Saguinus mystax mystax*, Callitrichidae, Primates) in Amazonian Peru. Ph. D. Thesis, Washington University, Seattle.

Cunha da, A. C. y Barnett, A. 1990. Sightings of the golden-backed uakari, *Cacajao melanocephalus ouakari*, on the upper Rio Negro, Amazonas, Brazil. *Primate Conservation* (11): 8-11.

Encarnación, F. 1985. Introducción a la flora y vegetación de la Amazonia peruana: estado actual de los estudios en su medio natural y ensayo de una clave de determinación delas formaciones vegetales en la llanura amazónica. *Candollea* (40): 237-252.

Encarnación, F. 1994. El bosque y las formaciones vegetales en la llanura amazónica del Perú. *Alma Mater* (6): 95-114.

Garber, P. A. 1993. Seasonal patterns of diet and ranging in two species of tamarin monkeys: Stability versus variability. *Am. J. Primatol.* 14(1): 145-166.

Heymann, E. W. 1989. Observaciones preliminares del mono huapo rojo, *Cacajao calvus ucayalii* (Primates: Platyrrhini), en el río Blanco, Amazonia Peruana. *Medio Ambiente* (10): 113-117.

Heymann, E. W. 1990.Further field notes on red uakaris, *Cacajao calvus ucayalii*, from the Quebrada Blanco,Amazonian Peru. *Primate Conservation* (11): 7-8.

Hershkovitz, P. 1987. Uakaries, New World monkeys of the genus *Cacajao* (Cebidae, Platyrrhini): A preliminary taxonomic review with the description of a new subspecies. *Am. J. Primatol.* 12: 1-53.

Kinzey, W. and Norconk, M. A. 1990. Hardness as a basis of fruit choice in two sympatric primates. *Am. J. Phys. Anthropol.* 81: 5-15.

Norconk, M. A. 1986. Interactions between primate species in a neotropical forest: Mixed-species troops of *Saguinus mystax* and *Saguinus fuscicollis* (Callitrichidae). Ph.D. Thesis, University of California, Los Angeles.

Puertas, P. y Bodmer, R. 1993. Conservation of a high diversity primate assemblage. *Biodiversity and Conservation* 2: 586-593.

Spichiger, R., Méroz, J., Loizeau, P. y Stutz de Ortega, L. 1989. *Contribución a la Flora de la Amazonia Peruana: Los Árboles del Arboretum Jenaro Herrera*, Vol. 1. Conservatoire et Jardin Botaniques, Geneve.

Spichiger, R., Méroz, J., Loizeau, P. y Stutz de Ortega, L. 1990. *Contribución a la Flora de la Amazonia Peruana: Los Árboles del Arboretum Jenaro Herrera*, Vol. 2. Conservatoire et Jardin Botaniques, Geneve.

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 Boubli (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 (Defler, 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 on 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.

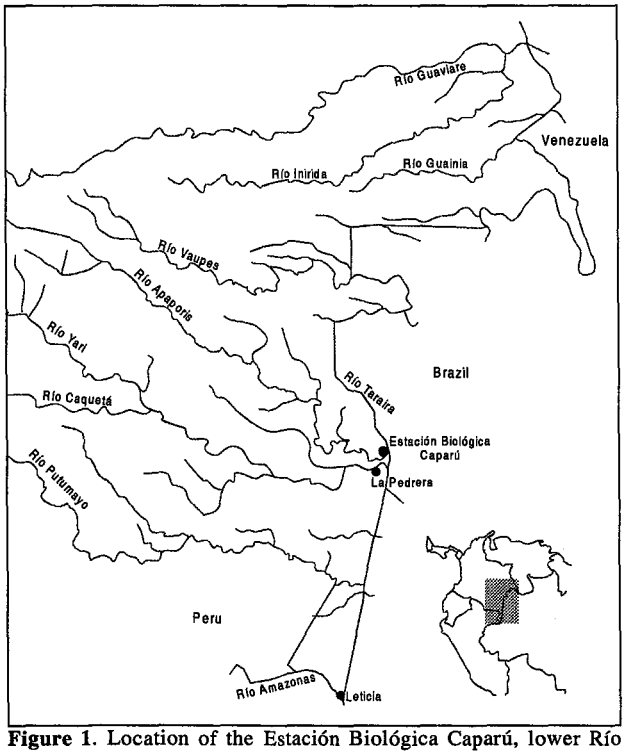


Figure 1. Location of the Estación Biológica Caparú, lower Río Apaporis, Colombia.

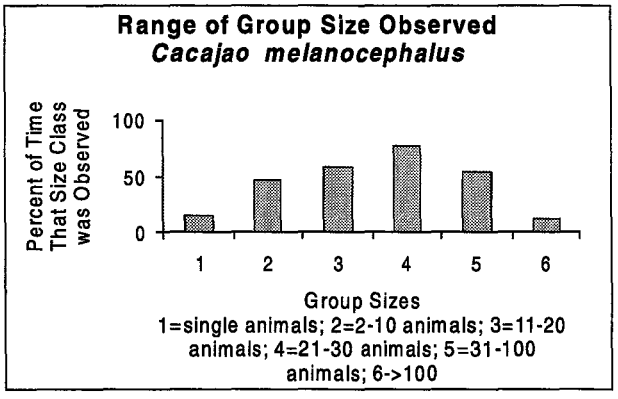


Figure 2. The range of group sizes observed for *Cacajao melanocephalus* at the Estación Biológica Caparú, Río Apaporis, Colombia.

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

Counting Monkeys

Several years ago, Dilver 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 (Defler 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 (Defler and Defler, 1996; Palacios *et al.*, 1997; S. Defler, 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 *Eschweilera* sp.

(Lecythidaceae) fruits mature in the seasonally flooded forest.

Although *Micrandra spruceana* (Euphorbiaceae) is found at appreciable densities at Caparú, 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 Boubli (1998) for his groups. The *Eschweilera* species is by far the most consumed fruit of the Caparú population, and I believe that the *igapó* is important to *Cacajao melanocephalus* at this site because of the widespread occurrence of *Eschweilera* there.

Lagothrix lagothricha at Caparú 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, Tinigua National Natural Park, north-western Colombian Amazon (Stevenson *et al.*, 1994). Several types of evidence suggest that Caparú (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 Florez (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 intraspecific 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 Kinzey 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 Caparú site. Fission-fusion of the type described above may be an ecological tactic of many Neotropical primates, allowing a more efficient and economic foraging mode, according to the circumstances of available food (Kinzey 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.

Thomas R. Defler, Instituto Amazónico de Investigaciones de la Universidad Nacional de Colombia (IMANI) & Fundación Natura (Colombia), A. A. 53200, Bogotá, Colombia. E-mail: <caparu@impsat.net.co>.

References

Ardila-C., J. O. and Florez-Z., A. N. 1994. Aspectos de la ecología de un grupo silvestre de *Lagothrix lagothricha* (Humboldt, 1812), Primates-Atelidae en la Amazonia Colombiana. Bachelor's thesis, Universidad Nacional de Colombia, Santa Fe de Bogotá.

Ayres, J. M. 1986. Uakaris and Amazonian flooded forest. Ph.D. thesis, Cambridge University, Cambridge.

Baldwin, J. D. and Baldwin, J. I. 1972. The ecology and behavior of squirrel monkeys (*Saimiri sciureus*) in a natural forest in western Panama. *Folia Primatol.* 18: 161-184.

Boubli, J. P. 1994. The black uakari in the Pico de Neblina National Park. *Neotropical Primates* 2(3):11-12.

Boubli, J. P. 1997. Ecology of the black uakari monkey *Cacajao melanocephalus melanocephalus* in Pico da Neblina National Park, Brazil. Ph.D. thesis, University of California, Berkeley.

Boubli, J. P. 1998. A study of the black uakari, *Cacajao melanocephalus* in the Pico da Neblina National Park, Brazil. *Neotropical Primates* 5(4):111-113.

Castro, R. and Soini, P. 1977. Field studies on *Saguinus mystax* and other callitrichids in Amazonian Peru. In: *The Biology and Conservation of the Callitrichidae*, D. G. Kleiman (ed.), pp. 73-78. Smithsonian Institution Press, Washington, D.C.

Chapman, C. A., Wrangham, R. W. and Chapman, L. J. 1995. Ecological constraints on group size: An analysis of spider monkey and chimpanzee subgroups. *Behav. Ecol. Sobiobiol.* 36: 59-70.

Defler, T. R. 1989. The status and some ecology of primates in the Colombian Amazon. *Primate Conservation* (10): 51-56.

Defler, T. R. 1991. Preliminary observations of *Cacajao melanocephalus* (Humboldt, 1812) (Primates, Cebidae). *TRIANEA (Act. Cient. Tecn. INDERENA)* 4: 557-558.

Defler, T. R. 1996a. An IUCN classification of Colombian primates. *Neotropical Primates* 4(3): 77-78.

Defler, T. R. 1996b. Aspects of the ranging pattern in a group of wild woolly monkeys (*Lagothrix lagothricha*). *Am. J. Primatol.* 38: 289-302.

Defler, T. R. 1999. Estación Biológica Caparú - Colombian Amazon. *Neotropical Primates* 7(1): 24-26.

Defler, T. R. In press. *Primates of Colombia.* Tropical Field Guide Series, Conservation International, Washington, D.C.

Defler, T. R. and Defler, S. B. 1996. The diet of a group of wild woolly monkeys (*Lagothrix lagothricha lagothricha*) in eastern Colombia. *Am. J. Primatol.* 38(4): 289-302.

Defler, T. R. and Pintor, D. 1985. Censusing primates by transect in a forest of known primate density. *Int. J. Primatol.* 6(3): 243-259.

Glander, K. 1987. Reproduction and population growth in free-ranging mantled howling monkeys. *Am. J. Phys. Anthropol.* 53: 25-36.

Goodall, J. 1986. *The Chimpanzees of Gombe.* Belknap Press, Cambridge, Mass.

Kinzey, W.G. and Cunningham, E. P. 1994. Variability in platyrrhine social organization. *Am. J. Primatol.* 34(2): 185-198.

Nishida, T. 1968. The social group of wild chimpanzees in

the Mahali Mountains. *Primates* 9: 167-224.
Nishimura, A. 1990. A sociological and behavioral study of woolly monkeys, *Lagothrix lagotricha*, in the upper Amazon. *The Science and Engineering Review of Doshisha University* 31(2): 1-121.
Palacios, E., Rodríguez, A. and Defler, T. R. 1997. Diet of a group of *Callicebus torquatus lugens* (Humboldt, 1812) during the annual resource bottleneck in Amazonian Colombia. *Int. J. Primatol.* 18(4): 503-522.
Robinson, J. G. 1988. Group size in wedge-capped capuchin monkeys, *Cebus olivaceus*. *Behav. Ecol. Sociobiol.* 23: 187-197.
Soini, P. 1986. A synecological study of the primate community in the Pacaya-Samiria National Reserve, Peru. *Primate Conservation* (7):63-71.
Stevenson, P. R., Quiñones, M. J. and Ahumada, J. A. 1994. Ecological strategies of woolly monkeys (*Lagothrix lagotricha)* in Tinigua National Park, Colombia. *Am. J. Primatol.* 32(2):123-140.
Strier, K. 1989. Effects of patch size on feeding associations in muriquis (*Brachyteles arachnoides*). *Am. J. Primatol.* 23: 113-126.
Symington, M. M. 1987. Ecological and social correlates of party size in the black spider monkey, *Ateles paniscus chamek*. Ph.D. thesis, Princeton University, Princeton, NJ.
Symington, M. M. 1988. Food competition and foraging party size in the black spider monkey (*Ateles paniscus chamek*). *Behaviour* 105: 117-134.
Symington, M. M. 1990. Fission-fusion social organization in *Ateles* and *Pan*. *Int. J. Primatol.* 11: 47-61.
Wrangham, R. W. 1977. Feeding behavior of chimpanzees in Gombe National Park, Tanzania. In: *Primate Ecology: Studies of Feeding and Ranging Behaviour in Lemurs, Monkeys and Apes*, T. H. Clutton-Brock (ed.), pp.503-538. Academic Press, London.

Uso de Plantas como Alimento por *Alouatta palliata* en un Fragmento de Selva en Los Tuxtlas, México

Saúl Juan Solano
Teresita de Jesus 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 aulladores, *Alouatta palliata*, del sur de México no han escapado de esta alteración resultando en el exterminio 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 (Kinzey, 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 aulladores 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 tropa de *A. palliata* compuesta por dos machos adultos, dos hembras adultas, dos infantes y un juvenil. Las observaciones del comportamiento alimenticio de los

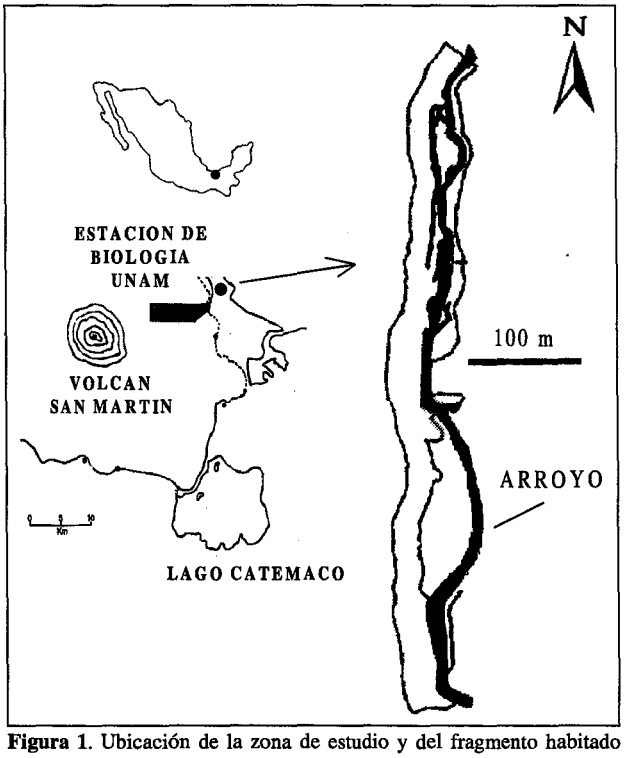


Figura 1. Ubicación de la zona de estudio y del fragmento habitado por la tropa de monos aulladores. Note la forma alargada y angosta del sitio.

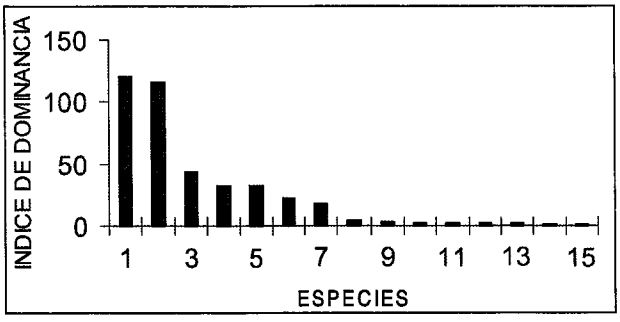


Figura 2. Indice de Dominancia para 15 especies arbóreas con valores >1 y usadas como fuente de alimento por la tropa estudiada. En orden jerárquico las siete más dominantes: *C. obtusifolia, B. alicastrum, P. armata, F. insipida, F. tecolutensis, S. radolkoferi* y *F. yoponensis.*

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 peciolos de epífitas, hemiparásitas 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 hemiepífitos. Una especie epífita y una hemiparásita, 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 hemiepífitos, el 3% correspondió a bejucos y el 1% a hemiparásitas 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 Indice 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 sobresalen 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 peciolos de epífitas, hemiparásitas 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 intermensual (Indice de Sorensen) en el uso de especies varió de 0.41 (Julio y Agosto) a 0.73 (Junio y Julio), con una media mensual de 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 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 de 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

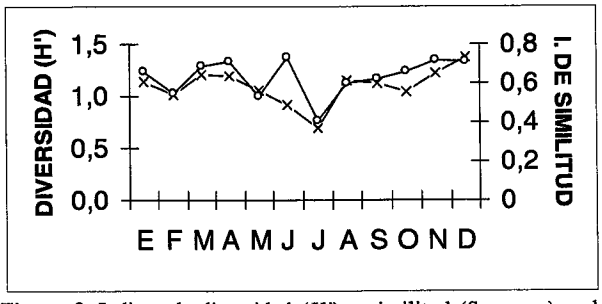


Figura 3. Indices de diversidad (*H'*) y similitud (Sorensen) en la dieta de los aulladores para los meses del ciclo anual estudiado.

Moraceae como parte principal en su dieta. Algunas de ellas, como *C. obtusifolia, F. yoponensis* y *F. tecolutensis* 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 tropa estudiada. Estudios de una tropa de aulladores introducida en una isla lacustre de 8.5 ha dominada por vegetación secundaria a 40 km de la zona de estudio, indicó el uso de 28 especies de plantas (Serio-Silva, 1992). Otro estudio de una tropa 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 tropas de *Alouatta* en extensiones de selva más amplias y sin perturbación antropogénica 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 (Indice 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 tropas de *Alouatta* en fragmentos selváticos pequeños, como el estudiado, existan bajo condiciones ecológicas subóptimas que las ponen en peligro de extinción. Por ejemplo, la biomasa por unidad de área para la tropa 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 tropas 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 del Neotrópico (Estrada y Coates-Estrada, 1993; Kinzey, 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 tropa 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 tropa 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.

Agradecimientos

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

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

Referencias

Alvarez-Buylla, E. R. y M. Martínez-Ramos. 1992. Demography and allometry of *Cecropia obtusifolia* a neotropical pioneer tree: an evaluation of the climax-pioneer paradigm for tropical forests. *J. Ecol.* 80: 275-290.

Brown, K., Jr. 1991. Conservation of Neotropical environments: Insects as indicators. En: *The Conservation of*

Insects and their Habitats, N. M. Collins y J. H. Thomas (eds.), pp. 349-404. Academic Press, London.

Estrada, A. 1984. Resource use by howler monkeys (*Alouatta palliata*) in the rain forest of Los Tuxtlas, Veracruz, Mexico. *Int. J. Primatol.* 5: 105-131.

Estrada, A. y Coates-Estrada, R. 1985. A preliminary study of resource overlap between howling monkeys (*Alouatta palliata*) and other arboreal mammals in the tropical rain forest of Los Tuxtlas, Mexico. *Am. J. Primatol.* 9:27-37.

Estrada, A. y Coates-Estrada, R. 1986. Use of leaf resources by howling monkeys (*Alouatta palliata*) and leaf-cutting ants (*Atta cephalotes*) in the tropical rain forest of Los Tuxtlas, Mexico. *Am. J. Primatol.* 10: 51-66.

Estrada, A. y Coates-Estrada, R. 1993. Aspects of ecological impact of howling monkeys (*Alouatta palliata*) on their habitat: a review. En: *Estudios Primatológicos en México*, Vol. 1, A. Estrada, E. Rodríguez-Luna, R. López-Wilchis y R. Coates-Estrada (eds.), pp.87-117. Asociación Mexicana de Primatología, A.C. y Patronato Pro-Universidad Veracruzana, A. C. Xalapa, Veracruz.

Estrada, A. y Coates-Estrada, R. 1996. Tropical rain forest fragmentation and wild populations of primates at Los Tuxtlas. *Int. J. Primatol.* 5: 759-783.

Estrada, A., Coates-Estrada, R., Vázquez-Yáñes, C. y Orozco-Segovia, A. 1984. Comparison of frugivory by howling monkeys (*Alouatta palliata*) and bats (*Artibeus jamaicensis*) in the tropical rain forest of Los Tuxtlas, Mexico. *Am. J. Primatol.* 7: 3-13.

Estrada, A., Coates-Estrada, R. y Martínez Ramos, M. 1985. La Estación de Biología Los Tuxtlas: Un recurso para el estudio y conservación de la selvas del trópico húmedo en México. En: *Regeneración de Selvas II*, S. del Amo y A. Gómez-Pompa (eds.), pp.379-393.Instituto Nacional de Investigaciones sobre Recursos Bióticos. Editorial Alhambra Mexicana, México.

Estrada, A., Coates-Estrada, R. y Meritt, Jr., D. 1993. Bat species richness and abundance in tropical rain forest fragments and in agricultural habitats at Los Tuxtlas, Mexico. *Ecography*, 16: 309-318.

Estrada, A., Coates-Estrada, R. y Meritt, Jr., D. 1994. Non flying mammals and landscape changes in the tropical rain forest region of Los Tuxtlas, Mexico. *Ecography* 17: 229-241.

Estrada, A., Coates-Estrada, R. y. Meritt, Jr., D. 1997. Anthropogenic landscape changes and avian diversity at Los Tuxtlas, Mexico. *Biodiv. Conserv.* 6(1): 19-43.

Jiménez-Huerta, J. 1992. Distribución y Abundancia del Recurso Alimenticio en un Fragmento de Selva Alta Perennifolia y su Uso por *Ateles* y *Alouatta* en el Ejido Magallanes (Municipio de Soteapan, Veracruz). Tesis de licenciatura, Universidad Veracruzana, Xalapa, Veracruz.

Julliot C. y Sabatier, D. 1993. Diet of the Red Howler monkey (*Alouatta seniculus*) in French Guiana. *Int. J. Primatol.* 14(4): 527-550.

Juan S. 1997. Recursos Alimenticios Utilizados por Monos Aulladores (*Alouatta palliata*) en un Hábitat con Alta Perturbación Antropogénica en la Región de Los Tuxtlas, Veracruz, México. Tesis Licenciatura, Facultad de Biología, Universidad Veracruzana, Xalapa, Veracruz.

Kinzey, W. G. 1997. *Alouatta*. En: *New World Primates: Ecology, Evolution and Behavior*, W. G. Kinzey (ed.), pp.174-185. Aldine, New York.

Martínez-Ramos, M. 1980. Aspectos Sinecológicos del Proceso de Regeneración Natural de una Selva Alta Perennifolia. Tesis de Licenciatura. Facultad de Ciencias. U.N.A.M., México.

Offerman, H. L., Dale, V. N., Pearson, S. M., Bierregaard, Jr., R. O. y O'Neill, R. V. 1995. Effects of forest fragmentation on neotropical fauna: Current research and data availability. *Environmental Review* 3 :190-211.

Serio-Silva, J. C. 1992. Patrón Diario de Actividades y Hábitos Alimenticios de *Alouatta palliata* en Semilibertad. Tesis Licenciatura. Facultad de Biología, Universidad Veracruzana, Córdoba.

General Guidelines for Standardizing Line-Transect 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 Pintor, 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./km^2).

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, 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 supersedes 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, 1997b, 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-effective 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 sciurids 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 a 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 previously familiar with their behaviour and escape responses.

Needless 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 rather subtle search 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 reptile, bird, and mammal species[1]. 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 census 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 rainshowers 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 raindrops 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: callitrichid primates (e.g. *Callithrix*, *Saguinus*), all larger primates (*Callicebus*, *Saimiri*, *Pithecia*, *Chiropotes*, *Cacajao*, *Cebus*, *Alouatta*, *Lagothrix*, and *Ateles*), squirrels (*Microsciurus* and *Sciurus* spp.), acouchis (*Myoprocta*), agoutis (*Dasyprocta*), five species of forest ungulates (collared peccary *Tayassu tajacu*, white-lipped peccary *T. pecari*, red brocket deer *Mazama americana*, gray brocket deer *M. gouazoubira*, and lowland tapir *Tapirus terrestris*), woodquails (*Odontophorus* spp.), small tinamous (*Crypturellus*), large tinamous (*Tinamus*), trumpeters (*Psophia*), common guans *Penelope* and piping guans *Aburria pipile*, curassows (*Crax* spp. and *Mitu mitu*), and tortoises (*Geochelone*).

ing censuses.

Transects 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 1800h 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 repaired 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 sighting/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 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, TRANSECT (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 superseded 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.

Carlos A. Peres, School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, UK. E-mail: <C.Peres@uea.ac.uk>.

References

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

Buckland, S. T., Anderson, D. R., Burnham, K. P. and Laake, J. L. 1993. *Distance Sampling: Estimating Abundance of Biological Populations*. Chapman & Hall, London.

Burnham, K. P., Anderson, D. R. and Laake, J. L.. 1980. Estimation of density from line transect sampling of biological populations. *Wildl. Monog.* 72: 1-202.

Defler, T. and Pintor, D. 1985. Censusing primates by transect in a forest of known primate density. *Int. J. Primatol.* 6:243-259.

Greenwood, J. J. D. 1996. Basic techniques. In: *Ecological Census Techniques: A Handbook*, W.J. Sutherland, (ed.), pp. 11-109. Cambridge University Press, Cambridge.

Hayes, R. J. and Buckland, S. T. 1983. Radial-distance models for the line-transect method. *Biometrics* 39: 29-42.

Janson, C. and Terborgh, J. 1980. Censo de primates en selva humeda tropical. *Publicaciones del Museo de Historia Natural "Javier Prado", Serie A (Zoologia)* 28: 1-39.

Johns, A. D. 1985. Differential detectability of primates between primary and selectively logged habitats and implications for population surveys. *Am. J. Primatol.* 8: 31-36.

Laake, J. L., Burnham, K. P. and Anderson, D. R. 1979. *User's Manual for Program Transect*. Utah State University, Logan, Utah.

Laake, J. L., Buckland, S. T., Anderson, D. R. and Burnham, K. P. 1991. *DISTANCE User's Guide*. Colorado State University, Fort Collins, Colorado.

NRC. 1981. *Techniques for the Study of Primate Population Ecology*. Subcommittee on Conservation of Natural Populations, National Research Council. National Academy Press, Washington, D.C.

Peres, C. A. 1988. Primate community structure in western Brazilian Amazonia. *Primate Conserv.* (9): 83–87.

Peres, C. A. 1989a. A survey of a gallery forest primate community, Marajó Island, Pará. *Vida Silvestre Neotropical* 2: 32–37.

Peres, C. A. 1989b. Costs and benefits of territorial defense in wild golden lion tamarins, *Leontopithecus rosalia*. *Behav. Ecol. Sociobiol.* 25: 227–233.

Peres, C. A. 1990. Effects of hunting on western Amazonian primate communities. *Biol. Conserv.* 54:47-59.

Peres, C. A. 1993a. Structure and spatial organization of an Amazonian terra firme forest primate community. *J. Trop. Ecol.* 9: 259–276.

Peres, C. A. 1993b. Diet and feeding ecology of saddleback and moustached tamarins in an Amazonian terra firme forest. *J. Zool., Lond.* 230: 567–592.

Peres, C. A. 1997a. Primate community structure at twenty western Amazonian flooded and unflooded forests. *J. Trop. Ecol.* 13: 381-405.

Peres, C. A. 1997b. Effects of habitat quality and hunting pressure on arboreal folivore densities in neotropical forests: a case study of howler monkeys (*Alouatta* spp.). *Folia Primatol.* 68: 199-222.

Peres, C.A. In press a. Evaluating the impact and sustainability of subsistence hunting at multiple Amazonian forest sites. In: *Hunting for Sustainability in Tropical Forests*, J. G. Robinson and E. L. Bennett (eds.). Columbia University Press, New York.

Peres, C. A. In press b. Effects of subsistence hunting and forest types on the structure of Amazonian primate communities. In: *Primate Communities*, J. G. Fleagle, C. Janson and K. Reed (eds.). Cambridge University Press, Cambridge.

Peres, C. A. and Dolman, P. In press. Density compensation in neotropical primate communities: evidence from 56 hunted and non-hunted Amazonian forests. *Oecologia*.

Skorupa, J. P. 1987. Do line-transect surveys systematically underestimate primate densities in logged forests? *Am. J. Primatol.* 13: 1-9.

Southwell, C. 1996. Estimation of population size and density when counts are incomplete. In: *Measuring and Monitoring Biological Diversity: Standard Methods for Mammals*, D. E. Wilson, F. R. Cole, J. D. Nichols, R. Rudran and M. S. Foster (eds.). Smithsonian Institution Press, Washington D. C.

Whitesides, G. H., Oates, J. F., Green, S. M. and Kluberdanz, R. P. 1988. Estimating primate densities from transects in a west African rain forest: a comparison of techniques. *J. Appl. Ecol.* 57:345-367.

Wilson, C. C. and Wilson, W. L. 1975. Methods for censusing forest-dwelling primates. In: *Contemporary Primatology*, S. Kondo, M. Kawai and A. Ehara (eds.), pp. 345-350. Karger, Basel.

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 howling, 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 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 rain forest, 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 (Altmann, 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, quadru/tripedal stand, bipedal stand, suspensory.* When the tail was not anchored, I recorded *tail free*. When the tail was anchored beneath the animal (or below the level of the midthoracic 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 midthoracic 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: G = 75.851, p<0.001, travel vs forage: G = 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

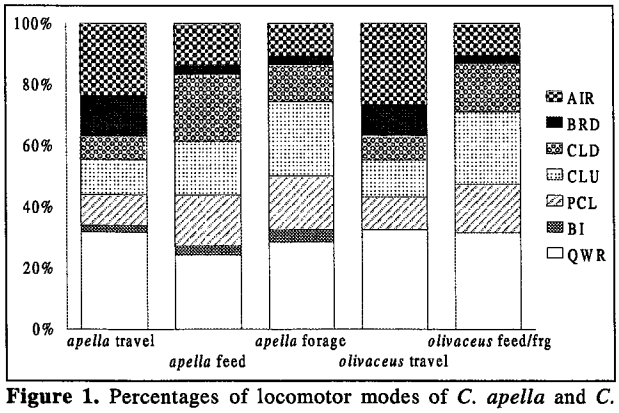


Figure 1. Percentages of locomotor modes of *C. apella* and *C. olivaceus* during travel, feeding and foraging. Sample sizes are: *apella* travel n = 1218, *apella* feed n = 219, *apella* forage n = 174, *olivaceus* travel n = 412, *olivaceus* feed/forage n = 138. QWR = quadrupedal walk and run, BI = bipedalism, PCL = pronograde clamber, CLU = climb up, CLD = climb down, BRD = bridging, AIR = leap, drop.

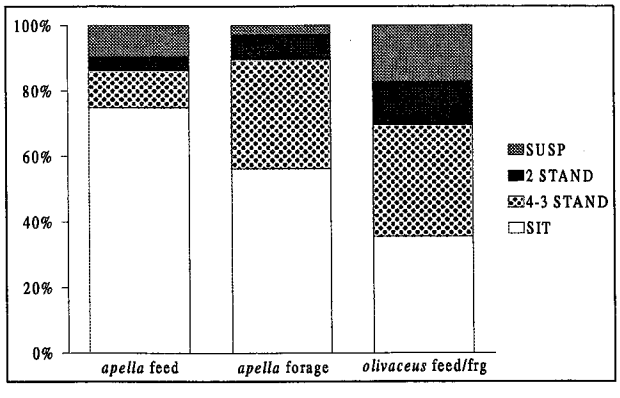


Figure 2. Percentages of postural modes of *C. apella* and *C. olivaceus* during feeding and foraging. Sample sizes are: *apella* feed n = 226 min, *apella* forage n = 17 min, *olivaceus* feed/forage n = 15 min. SIT = sit, 4-3 STAND = quadru/tripedal stand, 2 STAND = bipedal stand, SUSP = suspensory.

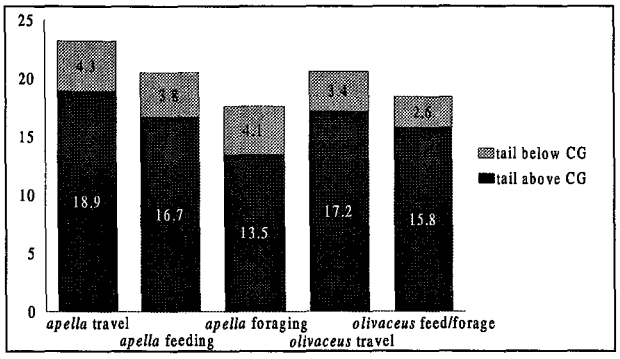


Figure 3. Use of the prehensile tail during locomotion. Labels on bars show percentages of use for each context (*apella* travel n = 1218, *apella* feeding n = 219, *apella* foraging n = 174, *olivaceus* travel n = 412, *olivaceus* feed/forage n = 138).

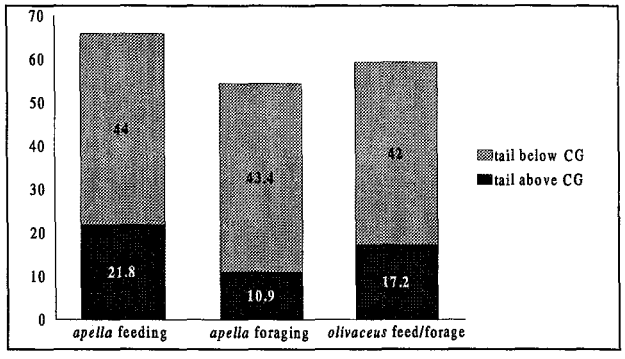


Figure 4. Use of the prehensile tail during feeding and foraging postural behavior. Labels on bars show percentages of use for each context (*apella* feeding n = 226 min, *apella* foraging n = 17 min, *olivaceus* feed/forage n = 15 min).

part of the body weight, controlling and braking the descent.

After leaping, bridging was the second most important gap crossing mode (Fig. 1). It was used extensively in travel, but its contribution decreased significantly in feeding and foraging (*apella*: travel vs feed G = 23.72, $p<0.001$, *olivaceus*: travel vs feed/forage G = 8.307, $p<0.05$). The tail was used very frequently during bridging (82.2% of the bridging subsample [n = 129] in *C. apella*; 87.8% of the bridging subsample [n = 41] in *C. olivaceus*) and was mostly anchored above CG, supporting the animal's weight. When employed, the tail was typically the last appendage to detach from the initial substrate giving the impression of controlling the passage and providing security.

No significant differences were detected in tail use during locomotion between the two species (travel *apella* vs *olivaceus*: G = 1.439, p = 0.487). The tail was anchored in less than 25% of the locomotor intervals in all contexts in both species (Fig. 3). In both species, the tail was anchored above CG in order to brake descents, control risky passages or in changes of direction. In *C. apella* there is a non significant tendency for the tail to be used less in feeding than in traveling (Fig. 3; travel vs feed: G = 0.8, p = 0.067; travel vs forage: G = 2.941, p = 0.23; feed vs forage: G = 0.731, p = 0.694).

Postural Behavior

Figure 2 shows the percentages of postural behaviors for both species during feeding and foraging. The species differed in the use of modes during feeding postural behavior (Fig. 2; *apella* vs *olivaceus* feeding postures: G = 10.80, $p<0.05$). Sitting was the dominant feeding posture in both species (Fig. 2). the tail was very frequently used during sitting (*apella* 64.5%, and mostly below CG). On the other hand, percentages of tail-anchoring below and above CG in quadru/tripedal postures were more similar (*apella* above CG 28.5%, below CG 37.4%).

Suspensory postures were quite infrequent in *C. apella*, while they represented a considerable proportion in *olivaceus* (Fig. 2; but this could be an artifact due to the small sample size for *olivaceus*). In both species, the most frequent suspensory posture was tail-2hindlimbs hang, while tail-only hang or tail-2hindlimbs-forelimb hang were used very rarely. Suspensory postures were adopted not only for food acquisition but also for processing of mostly soft-tissue food items. The tail was always used in suspensory postures.

The prehensile tail was frequently used in feeding postural behavior (*apella* feed 65.8%, *apella* forage 54.3%, *olivaceus* feed/forage 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). Youlatos (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, diversely 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 Youlatos (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 platyrrhines 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 Mizuno, 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. Hallgrímsson kindly provided valuable comments on previous drafts of this report.

Dionisios Youlatos, Muséum National d'Histoire Naturelle, Laboratoire d'Anatomie Comparée, 55 rue Buffon, 75005 Paris, France. *Address for correspondence*: 35, Agathoupoleos Street, 11252 Athens, Greece.

References

Altmann, J. 1974. Observational study of behavior: Sampling methods. *Behaviour* 49: 227-265.

Ankel, F. 1972. Vertebral morphology of fossil and extant primates. In: *The Functional and Evolutionary Biology of Primates*, R. H. Tuttle (ed.), pp. 223-240. Aldine, Chicago.

Bergeson, D., 1995. The ecological role of the platyrrhine prehensile tail. *Am. J. Phys. Anthropol.* (suppl.) 20: 64-65.

Cant, J. G. H. 1986. Locomotion and feeding postures of spider and howling monkeys: Field study and evolutionary interpretation. *Folia Primatol.* 46:1-14.

Cant, J. G. H. 1987. Effects of sexual dimorphism in body size on feeding postural behavior of Sumatran orangutans (*Pongo pygmaeus*). *Am. J. Phys. Anthropol.* 74: 143-148.

Cant, J. G. H. 1988. Positional behavior of long-tailed macaques (*Macaca fascicularis*) in northern Sumatra. *Am. J. Phys. Anthropol.* 76:29-37.

Emmons, L. H. 1990. *Neotropical Rain Forest Mammals. A Field Guide*. University of Chicago Press, Chicago.

Freese, C. H. and J. R. Oppenheimer, 1981. The capuchin monkey, genus *Cebus*. In: *Ecology and Behavior of Neotropical Primates*, Vol. 1., A. F. Coimbra-Filho and R. A. Mittermeier (eds.), pp.331-390. Academia Brasileira de Ciências, Rio de Janeiro.

Gebo, D. L. 1992. Locomotor and postural behavior in *Alouatta palliata* and *Cebus capucinus*. *Am. J. Primatol.* 26: 277-290.

German, R. Z. 1982. The functional morphology of caudal vertebrae in New World monkeys. *Am. J. Phys. Anthropol.* 58: 453-459.

Grand, T. I. 1972. A mechanical interpretation of terminal branch feeding. *J. Mammal.* 53: 198-201.

Grand, T. I. 1977. Body weight: Its relation to tissue composition, segment distribution, and motor function. I. Interspecific comparisons. *Am. J. Phys. Anthropol.* 47: 211-240.

Grand, T. I. 1984. Motion economy within the canopy. In: *Adaptations for Foraging in Non-Human Primates*, P. S. Rodman and J. G. H. Cant (eds.), pp.54-72. Columbia University Press, New York.

Izawa, K., 1979. Foods and feeding behavior of wild black-capped capuchins (*Cebus apella*). *Primates* 20: 57-76.

Janson, C. H., 1988. Food competition in brown capuchin monkeys (*Cebus apella*). Quantitative effects of group size and tree productivity. *Behaviour* 105: 53-76.

Janson, C. H. and Boinski, S. 1992. Morphological and behavioral adaptations for foraging in generalist primates: The case of the cebines. *Am. J. Phys. Anthropol.* 88: 483-498.

Lemelin, P. 1995. Comparative and functional myology of the prehensile tail in New World monkeys. *J. Morph.* 224: 351-368.

Robinson, J. G. 1986. Seasonal variation in use of time and space by the wedge-capped capuchin monkey, *Cebus olivaceus*. *Smiths. Contrib. Zool.* 431:1-60.

Rose, M. D. 1974. Postural adaptations in New World and

Old World monkeys. In: *Primate Locomotion*, F. A. Jenkins, Jr. (ed.), pp.201-221. Academic Press, New York.

Rosenberger, A. L. 1983. Tale of tails: Parallelism and prehensility. *Am. J. Phys. Anthropol.* 60: 103-107.

Terborgh, J. 1983. *Five New World Primates. A Study in Comparative Ecology.* Princeton University Press, Princeton.

Thorington, R. W., Jr. 1967. Feeding and activity of *Cebus* and *Saimiri* in a Colombian forest. In: *Neue Ergebnisse der Primatologie,* D. Starck *et al.* (eds.), pp.180-184. Gustav Fischer, Stuttgart.

Youlatos, D. 1993. Passages within a discontinuous canopy: Bridging in the red howler monkey (*Alouatta seniculus*). *Folia Primatol.* 61: 144-147.

Youlatos, D. 1994. Maîtrise de l'espace et accès aux ressources chez le singe hurleur roux (*Alouatta seniculus*) de la Guyane Francaise. Etude morpho-fonctionnelle. Muséum National d'Histoire Naturelle, Paris.

Zhang, S.-Y. 1995. Activity and ranging patterns in relation to fruit utilization by brown capuchins (*Cebus apella*) in French Guiana. *Int. J. Primatol.* 16: 489-507.

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 (Fedigan, 1993; Izawa, 1980; Janson, 1984; Perry, 1996). 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 (Izar 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 injures 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 typically 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

over the course of his lifetime (Walters and Seyfarth, 1987), but in *C. apella* reports on dominance reversal events involving the alpha male, are rare.

Acknowledgment: I thank Dr. Alfredo Langguth for valuable comments.

Antonio Christian de A. Moura, Departamento de Sistemática e Ecologia-CCEN, Universidade Federal da Paraíba, 58059-900 João Pessoa, Paraíba, Brazil. E-mail: mail:<quick@dse.ufpb.br>.

References

Byrne, G., Abbott, K. M. and Suomi, S. J. 1996. Reorganization of dominance rank among adult males in a captive group of tufted capuchins (*Cebus apella*). *Lab. Prim. Newsl.* 35: 1-6.

Fedigan, L. 1993. Sex differences and intersexual relations in adult white-faced capuchins monkeys (*Cebus capucinus*). *Int. J. Primatol.* 14: 853-877.

Freese, C. H. and Oppenheimer, J. R. 1981. The capuchin monkeys, genus *Cebus*. In: *Ecology and Behavior of Neotropical Primates*, Vol. 1, A. F. Coimbra-Filho and R. A. Mittermeier (eds.), pp.331-390. Academia Brasileira de Ciências, Rio de Janeiro.

Izar, P. and Sato, T. 1997. Influência de abundância alimentar sobre a estrutura de espaçamento interindividual e relações de dominância em um grupo de macacos-prego (*Cebus apella*). In: *A Primatologia no Brasil - 5*, S. F. Ferrari and H. Schneider (eds.), pp. 249-267. Sociedade Brasileira de Primatologia, Universidade Federal do Pará, Belém.

Izawa, K. 1980. Social behaviour of the wild black-capped capuchin (*Cebus apella*). *Primates* 21: 443-467.

Izawa, K. 1990. Social changes within a group of wild black-capped capuchins (*Cebus apella*) in Colombia (II). *Field Studies of New World Monkeys, La Macarena, Colombia* 3: 1-5.

Janson, C. 1984. Female choice and mating system of the brown capuchin monkey *Cebus apella* (Primates: Cebidae). *Z. Tierpsychol.* 65: 177-200.

Perry, S. 1996. Female-female social relationships in wild white-faced capuchin monkeys, *Cebus capucinus*. *Am. J. Primatol.* 40: 167-182.

Robinson, J. G. and Janson, C.H. 1987. Capuchins, squirrel monkeys, and atelines: Socioecological convergence with Old World Primates. In: *Primate Societies*. B. B. Smuts; D. L. Cheney, R. M. Seyfarth, R. W. Wrangham and T. T. Struhsaker (eds.), pp.69-82. University of Chicago Press, Chicago.

Santini, M. E. L. 1984. Observações sobre o comportamento social e reprodutivo do *Cebus apella* em cativeiro. In: *A Primatologia no Brasil*. M. T. de Mello (ed.), pp.313-319. Sociedade Brasileira de Primatologia, Brasília.

Walters, J. R. and Seyfarth, R. M. 1987. Conflict and cooperation. In: *Primate societies*. B. B. Smuts, D. L. Cheney, R. M. Seyfarth, R. W. Wrangham and T. T. Struhsaker (eds.), pp.306-317. University of Chicago Press, Chicago.

A Twin Birth in *Cebus xanthosternos* (Wied, 1820) (Cebidae, Primates)

Alcides Pissinatti
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. nigritus*) 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-FEEMA) 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 the first birth, to a primiparous female

Table 1. Development of the twin offspring of *Cebus xanthosternos* during the first 20 months.

	Father	Mother	Twins			
	474	1084	1739		1740	
Age	15 years	9 years	12 mo	20 mo	12 mo	20 mo
Weight (g)	3.900	3.000	1.600	1.750	1.500	1.850
Total body length (mm)	835	860	760	795	745	800
Tail length (mm)	460	500	440	450	440	460
Right foot (mm)	122	120	110	115	110	115
Ear (mm)	33 x 40	30 x 39	30 x 36	30 x 37	28 x 36	29 x 37
Upper canine	14	8 mm	7	6	6	4
Lower canine	11	8 mm	7	6	6	6
Distance upper canines	30.0	24 mm	17	25	23	26
Distance lower canines	23	18	21	21	17	21

Source: CPRJ/FEEMA animal register.

(CPRJ 324) which suffered a vaginal prolapse, and the newborn was found abandoned, still wrapped in the placental membranes and hand-reared (Pissinatti and Coimbra-Filho, 1991). From then on, however, all births were normal, and of single offspring, except for one twin birth reported here.

With the exception of callitrichines, twin births are rare among cebids, although they have been reported in wild populations of *Aotus vociferans* (*v.* Aquino *et al.*, 1990), *Callicebus cupreus cupreus* (*v.* Knogge and Heymann, 1995), *Alouatta palliata* (*v.* Chapman and Chapman, 1986), *Alouatta seniculus* (*v.* Crockett and Rudran, 1987), *Alouatta caraya* (*v.* Bicca-Marques and Calegaro-Marques, 1994), and *Brachyteles arachnoides* (*v.* Strier, 1991). Twin births have also been reported in captive populations of *Saimiri boliviensis* (*v.* Anonymous, 1993; Biben, 1993), *Aotus nancymaae* (*v.* Gozalo and Montoya, 1990; Màlaga *et al.*, 1991), *Pithecia pithecia* (*v.* Savage *et al.*, 1995), *Cebus apella* (*v.* Eisenstein and D'Amato, 1972; Stott, 1953), *Ateles fusciceps* (J. Vermeer, pers. comm.), and Bushmitz Moshe (pers. comm.) recorded three cases for *Cebus apella* in the Israel Monkey Park. A twin birth has also been reported for *Callimico goeldii*, which normally produces single offspring (Altmann *et al.*, 1988).

The birth of twins in *Cebus xanthosternos* at CPRJ-FEEMA was significant in that both survived well. In two of the three twin births reported by Bushmitz Moshe (pers. comm.) only one of the twins survived. Likewise one of the twin *C. apella* reported by Eisentein and D'Amato (1972) was born dead. Only one of the twin *Callicebus c. cupreus* reported by Knogge and Heymann (1995) and of *Brachyteles* reported by Strier (1991) survived. The twin *C. xanthosternos* (CPRJ 1739 and CPRJ 1740) were born on 25th February 1997. They were both male. Eisenstein and D'Amato (1972) recorded the birth of two females, with separate placentas, but we were unable to ascertain if the *C. xanthosternos* twins had separate placentas or not. Some biometric parameters are shown in Table 1.

The mother of the twins (CPRJ 1084) was primiparous, although she had had plenty of time to observe births of other females in her group. She was an extremely careful mother. During the first month, the offspring were carried ventrally, only rarely and briefly venturing to the mother's dorsum. Most of the time, and when not suckling, they were oriented similarly, with their heads on the same side of the mother. This is in contrast to marmoset twins, in which each 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 escapades 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).

Alcides Pissinatti, Centro de Primatologia do Rio de Janeiro (CPRJ/FEEMA), Rua Fonseca Teles 121/16°, São Cristovão, 20940-200 Rio de Janeiro, Rio de Janeiro, **Adelmar F. Coimbra-Filho**, Rua Artur Araripe 60/901, Gávea, 22451-020 Rio de Janeiro, Rio de Janeiro, **Anthony B. Rylands,** Conservation International do Brazil, Avenida Antônio Abrahão Caram 820/302, 31275-000 Belo Horizonte, Minas Gerais, and **Eduardo C. Nogueira Rubião**, Faculdade Niteroiense de Medicina Veterinária (FANIVE), Rua Visconde do Rio Branco 123, Centro, 24020-000 Niterói, Rio de Janeiro, Brazil.

References

Altmann, J., Warneke, M. and Ramer, J. 1988. Twinning among *Callimico goeldii*. *Int. J. Primatol.* 9: 165-168.

Anonymous. 1993. Squirrel monkey twins reported. *Lab. Prim. Newsl.* 32: 29.

Aquino, R., Puertas, P. and Encarnación, F. 1990. Supplemental notes on population parameters of north eastern

Peruvian night monkeys, genus *Aotus* (Cebidae). *Am. J. Primatol.* 21: 215-221.

Biben, M. 1993. Stillbirth of twins in a squirrel monkey (*Saimiri boliviensis peruviensis*). *J. Med. Primatol.* 22: 276-277.

Bicca-Marques, J. C. and Calegaro-Marques, C. 1994. Twins or adoption? *Neotropical Primates* 2(1): 6-7.

Chapman, C. and Chapman, L. J. 1986. Behavioral development of howling monkey twins (*Alouatta palliata*) in Santa Rosa National Park, Costa Rica. *Primates* 27: 377-381.

Coimbra-Filho, A. F. 1990. Sistemática, distribuição geográfica e situação atual dos símios brasileiros (Platyrrhini - Primates). *Rev. Brasil. Biol.* 50(4): 1063-1079.

Coimbra-Filho, A. F., Rocha e Silva, R. and Pissinatti, A., 1992a. *Cebus apella xanthosternos*: Its propagation in captivity. In: *Topics in Primatology, Vol. 3: Evolutionary Biology, Reproductive Endocrinology and Virology*, S. Matano, R. H. Tuttle, H. Ishita and M. Goodman (eds.), pp.459-466. University of Tokyo Press, Tokyo.

Coimbra-Filho, A. F., Rylands, A. B., Pissinatti, A. and Santos, I. B. 1992b. The distribution and status of the buff-headed capuchin monkey, *Cebus xanthosternos*, in the Atlantic forest region of eastern Brazil. *Primate Conservation* (12-13): 24-30.

Crockett, C. M. and Rudran, R. 1987. Red howler monkey birth data. 1 – Seasonal variation. *Am. J. Primatol.* 13: 347-468.

Eisenstein, N. and D'Amato, M. R. 1972. Twinning in the New World monkeys *Cebus apella. J. Mammal.* 53(2): 406-407.

Gozalo, A. and Montoya 1990. Reproduction of the owl monkey (*Aotus nancymai*) Primates - Cebidae, in captivity. *J. Med. Primatol.* 21: 61-68.

Hill. W. C. O. 1960. *Primates. Comparative Anatomy and Taxonomy IV. Cebidae Part A.* Edinburgh University Press, Edinburgh.

IUCN. 1996. *1996 IUCN Red List of Threatened Animals.* The World Conservation Union (IUCN), Gland,

Knogge, C. and Heymann, E. W. 1995. Field observation of twinning in the dusky titi monkey, *Callicebus cupreus. Folia Primatol.* 65: 118-120.

Màlaga, C. A., Weller, R. E. and Buschbom, R. L. 1991. Twinning in the karyotype I night monkey (*Aotus nancymai). J. Med. Primatol.* 20: 370-372.

Matayoshi, T., Seuánez, H. N., Nasazzi, N., Nagle, C., Armada, J. L., Freitas, L., Alves, G., Barroso, C. M. and Howlin, E. 1987. Heterochromatic variation in *Cebus apella*, (Cebidae, Playtrrhini) of different geographic regions. *Cytogenet. Cell. Genet.* 44: 158-162.

Mittermeier, R. A., Coimbra-Filho, A. F., Constable, I. D., Rylands, A. B. and Valle, C. 1982. Conservation of primates in Atlantic forest region of eastern Brazil. *Int. Zoo Yearb.* 22: 2-17.

Mittermeier, R. A., Rylands, A. B. and Coimbra-Filho, A. F. 1988. Systematics: species and subspecies - an update. In: *Ecology and Behavior of Neotropical Primates, Vol.2*, R. A. Mittermeier, A. B. Rylands, A. F. Coimbra-Filho and G. A. B. da Fonseca (eds.), pp.13-75. World Wildlife Fund, Washington, D. C.

Oliver, W. L. R. and Santos, I. B. 1991. Threatened endemic mammals of the Atlantic forest region of south-east Brazil. *Wildl. Preserv. Trust, Special Scientific Report* 4: 1-126.

Pissinatti, A. and Coimbra-Filho, A. F. 1991. Prolapso vaginal em *Cebus apella xanthosternos* (Wied, 1820) Cebidae-Primates. In: *A Primatologia no Brasil - 3*, A. B. Rylands and A. T. Bernardes (eds.), pp.307-310. Fundação Biodiversitas and Sociedade Brasileira de Primatologia, Belo Horizonte.

Rylands, A. B., Pinto. L. P. de S. and Subirá, R. J. 1993. Levantamento das populações do macaco-prego-de peito-amarelo (*Cebus apella xanthosternos*, Wied, 1820) no vale do Rio São Francisco. Unpublished report, International Committee for the Recovery and Management of *Cebus apella xanthosternos* and *Cebus apella robustus*, Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Ibama), Brasília.

Rylands, A. B., Mittermeier, R. A. and Rodríguez-Luna, E. 1995. A species list for the New World primates (Platyrrhini): Distribution by country, endemism, and conservation status according to the Mace-Lande system. *Neotropical Primates* **3**(suppl.): 113-160.

Santos, I. B. and Lernould, J.-M. 1993a. A conservation program for the yellow-breasted capuchin, *Cebus apella xanthosternos. Neotropical Primates* 1(1): 4-5.

Santos, I. B. and Lernould, J.-M. 1993b. 1st meeting of the International Committee for *Cebus apella xanthosternos* and *Cebus apella robustus. Neotropical Primates* 1(2): 9-10.

Santos, I. B. and Oliver, W. L. R. 1991. International cooperative breeding programme for the yellow-breasted capuchin monkey, *Cebus apella xanthosternos* - the acquisition of additional founders and preliminary recommendations for the future development of the programme. A report on the field project in S. E. Bahia in October 1991. Unpubl. Report. Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Ibama), Brasília, Parc Zoologique et Botanique de la Ville de Mulhouse, Mulhouse, Zoologischer Garten Zürich, Zürich, the North of England Zoological Society, Chester, UK, Centro de Primatologia do Rio de Janeiro, Rio de Janeiro, and Fundação Biodiversitas, Belo Horizonte. 25pp.

Savage, A., Lasley, B. L., Vecchio, A. J., Miller, A. E. and Shideler, S. E. 1995. Selected aspects of female white-faced saki (*Pithecia pithecia*) reproductive biology. *Zoo Biol.* 14: 441-452.

Seuánez, H. N., Armada, J. L., Freitas, L. , Rocha e Silva, R. da, Pissinatti, A. and Coimbra-Filho, A. F. Intraspecific chromosome variation in *Cebus apella* (Cebidae, Platyrrhini): The chromosomes of the yellow-breasted capuchin *Cebus apella xanthosternos* Wied, 1820. *Am. J. Primatol.* 10: 237-247.

Stott, K., Jr. 1953. Twinning in hooded capuchin. *J. Mammal.* 34(3): 385.

Strier, K. B. 1991. Demography and conservation of an endangered primate, *Brachyteles arachnoides. Conserv. Biol.* 5: 214-218.

Torres de Assumpção, C. 1988. Resultados preliminares de reavaliação das raças de macaco-prego *Cebus apella* (Primates: Cebidae). *Rev. Nordest. Biol.* 6(1): 15-28.

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., *Callicebus torquatus, Saimiri sciureus, Cebus apella, Cebus albifrons, Cacajao melanocephalus, Alouatta seniculus,* and *Lagothrix lagothricha.* My first priority was to begin a study of *Lagothrix lagothricha,* 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 black-water 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 piraracu (*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.

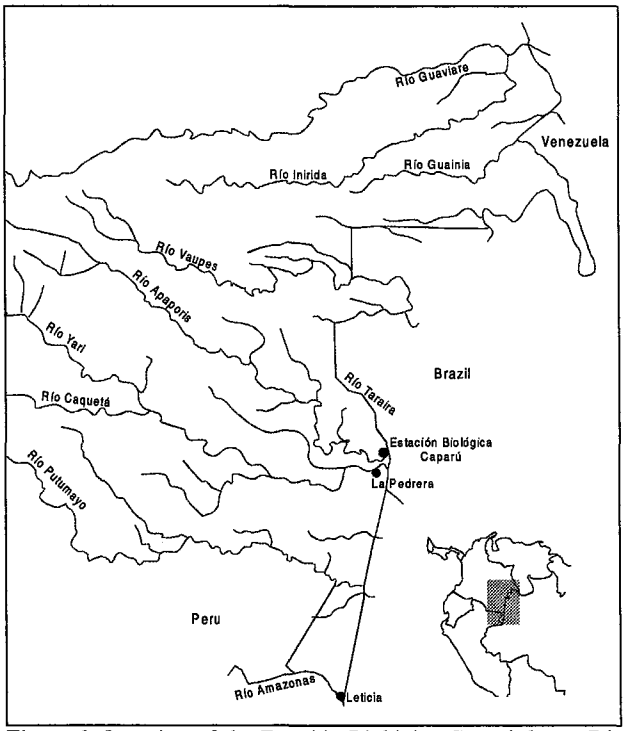


Figure 1. Location of the Estación Biológica Caparú, lower Río Apaporis, Colombia.

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 lagothricha*) 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, 1996c, 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 Yaigojé-Apaporis Indian Reserve. In a meeting with the Association of Captains of Yaigojé-Apaporis (ACIYA) in May, several NGOs and government conservation organizations signed an agreement with ACIYA 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 *Callicebus torquatus*. Some details of the process of reintroduction for some of these species have become clear (Defler and Defler, in prep.).

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 Corporation Regional del Desarrollo Sostenible del Norte y Oriente de Amazonia (C.D.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 International de Colombia in attempting to strengthen Caparú in the face of its present adversity.

The Fundación Natura has joined forces with IMANI for the administration of the Estación Biológica Caparú 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.

Thomas R. Defler, Instituto Amazónico de Investigaciones de la Universidad Nacional de Colombia - IMANI y la Fundación Natura, A. A. 53200, Santafé de Bogotá, Colombia. E-mail: <caparu@impsat.net.co>.

References

Ardila-C., J. O. and Florez-Z., A. N. 1994. Aspectos de la ecología de un grupo silvestre *Lagothrix lagothricha lagothricha* (Humboldt, 1812), Primates - Atelidae, en la Amazonia Colombiana. Bachelor's thesis, Universidad Nacional de Colombia, Bogotá.

Barrios, L.F. and Mantilla M., H. In prog. Estudio de la ecología básica de *Cebus apella* en el bajo Apaporis, Estación Biológica Caparú. Bachelor's thesis, Universidad Nacional de Colombia, Bogotá.

Bennett-Defler, S. 1994. Las aves de la Estación Caparú: una lista preliminar de especies. *TRIANEA (Act. Cient. Tecn. INDERENA)* 5:379-400.

Bennett-Defler, S. and Defler, T. R. 1997. Anotaciones sobre los crácidos del bajo Apaporis en el sureste de Colombia. In: *The Cracidae: Their Biology and Conservation*, S. D. Strahl, S. Beaujon, D. M. Brooks, A. J. Behazo, G. Sedaghatkish and F. Olmos (eds.), pp. 289-297. Hancock House Publishers Ltd., Surrey, B.C.

Botello, J. C. In prep. Ecología y dieta de *Pteronura brasiliensis*. Bachelor's thesis, Universidad del Valle, Cali.

Corea, S. In prep. Ictiofauna del Lago de Taraira (Estación Biológica Caparú). Bachelor's thesis, Universidad del Valle, Cali.

Defler, T.R. 1989a. The status and some ecology of primates in the Colombian Amazon. *Primate Conservation* (10): 51-56.

Defler, T. R. 1989b. Recorridos y uso del espacio en un grupo de *Lagothrix lagothricha* (mono lanudo o churuco) en la Amazonia colombiana. *TRIANEA (Acta Cient. Tecn. INDERENA)* 3: 183-205.

Defler, T. R. 1989c. El bajo Apaporis: un Nuevo Parque Nacional? *Colombia Su Gente y Paisaje* 16: 244-255.

Defler, T. R. 1990. Primates and the Colombian Amazon. *IPPL (International Primate Protection League) NEWS* 17(2): 8-12.

Defler, T. R. 1991. Preliminary observations of *Cacajao melanocephalus* (Humboldt, 1811) (Primates, Cebidae). *TRIANEA (Acta Cient. Tecn. INDERENA)* 4: 557-558.

Defler, T. R. 1994a. *Callicebus torquatus* is not a white-sand specialist. *Am. J. Primatol.* 33(2): 149-154.

Defler, T. R. 1994b. Jaguars eat dolphins, too. *TRIANEA (Acta Cient. Tecn. INDERENA)* 5: 415-416.

Defler, T. R. 1994c. La conservación de primates en Colombia. *TRIANEA (Acta Cient. Tecn. INDERENA)* 5: 255-287.

Defler, T. R. 1995. The time budget of a group of wild woolly monkeys, *Lagothrix lagothricha*. *Int. J. Primatol.* 16: 107-120.

Defler, T. R. 1996a. Some aspects of the ranging pattern in a group of wild woolly monkeys (*Lagothrix lagothricha*). *Am. J. Primatol.*

Defler, T. R. In press. *Primates of Colombia*. Conservation International, Tropical Field Guide Series, Washington, D. C.

Defler, T. R. Submitted. Locomotion and posture in *Lagothrix lagothricha*.

Defler, T. R. and Defler, S. B. 1996a. Diet of a group of *Lagothrix lagothricha lagothricha* in southeastern Colombia. *Int. J. Primatol.* 17(2):161-189.

Defler, T. R. and Defler, S. B. 1996b. The diet of a group of woolly monkeys (*Lagothrix lagothricha lagothricha*). *Am. J. Primatol.* 17(2): 161-189.

Defler, T. R. and Defler, S. B. In prep. Notes on the reintroduction of some species of neotropical primates at Caparú Biological Station.

Forero, O. 1986. Contribución al conocimiento del uso espacial de *Callicebus torquatus lugens* en el bajo río Apaporis, Vaupés. Bachelor's thesis, Pontificia Universidad Javeriana, Bogotá.

Gómez, C. In prog. La ecología del maicero *Cebus apella* en el bajo río Apaporis, el Vaupés, Colombia. Universidad del Valle, Cali.

Hernández-Camacho, J. and Defler, T. R. 1989. Algunos aspectos de la conservación de primates no-humanos en Colombia. In: *La Primatología en Latinoamérica*, C. J. Saavedra, R. A. Mittermeier and I. B. Santos (eds.), pp. 67-100. WWF-US, Washington, D. C.

Hernández-Camacho, J., Hurtado-G., A., Ortiz-Q., R. and Walschburger, T. 1992. Unidades biogeográficas en Colombia. In: *La Diversidad Biológica de Iberoamérica I*, ed. G.

Halffter, pp.105-151. Instituto de Ecología, A.C., México.
Ibarra, C., Morelo, J., Briceño, J., Cortés, A., Motta, B. de, Luna, C., Garavito, F. and Pulido, C. 1979. Suelos. In: *La Amazonia Colombiana y sus Recursos*, pp.93-216. Proyecto Radargrametrico del Amazonas, Bogotá.
Lora, C. 1991. Listado preliminar de mariposas de la zona propuesta para el Parque Nacional Caparú. In: *Propuesta para la Creación del Parque Nacional Natural Caparú*, T. R. Defler, S. B. Defler (eds.) and B. Arjona, 15pp. Fundación Natura, Bogotá, (Appendix).
Muñoz, J. 1991. Algunos aspectos de la dispersión, estructura social y uso del espacio habitado en un grupo de *Lagothrix lagothricha* (Humboldt, 1912) - Primates, Cebidae - en la Amazonia colombiana. Bachelor's thesis, Universidad Nacional de Colombia, Bogotá.
Palacios-A., E. 1997. Dieta y recorridos de *Alouatta seniculus* en el bajo río Apaporis, Vaupés, Colombia. Master's thesis, Universidad Nacional de Colombia, Bogotá.
Palacios-A., E. and Rodríguez-R., A. 1995. Caracterización de la dieta y comportamiento alimentario de *Callicebus torquatus lugens*. Bachelor's thesis, Universidad Nacional de Colombia, Bogotá.
Palacios-A., E., Rodríguez-R., A. and Defler, T. R. 1997. Diet of a group of *Callicebus torquatus lugens* (Humboldt, 1812) during the annual resource bottleneck in Amazonian Colombia. *Int. J. Primatol.* 18(4): 503-522.
Patiño, A. In prog. La ecología básica del chichico *Saimiri sciureus* en el bajo río Apaporis, el Vaupés, Colombia. Master's Thesis, Universidad Nacional de Colombia, Bogotá.
Rodríguez-R., J. A. 1997. La dieta de *Callicebus torquatus lugens* en el bajo río Apaporis, Vaupés. Master's Thesis, Universidad Nacional de Colombia, Bogotá.
Stephen, I. In prog. The lizard community of Caparú. Ph.D. thesis, Royal Holloway College, University of London, London.

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 Program (EEP) studbook 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. Studbook 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 transactions during the year 1996 are given for each spider monkey subspecies: *Ateles belzebuth belzebuth, Ateles belzebuth chamek, Ateles belzebuth hybridus, Ateles geoffroyi* (all ssp.), *Ateles fusciceps robustus, Ateles paniscus* and *Ateles* hybrids. For each of them, the situation in Europe and in the other regions (Australia, North America, South Africa) are summarized along with the recommendations 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 subspecies 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 various age classes. Males show a higher fecundity rate than females during their life span; they begin reproducing earlier. 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 institutions. Recommendations of transfers are based on the inbreeding 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 genes.

Sophie Durlot, 04 rue Jean-Baptiste Tubi, 78590 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

Durlot, S. and Gay, P. 1998. *European Regional Studbook for the Spider Monkeys,* Ateles *ssp.,* Ateles fusciceps robustus *E.E.P.* Number 3, 115 pp. Doué la Fontaine Zoological Park, France. Data through 31 December 1997.
Gay, P. 1995. *European Regional Studbook for the Spider monkeys* Ateles *ssp.,* Ateles fusciceps robustus *EEP.* 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 studbook (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. hybridus, 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 (3.0.2) 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, Ferndale, 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.

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

Reference

Newland, K. 1999. 1997 *North American Regional Studbook (Historical) for South American Spider Monkeys* Ateles belzebuth, A. fusciceps, A. paniscus - *all subspecies.* Memphis Zoo and Aquarium, Memphis, Tennessee. 131pp. + appendices. Data current through 31 December, 1997.

Nacimiento de Gemelos de *Saguinus labiatus* Observado en su Habitat Natural

Dos gemelos estaban naciendo en un grupo de *Saguinus labiatus* que son observados 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 norde del Río Tahuamanu y 63 km suroeste de la ciudad de Cobija.

El grupo de cinco individuos de *S. labiatus* estaba siendo seguido el dia 10 de noviembre, 1998. Observaciónes de el grupo empezó a las 07:10 de la manana. A las 08:35 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 investigando la salida del primer bebé. El bebé nació y ella lo tubo por menos de un minuto en sus manos lamiendolo. Despues 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 despues 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 regressaron 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 permitia.

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 meimbros del grupo empezaron a alarmarse con la caida del bebe y miraron el suelo. Seis minutos despues un macho bajó al suelo y recogío el bebé encima de su espalda y subió en los arboles. Por las seguientes horas el grupo viajó lentemente y paraba frequentemente 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 observaciónes por el dia. Por los siguiente cuatro dias el grupo estaba seguido con muchas difficultades porque ellos descansaban casi siempre en vegetaciónes densas y altas. Durante estos dias los bebés estaban cargados aveces juntos encima de un adulto y otros opportunidades separados encima de dos animales. Este grupo será observado por los seguinte cuatro meses para mirar el desarollo 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 northwest Bolivia, 2 km north of the Río Tahuamanu and 63 km

south-east of the city of Cobija.

A group of five individuals of *Saguinus 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 first 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.

Edilio Nacimento Bezerra, Correo Central, Cobija, 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.

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 (Gonzales, 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 Platyrrhine 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. libidinosus* (1), *Saimiri* sp. (13), *Saimiri boliviensis* (6), *Aotus* sp. (39), *Aotus azarae* (21), *Callicebus* sp. (29), *Callicebus donacophilus* (6). **Atelidae** (26%), *Pithecia* sp. (2), *Alouatta* sp. (14), *A. caraya* (60), *A. fusca* (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), *Saguinus* 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 platyrrhine 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 *Callicebus* sp. and 3 *Leontophitecus* 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 platyrrhine 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.

Marina Sofía Ascunce, **Romari Martinez**, Grupo de Investigación en Biología Evolutiva (GIBE), **Ignacio Avila**, GIBE and Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", División de Mastozoología, Avenida Angel Gallardo 470, (1405) Buenos Aires, and **Marta Mudry**, GIBE, Departamento de Ciencias Biológicas, Fac. Cs. Exactas y Naturales, UBA, Ciudad Universitaria, Pab. II 4o Piso, (1428) Buenos Aires, Argentina. E-mail of the first author: <marina@bg.fcen.uba.ar>.

References

Ford, S. 1986. Systematics of the New World Monkeys. In: *Comparative Primate Biology, Vol. 1: Systematics, Evoluition and Anatomy*, D. R. Swindler and J. Erwin (eds.), pp.73-135. Alan R. Liss, New York.

Gonzales, A. L. 1980. *El Museo de Ciencias Naturales de Buenos Aires*. Ediciones Culturales Argentinas, Buenos Aires. 135pp.

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 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; Rosemary de Carvalho Mamede, Department of Wildlife, Ibama; Anthony B. Rylands, IUCN/SSC Primate Specialist Group and Conservation International do Brasil; and Rosana J. 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 carried out 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.

Andrew J. Baker, Curator of Primates and Small Mammals, Zoological Society of Philadelphia, 3400 West Girard Avenue, Philadelphia, PA 19104-1196, USA, and **Maria Iolita Bampi**, Departamento de Vida Silvestre, Diretoria de Ecossistemas, Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Ibama), SAIN Avenida L4 Norte, Edifício Sede, 70800 Brasília, D.F., Brazil.

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

Species Survival Commission

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). Thousands 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 development 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

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 foer linking SSC'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 on 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 (<mgd@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 Mauverney 28, CH-1196 Gland, Switzerland.

Levantamento 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 o 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 muriquis 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, colher 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

populações do norte foram muito destruídas, e hoje estão muito fragmentadas, esta subespécie está sendo considerada pelos pesquisadores, como sendo a mais ameaçada de extinção. No entanto, não se tem certeza de qual das duas existe no Rio de Janeiro. O Rio de Janeiro está nos limites das distribuições das duas subespécies. Assim, o Projeto Muriqui-Rio contribuirá com informações atuais sobre a situação do muriqui no Rio de Janeiro, que servirão para dar um melhor direcionamento às ações que vissem a sua conservação, como também ajudará a esclarecer os limites de distribuição das subespécies atualmente reconhecidas. Este trabalho está sendo financiado pela Fundação O Boticário de Proteção à Natureza, Fundação MacArthur e a Margot Marsh Biodiversity Foundation e será realizado em três unidades de conservação situadas no Rio de Janeiro que representam uma ampla amostra geográfica da distribuição do muriqui neste estado. Ao sul, o Parque Nacional de Itatiaia, no centro, o Parque Nacional da Serra dos Orgãos, e ao norte o Parque Estadual do Desengano.

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>.

The L. S. B. Leakey Foundation - Awards 1997-1998

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 azarai*) of 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 fuscicollis* 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 (*Hylobates*). 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 proportions 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*: Primate 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*: Grant 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-

ber at: Primate Conservation Inc., 163 Town Lane, East Hampton, New York 11937-5000 USA, Tel: 516 267 6856, Fax 516 267 6856. E-mail: <74225.2342@compuserve.com>.

American Society of Mammalogists - Latin American Fellowship 1999

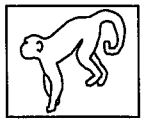
The Latin American Fellowship was established by the American Society of Mammalogists (ASM) to promote the support of mammalian field research by Latin Americans in Latin America. Eligible students must be citizens of Latin American countries (excluding Puerto Rico), and enrolled in a graduate program 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 Ecology Program

Florida State University-Panama is offering a 4-week 7-semester hour Primate Behavior and Ecology 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/ipsp/Program.htm>.

Primate Societies

IX Congresso Brasileiro de Primatologia



Em 1979 foi criada a Sociedade Brasileira de Primatologia que, a partir de então, passou a organizar, bianualmente, o Congresso Brasileiro de Primatologia, reunindo pesquisadores e estudantes do Brasil e de outros países interessados em nossa fauna de primatas. Os trabalhos apresentados no Congresso são publicados numa série de livros A *Primatologia no Brasil*, cujo 7° volume estará pronto antes do Congresso de 1999. Originalmente, o Congresso era organizado em paralelo com o Congresso Brasileiro de Zoologia, mas com o grande crescimento da primatologia no Brasil nos últimos anos, o Congresso passou a ser organizado independentemente, em data diferente. Atualmente, o Congresso tem reunido cerca de duzentos participantes, dentre pesquisadores brasileiros e estrangeiros e estudantes. Em 1999, o IX Congresso Brasileiro de Primatologia será realizado na região Sudeste, no Museu de Biológia Mello Leitão, Santa Teresa, Espírito Santo nos dias 25 a 30 de julho, com a comemoração dos 20 anos da SBPr, e acredita-se que poderá haver um maior número de participantes.

Em função da crescente preocupação com a preservação da biodiversidade e pelo fato de termos várias espécies de primatas brasileiros ameaçadas de extinção, o tema escolhido para 1999 é a conservação, que será abordada por diversos cientistas com diferentes enfoques. Além disto, por ser o último Congresso deste século, será o palco para a avaliação do crescimento da primatologia no Brasil e para a discussão das perspectivas para o Século XXI. O Congresso oferecerá mini-cursos e organizará mesas redondas, conferências, palestras e sessões de painéis. Em complemento às atividades científicas, serão organizadas atividades culturais e visitas a sítios de interesse primatológico.

Santa Teresa é uma pequena cidade de colonização predominantemente italiana, localizada na região serrana do estado do Espírito Santo, a 80 km da cidade de Vitória. Em Santa Teresa está localizado o Museu de Biologia Prof. Mello Leitão, fundado por Augusto Ruschi em 1949, que estará comemorando seu cinqüentenário em 1999. O Museu tem tradição em atividades de pesquisa e conservação da Mata Atlântica e tem desenvolvido trabalhos na área de primatologia, sendo um criadouro científico de primatas do gênero *Callithrix*. *Inscrições e Envio de Resumos*: Em breve serão envidas informações detalhadas sobre inscrições e apresentações de trabalhos no Congresso. *Programação Preliminar*: 1) Conferências - Conservação de primatas - Desafios para o Século XXI; e Conservação de primatas neotropicais; 2) Mesas Redondas - Conservação de primatas no Brasil; Sistemática, biogeografia e evolução de primatas neotropicais; Cognição, visão e comunicação em primatas; Manejo de primatas em cativeiro; 3) Palestras -

Comunidades de primatas neotropicais; A história da primatologia no Brasil; Estratégias reprodutivas de primatas neotropicais; A biogeografia dos primatas da Amazônia; A biogeografia dos primatas da Mata Atlântica; Evolução da comunicação em primatas neotropicais; Desafios no estudo do comportamento - os primatas como modelo; Avanços nos estudos do comportamento social de calitriquídeos; Avanços nos estudos do comportamento social de cebídeos; Ecologia alimentar em primatas neotropicais; 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 cativeiro; Comportamento social de calitriquídeos; Bioacústica de primatas; Biologia da conservação de primatas. *Comissão Coordenadora*: Alcides Pissinatti, Sérgio L. Mendes, Patrícia Izar, Cristina Santos, Adriana Rímoli, José Rímoli. *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.sbpr.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 meetings 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.

Part 1. The Common Marmoset and the Study of the Immune System and its Pathology. An overview of major points in immunology - 200 years in 20 minutes - Gareth Griffiths; The immunology of the marmoset, and its suitability for immuno-toxicological studies - Reinhard Neubert; Further immunological studies using the marmoset - Gareth Griffiths; Analysis of immune markers in the marmoset by flow cytometry - Rebecca Hornby; Creation of a new model of multiple sclerosis in the common marmoset - Bert 't Hart; Analysis of immunopathological pathways towards autoimmune encephalomyelitis in the common marmoset - Herbert Brok. Part 2. The Common Marmoset as a Biomedical Model. Physiological adaptations to cooperative breeding in female common marmosets and their application in biomedical research - David Abbott; The common marmoset, telemetry, and development of a model for applied cardiovascular research - Christian Schnell; The use of the marmoset to study neuroprotective drugs for the treatment of ischaemic stroke - Jonathan Marshall; The common marmoset, behavioural neurochemistry, and development of a model for Parkinson's disease - Michel Reibaud; The 5-HT1A antagonist, WAY 100 635, reverses cognitive deficits induced by dizocilpine (MK-801) treatment in the marmoset - Josie Harder. Part 3. Common Marmoset Biology and Development of Husbandry and Research Methods. The sociophysiology of the pair bond in common marmosets: behavioural and cardio-physiological responses to an unfamiliar environment - Patricia Gerber; Integrating marmoset husbandry and behavioural biology - Isabelle Allmann; Development of non-invasive methods for monitoring physiology in callitrichid monkeys - Christopher Pryce; The influence of food distribution on ranging behaviour and group cohesion in semi-free living common marmosets - Holger Westermann; Marmoset wasting syndrome: a case study - Anne-Dominique Degryse.

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 Schwerzenbach Switzerland, Tel +41 1 825 7386, +41 1 825 7416 (Secretariat), Fax +41 1 825 7417, email: pryce@toxi.biol.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.

Recent Publications

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 do Século 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, alem de ser um compromisso assumido no workshop de Serra Negra, São Paulo, 30 de julho - 2 de agosto de 1997. A serie é composta por sete volumes, abrangendo de microrganismos e vírus a mamíferos e fanerogamas, 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 3*

- *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 BIOTASP no endereço <www.bdt.org.br/bdt/biotasp/livros>.

Books

Flórula de las Reservas Biológicas de Iquitos, Peru: Allpahuayo-Mishana, Explornapo Camp, Explorama Lodge, by Rodolfo Vásquez Martínez, edited by Agustin Rudas Lleras and Charlotte M. Taylor, and supported by the John D. and Catherine T. MacArthur Foundation, 1046pp., 1997. Missouri Botanical Garden, Missouri. ISBN 0 915279 48 7. 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: <mbgpress@mobot.org>. For more information web site: <www.mobot.org/mobot/research/scipub/florula.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 exsiccatae 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: Morfologia, Distribución y Usos*, by C. Reynel and T. D. Pennington, illustrations by Rosemary Wise, 1997, £27.00 (+ p&p); *El Género* Inga *en el Ecuador: Morfologia, 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 Gradens, 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 Serediuk 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 naturalist 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 Wanderbilt Duarte de Barros. There are short biographies of each, and the subsequent chapters reproduce verbatim their memories and opinions (excepting Wanderbilt 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 Politécnico, Jardim das Américas, Caixa Postal 19.029, 81531-990 Curitiba, Paraná, Brazil, Tel: 267 5973, 361 3380.

Encyclopedia of Animal Rights and Animal Welfare, edited by Marc Bekoff and Carron A. Meaney, 472pp., June, 1998. Greenwood Publishing Group, Westport, VT. Price: US$59.95. ISBN 0-313-29977-3. Human beings' responsibility to and for their fellow animals has become an increasingly controversial subject. This book, which Jane Goodall in her foreword calls "unique, informative, and exciting", provides a provocative overview of the many different perspectives on the issues of animal rights and animal welfare in an easy-to-use encyclopedic format. Students, teachers, and interested readers can explore the ideas of well-known philosophers, biologists, psychologists, and historians such as Peter Singer, Tom Regan, and over 125 others, all of whom have contributed original entries. Available from: Greenwood Publishing Group, 88 Post Road West, Box 5007, Westport, VT 06881, USA, Toll free: 1-800-225-5800, e-mail: <bookinfo@greenwood.com>. URL: http://www.greenwood.com.

Queridos Animais. Relação Humanos & Animais: Novas Áreas Profissionais sob Enfoque Ecológico, edited by Angela Escosteguy, 1997, 204pp. L&PM Editores S/A., Porto Alegre. In Portuguese. Twelve chapters in eight sections: 1. Introdução; 2. Biotecnologia e Bioética; 3. Biodiverasidade: Animais Brasileiros em Extinção (including Biodiversidade e Conservação - Helena Romanowski &

Gerson Buss); 4. Agropecuária Ecológica; 5. Terapias Suaves; 6. Bem-estar Animal; 7. Exemplos de produção de Alimentos Ecológicos; 8. Aspectos Jurídicos. Available from: L&PM Editores, S/A., Rua Padre Chagas 185/802, 90570-080 Porto Alegre, Rio Grande do Sul, Brazil, Tel: 051 346 3444.

O Pensamento de Animais e Intelectuais: Evolução e Epistemologia, by Dennis Werner, 1997, 195pp. Editora da Universidade Federal de Santa Catarina, Florianópolis. In Portuguese. Price R$18.00. Available from: Editora da UFSC, Caixa Postal 476, 88010-970 Florianópolis, Santa Catarina, Brazil, Tel: 048 331-9408, Fax: 048 331-9680.

Articles

Abbott, D. H., Saltzman, W., Schultz-Darken, N. J. and Tannenbaum, P. L. 1998. Adaptations to subordinate status in female marmoset monkeys. *Comp. Biochem. Physiol.* 119(3): 261-274.

Bergeson, D. J. 1998. Patterns of suspensory feeding in *Alouatta palliata*, *Ateles geoffroyi*, and *Cebus capucinus*. In: *Primate Locomotion: Recent Advances*, E. Strasser, J. Fleagle, A. L. Rosenberger and H. McHenry (eds.), pp.45-60. Plenum Press, New York.

Colwell, D. D. and Milton, K. 1998. Development of *Alouattamyia baeri* (Diptera: Oestridae) from howler monkeys (Primates: Cebidae) on Barro Colorado Island, Panama. *J. Med. Entomol.* 35(5): 674-680.

Cropp, S. J., Larson, A. and Cheverud, J. M. 1999. Historical biogeography of tamarins, genus *Saguinus*: The molecular phylogenetic evidence. *Am. J. Phys. Anthropol.* 108: 65-89.

Dagosto, M. and Gebo. D. L. 1998. Methodologcial issues in studying positional behavior. In: *Primate Locomotion: Recent Advances*, E. Strasser, J. G. Fleagle, A. L. Rosenberger and H. McHenry (eds.), pp.5-29. Plenum Press, New York.

Ellowson, A. M., Snowdon, C. T. and Lazaro-Perea, C. 1998. Infant babbling in a nonhuman primate: Complex vocal sequences with repeated call types. *Behaviour* 135(5): 643-664.

Encarnación, F. and Heymann, E. W. 1998. Body mass of *Callimico goeldii*. *Folia Primatol.* 69: 368-371.

Garber, P. A. 1998. Within- and between-site variability in moustached tamarin (*Saguinus mystax*) positional behavior during food procurement. In: *Primate Locomotion: Recent Advances*, E. Strasser, J. G. Fleagle, A. L. Rosenberger and H. McHenry (eds.), pp.61-78. Plenum Press, New York.

Haefeli, R. J., Solms, J. and Glaser, D. 1998. Taste responses to amino acids in common marmosets (*Callithrix jacchus jacchus*, Callitrichidae), a non-human primate in comparison to humans. *Lebensmittel-Wissenschaft und Technologie* 31(4): 371-376.

Herrera Tirado, E. R. and Heymann, E. W. 1998. A possible case of myiasis in a wild moustached tamarin, *Saguinus mystax* (Callitrichinae, Cebidae). *J. Med. Primatol.* 27: 271-273.

Lemelin, P. and Grafton, B. W. 1998. Grasping performance in *Saguinus midas* and the evolution of hand prehensility in primates. In: *Primate Locomotion: Recent Advances*, E. Strasser, J. Fleagle, A. L. Rosenberger and H. McHenry (eds.), pp.131-144. Plenum Press, New York.

McGraw, W. S. 1998. Locomotion, support use, maintenance activities, and habitat structure. In: *Primate Locomotion: Recent Advances*, E. Strasser, J. Fleagle, A. L. Rosenberger and H. McHenry (eds.), pp.79-94. Plenum Press, New York.

Masterson, T. J. and Hartwig, W. C. 1998. Degrees of sexual dimorphism in *Cebus* and other New World monkeys. *Am. J. Phys. Anthropol.* 107(3): 243-256.

Mayeaux, D. J. and Mason, W. A. 1998. Development of responsiveness to novel objects in the titi monkey, *Callicebus moloch*. *Primates* 39(4): 419-431.

Meireles, C. M., Czelusniak, J., Sampaio, I., Schneider, H., Ferrari, S. F., Coimbra-Filho, A. F., Pissinatti, A., Muniz, J. A. P. C., Ferreira, H. S. and Schneider, M. P. C. 1998. Electrophoretic polymorphisms and their taxonomic implications in Callitrichini (Primates, Platyrrhini). *Biochem. Genet.* 36(7-8): 229-244.

Meldrum, D. J. 1998. Tail-assisted hind limb suspension as a transitional behavior in the evolution of the of the platyrrhine prehensile tail. In: *Primate Locomotion: Recent Advances*, E. Strasser, J. Fleagle, A. L. Rosenberger and H. McHenry (eds.), pp.145-156. Plenum Press, New York.

Michels, A. M. 1998. Sex differences in food acquisition and aggression in captive common marmosets (*Callithrix jacchus*). *Primates* 39(4): 549-556.

Nievergelt, C. M., Mundy, N. I. and Woodruff, D. S. 1998. Microsatellite primers for genotyping common marmosets (*Callithrix jacchus*) and other callitrichids. *Molecular Ecology* 7(10): 1432-1434.

Passamani, M. 1998. Activity budget of Geoffroy's marmoset (*Callithrix geoffroyi*) in an Atlantic forest in southeastern Brazil. *Am. J. Primatol.* 46(4): 333-340.

Phillips, K. 1998. Conservation of capuchin and howler monkeys in Trinidad. *ASP Bulletin* 22(4): 5.

Richard-Hansen, C., Bello, N. and Vié, J.-C. 1998. Tool use by a red howler monkey (*Alouatta seniculus*) towards a two-toed sloth (*Choloepus didactylus*). *Primates* 39(4): 545-548.

Rocha, V. J., Reis, N. R. dos and Sekiama, M. L. 1998. Uso de ferramentas por *Cebus apella* (Linnaeus) (Primates, Cebidae) para obtenção de larvas de Coleoptera que parasitam sementes de *Syagrus romanzoffianum* (Cham.) Glassm. (Arecaceae). *Revta. Bras. Zool.* 15(4): 945-950. Portuguese with English summary.

Smith, T. E. and Abbott, D. H. 1998. Behavioral discrimination between circumgenital odor from peri-ovulatory dominant and anovulatory female common marmosets (*Callithrix jacchus*). *Am. J. Primatol.* 46(4): 265-284.

Szapkievich, V. B., Comas, C. I., Zunino, G. E. and Mudry, M. D. 1998. Análisis de variabilidad proteica en *Alouatta caraya* y *Cebus apella* (Primates: Platyrrhini). *Mastozoologia Neotropical* 5(1): 5-11.

Torii, R., Moro, M., Abbott, D. H. and Nigi, H. 1998. Urine collection in the common marmoset (*Callithrix jacchus*) and its applicability to endocrinological studies. *Primates*

39(4): 407-417.
Walker, S. E. 1998. Fine-grained differences within postional categories: A case study of *Pithecia* and *Chiropotes*. In: *Primate Locomotion: Recent Advances*, E. Strasser, J. Fleagle, A. L. Rosenberger and H. McHenry (eds.), pp.31-43. Plenum Press, New York.
Westergaard, G. C. 1998. What capuchin monkeys can tell us about the origins of hominid material culture. *J. Material Culture* 3(1): 5-19.
Youlatos, D. 1998. Seasonal variation in the positional behavior of red howling monkeys (*Alouatta seniculus*). *Primates* 39(4): 449-457.
Zietkiewicz, E., Richer, C., Sinnett, D. and Labuda, D. 1998. Monophyletic orgin of AIu elements in primates. *J. Mol. Evol.* 47(2): 172-182.

Meetings

II International Wildlife Management Congress "Wildlife, Land and People: Priorities for the 21st Century", 28 June-2 July 1999, Gödölló, Hungary. Organized by The Wildlife Society with the Hungarian co-sponsor and host, the University for Agricultural Sciences in Gödölló, Hungary. 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, or 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 Wildlifer*, 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) 530-2471, e-mail: <tws@wildlife.org>. Decisions concerning acceptance of papers and posters will be made by 30 November 1998. The abstract submission form can be found on the TWS webpage <http://www.wildlife.org/abstract.html>. Dr. W. Daniel Edge, Co-Chair, Program Committee, Department of Fisheries and Wildlife, Oregon State University, 104 Nash Hall, Corvallis, Oregon 97331-3803, USA, e-mail - <daniel.edge@orst.edu>, <edged@netten.net>, also <http://www.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 Monterrico, Biotopo Chocon 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 accomodation, 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 Mesoamericana para la Biología y la Conservación, Avenida La Reforma 0-63 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

transduction, agrobiotechnology, plant tissue cultures and natural products. There will be roundtables on bioinformatics, biocatalysis, and natural products in antiparasitic drug development. Deadlines: Second announcement - December 1998; Submission of abstracts - 31st March 1999; Notification of acceptance - 30th April 1999. For further information: Secretary, 2nd IUPAC International Conference on Biodiversity, Faculdade de Farmácia, Universidade Federal de Minas Gerais, Avenida Olegário Maciel 2360, 30180-112 Belo Horizonte, Minas Gerais, Brazil, Tel: +55 31 339 7675, Fax: +55 31 339 7666. Home page: <www.cenapad.ufmg.br/iupac.biodiv99>.

IX Congresso Brasileira 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: <mendes@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, TECHLab, Zoo Atlanta, 800 Cherokee Ave., S.E., Atlanta, Georgia 30315, USA, Tel: (404) 624 5990, Fax: (404) 627-7514, e-mail: <mbloomsmith@mindsprin.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: mrclarke@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-oecologie, 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 1st June, 1999. For more information contact Annet Louwerse, Liesbeth Sterck or Jan van Hooff at: GfP, Projectgroep Ethologie & Socio-oecologie, Pb 80.086, 3508 TB Utrecht, NL, Tel: +31-(0)30-2535401, Fax: +31-(0)30-2521105, e-mail: <Kongr.GfP@Bio.UU.nl>. All information, including deadlines, fees, registration form etc. may also be obtained via the society's web page: http://www.dpz.gwdg.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@cableinet.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 Martinez, Depto. de Filosofía, UAM-Iztapalapa, Apdo. Postal 55-536, 09340 México, D. F. Tel: (5) 724 47 85, Fax: (5) 724 4778, e-mail: amp@xanum.uam.mx.

III Congreso de la Asociación Primatológica Española (APE), 20-22 September 1999, Universidad Autónoma de Barcelona, Spain. Inaugural lecture to be given by Professor Adriaan 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: Secretaria del Departamento de Biología Celular e Fisiología, Facultad de Ciencias, Universidad Autónoma de Barcelona, 08193 Barcelona, Spain, Fax: 93 581 2295. E-mail: <jvea@psi.ub.es>.

IV Congreso de Manejo de Fauna Amazonica, 4 al 8 de octubre de 1999, Asunción, Paraguay. Este importante evento, iniciado en 1992, resume en breves dias los resultados de todos los esfuerzos aplicados en pos de la conservación de la fauna de toda la región amazonica. En esta oportunidad se fortalecera 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 faunistico. 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 Fundación Moises Bertoni para la Conservación de la Naturaleza. Misión: Trabajar en forma pluriparticipativa y en acción coordinada para la optimización de las politicas de uso, tecnicas y estrategias de manejo de la vida silvestre amazonica para fomentar el desarrollo socio-economico sostenible y la conservación de la naturaleza. Los trabajos seran recibidos hasta el 1 de marzo de 1999. Se podran enviar por correo electronico, o en impresion en papel blanco tamano carta con una copia archivada en diskette. Unicamente se recibiran los siguientes formatos: WP5.1, Microsoft Word 6.0 o textos en ASCII (DOS IBM). Invitación a eventos: La comisión organizadora desearia recibir propuestas para la organización de simposios, talleres, cursos, mesas redondas y otras reuniones relacionadas a la tematica propuesta para el Congreso. Los interesados en organizar o en participar de algunos de estos eventos pueden comunicarse con el Comite Organizador. Inscripciones: Hasta el 31 de marzo de 1999, estudiantes: US$30, profesionales: US$60; Hasta el 30 de setiembre de 1999, estudiantes: US$50, profesionales: US$100; Inscripciones tardias (durante el Congreso),

estudiantes: US$60, profesionales: US$120. Los idiomas oficiales del Congreso seran Espanol y Portugues, no se haran servicios de traducción simultanea. Comisión Organizadora, IV Congreso de Manejo de Fauna Amazonica, Fundación Moises Bertoni, C.C. 714, Asunción, Paraguay, Tel: (595-21) 608 740, 600 855, Fax: (595-21) 608 741m, e-mail: <congreso@fmbert.una.py>. Visitenos en internet (a partir de julio): <www.mbertoni.org.py>.

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

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

2001

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

Contributions

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

Please send contributions to: **Anthony Rylands**, c/o Conservation International do Brasil, Avenida Antônio Abrahão Caram 820/302, 31275-000 Belo Horizonte, Minas Gerais, Brazil, Tel/Fax: +55 (31) 441-1795 or **Ernesto Rodríguez-Luna**, 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.

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

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

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

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

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

ISSN 1413-4703

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

IUCN/SSC

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