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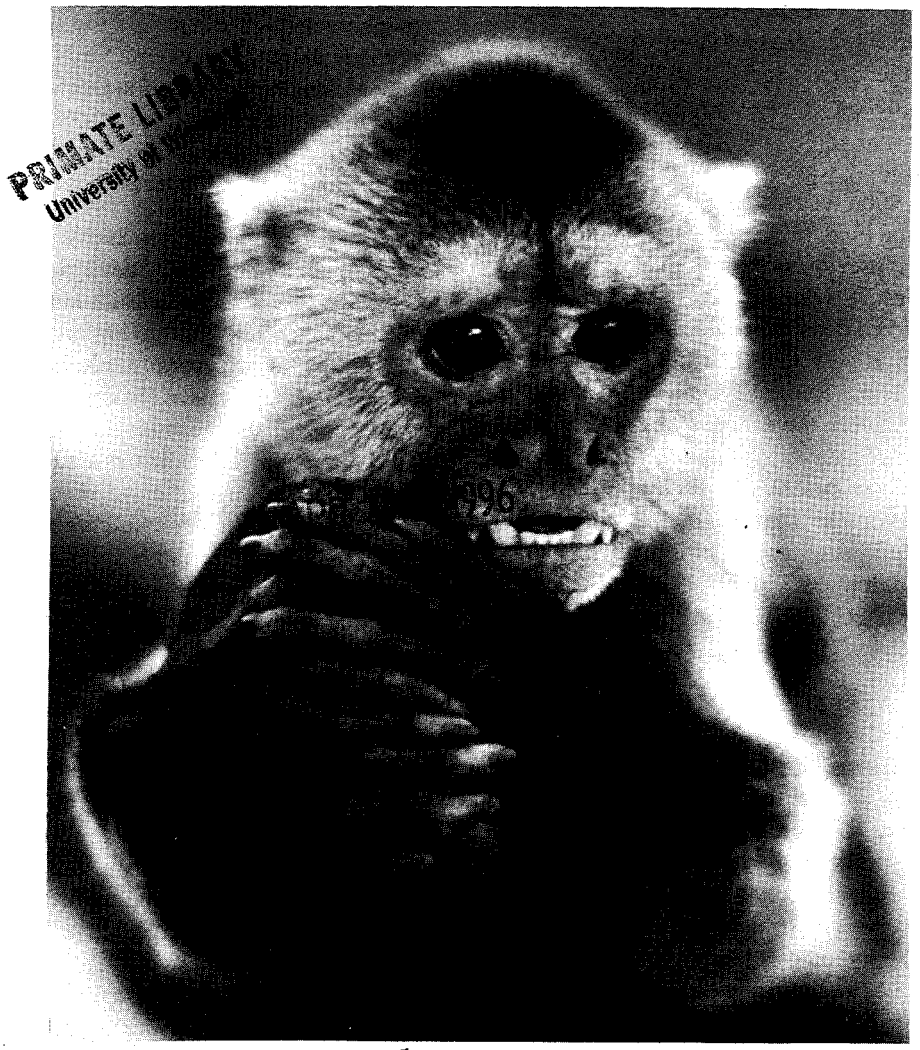

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Articles

Morphological Relationships between the Ka'apor Capuchin (*Cebus kaapori* Queiroz, 1992) and Other Male *Cebus* Crania: A Preliminary Report

Introduction

The genus *Cebus* is comprised of four widely distributed species, *C. albifrons*, *C. apella*, *C. capucinus* and *C. nigrivittatus* (= *olivaceus*) (taxonomy following Hershkovitz, 1949), and the recently described *Cebus kaapori* Queiroz, 1992. It is possible that other valid species may exist but are currently designated at the subspecific level (Mittermeier *et al.*, 1988; Torres, 1988). *Cebus kaapori*, a previously unknown form of untufted capuchin, seems to be restricted to an area between the Rios Gurupí and Pindaré in the state of Maranhão, Brazil, outside the previously known distribution of untufted capuchins. It was observed in undisturbed and slightly disturbed dense lowland forest, and was reported to occur in very low densities. Interviews with local residents suggest that *C. kaapori* also occurs in edge habitats between the Amazonian and *Cocais* (palm) forest, where they feed on palm fruits. Two specimens have been described, a juvenile female skeleton and skin in the Emílio Goeldi Museum, Belém, Brazil, designated as the holotype (MPEG 22025), and an adult male skull and skin designated as the paratype (MPEG 21978). The adult male was described by Queiroz (1992).

Using a limited number of external and craniometric measurements and small comparative samples, Queiroz (1992) reported that *C. kaapori* is longer in the body, and less robust, than the other untufted species. Queiroz argued that *C. kaapori* is "undoubtedly similar to *C. nigrivittatus*"(p.9) in its general physical appearance, and suggested that *C. nigrivittatus* may be ancestral to *C. kaapori*. This report will test the hypothesis that the crania of the adult males of these two species are morphologically similar. This was investigated by applying univariate, bivariate, and multivariate statistical tests to comparative samples of male crania from five capuchin species.

Methods

The comparative analyses in this study were based on two samples. The baseline sample consisted of a subset from a larger database used to examine the ontogeny of cranial form, growth, and sexual dimorphism in four capuchin species (Masterson, 1995). It was comprised of male *Cebus* crania from collections housed at the American, Field, and National Museums of Natural History. The samples are geographically heterogeneous as expected given the genus' wide distribution and adaptability. The comparative sample included the only known adult male specimen of *C. kaapori* (MPEG 21978), housed in the Museu Paraense Emílio Goeldi, Belém, Brazil. No subspecific analyses were performed. Table 1 gives the sample sizes for each species, broken down into subadult and adult specimens.

Table 1. Sample sizes of male capuchins broken down into subadult and adult developmental specimens.

Species	Subadults	Adults	Total
C. albifrons	46	43	89
C. apella	141	67	208
C. capucinus	66	42	108
C. nigrivittatus	20	40	60
C. kaapori	-	1	1
Total	**273**	**193**	**466**

Six linear measurements of the adult male cranium were provided in the initial description of *C. kaapori* Queiroz, 1992. These measurements were used as literature data in the following analyses. Only four measurements are comparable between Queiroz (1992) and the analysis of Masterson (1995): biorbital width, bizygomatic breadth, maximum cranial length, and neurocranial length. It was assumed that Queiroz used similar landmarks in his measurements, since they are standard in primate craniometric analyses. The biases of using a single specimen to represent a species are clearly recognized. However, the results from this study will provide hypotheses for future analyses when more *C. kaapori* specimens are available.

In examining the morphological relationships among these five capuchin species, univariate, bivariate, and multivariate analyses were performed using the statistical program SYSTAT (Wilkinson, 1992). Tukey's multiple comparison test for unequal sample sizes was used to examine significant differences ($p \leq 0.0083$ after a Bonferroni adjustment) among the adult male species' means. Only comparisons among adult male *C. albifrons*, *C. apella*, *C. capucinus*, and *C. nigrivittatus* were performed. The value for *C. kaapori* was assumed to represent the species' mean in each measurement (it represents a single specimen in all other analyses). It was not statistically tested, but was included in Table 2 for interspecific comparisons.

Bivariate growth allometries were analyzed using the log-transformed version of Huxley's (1932) bivariate

Cover photograph by Russell A. Mittermeier: Wedge-capped capuchin, *Cebus olivaceus*.

Table 2. Multi-group comparisons between adult male capuchin monkeys in four cranial variables. [1]AL = *C. albifrons*, AP = *C. apella*, CA = *C. capucinus*, NI = *C. nigrivittatus*, KA = *C. kaapori*. [2] Underlined species are not significantly different at $p \leq 0.0083$.

Measurements	Species[1]	n	Mean	SD	Tukey's test[2]
Biorbital width	AL	41	43.2	2.175	
	AP	62	43.1	1.821	
	CA	38	44.3	2.068	NI>KA>CA>AL>AP
	NI	38	45.9	2.631	
	KA	1	45.5	-	
Bizygomatic breadth	AL	42	63.9	3.638	
	AP	59	71.5	4.936	
	CA	41	67.0	3.212	AP>CA>NI>AL>KA
	NI	39	65.6	3.526	
	KA	1	61.5	-	
Max. cranial length	AL	43	93.2	4.928	
	AP	63	97.5	3.827	
	CA	42	97.3	2.276	AP>CA>NI>KA>AL
	NI	39	96.6	3.696	
	KA	1	94.5	-	
Neurocranial breadth	AL	43	52.2	1.997	
	AP	66	53.2	1.786	
	CA	41	52.9	1.700	NI>AP>CA>KA>AL
	NI	40	54.5	2.181	
	KA	1	52.7	-	

power function. Maximum cranial length was chosen as the independent variable. The best statistical fit to a respective species' regression line by *C. kaapori* was determined using the smallest standardized residual of the Ka'apor specimen after its inclusion in the calculation of each species' allometric coefficients.

Two multivariate factoring techniques, principal components analysis (PCA) and discriminant function analysis (DFA), were used to compare the capuchin species in multivariate space. The *C. kaapori* specimen was included in both analyses. Masterson and Leutenegger (1990) presented a detailed discussion of the PCA technique. Discriminant function analysis was used to examine how well the species can be differentiated based on the available cranial measurements. Klecka (1980) provided a detailed discussion of DFA.

The final test of the hypothesis used cluster analysis to produce a tree diagram. Euclidean distances between each variable and Ward's (1963) minimum variance linkage method were used to cluster the species. Wilkinson (1992) presented a detailed description of cluster analysis.

Results

The results of Tukey's multiple comparison test are presented in Table 2, as well as means and standard deviations for the capuchin species. Tukey's test indicated that *C. kaapori* is very similar in biorbital width to *C. nigrivittatus*, which is significantly larger than *C. capucinus, C. albifrons*, and *C. apella*. *Cebus kaapori* possesses the smallest bizygomatic breadth of all five capuchin species, being closest in size to *C. albifrons*. *Cebus albifrons* is not significantly different from *C. nigrivittatus*, but is significantly smaller than *C. capucinus* and *C. apella*. The maximum cranial length of *C. kaapori* is closest to *C. albifrons* in linear distance and lies on the small end of the male *Cebus* range. *Cebus albifrons* is significantly smaller than *C. nigrivittatus*, *C. capucinus*, and *C. apella*. The neurocranial breadth of *C. kaapori* is on the small end of the male *Cebus* range and lies between *C. capucinus* and *C. albifrons*. It is furthest in size from *C. nigrivittatus*. There are no significant interspecific differences present in neurocranial breadth.

Bivariate growth allometries for *C. albifrons*, *C. apella*, *C. capucinus*, and *C. nigrivittatus* are listed in Table 3. Standardized residuals indicated that *C. kaapori* lies closest to the regression line of *C. nigrivittatus* in biorbital width and is furthest from *C. apella*. In bizygomatic breadth *C. kaapori* lies closest to the line of *C. capucinus* and is furthest from *C. apella*. *Cebus nigrivittatus* is the next best fit after *C. capucinus*. For neurocranial breadth *C. kaapori* lies closest to *C. albifrons* and is furthest from *C. nigrivittatus*. Low correlation coefficients in all species suggest that the best fit lines do not explain the majority of the samples' variances in neurocranial breadth.

The results of the multi-group PCA for all male *Cebus* are presented in Table 4. Factor scores for all five species are illustrated in Figure 1, with 90% probability ellipsoids drawn for each species. The first principal component accounts for 89.72% of the total variation. The variable loadings are all positive, although a wide range of values does exist indicating

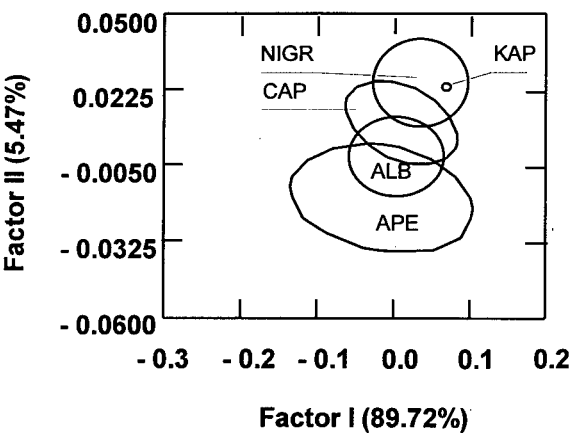

Figure 1. Results of the multi-group PCA showing 90% probability ellipsoids for males of the capuchin species. Cebus kaapori fits best within the sample of C. nigrivittatus and lies furthest from C. apella.

Table 3. Bivariate coefficients for three cranial variables regressed against maximum cranial length. [1]AL = *C. albifrons*, AP = *C. apella*, CA = *C. capucinus*, NI = *C. nigrivittatus*, KA = *C. kaapori*. log b = y intercept, a = slope, 95% C.I. (a) = 95% confidence interval for slope estimate, r = correlation coefficient, and SR = standardized residual.

Measurement	Species	n	log b	a	95% C.I. (a)	r	SR	Slope comparison
Biorbital width	AL	83	-0.540	1.101	(0.983, 1.220)	.899	1.091	
	AP	199	-0.391	1.016	(0.958, 1.075)	.925	2.326	
	CA	101	-0.328	0.991	(0.900, 1.082)	.908	1.617	AL>NI>AP>CA
	NI	58	-0.393	1.033	(0.885, 1.182)	.881	0.468	
Bizygomatic breadth	AL	81	-1.168	1.505	(1.359, 1.651)	.918	-0.658	
	AP	190	-1.515	1.689	(1.625, 1.757)	.965	-1.641	
	CA	102	-1.420	1.629	(1.528, 1.729)	.955	-0.473	AP>CA>NI>AL
	NI	59	-1.222	1.529	(1.402, 1.656)	.954	-0.547	
Neurocranial breadth	AL	85	0.199	0.199	(0.108, 0.291)	.429	0.032	
	AP	200	1.299	0.215	(0.159, 0.272)	.470	-0.152	
	CA	199	1.520	0.106	(0.014, 0.199)	.226	-0.459	NI>AP>AL>CA
	NI	60	1.307	0.218	(0.088, 0.348)	.403	-0.839	

that each variable contributes unequally to component I. Bizygomatic breadth and neurocranial breadth possess the largest and smallest loadings, respectively. The first component loadings are interpreted as an allometry vector. Little separation of the species occurs along the allometry vector.

Principal component II explains 5.47% of the remaining variation. Although this is a small percentage, it is clearly of biological importance because the species are differentiated along component II. The presence of bipolar component loadings indicates that more shape variation is reflected in component II than in the allometry vector. The separation of the species by shape differences relates to measurements possessing larger positive and negative loadings that either increase or decrease with respect to each other as one moves along the second component axis (Shea, 1985). The measurements primarily responsible for the separation of the species along component II are bizygomatic breadth, with a strong negative loading, and biorbital width and neurocranial breadth, each possessing strong positive loadings. The first two components explain 95.19% of the total sample variation. In examining the multi-group PCA (Figure 1), the adult male *C. kaapori* specimen falls directly within the sample of *C. nigrivittatus*. *Cebus capucinus* is the next best fit. *Cebus kaapori* lies furthest from the tufted capuchin, *C. apella*.

Results from the DFA using species membership as the test of effect are presented in Table 5. Figure 2 shows 90% probability ellipsoids for each species.

Table 4. Variable loadings on the first two principal components for the multi-group PCA. *Cebus kaapori* was included.

Measurement	Factor I	Factor II
Biorbital width	.5090	.6551
Bizygomatic breadth	.7363	-.5257
Max. cranial length	.4378	.0180
Neurocranial length	.0843	.5424
% of total variance	**.8972**	**.0547**

The DFA is statistically significant (Wilk's lambda = 0.2863, F = 15.5735, df = 16, 492, P = 0.0000). Discriminant function I is highly significant, P = 0.0000. It possesses a canonical correlation of 0.7899; therefore, a high association exists between function I and species membership. Function I seems to differentiate between the tufted and untufted species (Fig. 2) by overall skull size, as judged by bizygomatic breadth and maximum cranial length possessing negative canonical loadings.

Function II is also highly significant (P = 0.0000). It possesses a canonical correlation of 0.4163. Although the canonical loadings possess similar values, function II helps to differentiate the untufted species. Figure 2 illustrates that the differentiation between the untufted species and *C. apella* occurs along function I. Function II, in conjunction with function I, differentiates the untufted species. Along function I, *C. kaapori* lies closest to *C. nigrivittatus* and is furthest from *C. apella*.

Results and linkage distances from the cluster analysis are illustrated in Figure 3. The first cluster contains adult male *C. capucinus* and *C. nigrivittatus* (0.011). The next cluster joins *C. kaapori* and *C. albifrons* (0.015). *Cebus apella* then joins *C. capucinus* and *C. nigrivittatus* (0.022). This cluster joins with *C. kaapori*

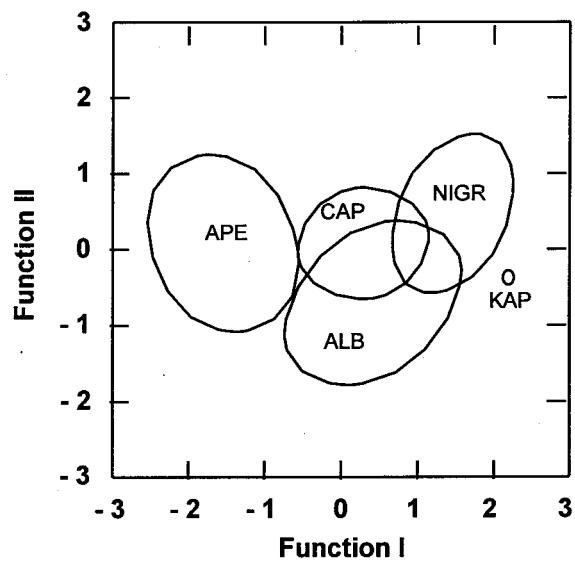

Figure 2. Results of the DFA showing 90% probability ellipsoids for males of the capuchin species. *Cebus kaapori lies* closest to the sample of *C. nigrivittatus* and is furthest from *C. apella*.

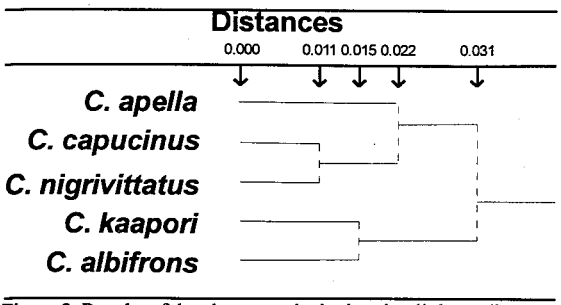

Figure 3. Results of the cluster analysis showing linkage distances and clustering patterns among the adult male capuchins. *Cebus kaapori* clusters with *C. albifrons* rather than *C. nigrivittatus* as predicted from the hypothesis.

and *C. albifrons* (0.031), forming the root of the adult male *Cebus* tree.

Discussion and Conclusions

The best corroborative evidence of the proposed hypothesis is provided by the multi-group PCA (Table 4, Fig. 1), which indicates that *C. kaapori* fits best within the *C. nigrivittatus* sample. Other supporting evidence is provided by (1) a similar linear distance (Table 2) to *C. nigrivittatus* in biorbital width, (2) a close fit to the regression line (Table 3) of *C. nigrivittatus* in biorbital width, and (3) *C. kaapori*'s DFA scores (Fig. 2) lie closest to *C. nigrivittatus*. At present, solid corroborative evidence for a close morphological relationship between the crania of *C. kaapori* and *C. nigrivittatus* is limited. Indeed, the present analyses provide some evidence that *C. kaapori* may be morphologically more similar to *C. albifrons* rather than *C. nigrivittatus*. This relationship is indicated by (1) similar linear distances (Table 2) in bizygomatic breadth, maximum cranial length, and neurocranial breadth, (2) a close fit to the *C. albifrons* regression line (Table 3) in neurocranial breadth, and (3) *C. kaapori* clusters with *C. albifrons* (Fig. 3) whereas *C. nigrivittatus* clusters with *C. capucinus*.

Whichever *Cebus* species *C. kaapori* is ultimately linked to, these analyses suggest that it will be an untufted capuchin and not *C. apella*. Given that *C. kaapori* is said to use palm nuts in a similar manner to *C. apella* (*v.* Queiroz, 1992), there is no evidence of similar cranial morphology between the two species based on available measurements. Masterson (1995) reported that bizygomatic breadth is one of several cranial variables related to palm nut usage in *C. apella*, that is, larger infratemporal fossae allow for larger muscles of mastication which are needed for cracking open palm nuts. Because there is no evidence of similar bizygomatic morphology between *C. apella* and *C. kaapori*, it may be that *C. kaapori* is using palm nuts more like *C. albifrons* rather than *C. apella*. Further behavioral data is needed to examine this suggestion.

Table 5. Canonical loadings, canonical correlations, and probabilities that species differ along specified axis for the first three discriminant functions. *Cebus kaapori* was included.

Measurement	Function I	Function II	Function III
Biorbital width	.3321	.6865	.0639
Bizygomatic breadth	-.5408	.8057	.0373
Max. cranial length	-.1135	.8685	-.4814
Neurocranial breadth	.1469	.8456	.4105
Canonical correlation	.7899	.4163	.2795
P	0.0000	0.0000	0.01

The taxonomy of *Cebus* is complex (see Queiroz, 1992, for a discussion). Anonymous (1993) has discussed the taxonomic status of *C. kaapori* at length, and concludes that "the evidence for the species' status of *C. kaapori* is slim" (p.7). Whether *C. kaapori* is a valid species will only be answered when more specimens have been collected and comparative analyses use more measurements. Future morphometric analyses will need to be supplemented with molecular data from all capuchin species to answer this and other questions about *Cebus* taxonomy.

Acknowledgments

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References

Anonymous. 1993. A new species of untufted capuchin from the Brazilian Amazon. *Neotropical Primates* 1: 5-7.

Hershkovitz, P. 1949. Mammals of northern Colombia. Preliminary report No. 4: Monkeys (Primates), with taxonomic revisions of some forms. *Proc. U. S. Nat. Mus.* 98: 323-427.

Huxley, J. S. 1932. *Problems of Relative Growth.* Methuen, London.

Klecka, W. R. 1980. *Discriminant Analysis.* Sage Publications, London.

Masterson, T. J. 1995. Cranial Form in *Cebus*: An Ontogenetic Analysis of Cranial Form and Sexual Dimorphism. Ph. D. thesis, University of Wisconsin-Madison, Madison.

Masterson, T. J. and Leutenegger, W. 1990. The ontogeny of sexual dimorphism in the cranium of

Bornean orang-utans (*Pongo pygmaeus pygmaeus*) as detected by principal-components analysis. *Int. J. Primatol.* 11: 517-539.

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.

Queiroz, H. L. 1992. A new species of capuchin monkey, genus *Cebus* Erxleben 1777 (Cebidae: Primates) from eastern Brazilian Amazonia. *Goeldiana Zoologia* 15: 1-13.

Shea, B. T. 1985. Bivariate and multivariate growth allometry: statistical and biological considerations. *J. Zool., Lond.* 206: 367-390.

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

Ward, J. H. 1963. Hierarchical grouping to optimize an objective function. *J. Am. Stat. Ass.* 58: 236-244.

Wilkinson, L. 1992. *SYSTAT: Statistics, Version 5.2.* SYSTAT, Inc., Evanston, Illinois.

An Overview of Primatological Studies in Ecuador: Primates of the Cuyabeno Reserve

In a small area of 270,000 km², Ecuador has 19 species of primates (Albuja, 1991) (Table 1). Primate communities of 10 to 12 species have been reported in some tropical areas such as the Cuyabeno Reserve and the Yasuni National Park in Ecuadorian Amazonia (Albuja, 1994; de la Torre *et al.*, 1995). However, little is known about the ecology, behavior and conservation status of the species. Only few field primatological studies have been done, most of them by biologists of the Pontificia Universidad Catolica of Quito, in the Cuyabeno Reserve (de Vries *et al.*, 1993). Ulloa (1988) carried out a preliminary synecological study of the primate species of the reserve, in the area of the Laguna Grande, in the Cuyabeno river basin, that was continued by de la Torre and Campos (in press) during 1989 and 1990. Schell (unpubl. data) carried out a similar study in the area of Zabalo, in the Aguarico river basin, during 1994 and 1995.

The Cuyabeno Reserve is a protected area in the Province of Sucumbios, northeastern Ecuador. The reserve of 655,781 ha is located on the equator. It extends from the origins of the Río Cuyabeno through its hydrographic system, until it empties into the Río

Table 1. List of the primate species in Ecuador (Albuja, 1991)

Family Callitrichidae	
Cebuella pygmaea	*Saguinus fuscicollis*
Saguinus nigricollis	*Saguinus tripartitus*
Family Cebidae	
Alouatta palliata	*Cebus albifrons*
Alouatta seniculus	*Cebus apella*
Aotus vociferans	*Cebus capucinus*
Aotus lemurinus	*Lagothrix lagotricha*
Ateles belzebuth	*Pithecia monachus*
Ateles fusciceps	*Pithecia aequatorialis*
Callicebus cupreus	*Saimiri sciureus*
Callicebus torquatus	

Aguarico; then 60 km east to the lakes Zancudococha and Lagartococha (76°30' W - 75°30' W). With an altitude around 200-300 m above sea level, it is part of the Tropical Humid Forest life zone (Cañadas Cruz, 1983; Ministerio de Agricultura y Ganaderia, Republica del Ecuador, Acuerdo Ministerial No. 0328, 1991).

Limited rainfall records indicate an annual mean precipitation of about 3,000 mm; with more than 250 mm of monthly rainfall during the rainy season (from mid-March through August) and less than 250 mm during the dry season (from September through the first days of March), when the rivers and lakes may dry out.

The study area, of 1 km², was located near one of the margins of the Laguna Grande, in the Cuyabeno basin. Additional surveys were carried out along the Río Cuyabeno. Four types of forest were recognized: 1) non-flooded, terra firma forest located on small hills; 2) swamps, with a vegetation dominated by *Mauritia*

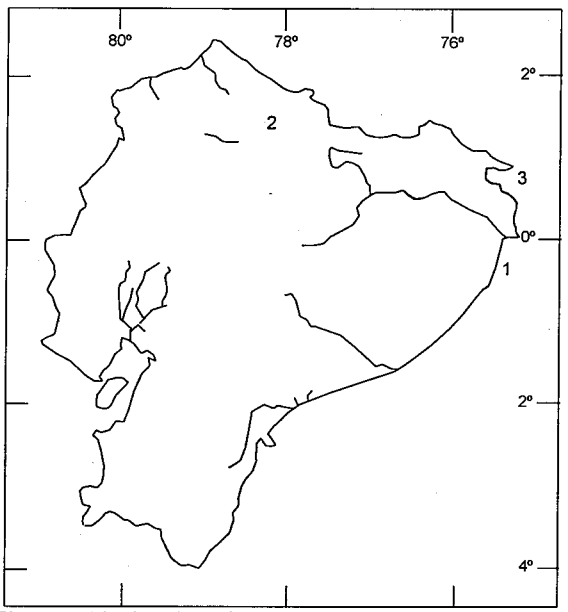

Figure 1. The location of the Yasuni National Park (1), the Cotacachi-Cayapas Ecological Reserve (2), and the Cuyabeno Reserve (3) in Ecuador..

flexuosa palms; 3) forests flooded by white-water rivers, or *várzea* (Pires and Prance, 1985); and 4) forests flooded by black-water rivers, or *igapó* (Pires and Prance, 1985).

The Cuyabeno Reserve supports a primate community which comprises ten species: *Cebuella pygmaea*, *Saguinus nigricollis*, *Aotus vociferans*, *Callicebus cupreus*, *Callicebus torquatus*, *Pithecia monachus*, *Saimiri sciureus*, *Cebus albifrons*, *Alouatta seniculus* and *Lagothrix lagotricha* (Emmons and Feer, 1990; Hershkovitz, 1977, 1983, 1990; but see Albuja, 1991). Data on habitat use and reproduction of all the primate species were obtained during 1989 and 1990.

Preliminary results showed that *Callicebus torquatus* and *Pithecia monachus* use almost exclusively the non-flooded terra firma forests; the former species shows some preference for edge habitats. *Cebus albifrons*, *Saimiri sciureus* and *Saguinus nigricollis* are generalists, but *C. albifrons* makes more use of palm swamps, *S. sciureus* spends more time in the black-water flooded forest (*igapó*), and *S. nigricollis* uses more the terra firma forests. *Cebuella pygmaea* inhabits only the flooded black-water and white-water forests (*igapó* and *várzea*, respectively). Limited data suggested the preference of *Callicebus cupreus* for *várzea*, of *Alouatta seniculus* and *Lagothrix lagotricha* for terra firma, and a possible widespread use of habitat by *Aotus vociferans*.

Generalized birth peaks for all primate species occurred in the dry season, from December through February. The callitrichids presented a second birth peak, limited to some of the groups, in the middle of the rainy season, from June through August.

Further research at the Cuyabeno Reserve has focused on the ecology of the black-mantle tamarin, *Saguinus nigricollis* (de la Torre, 1991; de la Torre *et al.*, 1992; 1995; Reyes, 1991), yellow-handed titi monkeys, *Callicebus torquatus* (Campos, 1991; Campos *et al.*, 1992); white-fronted capuchins, *Cebus albifrons* (Jimenez, unpubl. data); and saki monkeys, *Pithecia monachus* (Navarrete, unpubl. data).

Additional studies have been done in the Cotacachi-Cayapas Reserve, western Ecuador, on spider monkeys, *Ateles fusciceps* (Maddem and Albuja, 1989), and in the Yasuni National Park (Albuja, 1994). Currently, field research is being carried out in the Yasuni National Park by the University of California, Davis, the Pontificia Universidad Catolica, Quito, and the Escuela Politecnica Nacional, Quito; and in the Cuyabeno Reserve by the University of Wisconsin-Madison, and the Pontificia Universidad Catolica, Quito. These studies focus on the ecology and behavior of the different species, such as woolly monkeys, *Lagothrix lagotricha*, in the Yasuni National Park, and the pygmy marmoset, *Cebuella pygmaea*, in the Cuyabeno Reserve

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References

Albuja, L. 1991. Lista de vertebrados del Ecuador, mamíferos. *Rev. Inform. Técn.-Cient.* 16(3): 163-203. Escuela Politécnica Nacional, Quito.

Albuja, L. 1994. Nuevos registros de *Saguinus tripartitus* en la Amazonía Ecuatoriana. *Neotropical Primates* 2(2): 8-10.

Campos, F. 1991. Preferencia de hábitat, aspectos reproductivos y comportamiento de canto como factores determinantes de la territorialidad de *Callicebus torquatus* en la Amazonía Ecuatoriana. Tesis de Licenciatura. Pontificia Universidad Católica del Ecuador, Quito.

Campos, F., de la Torre, S. and de Vries, T. 1992. Territorial behavior and home range establishment of *Callicebus torquatus* (Primates: Cebidae) in Amazonian Ecuador. *Abstracts of the XIVth Congress of the International Primatological Society*, Strasbourg, p.316.

Cañadas Cruz, L. 1983. El mapa bioclimático y ecológico del Ecuador. Ministerio de Agricultura y Ganadería, Programa Nacional de Regionalización Agraria. Banco Central del Ecuador, Quito.

de la Torre, S. 1991. Area de vida, comportamiento reproductivo y hábitat de *Saguinus nigricollis graellsi* (Primates: Callitrichidae) en la Amazonía Ecuatoriana. Tesis de Licenciatura. Pontificia Universidad Católica del Ecuador, Quito.

de la Torre, S.; Campos, F. and de Vries, T. 1992. Seasonal reduction in the home ranges and birth peak bimodality of *Saguinus nigricollis graellsi* (Primates: Callitrichidae) in Amazonian Ecuador.

Abstracts of the XIVth Congress of the International Primatological Society, Strasbourg, p.316.

de la Torre, S., Campos, F.and de Vries, T. 1995. Home range and birth seasonality of *Saguinus nigricollis graellsi* in Ecuadorian Amazonia. *Am. J. Primatol.* 37: 39-56.

de la Torre, S. and Campos, F. In press. Uso del hábitat, área de vida y reproducción de diez especies de primates presentes en la Reserva de Producción Faunística Cuyabeno, Amazonía Ecuatoriana. In: *Estudios Ecológicos en Cuyabeno*. T. de Vries and E. Asanza, (eds.). Abya-Yala, Quito.

de Vries, T., Campos, F., de la Torre, S., Asanza, E., Sosa, A. and Rodríguez, F. 1993. Investigación y conservación en la Reserva de Producción Faunística Cuyabeno. In: *La Investigación para la Conservación de la Diversidad Biológica en el Ecuador*. P.A. Mena and L. Suárez (eds.), pp.167-221. Ecociencia, Quito.

Emmons, L. H. and Feer, F. 1990. *Neotropical Rainforest Mammals: A Field Guide*. The University of Chicago Press, Chicago.

Hershkovitz, P. 1977. *Living New World Monkeys (Platyrrhini): With an Introduction to Primates. Vol I.* The University of Chicago Press. Chicago.

Hershkovitz, P. 1983. Two new species of night monkeys, genus *Aotus* (Cebidae, Platyrrhini): a preliminary report on *Aotus* taxonomy. *Am. J. Primatol.* 4: 209-243.

Hershkovitz, P. 1990. Titis, New World monkeys of the genus *Callicebus* (Cebidae, Platyrrhini): a preliminary taxonomic review. *Fieldiana Zoology* 55:

Maddem, R. and Albuja, L. 1989. Estado actual de *Ateles fusciceps fusciceps* en el noroccidente ecuatoriano. *Rev. Escuela Politécnica Nacional* 14(2), Biología 2: 113-157.

Ministerio de Agricultura y Ganadería, República del Ecuador. 1991. Acuerdo Ministerial No. 0328 (07/03/91). Registro Oficial.

Pires, J. M. and Prance, G. T. 1985. The vegetation types of the Brazilian Amazon. In: *Amazonia,*. G.T. Prance and T. E. Lovejoy (eds.), pp 109-145. Pergamon Press, New York.

Reyes, H. 1991. Estudio ecológico y etológico de *Saguinus nigricollis graellsi* (Primates: Callitrichidae), Cuyabeno, nororiente ecuatoriano. Tesis de Licenciatura. Pontificia Universidad Católica del Ecuador, Quito.

Ulloa, R. 1988. Estudio sinecológico de primates en la Reserva de Producción Faunística Cuyabeno, Amazonía Ecuatoriana. Tesis de Licenciatura, Pontificia Universidad Católica del Ecuador, Quito.

Primates from the Vicinity of Viçosa, Minas Gerais, Brazil

There is an urgent need for an understanding of the human impacts on animal communities, especially in such as the tropical forests, due to their very high biodiversity and the rapidity and extent of their destruction and fragmentation. Fragmentation of forests on a fine scale results in the confinement of one or few groups of primate species, for example, and limits the genetic flow between populations, accelerating extinction processes on local, regional and national levels. As such, it is most important to verify how these animals are distributed in impacted areas in order to obtain a better understanding of their ability to survive in forest mosaics separated by open vegetation formations and urban environments.

Fragmentation of natural areas is a reality in most of the Brazilian ecosystems, and is most evident in the Atlantic forest, once covering an area of more than 1,200,000 km², but today reduced to forest fragments in less than 8% of its original extent. The city of Viçosa (20° 45' S, 42° 51'W), state of Minas Gerais, lies within the Atlantic Forest, and remnant patches are located on hilltops separated by pasture. Forest can no longer be found in valleys and other areas of low relief.

The project reported here involved a survey of primates in the main fragments remaining in the vicinity of Viçosa which are still able to sustain groups over the mid- to long-term. Four monkey species are believed to occur in the region, following Kinzey (1982) and Coimbra-Filho (1982): *Cebus apella*, *Alouatta fusca*, *Callicebus personatus* and *Callithrix aurita*. Of these, only *C. apella* is not classified as threatened (Rylands *et al.*, 1995). The selected fragments were mapped during July 1993 and June 1994. Selection involved the use of the following parameters: fragment area, topographic location, easy access, vegetation structure, disturbance and successional stage, extent of urbanization near the area, and the probable presence of primates. The data were obtained by interviewing local people, and using maps and aerial photographs. Confirmation of the presence of primates, either through vocalizations or sightings, was by periodic surveys.

Eight forest fragments were chosen and investigated, seven of which were between 15 and 60 ha and just one, the "Mata do Paraíso", covered 194 ha (Fig. 1). Six primates species were recorded: *Alouatta fusca*, *Callicebus personatus nigrifrons*, *Cebus apella nigritus*, *Callithrix aurita*, *C. geoffroyi* and *C. jacchus* (Table 1).

Table 1- Distribution of primates in eight forest fragments in the vicinity of Viçosa, Minas Gerais.

Forest fragment	Species
Mata do Paraiso	*Callicebus personatus nigrifrons*
	Cebus apella nigritus
Fazenda Arruda	*Callithrix aurita*
	Alouatta fusca
	Callicebus personatus nigrifrons
Área dos Nobres	*Callithrix* sp.
	Callicebus personatus nigrifrons
Sítio Cascalho	*Callithrix* sp.
	Callicebus personatus nigrifrons
Mata da Biologia	*Callithrix geoffroyi*
	Callicebus personatus nifgrifrons
Fazenda São Geraldo	*Callithrix* sp.
	Callicebus personatus nigrifrons
Sítio Paraíso	*Callithrix jacchus*
	Callicebus personatus nigrifrons

The occurrence of two of the *Callithrix* species has evidently resulted from introductions: *C. jacchus* and *C. geoffroyi* are species from northeast Brazil and the east of the state of Minas Gerais and Espírito Santo (Vivo, 1991), respectively. This was verified through interviews. The animals were introduced by local people, who feed them in their backyards, and result in the colonization of nearby forest patches.

Only one individual of *C. aurita* (Fazenda Arruda) was observed. It was following a group of *C. personatus nigrifrons*. Interviews and vocalizations pointed, however, to the occurrence of *Callithrix* in three other areas (Fazenda São Geraldo, Área dos Nobres, Sítio Cascalho), but we were unable to identify the species, and the possibility remains that they are *C. aurita* (Vivo, 1991). *C. personatus nigrifrons* was the most abundant species, occurring in all fragments studied, and is probably the most common primate in the region. *C. aurita* and *C. apella nigritus* were the least abundant, and only a few individuals were seen.

Regarding the conservation status of the native species around Viçosa, we consider all, except for *C. personatus nigrifrons*, to be seriously threatened. Through field surveys and interviews, we have recorded a pronounced population decline for *C. apella* and *A. fusca*, the first recorded in just one fragment with three individuals, and the second only in the northwest of the municipality.

Contacts with local residents revealed that *A. fusca* and *C. apella* were abundant in all regions, and that their current rarity is due mainly to hunting. This is not the only factor, however, and forest fragmentation and possibly even epidemic diseases, such as has been cited for *A. fusca* by Bitetti *et al.* (1994) in Argentina, Hirsch *et al.* (1994) for the Rio Doce State Park in Minas Gerais, and Mendes (1991) in Espírito Santo, also contribute significantly to their decline.

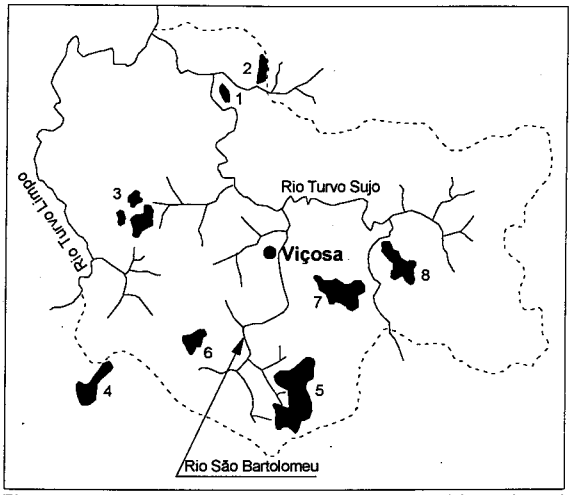

Figure 1. Map showing the fragments selected and investigated in Viçosa, Minas Gerais, Brazil. 1=Fazenda Arruda; 2=Fazenda Tudi; 3=Área dos Nobres; 4=Fazenda São Geraldo; 5=Paraíso; 6=Fazenda Paraíso; 7=Biologia; 8=Fazenda Cascalho. Broken line indicates the municipality of Viçosa.

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References

Bitetti, M. S. di, Placci, G., Brown, A. D. and Rode. D. 1994. Conservation and populations status of brown howling monkey (*A. fusca clamitans*) in Argentina. *Neotropical Primates* 2 (4): 1-3.

Kinzey, W. 1982. Distribution of primates and forest refuges. In: *Biological Diversification in the Tropics*, G. T. Prance (ed.), pp. 455-482. Columbia University Press, New York.

Hirsch, A., Moraes, W. B., Landau, E. C. and Rylands, A. B. 1994. Censo de *Alouatta fusca* Geoffroy 1812, e qualidade de habitat em duas áreas com remanescentes de Mata Atlântica em Minas Gerais.

In: *Resumos do XX Congresso Brasileiro de Zoologia*, Rio de Janeiro. p.144.

Mendes, S. L. 1991. Situação atual dos primatas em reservas florestais do estado do Espírito Santo. In: *A Primatologia no Brasil- 3*, A. B. Rylands and A. T. Bernardes (eds.), pp.347-356. Sociedade Brasileira de Primatologia and Fundação Biodiversitas, Belo Horizonte.

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.

Vivo, M. de. 1991. *Taxonomia de* Callithrix *Erxleben 1777 (Callitrichidae, Primates)*. Fundação Biodiversitas, Belo Horizonte.

Sobre la Posible Presencia de *Alouatta caraya* en Uruguay

Introducción

Si bien existen algunas referencias imprecisas, la presencia del orden Primates nunca ha sido detectada en el país. Aunque existen áreas de bosque indígena de real importancia y en su mayoría asociadas a cursos de agua, el porcentaje con respecto a la superficie territorial total, es muy reducido. Este argumento es el que podría manejarse para suponer que no existiría la cobertura vegetal capaz de soportar poblaciones de monos, dado su régimen alimentício. Sumado a esto, la presencia de alguna forma perteneciente a este grupo llamaría poderosamente la atención por la atracción que el común de la gente siente por estos mamíferos.

Antecedentes

En el verano de 1993 fue capturado un mono aullador negro (*Alouatta caraya*) en la estancia Charqueada, km 85 de la Ruta Nacional Nº. 30, próximo a Masoller, departamento de Artigas, 3ª Sección Judicial (aprox. 31°00'S, 56°00'W). El ejemplar fue mantenido cautivo algunos días, escapándose posteriormente. Se obtuvo una fotografía con una cámara sencilla, que pese a presentar algunas deficiencias técnicas permite identificar a un mono aullador negro, adulto, macho. La presencia de un ejemplar aislado permitiría suponer la fuga de un aullador cautivo de algún particular o traficante de animales salvajes, pero es importante destacar la observación de otros individuos en la zona.

Redford y Eisenberg (1992) reportan que *Alouatta* es el género más ampliamente distribuido de los primates del Nuevo Mundo, con un rango que se extiende desde

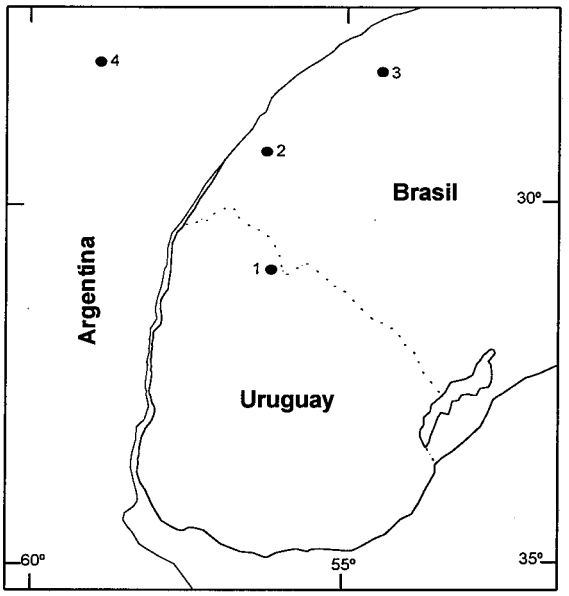

Figure 1. 1. Estancia Charqueada, Departamento Artigas, Uruguay 31°00'S, 56°00'W. 2. Fazenda Casa Branca, Estado Rio Grande del Sur, Brasil, 29°37'S, 56°17'W. 3. Fazenda Morais, Capão Rolador, Estado Río Grande del Sur, Brasil, 28°25'S, 54°57'W. 4. Isla Yuruhatá, Provincia de Corrientes, Argentina, 28°17'S, 59°07'W.

Veracruz, México, hasta la norte de Argentina. Estas especies toleran un rango de hábitats que varían desde florestas semideciduas tropicales hasta el multiestrato tropical de florestas siempre verdes. Los autores citados mencionan que *A. caraya* está confinada al sur del Brasil, Paraguay, Bolivia y norte de Argentina. En este último país, se ha encontrado en las provincias de Salta, Formosa, Chaco, Santa Fé y Misiones y a lo largo de florestas en galería hasta el sur de Corrientes. También puede ser encontrado esporádicamente a través de áreas xéricas contiguas al Chaco. Hacen referencia a que el género incluye un cincuenta porciento de hojas en su dieta.

Nowak y Paradiso (1983), refiriéndose a Mittermeier y Coimbra-Filho (1977), citan a la especie para el este de Bolivia, sur del Brasil, Paraguay y norte de Argentina. Ellos indican que los monos de este género consumen más hojas que ningún otro mono del Nuevo Mundo.

Bicca-Marques y Calegaro-Marques (1994) citan un grupo de aulladores en la estancia Casa Branca (29°37'S, 56°17'W), Río Grande del Sur, Brasil, y Hirsch *et al.* (1991) reportan la Fazenda Morais (28°25'S, 54°57'W), Capão Rolador, Río Grande del Sur, Brasil. La primera de las mencionadas sería la localidad más austral para la espécie.

Hirsch *et al.* (1991) refieren que *A. caraya* ocupa el Brasil central desde la *catinga* al nordeste pasando por el *cerrado*, pantanal matogrossense, chaco central,

región mesopatámica de Entre Ríos, Argentina y hasta las vertientes orientales de los Andes en la región centro-sur de Bolívia. Cabe destacar que a pesar de citar a la provincia de Entre Ríos, Argentina, no destaca localidad alguna en el Apéndice II del trabajo. La única referencia, y como más austral para Argentina, la constituye la 149 (Isla Yuruhatá, Corrientes, 28°17'S, 59°07'W). Destacan que las dos especies (*A. caraya* y *A. fusca*) llegan a traspasar el paralelo de 30°, en el estado de Río Grande del Sur, Brasil y Argentina (*A. caraya*), reconocido por Hershkovitz (1977) como limite meridional de este género.

La amplia distribución geográfica del género la sustentan por la combinación de factores como: capacidad de los individuos de habitar áreas abiertas y cruzar barreras ecológicas, hábitos alimentarios no especializados y alta fecundidad.

Di Bitetti *et al.* (1994), haciendo referencia a Rumiz (1990), indican que "el aullador negro vive en muy fragmentadas y perturbadas florestas y tiene una gran capacidad para dispersarse y colonizar manchas y remanentes de floresta en la región del chaco boliviano. Altas densidades de aulladores negros son mantenidos en las islas del río Paraná con una vegetación de crecimiento secundario y una baja concentración de componentes secundarios."

Conclusiones

La distribución geográfica en países limítrofes como Argentina y Brasil muestran una relativa proximidad de grupos salvajes de *A. caraya*. La no especificidad de su dieta que incluye una importante fracción de hojas, la posibilidad de desplazamiento a través de áreas abiertas, el trasponer barreras ecológicas y el área de captura del ejemplar citado, que coincide con la isoterma más alta para el promedio 1946-1970, así como con la mayor isoyeta (1300 lts/m) en el mismo periodo (Lafitte, 1980), sugerirían la posible ocurrencia de esta forma en nuestro territorio. La presencia de un primate, hasta el momento no citado en ninguna lista sistemática dentro de la literatura mastozoológica uruguaya, de confirmarse, ameritaría paralelemente medidas de protección en lo que respecta al hábitat. Zonas muy próximas como el Valle del Lunarejo, no se encuentran protegidas y poseen características naturales excepcionales.

A. caraya está incluída en el Apéndice II de CITES y goza de protección en los países con poblaciones estables, integrantes de la Convención.

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Bibliografia

Bicca-Marques, J. C. y Calegaro-Marques, C. 1994. Twins or adoption? *Neotropical Primates* 2(3): 6-7.

Di Bitetti, M. S., Placci, G., Brown, A. D. y Rode, D. I. 1994. Conservation and population status of the brown howling monkey (*Alouatta fusca clamitans*) in Argentina. *Neotropical Primates* 2(4): 1-4.

Hershkovitz, P. 1977. *Living New World Monkeys (Platyrrhini), With an Introduction to Primates, Volume 1.* University of Chicago Press, Chicago.

Hirsch, A., Landau, A. C., Tedeschi, M. de y Menegheti, J. O. 1991. Estudo comparativo das espécies do género *Alouatta* Lacépède, 1799 (Platyrrhini, Atelidae) e sua distribuição geográfica na América do Sul. In: *A Primatologia no Brasil - 3*, A. B. Rylands y A. T. Bernardes (eds.), pp. 239-262. Sociedade Brasileira de Primatologia y Fundação Biodiversitas, Belo Horizonte.

Laffitte, A. 1980. Inventario Nacional para Selección de Nuevas Areas para Parques Nacionales. Tesis, Facultad de Agronomía, Universidad de la Republica Oriental del Uruguay. 138pp.

Mittermeier, R. A. y Coimbra-Filho, A. F. 1977. Primate conservation in Brazilian Amazonia. In: *Primate Conservation*, H.S.H Prince Rainier III of Monaco y G. Bourne, pp.117-166. Academic Press, New York.

Nowak, R. M. y Paradiso, J. L. 1983. *Walker's Mammals of the World. Vol. 1.* 4th Edition. Johns Hopkins University Press, Baltimore and London.

Redford, K. H. y Eisenberg, J. F. 1992. *Mammals of the Neotropics. The Southern Cone. Vol. 2. Chile Argentina, Uruguay and Paraguay.* Chicago University Press, Chicago.

Rumiz, D. I. 1990. *Alouatta caraya*: population density and demography in northern Argentina. *Am. J. Primatol.* 21: 279-294.

The Red-Handed Howling Monkey in the State of Pernambuco, North-East Brazil

The red-handed howler, *Alouatta belzebul*, is endemic to Brazil and has a disjunct distribution, being found mainly in eastern Amazonia but also in the northeastern Atlantic forest, an area today separated from the Amazon by wide expanses of dry *caatinga* (thorn scrub) and *cerrado* (bush savanna). The majority of localities are from the south bank of the Rio Amazonas, east of the Rio Purus, but records extend east as far as Miritiba, Maranhão, and south and east into the states of Ceará, Alagoas and Paraíba (Bonvicino, 1989; Bonvicino *et al.*, 1989, Langguth *et al.*, 1987).

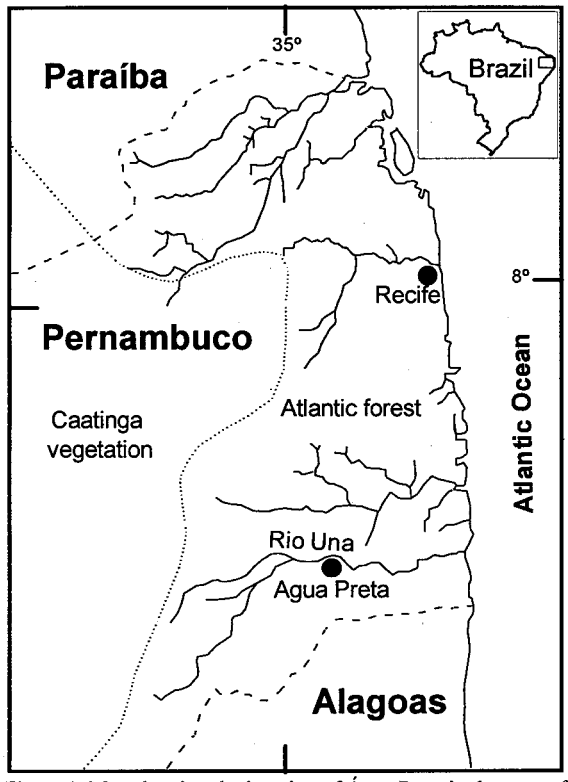

Figure 1. Map showing the location of Água Preta in the state of Pernambuco, Brazil.

The four subspecies recognized are *Alouatta belzebul belzebul*, *A. b. discolor*, *A. b. nigerrima*, and *A. b. ululata* (see Hill, 1962; Bonvicino *et al.*, 1989). Chromosome studies, taken together with phenotype and field observations, suggest, however, that *A. b. belzębul* is phenotypically variable in respect to pelage coloration, which is, therefore, unreliable for identification of the subspecies (Armada *et al.*, 1987). Relatively minor phenotypic differences have been observed in animals which are karyotypically divergent. The possibility remains that the disjunct Amazonian and northeastern Brazilian populations may be different subspecies.

The red-handed howler was first registered for the Atlantic forest of Pernambuco by Marcgrave and Piso in 1648 (Marcgrave, 1648). No further report of its existence in the region was forthcoming over the following 346 years. During primate surveys in the north-east of Brazil, Langguth *et al.* (1987) discovered a few surviving populations in the states of Paraíba and Alagoas, and also registered the existence of specimens collected in the state in the state of Ceará. Recently this species has also been recorded in the southernmost tip of the state of Rio Grande do Norte (M. de F. Arruda, pers .comm.).

Further populations of *A. b. belzebul* were located during surveys of primate distributions in the state of Pernambuco in 1987 and 1988. The first was a report of howling monkeys in two patches of forest belonging to the Sacramento Sugar Mill, the "Grota da Ferrugem" and "Grota do Inferno", in the municipality of Água Preta (08°42'S, 35°24'W, see Fig. 1). In 1993, eight trips, each of 3-8 days, were made to this area in order to obtain information on these groups. A total of 364 hours were spent searching for the monkeys, but only one group was seen (six times) in the larger of the two forests, the Grota do Inferno, of about 180 ha. Local people reported that *A. belzebul* occurred in three other forest patches on the property, all surrounded by sugar cane plantations (Almeida *et al.*, 1994). Two other primates were observed in these forest patches, *Cebus apella* (believed to be the subspecies *libidinosus*), and *Callithrix jacchus*, and as such are the only forests in the state known to have three primate species (Almeida *et al.*, 1994).

Hunting for food is a common practice in the region, and game include medium-sized birds such as Spix's guan (*Penelope* sp.), the channel-billed toucan (*Ramphastos vitellinus*), and especially such mammals such as *Mazama gouazoubira*, *Tayassu* spp., *Agouti paca*, *Euphractus sexcinctus*, and *Tamandua tetradactyla*. Primates are also killed occasionally, and an adult howling monkey was shot in June 1993.

Further surveys will be carried out by the non-governmental organization Centro Faune and the Natural History Museum of the Federal Rural University of Pernambuco in order to document the now scarce and little-known fauna of the state (Almeida *et al.*, 1990, 1992). Environmental education projects have already been set up in order to promote the protection of the forests in the property of the Sacramento Sugar Mill, and will hopefully improve the dim prospects for the survival of this small, but important population of howling monkeys.

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References

Almeida, R. T. and Silva, F. J. L. 1990. Distribuição da fauna primatológica no estado de Pernambuco,

Região Nordeste do Brasil. In: *Resumos. VIII Encontro de Zoologia do Nordeste*, p.5. Universidade Federal de Sergipe, Aracajú.

Almeida, R. T., Pimentel D. S. and Silva, F. J. L. 1992. Mamíferos ameaçados de extinção do estado de Pernambuco. In: *Resumos. IX Encontro de Zoologia do Nordeste*, p.146. Universidade Federal de Pernambuco, Recife.

Almeida, R. T., Pimentel D. S. and Silva, E. M. S. 1994. Guariba-de-mão-ruiva *Alouatta belzebul belzebul* no estado de Pernambuco. In: *Resumos. XX Congresso Brasileiro de Zoologia*, p.143. Universidade Federal do Rio de Janeiro, Rio de Janeiro.

Armada, J. L. A, Barroso, C. M. L., Lima, M. M. C., Muniz, J. A. P. C. and Seuánez, H. N. 1987. Chromosome studies in *Alouatta belzebul*. *Am. J. Primatol.* 13: 283-296.

Bonvicino, C. R. 1989. Ecologia e comportamento de *Alouatta belzebul* (Primates: Cebidae) na Mata Atlântica. *Rev. Nordestina Biol.* 6(2): 149-179.

Bonvicino, C. R., Langguth, A. and Mittermeier, R. A. 1984. A study of pelage color and geographic distribution in *Alouatta belzebul* (Primates: Cebidae). *Rev. Nordestina Biol.* 6(2): 139-148.

Hill, W. C. O. 1962. *Primates: Comparative Anatomy and Taxonomy V. Cebidae Part B*. Edinburgh University Press, Edinburgh.

Langguth, A., Teixeira, D. M., Mittermeier, R. A. and Bonvicino, C. R. 1987. The red-handed howler monkey in northeastern Brazil. *Primate Conservation* (8): 36-39.

Marcgrave, G. 1648. *Historiae Rerum Naturalium Brasiliae. Libri sextus: De Quadrupedibus et Serpentibus*. Leiden and Amsterdam. 293pp.

On the Geographic Distribution of the Red-Handed Howling Monkey, *Alouatta belzebul*, in North-East Brazil

The red-handed howling monkey, *Alouatta belzebul*, has a wide geographic distribution which includes a large part of the lower Amazon, south of the Rio Amazonas, in the states of Amazonas, Pará, and Maranhão, and also North-east Brazil (Hill, 1962; see also Hirsch *et al.*, 1991). Langguth *et al.* (1987) and Bonvicino *et al.* (1989) reviewed the distribution of this species and the sparse information available regarding the non-Amazonian part of its range. They listed records for the coastal regions of the states of Ceará, Paraíba and Alagoas (Fig. 1), and indicated that the original range also included Piauí, Rio Grande do Norte, and Pernambuco, and that the southern limit to the Atlantic forest population was the Rio São Francisco. They argued that the similarity in pelage coloration with Amazonian populations of *A. b. belzebul* indicates that the connections between the now disjunct populations were through the interior, western portions of these states as well as along the coast. Since these reviews, further, very small, remnant populations have been recorded for the states of Pernambuco and Rio Grande do Norte, again near the coast (Fig. 1). Due to the widespread and almost total destruction of the Atlantic forest of North-east Brazil information concerning the extent of its non-Amazonian distribution is extremely scarce and difficult to obtain.

The first reference to *A. belzebul* was by Marcgrave (1648) who obtained specimens from rain forest in the state of Pernambuco. Two-hundred and sixty-six years later, Marcgrave (1648) was probably the source that led Ihering (1914) to give the Rio São Francisco as the southern limit to its distribution, besides the fact that extensive rain forest still existed along the coast of Alagoas at the beginning of the century. Ihering's (1914) supposition was endorsed by Hill (1962) who, lacking further concrete information however, merely placed an arrow on the distribution map for the genus (opposite p.136), which extended the range of *A. b. ululata*, otherwise known from coastal Maranhão.

As was recorded by Ihering (1914) and Bonvicino *et al.* (1989), Burmeister (1854) registered the distribution of the brown howling monkey, *A. fusca*, as extending north in the Atlantic forest as far as the Rio São Francisco. The presence of gallery forests along the tributaries of the Rio São Francisco in the 16th Century would indicate that both species extended well inland, and that a large part of the basin was occupied by howling monkeys: *A. fusca* along its right margin and *A. belzebul* along its left margin. *A. fusca* is extinct throughout a large part of Bahia, with very small populations possibly still surviving only in the southernmost regions of the state, but in the past it undoubtedly occupied gallery forests and forests along the slopes of the mountain ranges inland, from the coast as far west as the Rio São Francisco, in regions which are today characterized by semi-desert scrub.

The survival of *A. belzebul* in North-east Brazil was first documented during an expedition of Olivério Pinto to Alagoas in 1967, when two specimens were collected in the forest of the Usina Sinimbu, although this fact was only recorded in 1981 by Silva (p.899). Nearly a decade later, Paiva (1973, 1974) referred to the existence of howling monkeys in Ceará, but confused *A. belzebul* with the black howling monkey, *A. caraya*, typical of central and southern Brazil. Coimbra-Filho and Maia (1979) were also mistaken

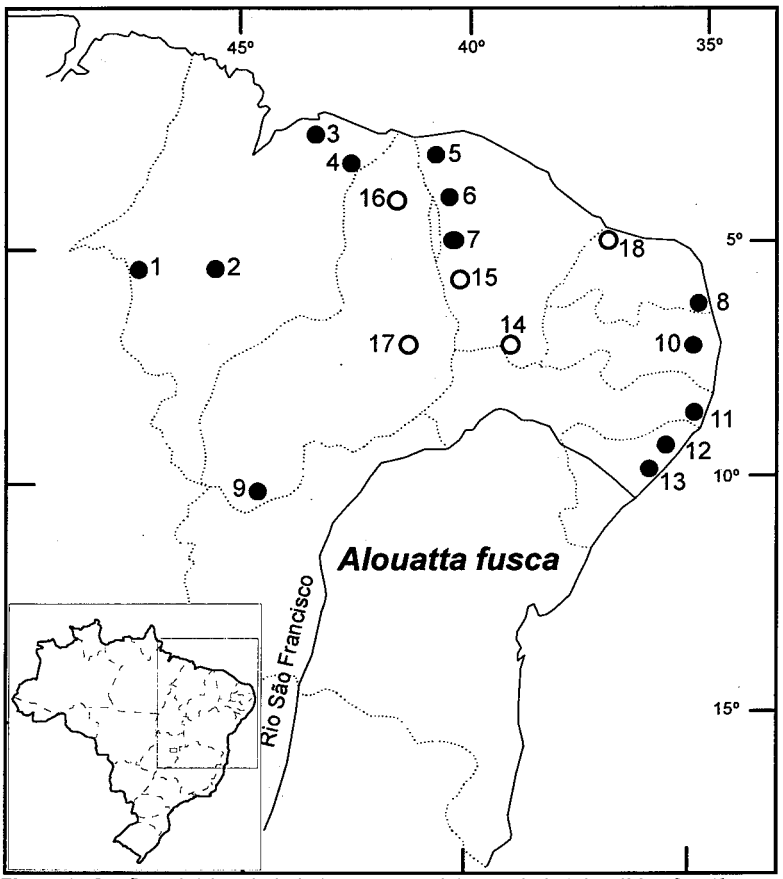

Figure 1. Confirmed (closed circles) or supposed (open circles) localities for *Alouatta belzebul* in the north-east of Brazil. The distribution of *A. fusca* is believed to have included the entire area south of the right margin of the Rio São Francisco. The localities marked with an open circle are those which have the name of "Guariba" or "Guaribas" and which we argue indicate the existence in the past of howler monkeys. *Gazetteer*: 1. Imperatriz, Maranhão (MNRJ); 2. Barra do Corda, Maranhão (MZUSP); 3. Miritiba, Maranhão (MNRJ); 4. Boa Vista, Maranhão (MZUSP); 5. Goiabeira, Granjá, Ceará (MNRJ); 6. Bom Jardim, São Benedito, Ceará (MNRJ); 7. Cinta Sulidon, São Benedito, Ceará (MNRJ) and 8. Mata da Estrela, Baía Formosa, Rio Grande do Norte (M. da F. Arruda, UFRN, unpubl. data); 9. Angico, Parnaguá, Piauí, specimens cited by Neiva and Penna (1916) which have not been located; 10a. Usina São João (Mata do Açude dos Reis, Mata de Jacuípe and Mata do Açude Cafundó), Usina Miriri (Grota dos Dois Rios) and Usina Santana (Mata da Usina Santana), Santa Rita, Paraíba (Oliveira and Oliveira, 1993); 10b. Fazenda Pacatuba, Sapé, Paraíba (UFPB); 11. Usina Sacramento, Água Preta, Pernambuco (Almeida *et al.*, 1995); 12. Serra Branca, Muricí, Alagoas (MNRJ); 13. Usina Sinimbu, Alagoas (MZUSP). Locations 1-7, 10b, 12-13 are cited by Langguth *et al.* (1987), Bonvicino (1989), Bonvicino *et al.* (1989) and Hirsch *et al.* (1991). *Abbreviations*: MNRJ - Museu Nacional, Rio de Janeiro; MZUSP - Museu de Zoologia da Universidade de São Paulo, São Paulo; UFPB - Universidade Federal da Paraíba; UFRN - Universidade Federal do Rio Grande do Norte. *Places with names including "Guariba" or "Guaribas"*: 14. Vila dos Guaribas (Spix and Martius, 1938); 15. Serra dos Guaribas (IBGE, 1972); 16. Olho d'Água dos Guaribas (Coimbra-Filho and Maia, 1979); 17. Rio dos Guaribas (IBGE, 1972); 18. Serra do Apodi ou dos Guaribas (Spix and Martius, 1938).

in suggesting the possibility of *A. caraya* occurring in the Sete Cidades National Park, Piauí. The Brazilian common name for howling monkeys is *guariba*. There are a number of localities around this Park which bear this name and local people informed that howling monkeys occurred there in the past. Coimbra-Filho and Maia (1979) failed to see the monkeys, and the already advanced destruction of the remaining forest, and the widespread hunting and fires, indicated that *A. belzebul*, undoubtedly the species in question, was probably already extinct there.

Numerous localities in the north-eastern Brazilian states of Piauí, Ceará and Rio Grande do Norte have the name of Guariba or Guaribas (Vanzolini and Papavero, 1968). It is reasonable, as such, to presume that *A. belzebul* once occurred throughout the north-east. to the left margin of the Rio São Francisco. This coincides with the distribution map presented by Emmons and Feer (1990, p.125). Today, however, *A. belzebul* populations have been eliminated by the decimation of their forests and a long history of hunting, and only a few minute remnant populations in the coastal region remain. In 1979, A. Langguth discovered a small population in a rain forest remnant in the state of Paraíba, at the Fazenda Pacatuba, municipality of Sapé. In 1984, an ornithological expedition organized by the National Museum, Rio de Janeiro, resulted in the collection of specimens by F. M. de Oliveira, from Serra Branca, municipality of Muricí, Alagoas (Coimbra-Filho, 1984; Langguth *et al.*, 1987; Bonvicino *et al.*, 1989). Numerous populations probably existed in Alagoas as recently as 1970, up to which time the last forests of the state were being cut down for sugar cane plantations. This included the forest of São Miguel dos Campos, one of the richest remaining forests of the northeastern Atlantic coast in terms of biodiversity, and now destroyed (Coimbra-Filho, 1971).

The discovery of the populations in Paraíba and Alagoas stimulated the search for further sites. Oliveira and Oliveira (1993) found howling monkeys in five secondary forest patches amongst 17 which were surveyed in the coastal region near to and north of João Pessoa. All are very small, degraded, isolated and privately-owned, and the minute populations resident in them are as such highly vulnerable. With a view to providing for their protection, the Brazilian Environment Institute (Ibama) created the Guaribas Biological Reserve (4321 ha), in the municipalities

of Mamanguape and Rio Tinto. Despite its name, no howling monkeys have survived there, but plans are underway to translocate groups from the other sites where there are no prospects for their future. Surveys in the state of Pernambuco have resulted in the finding of a population in two forest patches at the Usina Sacramento, in the municipality of Água Preta, Pernambuco (Almeida *et al.*, 1995), and also in the Mata da Estrela, municipality of Baía Formosa, Rio Grande do Norte, on the coast near to the state border with Paraíba (M. da F. Arruda, unpubl. data).

Perhaps the most important locality, reinforcing the argument that *A. belzebul* and its forests were until recently widespread throughout the north-east of Brazil, and which has not been included in the literature concerning its range, is in the south of the state of Piauí. During an expedition for medical and natural history purposes carried out in 1912, Neiva and Penna (1916, p.106) observed bands of howling monkeys, described as black with the upper surface of the hands yellowish, in the locality of Angico, municipality of Parnaguá. Specimens collected at the time were identified as *Alouatta belzebul* (Linnaeus, 1766). This locality, along with those mentioned above, and the numerous places which have the name of Guariba, demonstrates that the original distribution of *A. belzebul* extended throughout the north-east of Brazil, and confirms the supposition of Ihering (1914) that it once extended as far south as the Rio São Francisco. Ihering (1914), however, did not extend the range beyond Alagoas, possibly because of the absence of forests resulting from the long history of destructive occupation of the region. The record of Neiva and Penna (1916) indicates that the species occurred throughout Pernambuco, to the west and south as far as at least southernmost Piauí, and, as mentioned, the most precise published description of the range of this species is given by Emmons and Feer (1990, p.125).

Although the expedition carried out by Neiva and Penna (1916) was at the beginning of the century, the vegetation of the north-east of Brazil had already undergone profound alterations. The presence of *A. belzebul* in southern Piauí represents important evidence for the historic existence of a forest continuum between Amazonian and Atlantic forests in the Brazilian North-east (Coimbra-Filho and Câmara, in press).

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References

Almeida, R. T., Pimentel, D. S. and Silva, E. M. S. 1995. The red-handed howling monkey, *Alouatta belzebul*, in the state of Pernambuco, North-east Brazil. *Neotropical Primates* 3(4): 174-176

Bonvicino, C. R. 1989. Ecologia e comportamento de *Alouatta belzebul* (Primates: Cebidae) na Mata Atlântica. *Rev. Nordestina Biol.* 6(2): 149-179.

Bonvicino, C. R., Langguth, A. and Mittermeier, R. A. 1989. A study of the pelage color and geographic distribution in *Alouatta belzebul* (Primates: Cebidae). *Rev. Nordestina Biol.* 6(2): 139-148.

Coimbra-Filho, A. F. 1971. Três formas da avifauna do Nordeste do Brasil ameaçadas de extinção: *Tinamus solitarius pernambucensis* Berla, 1946, *Mitu m. mitu* (Linnaeus, 1766) e *Procnias a. averano* (Hermann, 1733). *Rev. Brasil. Biol.* 31(2): 239-247.

Coimbra-Filho, A. F. 1984. Situação da fauna na floresta Atlântica. *Bol. FBCN*, Rio de Janeiro, 19: 89-110.

Coimbra-Filho, A. F. and Maia, A. de A. 1979. Preliminares acerca da fauna no Parque Nacional de Sete Cidades, estado do Piauí. *Bol. FBCN*, Rio de Janeiro, 14: 42-61.

Coimbra-Filho, A. F. and Câmara I. de G. In press. *Os Limites Originais do Bioma Mata Atlântica na Região Nordeste do Brasil.*

Emmons, L. H. and Feer, F. 1990. *Neotropical Rainforest Mammals; A Field Guide.* Chicago University Press, Chicago.

Hill, W. C. O. 1962. *Primates. Comparative Anatomy and Taxonomy V. Cebidae, Part B.* Edinburgh University Press, Edinburgh.

Hirsch, A., Landau, E. C., Tedeschi, A. C.de M., Menegheti, J. O. 1991. Estudo comparativo das espécies do gênero *Alouatta* Lacépède, 1799 (Platyrrhini, Atelidae) e sua distribuição geográfica na América do Sul. In: *A Primatologia no Brasil - 3*, A. B. Rylands and A. T. Bernardes (eds.), pp.239-262. Fundação Biodiversitas and Sociedade Brasileira de Primatologia, Belo Horizonte.

IBGE. 1972. *Carta do Brasil ao Milionésimo.* Fundação Instituto Brasileiro de Geografia e Estastíca (IBGE), Instituto Brasileiro de Geografia (IBG), Rio de Janeiro.

Ihering, H. von. 1914. Os bugios do gênero *Alouatta. Rev. Mus. Paulista*, 9: 231-280.

Langguth, A., Teixeira, D. M., Mittermeier, R. A. and Bonvicino, C. 1987. The red-handed howler monkey in northeastern Brazil. *Primate Conservation* (8): 36-39.

Marcgrave, G. 1648. *Historiae Rerum Naturalium Brasiliae, Libri Sextus: De Quadrupedibus et Serpentibus*. 287pp. Amsterdam.

Neiva, A. and Penna, B. 1916. Viagem científica pelo norte da Bahia, sudoeste de Pernambuco, sul do Piauhi e de norte a sul de Goiaz. *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, 8(3): 74-224.

Oliveira, M. M. de and Oliveira, J. C. C. 1993. A situação dos cebídeos como indicador do estado de conservação da Mata Atlântica no estado da Paraíba, Brasil. In: *A Primatologia no Brasil - 4*, M. E. Yamamoto and M. B. C. de Souza (eds.), pp.155-167. Sociedade Brasileira de Primatologia, Natal.

Paiva, M. P. 1973. Distribuição e abundância de alguns mamíferos selvagens no estado do Ceará. *Ciênc. e Cult.* 25(5): 442-450.

Paiva, M. P. 1974. Algumas considerações sobre a fauna da região semi-árida do nordeste brasileiro. *Rev. Inst. Ceará* 93: 187-205.

Silva Jr. E. C. da 1981. Preliminary survey of brown howler monkeys (*Alouatta fusca*) at the Cantareira Reserve (São Paulo, Brazil). *Rev. Brasil. Biol.* 41(4): 897-909.

Spix, J.B., and Martius, C.F.P von. 1938. *Viagem pelo Brasil*. Translation by L. F. Lahmeyer. 4 vols. Instituto Histórico e Geográfico Brasileiro, Rio de Janeiro.

Vanzolini, P. E. and Papavero, N. 1968. *Índice dos Topônimos Contidos na Carta do Brasil 1:1.000.000 do IBGE*. FAPESP, São Paulo. 201pp.

AGGRESSION BETWEEN *ALOUATTA CARAYA* MALES IN FOREST PATCHES IN NORTHERN ARGENTINA

The aggressive interactions between primates that live in social groups varies in form and intensity according to the species, social organization, and habitat type. Aggressive behavior can involve fights over food, water, and sites for resting and feeding (Calegaro-Marques and Bicca-Marques, 1994). Howler monkeys are considered to be a peaceful species in terms of group interactions as a result of their adaptation to a folivorous diet, where the presence of anti-herbivorous defenses impose selective forces that constrain the use of aggressive behavior (Jones, 1980; Calegaro-Marques and Bicca-Marques, 1994).

In *Alouatta*, both sexes obtain benefits through intrasexual aggressive competence, maintaining as such the possibility of entering and remaining in a stable group. This is a prerequisite for reproductive success in this genus (Crockett and Pope, 1988; Calegaro-Marques and Bicca-Marques, 1994). Solitary individuals, males or females that leave their natal groups, are found in *A. caraya* as for other species. The howlers may leave a group because of intense intrasexual competition which can limit group size. Non-stable groups promote dispersal (Neville *et al.*, 1988). Solitary individuals are subadults or young adults that are forced to occupy marginal zones of the habitat, with low availability of resources. They may join an established group or form a new one with other solitary animals, and compete as such for sites with adequate availability of food sources (Zunino *et al.*, 1985).

The arrival of immigrant males in established groups is interpreted as an invasion with fights between males. The encounters can result in: coexistence with the residents, the replacement of the dominant male, or the withdrawal of the invader (Rumiz, 1990). The replacement of the dominant male has been associated with infanticide and the disappearance of infants in several howler species (Clarke, 1983; Zunino *et al.*, 1985; Rumiz, 1990; Galetti, 1994). Howling occurs in a variety of contexts, and is believed to act as a mechanism of communication, spacing, and territory defense (Baldwin and Baldwin, 1976; Jones, 1980; Sekulic, 1982).

Behavioral observations on *A. caraya* were made during of a study of seed dispersal in forest patches in the Province of Corrientes in northeastern Argentina (27° 30' S - 58° 41' W), during August 1994 (Figure 1). One forest fragment (10 ha) was occupied by a group of nine howlers comprised of: one adult male (male A), two subadult males, three adult females, one juvenile female, and two infants. When an adult male (B) strange to the troop appeared, we began to observe aggressive interactions. During the first three days, the strange male B remained 20-30 m from the troop. Subsequently, he began moving closer to the group, and the male A, followed by the other males, chased the male B for about 250 m into low forest. The females did not participate, and remained where they were until the chase finished, about 1-2 hours later, after which they rejoined the males.

When the resident males returned, the male B began to follow the group at a distance of 23-30 m. Each time the male B approached, it resulted in a series of vocalizations, involving all of the group members. On the fourth day, the male B was observed to descend to the ground, and ran for about 25 m, followed by the male A. On day 6 there was a fight between males A and B when the male B again approached the group, coming to within about 1 m of an adult female (about 1 m) and an infant (about 0.5 m). This resulted in vocalizations and chasing, but this time the male B did not retreat, and attacked male A. They hung from

Figure 1. Study site.

their tails and the fight resulted in injuries to both. When male B, smaller than male A, freed himself, he jumped to the ground and was chased for about 50 m. During the following days, male B disappeared, along with a subordinate adult female, but we were unable to discover if they were together.

Another forest patch of 12 ha was inhabited by a group of *A. caraya*, also comprised of nine individuals: one adult male, two subadult males, three adult females, one juvenile female, and two infants. When an adult male and an adult female appeared in a strip of forest about 90 m from the group, it began a series of vocalizations towards the pair. On the following day, the group came to the ground and went to the forest strip through the grassland. Although the infants were already independent, they were carried dorsally by the adult females. The group remained in the forest strip for four days.

The presence of injuries is connected with the intrasexual competition and the acquisition and maintenance of status in the group. Aggression between males and females is rare and has been observed in infant defense from immigrant males (Crockett and Pope, 1988). Infanticide in mammals may be interpreted in a variety of ways, including, for example, sexual selection. This hypothesis predicts that the infanticidal male may be an invader or a member of the family group that has risen in the hierarchy. Killing infants would reduce the reproductive success of competitors, as well increasing the infanticidal male's success as the females involved become receptive in a shorter time. Another hypothesis tries to explain this behavior through competition for food resources, where the death of non-related individuals would result in an increase of resource availability to the infanticidal individuals and their offspring (Hrdy, 1979; Rudran, 1979). If infanticide occurs frequently it will represent as such an important source of mortality. During 1984 in our study area, infanticide and infant disappearance represented 25% of mortality for the population (Zunino *et al.*, 1985). When populations reach a low density, male replacement and the infanticide become less frequent, along with a return to population growth (Hrdy, 1979; Rudran, 1979). In *A. caraya*, infanticide and dominant male replacement are correlated with an increase in density through the increase of the number of solitary males (Zunino *et al.*, 1985; Galetti, 1994). The elimination of non-related infants would have a double effect, on the one hand, the females become fertile in less time, and on the other, this reduces the number of potential competitors for its descendants. Male replacement may also contribute to reduce the inbreeding, increasing the genetic variability in the groups (Zunino *et al.*, 1985).

We observed agonistic interactions caused principally by the expression of intrasexual competition, but also for the most profitable feeding sites. We believe that competition in our study site may increase due to progressive deforestation, which is resulting in an alarming reduction of the habitat available for *A. caraya*, and predicting a future reduction in the ecological density (Zunino *et al.*, 1994; Amaya Santi *et al.*, 1994). If habitat reduction acts as a stressor, the rate of aggression may increase, along with the number of dispersing individuals (Jones, 1980), but this has to be confirmed. We are presently looking for a relation between habitat destruction and aggression.

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References

Amaya Santi, M., Kowalewski, M. and Ruiz, J. C. 1994. Comparación de métodos de censado por transecta en monos aulladores (*Alouatta caraya*) en areas fraccionadas. 9nas. Jornadas de Mastozoología, Sociedad Argentina para el Estudio de los Mamíferos, Pcia. de Córdoba.

Baldwin, J. D. and Baldwin J. I. 1976. Vocalizations of howler monkeys (*Alouatta palliata*) in southwestern Panama. *Folia Primatol.* 26: 81-108.

Calegaro-Marques, C. and Bicca-Marques, J. C. 1994. Comportamento agressivo em um grupo de bugios

pretos, *Alouatta caraya* (Primates, Cebidae). In: *Abstracts. VI Congresso Brasileiro de Primatologia*, Universidade Federal do Rio de Janeiro, Rio de Janeiro.

Clarke, M. R. 1983. Infant-killing and infant disappearance following male takeovers in a group of free-ranging howling monkeys (*Alouatta palliata*) in Costa Rica. *Am. J. Primatol.* 5: 241-247.

Crockett, C. M. and Pope, T. 1988. Inferring patterns of aggression from red howler monkey injuries. *Am. J. Primatol.* 15: 289-308.

Galetti, M. 1994. Infanticide in the brown howler monkey, *Alouatta fusca*. *Neotropical Primates* 2(4): 6-7.

Hrdy, S. B. 1979. Infanticide among animals: a review classification, and examination of the implications for reproductive strategies of females. *Ethol. Sociobiol.* 1: 13-40.

Jones, C. B. 1980. The function of status in the mantled howler monkey, *A. palliata* Gray; intraspecific competition for group membership in a folivorous Neotropical primate. *Primates* 21(3):389-405.

Neville, M. R., Glander, K. E., Braza, F. and Rylands, A. B. 1988. The howling monkey, genus *Alouatta*. 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.349-453. World Wildlife Fund, Washington, D.C.

Rudran, R. 1979. The demography and social mobility of a red howler (*Alouatta seniculus*) population in Venezuela. In: *Vertebrate Ecology in the Northern Neotropics*, J. F. Eisenberg (ed.), pp.107-126. Smithsonian Institution Press, Washington, D.C.

Rumiz, D. I. 1990. *Alouatta caraya*: population density and demography in northern Argentina. *Am. J. Primatol.* 21(4):279-294.

Sekulic, R. 1982. Daily and seasonal patterns of roaring and spacing in four red howler, *Alouatta seniculus*, troops. *Folia Primatol.* 39:222-248.

Zunino, G. E., Chalukian, S. C. and Rumiz, D. I. 1985. Infanticidio y desaparición de infantes asociados al reemplazo de machos en grupos de *Alouatta caraya*. In: *A Primatologia no Brasil-2*, M. T. de Mello (ed.), pp.185-190. Sociedade Brasileira de Primatologia, Brasília.

Zunino, G. E., Reisenman, C. E., Bravo, S. P. and Ferreira, F. M. 1994. Habitat y estructura poblacional del mono aullador negro (*Alouatta caraya*, Primates, Cebidae) en el noreste de la Argentina. In: *Abstracts. VI Congresso Brasileiro de Primatologia*, Universidade Federal do Rio de Janeiro, Rio de Janeiro

CHROMOSOMAL VARIATION IN *ALOUATTA FUSCA*

The genus *Alouatta* (Primates, Atelidae) includes six different species, with a wide distribution in South and Central America (James *et al.*, 1993). Of these, the brown howling monkey (*Alouatta fusca*) is endemic to the Atlantic Coastal Forest being found from Bahia, Espírito Santo and Minas Gerais (Brazil) south to Missiones (Argentina), and comprises two subspecies: *A. fusca fusca* and *A. fusca clamitans*.

Koiffmann (1977) reported a variation in the diploid number of *A. fusca* from 48 to 50. The diploid number of 48 chromosomes was found in a single male from Registro (southern part of the state of São Paulo), heterozygotic for two Robertsonian rearrangements. The same author reported males with 2n = 49, due to a y-autosome translocation, and males and females with 2n = 50.

Methods

Blood samples of ten specimens of *Alouatta fusca*, eight males and two females from different localities (Table 1), were collected using heparinized plastic syringes. Lymphocytes were cultivated for 72 hours in RPMI medium, enriched with fetal calf serum at 20% and Phytohemagglutinin at 2%. The chromosome analyses were performed by G-C-NOR banding procedures (Seabright, 1971; Sumner, 1972; Howel and Black, 1980).

Results and Discussion

The chromosome complement of *Alouatta fusca* showed a wide variation in the diploid number, with 2n = 45, 46, 49 and 52. This variation may be associated with the geographic origin of each individual (Table 1).

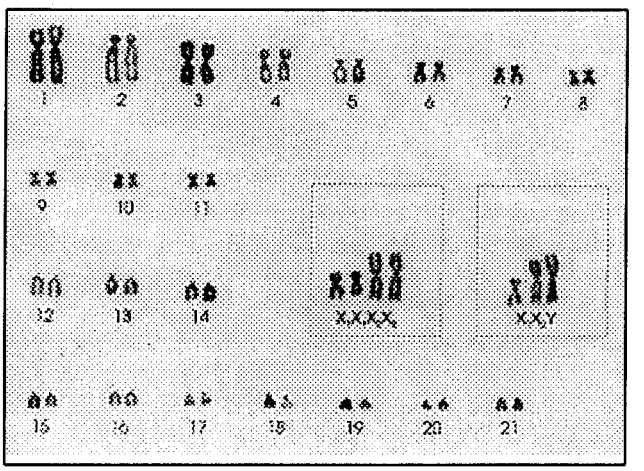

Figure 1. Karyotype of *Alouatta fusca* from southern Brazil.

Table 1 Procedence and diploid number of the specimens of *A. fusca* analyzed in this study.

Sex	Procedence	Diploid Number
Male	Espírito Santo	52
Male	Rio de Janeiro	49
Male	Rio de Janeiro	49
Male	Rio de Janeiro	49
Male	Rio de Janeiro	49
Female	Santa Catarina	46
Female	Santa Catarina	46
Male	Paraná	45
Male	Paraná	45
Male	Paraná	45

The karyotype of the specimens from southern Brazil comprised 45 chromosomes in the males, and 46 in the females (Fig. 1). The analysis of the G-banded chromosomes of the males, compared to those of the females, allowed us to assume that this variation was due to a y-autosome translocation involving a large submetacentric pair. This rearrangement was also observed in the four males from the state of Rio de Janeiro, which showed 2n = 49 (Fig. 2), with a heteromorphic submetacentric pair, not found in previously reported karyotypes of females (Koiffmann, 1977). The only male from the state of Espírito Santo had 52 chromosomes, with a small

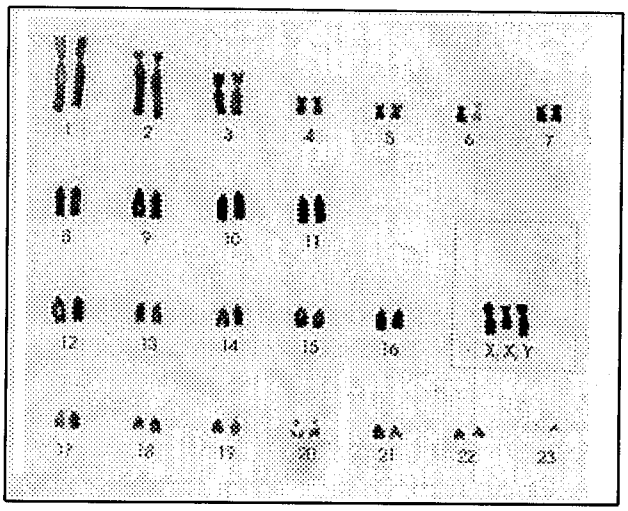

Figure 2. Karyotype of *Alouatta fusca*, male, from Rio de Janeiro.

acrocentric y-chromosome (Fig. 3).

G-banded karyotypes of 2n = 45 and 46 and 2n = 49 were compared. Unfortunately, we did not succeed in banding the karyotype with 2n = 52. Based on this comparison, we could clearly identify two Robertsonian rearrangements (fusion/fission), as well as pericentric inversions. Moreover, some chromosomes found in the southern karyotype could not easily be recognized in 2n = 49, suggesting that complex rearrangements, such as multiple translocations, were also involved in the differentiation of these two cytotypes. We assume

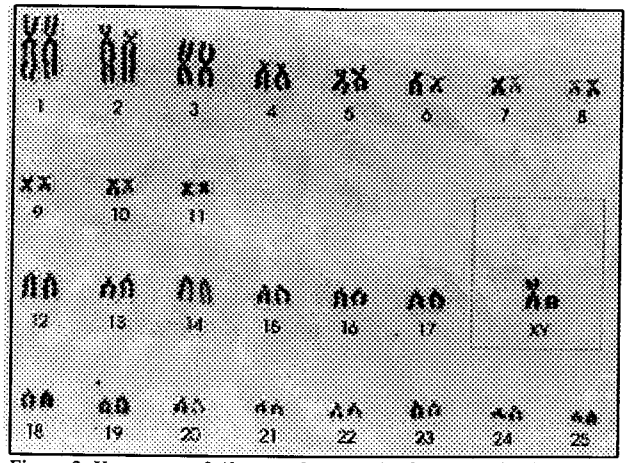

Figure 3. Karyotype of *Alouatta fusca*, male, from Espírito Santo.

that Robertsonian rearrangements and pericentric inversions have played a critical role in the chromosomal evolution of this species.

Although the chromosomal variation in *A. fusca* seems to be clinal, and agrees with the clinal variation found in the hair color patterns, (R. Gregorin, pers. comm.), the results of the chromosome comparisons suggest that the populations analyzed are in different stages of speciation, and probably reproductively isolated, due to meiotic disturbances. A complete failure to hybridize, or the production of hybrids presenting reduced fertility or complete sterility would indicate that the parents belong to different species. Although meiotic and crossbreeding studies should be carried out to confirm our hypothesis, we suggest that the different cytotypes found in *Alouatta fusca* are reproductively isolated, with hybrids presenting very low fertility, if not complete sterility. We suggest that the taxonomy of *Alouatta fusca* should be critically reviewed, based not only on morphology, but also cytotaxonomy, biochemistry and other approaches that could clarify the phylogeny and taxonomy of this species.

Acknowledgments, we are most grateful to Alcides Pissinatti (Centro de Primatologia do Rio de Janeiro), Emerson Suemitsu (Itaipu Binacional), and the staff of the Passeio Público de Curitiba and the Rio de Janeiro Zoo, for allowing us to collect the blood samples from the animals housed in their institutions. We also thank Renato Gregorin (University of São Paulo) for providing unpublished information. This study was supported by the Brazil Science Council (CNPq), the Brazilian Higher Education Authority (CAPES), and the Federal Universities of Paraná (UFPR), Curitiba, and Pará (UFPA), Belém.

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References

Howel, W. M. and Black, D. A. 1980. Controlled silver-staining of nucleolus organizer regions with a protective colloidal developer: a 1-step method. *Experientia* 36: 1014-1015.

James , R. A.and Horwich, R. H. 1993. Phylogeny and conservation genetics of howler monkeys - *Symposium on the Primate Family Cebidae - AAZPA Regional Proceedings*, pp. 692-698.

Koiffmann, C. P. 1977. Variabilidade cromossômica na Família Cebidae (Primates, Platyrrhini). Doctoral thesis, Instituto de Biociências, Universidade de São Paulo, São Paulo.

Seabright, M. 1971. A rapid banding technique for human chromosomes. *The Lancet* 2: 971-972.

Sumner, A. T. 1972. A simple technique for demonstrating centromeric heterochromatin. *Exp. Cell Res.* 75: 304-306.

News

Two Breeding Females in a *Saguinus fuscicollis weddelli* Group

On 20 September 1994, we captured a group of saddleback tamarins composed of six individuals (one adult male, two adult females, one subadult male, one subadult female, and one juvenile male) in a "*Saguinus* trap" (Encarnación *et al.*, 1990) in the Zoobotanical Park of the Federal University of Acre (956'30" - 957'19"S, 6752'08" - 6753'00"W; 155 m above sea level; area 100 ha). All individuals except one adult female, suspected to be pregnant, were anesthetized, weighed, measured and fitted with collars of different colors.

On 24 October, the adult male (Blue) was seen carrying two newborn infants of the unmarked adult female. One week later, while Blue was carrying the infants (the only individual except the mother seen to do so), the other adult female (Orange) was seen surrendering food (banana) to him. By 13 December the infants were feeding at the capture platform, and were quite independant.

About two months later, Orange gave birth to twins, first seen on 23 January, increasing the group size to 10. These new infants were carried by Orange, Blue and a subadult female (Yellow). It seemed that Blue was the father, being the onlty adult male. The infants were last seen in April 1995, apparently healthy.

This would seem to be a case of poligyny, an uncommon mating system in callitrichids (for reviews see Rylands, 1993), having been observed in only four species to date (*Callithrix jacchus* - Digby and Ferrari, 1994; *Callithrix kuhli* - Alonso and Porfirio, 1993; *Saguinus fuscicollis* - Terborgh and Goldizen, 1985; and *Leontopithecus rosalia* - Dietz and Baker, 1993).

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References

Alonso, C. and Porfírio, S. 1993. Um caso de poliginia em *Callithrix kuhli* com criação simultânea dos filhotes. *Biotemas* 6(2): 89-99.

Dietz, J. M. and Baker, A. J. 1993. Polygyny and female reproductive success in golden lion tamarins, *Leontopithecus rosalia. Anim. Behav.* 46: 1067-1078.

Digby, L. J. and Ferrari, S.F. 1994. Multiple breeding females in free-ranging groups of *Callithrix jacchus. Int. J. Primatol.* 15(3): 389-397.

Encarnación, F., Moya, L., Soini, P., Tapia, J. and Aquino, R. 1990. La captura de Callitrichidae (*Saguinus* y *Cebuella*) en la Amazonia Peruana. In: *La Primatologia en el Perú*, N. E. Castro-Rodríguez (ed.), pp. 45-56. Proyecto Peruano de Primatologia, Iquitos.

Rylands, A.B. (ed.). 1993. *Marmosets and Tamarins: Systematics, Behaviour, and Ecology*. Oxford University Press, Oxford.

Terborgh, J. and Goldizen, A. W. 1985. On the mating system of the cooperatively breeding saddle-backed tamarin (*Saguinus fuscicollis*). *Behav. Ecol. Sociobiol.* 16: 293-299.

PRELIMINARY FIELD STUDY OF THE RED-HANDED TAMARIN, *SAGUINUS MIDAS*, IN FRENCH GUIANA

A six-month field study was carried out on the ecology and behaviour of free-ranging red-handed tamarins (*Saguinus midas midas*), concentrating on ranging behaviour and habitat use. The data were collected at the Station of Nouragues (CNRS) in French Guiana between July and December 1994, using a scan-sampling method (Altmann, 1974; Rylands, 1982). The home ranges of most callitrichids are characterised by a mix of habitats, usually including an abundance of forest edge (Sussman and Kinzey, 1984; Rylands, 1996). Seasonal availability, distribution, and habitat location of food resources are known to have a major impact on the feeding and ranging patterns of tamarins (Garber, 1993). Seasonal changes in climate and the distribution of different forest types had the effect that the *S. midas* in this study were confronted with both spatial and temporal variation in ecological conditions. The periods of data collection permitted assessment of behavioural changes resulting from seasonal changes, including those in food supply.

Four groups were identified in the study area, one of which, containing three individuals, was taken as the main focus of study. The groups contained three to seven individuals, and had home ranges of 34 to 39 ha. In the dry season (September to November), the tamarins spent more time foraging. Feeding on fruits increased at the beginning of the wet season. *Saguinus midas* was never observed feeding on exudates. During the dry season, insectivory appeared to influence how the tamarins moved about their home range. Movement during the dry season was less goal-directed, probably related to the fact that insects are a spatially and temporally fluctuating food resource. At the beginning of the wet season, the tamarins started to visit their feeding trees more systematically. Home range overlap between the range of the focal group and neighbouring home ranges amounted to at least 46%, but many confrontations were recorded. These aggressive encounters did not serve to defend the border of the home range. Instead, they were concentrated around the liana forest, which was located in the centre of the focal group's home range. The increase in confrontations during the dry season, which was accompanied by increased time spent foraging, would suggest that liana forests are an important potential foraging area and that their defence is therefore economical.

Saguinus midas was observed predominantly in the lower and middle strata of the forest (10-30 m) and mainly used supports 1 to 5 cm in diameter. While the tamarins were mostly at heights of 20-30 m during feeding on fruits, they spent more time at heights between 10 and 20 m during foraging for insects on leaves and lianas, as is also shown by *S. imperator* and *S. mystax* (Terborgh, 1983; Garber, 1988). Different heights were preferred according to the forest type, which might reflect either convenient travel paths or anti-predator behaviour. *S. midas* showed a distinct preference for edge habitats and was more frequently observed in liana forests than expected by chance. In addition to their apparent importance as foraging sites, the liana forests afford protection against predators of small-bodied primates. Raptors are the main threat for callitrichids (Ferrari and Lopes Ferrari, 1990; Heymann, 1990), so that predator pressure is probably stronger in open vegetation. This was confirmed by one observed attack on an individual tamarin made by a crested eagle (*Morphnus guianensis*) in an open forest. Anti-predator behaviour appeared to have consequences for group cohesion. In the open forest, the tamarins travelled in close-knit groups, because co-ordination was favoured not only for visiting patchily distributed food sources such as fruits but also for early detection of predators (see Caine, 1993). In the cover of the dense liana forest, the tamarins searched individually for the dispersed animal prey.

This text is a summary of a Master's thesis supervised by Prof. Dr. R. D. Martin and Dr. P. Charles-Dominique. The thesis (in German) may be requested from Philip Kessler at the address below. A full publication in English is in preparation.

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References

Altmann, J. 1974. Observational study of behaviour: sampling methods. *Behaviour* 49: 227-267.

Caine, N. G. 1993. Flexibility and co-operation as unifying themes in *Saguinus* social organisation and behaviour: the role of predation pressures. In: *Marmosets and Tamarins: Systematics, Ecology. and Behaviour*, A. B. Rylands (ed.), pp.200-219. Oxford University Press, Oxford.

Ferrari, S. F. and Lopes Ferrari, M. A. 1990. Predator avoidance behavior in the buffy-headed marmoset, *Callithrix flaviceps*. *Primates* 31: 323-338.

Garber, P. A. 1988. Diet, foraging patterns and resource defence in a mixed species troop of *Saguinus mystax* and *Saguinus fuscicollis* in Amazonian Peru. *Behaviour* 105: 18-34.

Garber, P. A. 1993. Feeding ecology and behaviour of the genus *Saguinus*. In: *Marmosets and Tamarins: Systematics, Ecology. and Behaviour*, A. B. Rylands (ed.), pp.273-295. Oxford University Press, Oxford.

Heymann, E. W. 1990. Reactions of wild tamarins, *Saguinus mystax* and *Saguinus fuscicollis* to avian predators. *Int. J. Primatol.* 11: 327-337.

Kessler, P. 1995. Revierverhalten, Nahrungsstrategie und Habitatpräferenzen des Rothandtamarins (*Saguinus midas midas*) in Französisch Guayana. Master's thesis, Institute and Museum of Anthropology, University of Zurich.

Rylands, A. B. 1982. The Behaviour and Ecology of Three Species of Marmosets and Tamarins (Callitrichidae) in Brazil. Unpublished Ph.D. thesis, University of Cambridge, Cambridge.

Rylands, A. B. 1996. Habitat and the evolution of social and reproductive behavior in Callitrichidae. *Am. J. Primatol.* 38. In press.

Sussman, R. W. and Kinzey W. G. 1984. The ecological role of the Callitrichidae. *Am. J. Phys. Anthropol.* 64: 419-449.

Terborgh, J. 1983. *Five New World Primates*. Princeton University Press, Princeton, New Jersey.

Census of *Alouatta fusca* and Habitat Quality in Two Areas of Atlantic Forest in Minas Gerais, Brazil

In September 1995, André Hirsch defended his thesis on a census of *Alouatta fusca* in relation to habitat quality in two protected areas of Atlantic Forest in the state of Minas Gerais, Brazil. The thesis formed part of the requirements for the Master's course in Ecology, Conservation and Wildlife Management, Institute of Biological Sciences, Federal University of Minas Gerais, Belo Horizonte, Brazil. His supervisor was Dr. Anthony B. Rylands, and the study was supported by the World Wide Fund for Nature (WWF/Brazil), the Brazil Science Council (CNPq) and the PADCT/ CIAMB Interdisciplinary Program - Biodiversity, Population and Economy of the Federal University of Minas Gerais. The following is a summary of the thesis.

The study was carried out in the Estação Biológica de Caratinga - EBC (860 ha) and the Parque Estadual do Rio Doce - PERD (36.113.6 ha), two protected areas of Atlantic Forest in the state of Minas Gerais. The aim was to evaluate habitat quality in both areas and correlate this with the density of *A. fusca*. Data on habitat quality was obtained using a Point Sampling Method (MTAP): sample points (300 m between each) were placed along the same transects as those used for censusing *A. fusca*. Ninety-nine points were sampled at EBC and 67 at PERD. Thirty-six environmental variables were recorded. The habitat data were analysed using multivariate techniques, including Cluster Analysis, Principal Co-ordinate Analysis and Discriminant Analysis (MULVA-5 Program). The Cluster Analysis produced four consistent groups of sampling points, making it possible to order them in a gradient of habitat quality. Discriminant Analysis allowed for the selection of 14 variables at EBC and 13 at PERD, all with a strong relation to habitat structure and the floristic composition of the forest. Census data were obtained using the Linear Transect Method adapted for two simultaneous observers. Fifty-two transects at EBC and 18 at PERD were surveyed three times by each observer, resulting in 157.8 km and 112.5 km of census, respectively. The time spent censusing was 234.7 h at EBC and 140.8 h at PERD. Average density estimates for *A. fusca* at EBC were 1.493 indiv./ha for the first observer, and 0.922 indiv./ ha for the second observer. Likewise, for PERD the estimates were of 0.495 indiv./ha and 0.018 indiv./ha, respectively.

The relation between howler density and habitat for each the specific regions identified in the study areas was clearer at EBC, where a closer relation was found between the complexity of the habitat structure, floristic diversity and *A. fusca* density. At the PERD, few records were obtained due to the low density of *A. fusca,* despite the very similar habitat structure and floristic composition of this, the larger, area. The reason for the density difference remains unclear, but such possibilities as habitat structure, size of the area, forest fires, disease epidemics (yellow fever, simian malaria and leishmaniosis), predation and hunting are possibly involved. The most important problems arising are related to the limited carrying capacity of the habitat in the case of EBC, and the increase of inbreeding depression between the howlers, related to their high density, the relatively small area, and the degree of isolation of the area. Future management and translocation programs must take these factors into account, and it will be necessary to involve the owners of private areas for protecting the forest fragments still remaining and encourage the regeneration of degraded areas, that can serve as forest "corridors" between fragments.

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Reference

Hirsch, A. 1995. Censo de *Alouatta fusca* Geoffroy, 1812 (Platyrrhini, Atelidae) e Qualidade do Habitat em dois Remanescentes de Mata Atlântica em Minas

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NEOTROPICAL PRIMATES

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Gerais. Unpublished Master's Thesis. Universidade Federal de Minas Gerais, Belo Horizonte. 147pp.

Molecular Phylogeny of the Callitrichinae

In September 1995, Carmem Barroso defended her doctoral thesis on the molecular phylogeny of the subfamily Callitrichinae (*sensu* Rosenberger, 1981) for the postgraduate course in Biological Sciences (specialization in Genetics and Molecular Biology) of the Federal University of Pará, Belém. The study was supported by the Federal University of Pará, Belém, the Brazil Science Council (CNPq), and Wayne State University, Detroit, Michigan. The thesis was supervised by Dr. Horacio Schneider. The following is a summary.

DNA sequences encompassing the intron 1 of the IRBP gene, with approximately 1800 base pairs, were obtained for the following species: *Saguinus midas*, *S. bicolor*, *Leontopithecus rosalia*, *Callimico goeldii*, *Callithrix jacchus*, *C. geoffroyi*, *C. argentata*, *C. humeralifera* and *Cebuella pygmaea*. The sequences were added to the IRBP data base created for the remaining ceboid genera by Harada *et al.* (1995). An in-tandem alignment was constructed with this data along with the epsilon-globin data of Schneider *et al.* (1993). The arrangements observed confirm the monophyly of the family Cebidae; demonstrate that *Saguinus* is the most primitive of the Callitrichinae; and place *Cebuella* unequivocally as a member of the genus *Callithrix*, in the group "pygmaea", equivalent to the "argentata" and "jacchus" groups. A model of callitrichine evolution is proposed based on the phylogenetic evidence from this study. According to this model, the ancestral population of *Leontopithecus* and *Callimico-Callithrix* (or *Leontopithecus-Callimico* and *Callithrix*) would have arisen from proto-*Saguinus* stock. The proto-lion tamarins would have migrated eastwards, where they were isolated in refugia, becoming the genus *Leontopithecus*. The stock remaining in Amazonia gave rise to present-day *Callimico* and *Callithrix*. The latter genus occupied a vast geographic area, giving rise to the "argentata" and "pygmaea" groups in Amazonia, and the "jacchus" group in central and eastern Brazil.

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References

Barroso, C. M. L. 1995. Filogenia molecular da subfamília Callitrichinae (*sensu* Rosenberger, 1981). Doctoral Thesis, Universidade Federal do Pará, Belém. 114pp.

Harada, M. L., Schneider, H., Schneider, M. P.C., Sampaio, M. I. C., Czelusniak, J. and Goodman, M. 1995. DNA evidence on the phylogenetic systematics of New World monkeys: support for the sister grouping of *Cebus* and *Saimiri* from two unlimked nuclear genes. *Mol. Phylogen. Evol.* In press.

Rosenberger, A. L. 1981. Systematics: the higher taxa. In: *Ecology and Behavior of Neotropical Primates, Vol. 1*, A. F. Coimbra-Filho and R. A. Mittermeier (eds.), pp. 9-27. Academia Brasileira de Ciências, Rio de Janeiro.

Schneider, H., Schneider, M. P. C., Sampaio, M. I. C., Harada, M. L., Stanhope, M., Czelusniak, J. and Goodman, M. 1993. Molecular phylogeny of the New World monkeys (Platyrrhini, Primates). *Mol. Phylogen. Evol.* 2(3): 225-242.

Vocal Communication Studies at the University of São Paulo

A doctoral thesis "Vocal Interactions in the Muriqui (*Brachyteles arachnoides*)" was defended in April 1995, at the Department of Experimental Psychology of the University of São Paulo (USP), by Francisco Dyonísio Cardoso Mendes, under the supervision of Dr. César Ades (USP), and with the collaboration of Dr. Charles Snowdon and Dr. Karen Strier (University of Wisconsin, Madison). It represented the first systematic study on the vocal communication of the muriqui, and the first thesis on primate vocalizations produced in Brazil. As a result, Dr. Ades and and Dr. Mendes have established the "Laboratório de Comunicação Acústica" at USP, with the acquisition of digital equipment for acoustic analysis of animal sounds. The laboratory will allow further analyses of muriqui vocalizations, as well as other studies on the vocal communication of different neotropical species.

Vocal interactions in the muriqui (*Brachyteles arachnoides*)

The major interest of the thesis was the interactional aspect of vocal signals. Observations and recordings of spontaneous vocalizations were carried out at the Biological Station of Caratinga, Minas Gerais. Vocal and contextual data were obtained through focal animal samplings and *ad libitum*. Contextual data included information on the identity of the caller, its behavior, social referents, and vocal and non-vocal

responses from other group members. Digital sonographic procedures and contextual analyses were used in the classification of the main vocal categories of the species' repertoire, registered with 160 hours of recordings.

Broad categories of vocalizations were initially grouped according to the specificity of eliciting stimuli and evoked behavioral and vocal responses. Twenty four vocal categories encountered were given exclusively in specific situations, and/or to particular listeners. These categories included: alarm calls emitted in the presence of terrestrial and aerial species; vocalizations given by participants of different types of peer interactions (i.e., play of immature and embraces of adults); categories produced during mother-infant interactions; vocalizations bound to sexually receptive females; vocal signals emitted in isolation or in choruses, during intergroup encounters.

Four other vocalizations frequently evoked antiphonal continuous responses from other individuals. These vocalizations included: "piados", or chirps (Strier, 1986, 1992), usually heard while group members feed in proximity; "piados silábicos" or "kh-kh-kh" (Torres de Assumpção, 1983), usually emitted by resting individuals; "gemidos"and "latidos" (barks- Strier, 1986, 1992; Nishimura *et al.*, 1988) sometimes given by individuals disturbed by the proximity of other groups or other species. A variety of acoustic forms occurred in a yet different pattern of interindividual participation, named sequential exchanges. Typically, one individual vocalized, and others responded with one call each, with little or no overlap between adjacent calls. Sequential exchanges occurred throughout the day, in a variety of contexts. Sequential exchange calls are composed of different recombinations of short emissions (pulsed elements, less than 100 ms duration) and longer emissions (run-on elements of more than 100 ms). Five categories of pulsed elements and nine categories of run-on elements were identified, according to duration, spectral shape, and energy distribution of the emission.

Each element present in a sample of 322 calls was then assigned to one of the fourteen categories of elements. The mean number of elements per call was 10,2 (sd = 4,8), with at least two categories of elements represented in 94% of the sample. Two hundred and two calls (stacattos) were composed exclusively of pulsed elements. The remaining one hundred and twenty calls (neighs) included at least one run-on element.

Cluster analysis, based on call composition, resulted in six patterns of stacattos, and six patterns of neighs, used in sequential exchanges. Stacattos were preferentially used during exchanges of a few nearby individuals, and could not be associated to specific referents. Staccatos dominated by harsh pulsed elements were preferentially used during during contexts of intragroup competition, such as when the whole group fed at a single source. Neighs occurred more frequently during exchanges among a larger number of participants, with at least one participant distant from the others (more than 50 m away). Some run-on elements present in neighs were almost exclusively emitted by receptive females, and others showed a strong association with contexts of a great intragroup dispersion. Two acoustic patterns were exclusively recorded after the group had spread out following encounters with members of the neighbouring group of muriquis. Sequential exchanges may operate as a system of temporally associated vocalizations that aid intragroup spacing and coordination among both nearby and distant individuals.

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References

Nishimura, A., Fonseca, G.A.B., Young, A.L., Strier, K.B., Mittermeier, R.A. and Valle, C.M.C. 1988. The muriqui, genus *Brachyteles*. 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.577-610. World Wildlife Fund, Washington, D. C.

Strier, K.B. 1986. The ecology and behavior of the woolly spider monkey, or muriqui (*Brachyteles arachnoides* - E. Geoffroy 1806). PhD thesis. University of Harvard, Cambridge, MA.

Strier, K.B. 1992. *Faces in the Forest*. Oxford University Press, New York.

Torres de Assumpção, C. (1983). Ecological and behavioural information on *Brachyteles arachnoides*. *Primates* 24: 584-593.

Status of South American Spider Monkeys in North American Collections

The 1994 North American Regional Studbook for South American spider monkeys (*Ateles belzebuth, A. fusciceps* and *A. paniscus*) was recently published by the Sedgwick County Zoo, Wichita, Kansas, USA. Representatives of all but two of the subspecies of these primates (*A. belzebuth marginatus* and *A. fusciceps fusciceps*) are currently maintained. The complete studbook and the status of the living populations (in February 1995) are provided for each species and

subspecies. Age pyramids, and fecundity and mortality reports are also provided. Four *A. b. belzebuth* (2.2.0) are kept in three institutions and 13 *A. b. chamek* (5.7.1) in four. A further three collections have three *A. belzebuth* (2.1.0) but the subspecies remains undetermined. The population of *A. b. hybridus* is considerably larger, with 35 animals (14.21.0) in 10 institutions. The studbook for *A. f. robustus* goes back to the late 1950's and includes records for 248 animals (84.140.24). A total of 123 *A. f. robustus* (40.76.7) were recorded alive in 25 institutions on 12 February 1995 (in addition to a male for which the subspecies was undetermined). The studbook also provides records for 131 (50.59.22) *A. paniscus*, of which 17 (8.8.1) in eight collections comprised the living population in February 1995.

Although no *A. f. fusciceps* occur in North American collections, the European population is sizable and precludes the need for efforts to establish a captive breeding program for this species in the region. However, consideration will be given to the organization of captive populations of the most threatened of the subspecies, *A. b. marginatus*, after the status of the founder base is determined for Europe and South America.

Concerning the subspecies currently held in North America, the New World Primate Taxon Advisory Group of the American Zoo and Aquarium Association (AZA) has determined that special consideration be given to *A. belzebuth hybridus* and *A. fusciceps robustus*, both listed as endangered by the World Conservation Union (IUCN), and which make up most of the holdings. Management will be directed toward retaining as much gene diversity as possible, while minimizing increases in the population size.

It is most important that collection managers use the information in the studbook to aid them in decisions regarding the management of their animals, and, likewise, that institutions maintaining South American spider monkeys supply accurate and regular reports concerning the status of their collections. The studbook keeper would also be grateful for information concerning current research projects on both wild and captive animals.

Kristi Newland, North American Regional Studbook Keeper for South American Spider Monkeys, Sedgwick County Zoo, 5555 Zoo Boulevard, Wichita, Kansas 67212, USA.

Reference

Newland, K. 1995. *1994 North American Regional Studbook for South American Spider Monkeys* Ateles belzebuth, A. fusciceps, A. paniscus - *All Subspecies*. Sedgwick County Zoo, Wichita. 121pp.

WHITE-FACED SAKI, *PITHECIA PITHECIA*, STUDBOOK

The 1993-1994 update for the studbook of the North American populations of the white-faced saki, *Pithecia pithecia*, organized by Tracy Frampton, was published recently by the Roger Williams Park Zoo, Rhode Island, USA. It includes a list of holding institutions, a studbook of the living animals, a listing of births, deaths, and transfers, population analyses, insititution reports and addresses and selected bibliography.

The studbook, current up to 31 December 1994, lists 112 individuals with a 1:1 sex ratio (56.56.0) in 26 collections in North America. The population analyses show that the captive population has been growing since 1979/80. Between 1 January 1993 and 31 December 1994, there were 32 births (two stillborn) and 14 deaths, and 34 animals were transferred between collections.

Tracy Frampton, Studbook keeper, Roger Williams Park Zoo, Providence, Rhode Island 02907, USA.

Reference

Frampton, T. 1995. *1993-1994 Update to The North American Regional Studbook for the White-Faced Saki* (Pithecia pithecia). Roger Williams Park Zoo, Rhode Island.

GRUPO ESPECIALISTA DO *CALLICEBUS PERSONATUS*

Durante o VII Congresso Brasileiro de Primatologia, em Natal, 1995, alguns pesquisadores que realizam pesquisas com o guigó, *Callicebus personatus*, se uniram para criar um "Grupo Especialista do *Callicebus personatus*". O primeiro passo dessa sociedade informal terá a finalidade de recolher informações sobre os pesquisadores que trabalham com a espécie, as áreas de estudo, interesse científico e a formulação dos objetivos do Grupo. As seguintes pessoas compuseram o grupo fundador: Fabiano Rodrigues de Melo (Universidade Federal de Viçosa, Minas Gerais), Wilson Ferreira de Melo (Universidade Federal do Mato Grosso do Sul, Corumbá), Klaus-Heinrich Müller (Deutsches Primatenzentrum, Alemanha), Fernanda Maria Neri (Universidade Federal de Minas Gerais, Minas Gerais) e Silvia Beatriz de Souza (Universidade de Campinas, São Paulo). Para maiores informações, favor entre em

contato com: Klaus-Heinrich Müller, Deutsches Primatenzentrum GmbH, Kellnerweg 4, D-37077 Göttingen, Alemanha, Tel: + 49 551-3851125, Fax: + 49 551 385-1228.

Wisconsin Regional Primate Research Center Library Chosen WLA Library of the Year

The Wisconsin Regional Primate Research Center (WRPRC) Library was selected as the 1995 Library of the Year by the Wisconsin Library Association. The award is conferred upon a library "for distinguished achievement in service". The WRPRC, funded by the National Institutes of Health, is recognized for its programs in primate research, conservation and education. The WRPRC Library has evolved from a small reference library to one that has, with the addition of modern service components,become the largest primate-oriented library collection in the world. The International Directory of Primatology, now in its second edition, is produced by the library staff. The staff also designed and initiated services on the Internet that furnish an open communication system for primatologists and other professionals all over the world. Primate-Talk, established in 1991, provides a free-of-charge, open electronic forum for the discussion of primatology. Primate Info Net, a gopher/World Wide Web Server, was created in 1993 as a permanent electronic reservoir for materials dealing with primatology.

The WRPRC Library serves a wide range of users. Recently, staff initiated a section of Primate Info Net to highlight primate resources for children and young adults. This was the first University of Wisconsin - Madison library to institute a document delivery program. Its audiovisual archives includes 6,000 slides and 600 videotapes which are loaned internationally.

John D. Wiley, Provost of the University of Wisconsin said, "The level of professionalism, friendly service and knowledge provided by the Staff to all users is an integral part of the success of this library, and contributes greatly to the visibility of the Primate Center, both on campus and around the world."

The award was presented to the WRPRC Library at the Awards Banquet during the Annual Wisconsin Library Association Conference in Appleton on 25 October 1995. The Wisconsin Library Association is a 1,500-member professional organization made up of public, academic, school, and special librarians, library trustees and others interested in libraries and informational sciences. For more information, contact: Larry Jacobsen, Head of Library Services, WRPRC Library, Tel: 1 (608) 263-3512, Fax: 1 (608) 263-4031, e-mail: jacobsen@primate.wisc.edu.

Grupo de Etologia de Primatas (PSE) The University of São Paulo

The "Grupo de Etologia de Primatas" is a group of graduate students and researchers interested in primate behavior, recently formed at the Experimental Psychology Department of the University of São Paulo. The group promotes weekly discussions on primate social behavior and cognition. Discussions are open to anyone interested in participating, and are centered on recent publications, previously chosen at the beginning of each semester.

A thorough review of the "Machiavellian Inteligence" theory was the topic for the first semester of 1995, and the meetings for the second semester focused on different approaches to cognition, awareness, and decision taking in primates. The group is also ministering a University Extension Course on "Primate Social Behavior" to undergraduate and graduate students from São Paulo. Outside researchers or students visiting São Paulo are welcome to participate in the weekly meetings, and may propose a lecture about their own research projects. For additional information on weekly discussions and courses, please contact: Francisco D. C. Mendes (Dida) or Eduardo Ottoni, Departamento de Psicologia Experimental, Universidade de São Paulo (USP), Av. Prof. Mello Moraes, 1721, Caixa Postal 66.261, 05508-900 São Paulo, São Paulo, Brazil.

Projeto Dinâmica Biológica de Fragmentos Florestais - Vagas para Estagiários

O Projeto Dinâmica Biológica de Fragmentos Florestais (PDBFF) anuncia vagas para estagiários para trabalhar em projetos de pesquisas ligados a fragmentação florestal na Amazônia Central. O PDBFF, um projeto binacional entro o Instituto Nacional de Pesquisas da Amazônia e o Smithsonian Institution dos EUA, quantifica as mudanças no ecossistema que ocorrem à medida que a floresta contínua é transformada pelo desenvolvimento humano em um mosaico de habitats. O PDBFF é o único estudo integrado a longo prazo dos efeitos da presença humana sobre a floresta úmida contínua da Amazônia Central. A pesquisa foi desenhada para estudar comunidades de plantas e animais nas florestas

antes e depois do isolamento para criação de pastagens comparando-se estas informações com as das áreas de controle de floresta não perturbada. Com o isolamento de replicatas de floresta de 1, 10, 100 e 1000ha., para o estudo de estrutura, microclima, populações, comunidades, e processos ecológicos antes e depois da fragmentação e no decorrer do tempo, pode se gerar previsões sobre qual o tamanho dos fragmentos de florestas que são necessários para manter a integridade do ecossistema original.

Cada ano vários sub-projetos da pesquisa investigam os efeitos da fragmentação florestal sobre um componente do ecossistema. Todas as áreas de ecologia estão sendo investigadas: ecologia vegetal, invertebrados, vertebrados, solos e regeneração florestal. Nos estamos oferecendo estágios de no mínimo 4 meses e no máximo 6 meses a alunos graduados que tem interesse em adquirir experiência em trabalho de campo. Durante este período de 6 meses o(a) aluno(a) participará de um sub-projeto sob a supervisão de um pesquisador qualificado. Após o estágio inicial, terá a possibilidade de continuar mais um estágio de pesquisa dirigida para mais seis meses. Deverá submeter um projeto desenvolvido com um pesquisador para avaliação.

O PDBFF oferece a passagem de ida e volta da instituição de origem até Manaus, as despesas de campo, e uma bolsa de aperfeiçoamento do CNPq. As pessoas interessadas devem enviar uma carta explicando por que um estágio seria benéfico ao seu desenvolvimento, incluindo as áreas de interesse, um Curriculum Vitae, e uma carta de recomendação de um professor que lhe conheça bem. Será criado um banco de candidatos(as) a estágios, que será consultado pelos pesquisadores precisando de estagiários. O pesquisador entrará em contato direto com o(a) candidato(a) de preferência. Mandar documentação para: Dr. Claude Gascon, Departamento de Ecologia, Instituto Nacional de Pesquisas da Amazônia (INPA), Caixa Postal 478, 69011-970 Manaus, Amazonas. Fax: (092) 642-2050.

New Address for the Primate Information Center

The Primate Information Center, which publishes the monthly bibliographical review *Current Primate References*, has changed it's address. As from 1 November 1995 all mail should be sent to: Primate Information Center, Regional Primate Research Center Westlake Facility, University of Washington, 1101 Westlake Avenue North, Seattle, Washington 98109, USA. Tel: (206) 543-4376, Fax: (206) 616-1540, e-mail: pic@bart.rprc.washington.edu.

Protected Areas Virtual Library

Throughout the world, national governments have established systems of national parks and other types of protected areas to fulfil a broad range of needs. Information available on these systems varies widely from country to country, but increasingly information is becoming available through electronic media. The Protected Areas Virtual Library is an information service developed by the World Conservation Monitoring Centre (WCMC), working in close collaboration with the IUCN Commission on National Parks and Protected Areas (IUCN/CNPPA). It is a WWW service, providing links to other Web servers with protected areas information. The URL is: " http : // www . wcmc . org . uk / ~ dynamic / pavl / ". Your assistance in further developing the Protected Areas Virtual Library is actively encouraged. Comments, the identification of other relevant WWW servers, or the provision of material which WCMC can incorporate, funds allowing, are very welcome.

For further information: Jeremy Harrison, Head of Information Services, World Conservation Monitoring Centre (WCMC), 219 Huntingdon Road, Cambridge CB3 0DL, UK. Tel: + 44 (0)12 23 27 73 14 , Fax : + 44 (0) 12 23 27 71 36, e - mail : jerry .harrison @wcmc .org.uk, WWW : http : // www.wcmc.org.uk.

XIII Encontro Anual de Etologia - Brazil

The "XIII Encontro Anual de Etologia" was held in Pirassununga, São Paulo, Brazil, from 2-4 November 1995. More than 300 scientists and students from 11 Brazilian states and five countries participated. As has been the case since the first of these meetings, participation was multidisciplinary, including the fields of Psychology, Biology, Animal Production, Zoology, Anthropology, Physiology and Ecology.

Special homage was paid to Beatrix T. Gardner, the Swiss researcher recently deceased, who together with her husband Allen Gardner, was a pioneer in teaching sign language to chimpanzees. Beatrix, who lived part of her childhood in Brazil, was remembered in a talk given by Dr. Gardner, along with a film on Washoe, the world famous chimp, the first of her species to learn sign language. Other talks were given by Drs. M. and K. Tomonaga, Japanese scientists working on face recognition and tool use in chimpanzees, and Dr César Ades (University of São Paulo) gave a talk on his findings concerning how university students see animal minds.

Five symposia considered a good part of the *Scala Naturae*, from invertebrates to primates. The highlights were those on Animal Communication, examining cricket songs to primate spacing, and on The Marmoset as a Model for Ethological Studies, in which three researchers from the Federal University of Rio Grande do Norte and one from the Federal Rural University of Pernambuco discussed reproduction, dominance, infant care, and group stability in wild and captive marmosets. Finally a round table on the teaching of Ethology confirmed the diversity and ample range of this research field. Representatives from Psychology, Biology, and Animal Production graduate and undergraduate programs were present, besides a senior high school teacher, who has been the first to introduce the study of animal behavior as part of a High School Biology course, using it especially for the understanding of anatomical and physiological differences, and in mechanisms of gene transmission and natural selection.

Eighty-nine posters, provided by participants from 50 institutions, completed the meeting. Such a demonstration of vitality, and the need to meet the demands of students and research topics, will result, we expect, in an increase in the number of courses on Ethology and related disciplines in Brazilian graduate and undergraduate programs in the near future.

Maria Emília Yamamoto, Departamento de Fisiologia, Universidade Federal do Rio Grande do Norte, Caixa Postal 1511, 59072-970 Natal, Rio Grande do Norte, Brazil.

II Curso Nacional de Biologia da Conservação e Manejo de Vida Silvestre

O Instituto de Pesquisas Ecológicas (IPÊ) e a Smithsonian Institution, com apoio financeiro do Fundo Nacional do Meio Ambiente (FNMA), estarão organizando, de 27 de maio a 28 de junho de 1996, na Estação Experimental de Assis, do Instituto Florestal de São Paulo, o II Curso Nacional de Biologia da Conservação e Manejo de Vida Silvestre. O número de vagas é limitado e para a seleção os interessados em se candidatar deverão enviar ao IPÊ, os seguintes documentos: carta de intenções, carta de recomendação e curriculum vitae, até 29 de março de 1996. Poderão se candidatar profissionais que trabalham com conservação de vida silvestre, alunos de mestrado em áreas afins e alunos de graduação em final de curso. O curso oferece alojamento, alimentação e, em casos especiais, transporte até a E. E. de Assis. Para maiores informações, favor contactar: Eduardo Humberto Ditt (Coordenador do Curso), IPÊ -Instituto de Pesquisas Ecológicas, Av. dos Operários 587, 13416-460 Piracicaba, São Paulo. Tel / Fax : (0194) 38 72 59, e-mail: edhuditt@carpa. ciagri.usp.br.

Warren Kinzey Fund

This fund, to sponsor field work on primates by graduate students, was established in memory of Warren G. Kinzey, who died in 1994 (see *Neotropical Primates*, 2(4), pp.18-23, 1994). Graduate students are invited to apply for small grants from this fund, from which two awards of up to $500 each are available. Applicants should send a statement of no more than two pages to Dr. John Oates, Department of Anthropology, Hunter College, City University of New York, 695 Park Avenue, New York, NY 10021, USA. This statement should: (a) explain the nature of the project (including location, species, aims, timetable and a brief description of methods); (b) state how grant funds would be used; and (c) include a brief Curriculum Vitae. Applications will be reviewed by a small committee of Warren Kinzey's colleagues and research associates. In making awards, preference will be given to proposals involving areas, species, and/or topics that were of special interest to Warren Kinzey. Deadline: October 13. From: *ASP Bulletin* 19(3): 1, September 1995.

The Whitley Award for Animal Conservation

The Whitley Animal Protection Trust and the Royal Geographical Society have joined forces to establish an annual award that will make a substantial contribution to field projects directly concerned with the protection and conservation of animals in their habitat. The aim of the award is to provide an annual prize for the best animal conservation project submitted to the Trust each year. Applications are open to conservationists from any nation working in conjunction with the host country. One prize is awarded each year up to a value of £15,000. This should cover the major costs of the winning project, enabling it to proceed without having to wait to secure other funds. *The research programme*: the main criterion is that the project's objectives should make a practical, lasting and substantial contribution to the protection and conservation of animals in their habitat. Applicants will be asked to explain the origin of the project, provide detailed costings, evidence of support from the host government or local non-government organisations, and a statement on how the project is going to make a practical contribution to animal conservation.

Applicants should note that they could apply for The Whitley Award either by a single visit to the host

country or by living there for a longer period. Close involvement of the host country and links with local institutions are essential. *The applicant and team*: The Whitley Award supports multi-disciplinary teams rather than individuals, so that one-person ventures are rarely eligible. The applicant may be from any nation and must be aged over 25. Multi-national teams of any age group are encouraged. Applicants will not be restricted to qualified scientists, but the Award Winner must be able to compile a written report to describe and quantify the success of their work with appropriate references. Undergraduate expeditions are not eligible, but may apply separately to the Royal Geographical Society's expedition grant scheme, if the majority of the team are British. Teams must demonstrate that they have done sufficient planning and allowed enough time in the field to achieve their objectives safely and efficiently. *The Award*: It is intended that the award should cover the major costs of the winning project, enabling it to proceed without having to wait to secure other funds. An itemised budget detailing income and expenditure is required. The project's budget should be realistic and attainable, demonstrating whether these monies are to be spent in the home or host country. Salaries for scientists will not normally be included. *How to apply*: All applications must be made on the forms obtainable from the Whitley Award Office at the Royal Geographical Society. Forms and supporting documents should be submitted by the 10th January for projects planning to be in the field after 1st April in the same or subsequent year. A short list of applicants will be called for interview in early February, and the Award Winner will be notified by the end of February.

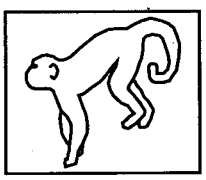
If you wish to receive guidelines and the application form for The Whitley Award, send a letter with your: name, address, postcode, telephone (day & evening), and fax. to: The Whitley Award, Royal Geographical Society, 1 Kensington Gore, London SW7 2AR. UK. Primate Societies

Erratum: El Comercio de Primates en La República Argentina, C. Bertonatti

The editors would like to call attention to an error printed in the article "El Comercio de Primates en La República Argentina" by Claudio Bertonatti, *Neotropical Primates* 3(2), June 1995. On page 36, first paragraph, the following sentence was printed: "Se han detectado cargamentos de 50 *Saimiri sciureus*, 80 *Alouatta caraya* y 250 *Callithrix jacchus*." This should have read: "Se han detectado cargamentos de 95 *Saimiri sciureus*, 80 *Alouatta caraya* y 150 *Callithrix jacchus*." The editors apologize for the error.

Primate Societies

VII Congresso Brasileiro de Primatologia



No período de 23 a 28 de julho foi realizado com grande êxito o VII Congresso Brasileiro de Primatologia na Universidade Federal do Rio Grande do Norte. Pela primeira vez, o Congresso foi realizado fora do âmbito do Congresso de Zoologia, e seu sucesso significa que temos alcançado o grau de maturidade suficiente para fazer nossas reuniões independentemente. O Congresso contou com a participação de renomados pesquisadores estrangeiros que trouxeram valiosas contribuições. Foram apresentados sete sessões coordenadas com 33 trabalhos, sete sessões de painéis com 56 trabalhos, quatro minicursos, sete palestras, duas mesas redondas e três sessões de vídeo. No futuro, o Congresso Brasileiro de Primatologia será bianual, alternando-se com o Congresso da Sociedade Internacional de Primatologia (IPS).

Nova Diretoria da Sociedade Brasileira de Primatologia (SBPr)

Na assembléia geral da Sociedade Brasileira de Primatologia realizada no dia 26 de julho de 1995, durante o VII Congresso Brasileiro de Primatologia, foram aprovadas modificações do Estatuto da Sociedade (a nova versão foi enviada aos sócios em dezembro de 1995) e eleita a nova nova diretoria: Presidente - Carmen Alonso (Universidade Federal da Paraíba); Vice-Presidente - Alcides Pissinatti (Centro de Primatologia do Rio de Janeiro), Primeira Secretaria - Aurora Costa (Universidade Federal da Paraíba); Segunda Secretaria - Simone Porfírio (Universidade Federal da Paraíba); Primeiro Tesoureiro - Pedro Bias (Universidade Federal da Paraíba); Segunda Tesoureira - Maria Adélia Monteiro da Cruz (Universidade Federal Rural de Pernambuco). O Conselho Fiscal e os suplentes continuam sendo os eleitos em 1994.

A primeira reunião da nova diretoria realizou-se no dia 17 de outubro de 1995, após ter recebido o material

da diretoria anterior. Nesta ocasião estabeleceram-se as seguintes metas: 1) continuar promovendo cursos relativos a temas primatológicas, inclusive o Curso de Especialização, em diversas regiões do pais; 2) continuar a descentralização das atividades da SBPr através do fortalecimento das representações regionais do Conselho Fiscal, afim de estimular o desenvolvimento de atividades regionais; 3) organizar o VIII Congresso Brasileiro de Primatologia, que se realizará em julho de 1997 na cidade de João Pessoa, Paraíba; 4) aumentar o número de sócios através de participacação em diversos eventos científicos. Um passo nesse sentido já foi tomado com a participação da Segunda Tesoureira, Maria Adélia Monteiro da Cruz, no XIII Encontro Anual de Etologia, em Pirasununga, São Paulo, onde levou material da SBPr e fichas de inscrição.

A nova diretoria começou a trabalhar com grande entusiasmo, mas lembra aos sócios que uma sociedade é feita por seus associados, portanto está aberta a sua participação através de comunicações, comentários, sugestões e críticas, e aproveito para pedir que atualizam seus endereços e anuidade enviando cheque nominal e cruzado ém nome da Sociedade Brasileira de Primatologia, a/c Pedro Bias ou Carmen Alonso.

Carmen Alonso, Laboratório Tropical de Primatologia, Departamento de Sistemática e Ecologia - CCEN, Universidade Federal da Paraíba, 58059-900 João Pessoa, Paraíba. Tel: (083) 216-7025, e-mail: amor@br.ufpb.

The PSGB Winter Meeting - Biology and Conservation of New World Primates

The Winter meeting of the Primate Society of Great Britain was held at the Zoological Society of London on the 29th November, 1995. Unusually it was devoted to a group of animals - New World monkeys - rather than a theoretical theme. We felt, and rightly so as it turned out, that the meeting would give an opportunity for people of various interests within primatology to hear new information about a group of animals with which many are relatively unfamiliar. A wide range of topics were addressed including reproduction, gender differences, polyspecific associations, behavioural ecology, biogeography and conservation. The proceedings will be published, together with a number of additional invited papers in a special issue of *Folia Primatologica*. The meeting itself was a most productive and pleasant occasion, and pleasingly international. Papers were given by delegates from Brazil, the U.S.A., Italy, Germany, Switzerland and the U.K. It was very well attended, with a number of people travelling from abroad to join us.

The enjoyment of the occasion was facilitated by an excellent table of PSGB goods for sale personned by a dedicated group of helpers; a professional book display (Wisepress); posters on the activities of PSGB and their Captive Care and Conservation Working Parties, in addition to information about the IUCN; and an opportunity to visit the animal collection at the zoo. The Napier Medal of the Society, one that is award bi-annually in honour of our founding President, Professor John Napier, for an outstanding recent Ph.D. thesis, was awarded to Carlos Drews from Cambridge University. Unfortunately Dr. Drews was unable to attend but his medal was collected for him by Carlos Peres. Very happily, on this occasion, Dr. Prue Napier, herself a distinguished primatologist and widow of John Napier, presented the medal and received a long and sincere ovation. The Society also took the opportunity to present a gift to Greta Mitchell of Top Copy, the publisher of *Primate Eye* for so many years, to mark the help and friendship of both herself and her husband, Tony, who died earlier this year. The day ended with a wine reception and the auction of an exceedingly fine drawing of Jambo, the silverback gorilla, which was kindly donated for the occasion by the artist Richard Johnston-Scott of the Jersey Wildlife Preservation Trust.

Hilary O. Box, President, Primate Society of Great Britain (PSGB), Department of Psychology, University of Reading, Reading RG6 2AL, England, UK, and **Hannah Buchanan-Smith**, PSGB Membership Secretary, Department of Psychology, University of Stirling, Stirling FK9 4LA, Scotland, UK.

Conservation Programs of the American Society of Primatologists - An Appeal

"The American Society of Primatologists (ASP) works to save primate lives and to arrest the terrifying shrinkage of primate populations worldwide". As the premier organization in the United States for primate scientists, ASP holds annual meetings to exchange information on scientific research and primate conservation, sponsors the *American Journal of Primatology*, and raises funds for four kinds of awards.

Subscription Awards: The *American Journal of Primatology* carries articles in all areas of primatology, from details of basic biology to behavior in the wild. Journal subscriptions are awarded to

worthy individuals from countries with native primates where little access to primate information is available. *Conservation Small Grants*: In the past, one to four small grants of $500 have been awarded each year for research, education or emergency projects. The number and size of these grants needs to be increased. They can be add-ons to ongoing projects. These small grants are especially helpful for individuals or communities in primate habitat countries. An example is an add-on grant for a joint US/Colombia project in which the plight of the endangered cotton-top tamarin is used to raise community conservation awareness. High school students are trained in the field biology of a Colombian nature reserve, and then lead groups of young children on educational tours of the reserve. *Conservation Award*: The purpose of this $500 award is to encourage conservation efforts of outstanding students, young investigators and educators in habitat countries. They are presented in public ceremonies to stress the importance of primate conservation and habitat preservation. *Senior Biology and Conservation Award*: Ensuring the well-being and survival of primates takes skills and dedication from people serving in many capacities, such as field assistants, research facilitators, animal caretakers, park rangers, and administrators. A $500 honorarium is awarded annually to an outstanding individual without a postgraduate degree who has a long and respected history devoted to primate well-being or conservation. Honoring such individuals encourages others to follow in their footsteps. One award recipient played a central role in the establishment and operation of major primate breeding centers in the Amazon basin. It was presented by the Scientific Counselor of the American Embassy, who noted that the awardee's work improved public support of primate conservation by impressing upon legislators and administrators the national-resource value of their country's animal life.

The 1995 Senior Biology and Conservation Award was given to Dehua Yang of the Yunnan Laboratory Primate Center, Kunming, China, for 35 years of devoted work on the distribution and population of primates over a wide area of China, resulting in judicious planning for primate protection. Small grants went to Lilan Basse (Tufts University), Loretta Cormier (Tulane University), Anne Savage (Roger Williams Park Zoo), Lori Sheeran (California State University, Fullerton), Zhang Yonzu (Academica Sinica, Beijing), Carey Yeager (Fordham), Jatna Supriatna (University of Indonesia) and Herry Djoko Susilo (Director, Tanjung Puting Park).

Conservation education is a high priority of ASP: education that permeates entire habitat-country communities and becomes favorably known to the country's scientific, business, and political leadership, and thereby multiplying the effectiveness of small amounts of money by many orders of magnitude. Aside from a few indirect costs, all monies received go directly into a fund that finances awards and grants. Administrative support, communications, and selection of award winners are done by ASP members as a service to conservation. The Society can contact members already working in habitat countries and encourage them to add a conservation dimension to existing projects. Such add-ons are a bargain because they support conservation research and education by committed professionals without having to pay for international or domestic travel, subsistence, equipment, site development, site operations, etc., etc.

Contributions to primate conservation can be made via the Conservation Fund of ASP. Society members contribute thousands of dollars to this fund each year, but ASP needs additional contributions from other concerned individuals, businesses, and institutions, if it is to expand in its conservation activities. Contributors of $500 or more will be listed in the *ASP Bulletin*. Please send donations to the "*ASP Conservation Fund*" to Dr. Ramon J. Rhine, Chair, ASP Conservation Committee, Psychology Department, University of California, Riverside, CA 92521, USA.

Recent Publications

Anais da Academia Brasileira de Ciências - Supplements

The Proceedings of the First International Workshop on Ecology and Biodiversity, organized by the Brazilian Academy of Sciences and held in Rio de Janeiro, 22-24 August 1994, were published (June 1995) in two special supplements of volume 66 (1994) of the *Anais da Academia Brasileira de Ciências*. The supplements were edited by Affonso Guidão Gomes, and sponsored by the Academy, the Financiadora de Estudos e Projetos (FINEP), Rio de Janeiro, and the Ministério da Ciência e Tecnologia (MCT), Brasília. All articles are in English. Part 1, pp.1-147, includes 14 articles under the following titles: General theory, Limnology, Chemical Botany, Forest, Meteorology, and Water.

Part 2, pp.149-276, includes a further 14 articles under the following titles: Cerrado, Herpetology, Soil, and Energy. For further information: Academia Brasileira de Ciências, Rua Anfilófio de Carvalho 29, 3° Andar, 20030-060 Rio de Janeiro, Rio de Janeiro, Brazil.

Journal of Practical Ecology and Conservation

The *Journal of Practical Ecology and Conservation* is a new, independent, twice-yearly publication which covers all aspects of practical ecology and conservation. The annual subscription is £10 individual, £20 overseas, and £20 for institutions, plus postage and packing (£2 Great Britain, £6 overseas). For further details contact: Dr. Ian Rotherham, Managing Editor, Sheffield Center for Ecology and Environmental Management, Town Hall Chambers, 1 Barkers Pool, Sheffield S1 1EN, UK.

BES Journals on Compact Disk (CD-ROM)

The Blackwell Science, with the agreeement of the Publications Committee of the British Ecological Society (BES) are be publishing all four BES journals on CD-ROM, four times year from March 1995. The journals on CD have the advantage of access to full searching of the contents, abstracts, and key words, and bit-mapped images. The bit-mapped images will allow the journal page to appear on screen or be printed out as hardcopy in exactly the same format as in the paper journal, including figures. There will also be unlimited access to the tables of contents of all other journals included in the service. Journals on CD-ROM also reduce storage space.

The new product **Ecofile** will contain over 25 ecological journals, including the four of the BES. Access to each of the journals on CD will be obtained by paying the appropriate subscription (in the case of BES journals equal to the subscription for the journal on paper) plus an annual CD premium to cover the CD production costs. The CD premium for individuals will be £25 ($40), no matter how many journals are subscribed to on the disk.

The British Ecological Society is one of the first of its kind to begin to publish in this way. For a copy of the demonstration version of the CD, or information on how to subscribe to other journals through **Ecofile**, contact: Anna Rivers, Blackwell Science Ltd., Osney Mead, Oxford OX2 0EL, UK.

Books

Primates: Expedition Field Techniques, by Adrian Barnett, 1995. Expedition Advisory Centre, Royal Geographical Society, London. Price £10.00. ISBN 0-907649-69-6. This new addition to the Expedition Field Techniques Series of the Royal Geographical Society gives ideas on what primate projects can and cannot be done by expeditions, reviews field techniques for surveys, data recording and indirect information collection, and provides an introduction to the extensive literature. An excellent manual for students beginning field work or planning expeditions. A second edition is planned and the author would be grateful for suggestions and ideas. Available from: Expedition Advisory Center, Royal Geographical Society, 1 Kensington Gore, London SW7 2AR. Tel: (0171) 581-2057.

The Monkey Sanctuary: Woolly Monkeys in Cornwall and the Amazon, by the Monkey Sanctuary, Looe, Cornwall, UK, 1994. 30pp. Available from: Monkey Sanctuary, Murrayton, Looe, Cornwall PI3 1NZ, UK.

Handbook of Laboratory Animal Management and Welfare, by S. Wolfensohn and M. Loyd, 1994, 304pp. Oxford University Press, Oxford. ISBN 0-19-854835-8. Price US 32.00. Available from Oxford University Press, Order Department, 2001 Evans Road, Cary, NC 27513, USA. Tel: 800-451-7556, Fax: 919-677-1303.

Nonhuman Primates in Biomedical Research: Biology and Management, edited by B. T. Bennett, C. R. Abee and R. Henrickson. 1995, xiv + 428pp. Academic Press, San Diego. ISBN 0-12-088661-8. Price US$125.00. Available from: Academic Press Order Fulfillment Department DM27103, 6277 Sea Harbor Drive, Orlando, Florida 32887, USA. Tel: 800-321-5068, Fax: 800-336-7377.

Symposium on the Health and Nutrition of New World Primates, edited by the American Zoo and Aquarium Association, New World Primates Taxon Advisory Group. 1995, 31pp. Includes: Abbott, D. H. Reproductive physiology of pregnancy and lactation in the common marmoset, *Callithrix jacchus*, pp. 1-3; Oftedal, O. T. The comparative nutrition of New World primates, pp.4-8; Ausman, L. M. and Petto, A. J. Nutrition of New World monkey breeding pairs with particular emphasis on nutrient intakes in family housed common marmosets (*Callithrix jacchus*),

pp.9-14; Ausman, L. M. Nutritional needs of the neonate and growing young monkey, pp.15-19; Line, A. S. Medical management of the neonate, pp.20-24; Collins, B. R. Geriatric diseases of some common New World nonhuman primates, pp.26-31. Information: Anne Baker, Burnet Park Zoo, 1 Conservation Place, Syracuse, NY 13204, USA.

Hands of Primates, edited by H. Preuschoft and D. J. Chivers. 1993. ix + 421pp. Springer Verlag, New York. ISBN 0-387-82385-9. Price US$136.00 or 198DM. Includes amongst other chapters: Hand usage in the ring-tailed lemur (*Lemur catta* Linnaeus 1758) when solving manipulatuive tasks - S. Schoenich; Locomotive and manipulative use of the hand in the Cayo Santiago macaques (*Macaca mulatta*) - R. G. Rawlins; Different hand postures for pounding nuts with natural hammers by wild chimpanzees - C. Boesch and H. Boesch; Lateralised handedness, bipedalism and cortical specialisation - P. H. Brenot; The development of prehension in human and gorilla infants - M. E. Redshaw; Grasping techniques and hand preferences in Hominoidea - M. Christel; Energetic cost of nutcracking behaviour in wild chimpanzees - M. M. Guenther and C. Boesch; Biometrical characteristics of primate hands - F. K. Jouffrey, M. Godinot and Y. Nakano; Adaptations in the hands of cercopithecids and callitrichids - W. Maier; Joints and muscles of hands and paws - R. M. Alexander; Evolution and the hand - J. M. F. Landsmeer. Available from: Springer Verlag New York, Inc., 44 Hartz Way, Secaucus, NJ 07094. Tel: 1-800-SPRINGER, Fax: (212) 533-3503.

Ape, Man, Apeman: Changing Views since 1600, edited by Raymond Corbey Tilburg University and Leiden University) and Bert Theunissen (Utrecht University), 1995, 411pp. Department of Prehistory, Leiden University, Leiden. ISBN 90-73368-057. The Evaluative Proceedings of the Symposium "Ape, Man, Apeman: Changing Views since 1600", held in Leiden, The Netherlands, 28 June - 1 July, 1993. This fine volume contains 32 papers contributed by philosophers, primatologists, historians, historians of science, paleolithic archeologists, animal activists, ethicists, literary scholars and anthropologists - many of them prominent. Four areas are covered in this abundantly illustrated book: 1) *Interpreting Apes* - views of nonhuman (and human) primates in the West since the middle ages; 2) *Apish Ancestors* - the history of interpretations of human origins and early hominids; 3) *Ape Ethnozoology, Apelore, Ape Imagery* - the ritual, cultural and symbolic roles of apes and monkeys in nonwestern as well as western cultures; and 4) *Apes and Ethics* - moral issues pertaining to human practices vis-à-vis apes and monkeys. The 32 essays show how radically views of apes have started to change recently. As such they are significant expressions of the continuing, and, hopefully, changing history of our dealings with our closest relatives in nature. A fascinating book, and highly recommended. Contact: Dr. R. Corbey, Department of Prehistory, P. O. Box 9515, NL 2300 RA, Leiden, The Netherlands. Fax: 31 71 272928, or 272429.

Abordagens Interdisciplinares para a Conservação da Biodiversidade e Dinâmica do Uso da Terra no Novo Mundo, edited by Gustavo A. B. da Fonseca, Marianne Schmink, Luiz Paulo de S. Pinto and Fausto Brito, 1995, 334pp. Conservation International do Brasil, Belo Horizonte, Brazil. In Portuguese and Spanish. Price: US$25.00 (incl. postage and packing). Based on the proceedings of the International Conference "On Common Ground: Interdisciplinary Approaches to Biodiversity Conservation and Land Use Dynamics in the New World", organized by Conservation International do Brasil, Universidade Federal de Minas Gerais and the University of Florida, Gainesville, and held in Belo Horizonte, Minas Gerais, 1-4 December 1993. This book has 23 chapters on a wide range of subjects concerned with land use and biodiversity conservation including: Apresentação e histórico de um programa interdisciplinar - G. A. B. da Fonseca, M. Schmink. L. P. de S. Pinto, F. Brito; A tomada de decisão pelos governantes e o papel dos cientistas - M. L. D. de Freitas; Conservação da biodiversidade e o Fundo Mundial para o Meio Ambiente (GEF): lições assimiladas - I. A. Bowles; Pressão demográfica ou pressão econômica? Algumas questões básicas para a análise do meio ambiente - F. Brito; Población, biodiversidad y uso de la tierra en Argentina - C. Reboratti; Enfoques interdisciplinares para a conservação de biodiversidade: a experiência do programa de pós-graduação em Ecologia, Conservação e Manejo de Vida Silvestre da UFMG - G. A. B. da Fonseca, L. M. de S. Aguiar; O desafio do desenvolvimento sustentável e as comunidades locais da Amazônia Brasileira - M. Schmink; Abordagens interdisciplinares para a conservação dos recursos de água doce: uma necessidade de programas especiais - F. A. R. Barbosa; Uma abordagem interdisciplinar do estudo dos cerrados brasileiros: o caso da degradação dos solos - A. S. Cunha; Símbolos políticos na conservação da biodiversidade no sul da Bahia - K. Alger; Limites econômicos e demográficos da proteção da biodiversidade: o desafio ambiental no litoral de São Paulo, Brasil - D. J. Hogan; Conservação da biodiversidade de fragmentos de florestas tropicais em paisagens intensivamente

cultivadas - V. M. Viana; Dos procesos de planificación comparados: La Reserve de La Biósfera del Beni, Bolivia y La Zona Reservada Tambopata-Candamo, Peru - A. Chicchón; Mamirauá: ribeirinhos e a preservação da biodiversidade da várzea amazônica - D. L. Ayres, J. M. Ayres; Área protegidas na Amazônia Brasileira - A. B. Rylands; Extrativismo vegetal e reservas extrativistas - limitações e oportunidades - A. B. Anderson; Costos y beneficios del establecimiento de una extracción de recursos mas sostenible en la Amazonia Occidental - R. E. Bodmer, J. W. Penn, E. Durand; Pecuária na Amazônia Oriental: situação atual e tendências futuras - E. Arima, C. Uhl; Organización campesina y conservación comunitaria de recursos naturales del tropico seco en Chilapa, Guerrero - J. Aguilar; Deforestación, desarrollo rural y marginación social: un estudio de caso en el Cofre de Perote, Veracruz, México - P. Gerez-Fernandez; Plan de Manejo de La Zona Costera Patagónica - GEF/PNUD: un enfoque integral para la protección de la biodiversidad - P. Yorio; PROBIDES: el desafio de un programa integral para la conservación de la biodiversidad y el desarrollo sustentable de los humedales del este, Rocha, Uruguay - A. Díaz; Incentivos económicos y de conservación para el manejo de las zonas de amortiguamiento: la iniciativa AMISCONDE - T. E. Lacher, Jr., J. C. Calvo-Alvarado, M. Ramirez Umaña, J. D. Maldonado. Available from: Luiz Paulo de Souza Pinto, Conservation International do Brasil, Avenida Antônio Abrahão Caram 820/302, 31275-000 Belo Horizonte, Minas Gerais, Brazil. Tel: +55 31 441-1795, Fax: +55 31 441-1795, e-mail: cibrasil@ax.apc.org.

Conservación y Uso Sostenible de la Diversidad Biológica en América Latina, preparado por Carlos Noton Ramírez, 1995, viii + 146pp. RLAC/95/07 Documento Técnico 18, Proyecto FAO/PNUMA. Oficina Regional de la FAO para América Latina y el Caribe, Santiago, Chile. El documento está basado en los resultados del Taller Internacional sobre Políticas de los Sistemas de Areas Protegidas en la Conservación y Uso Sostenible de la Biodiversidad en América Latina, realizado en el Parque Nacional Iguazú, Argentina, del 27 de setiembre al 1 de octubre de 1993, por encargo de la Oficina Regional de la FAO para América Latina y el Caribe. El evento se efectuó como parte del programa de actividades de la Red Latinoamericana de Cooperación Técnica en Parques Nacionales, otras Areas Protegidas, Flora y Fauna Silvestres y en colaboración con la Secretaria de Recursos Naturales y Ambiente Humana de Argentina. Indice: 1) Introducción, 2) La situación de la diversidad biológica y el convenio, 3) El rol de la instituciones que administran las áreas protegidas dentro del marco del convenio, 4) Estructura y amplitud de los sistemas de áreas protegidas, 5) El manejo de los sistemas de áreas protegidas, 6) Los desafios del financiamento, 7) Acciones complementarias para la conservación de la diversidad biológica. Para mayores informaciones dirigirse a: Kyran D. Thelen, Oficial Regional Forestal, Oficina Regional de la FAO para América Latina y el Caribe, Bandera 150, Casilla 10095, Santiago, Chile. Tel: 699-10-05, Gax: 696-11-21, e-mail: fao-rlac@cgnet.com.

A Conservation Assessment of the Terrestrial Ecoregions of Latin America and the Caribbean, by Eric Dinerstein, David M. Olson, Douglas J. Graham, Avis L. Webster, Steven A. Primm, Marnie P. Bookbinder and George Ledec. 1995, 129pp + 9 maps, + a poster size insert map, and including 7 appendices. The World Wildlife Fund and the World Bank, Washington, D. C. The results of a study involving a biogeographic approach to setting conservation priorities in Latin America and the Caribbean, financed by the World Bank, the Global Environment Facility (GEF), and the World Wildlife Fund. It was carried out by WWF's Conservation Science Program in close collaboration with the World Bank's Environment Unit for Latin America and the Caribbean. Chapters include: 1) Approach; 2) Major ecosystem types, major habitat types, and ecoregions of LAC; 3) Conservation status of terrestrial ecoregions of LAC; 4) Biological distinctiveness of terrestrial ecoregions of LAC at different biogeographic scales; 5) Integrating biological distinctiveness and conservation status; 6) Conservation assessment of mangrove ecosystems; 7) Conclusions and recommendations. Available from: Distrubtion Unit, Office of the Publisher, The World Bank, 1818 H Street, N. W., Washington, D. C.; or Publications, The World Bank, 66 avenue d'léna, 75116 Paris, France.

Economia Ecológica: Aplicações no Brasil, editado por Peter H. May, 1995, 179pp. Editora Campus, Rio de Janeiro. ISBN 85-353-0003-7. Seis capítulos: Economia ecológica e o desenvolvimento eqüitativo no Brasil - Peter H. May; Estimativas de depreciação de capital natural no Brasil - Ronaldo Serôa da Motta; Aplicação de técnicas de avaliação econômica ao ecossistema manguezal - Mônica Grasso, Mônica M. P. Tognella, Yara Schaeffer-Novelli e Antônio E. Comune; Aspectos econômico-ecológicas da produção e utilização do carvão vegetal na siderurgia brasileira - Josemar X. Medeiros; Identificando os custos de usos alternativos do solo para o planejamento municipal na Amazônia - o caso Paragominas (PA) - Oriana Trindade de Almeida e

Christopher Uhl; Custos e benefícios da recuperação ambiental em morros favelados: O Projeto Mutirão - Reflorestamento em São José Operário - Peter H. May, Aluísio G. de Andrade e Marília Pastuk. Maiores informações: Editora Campus Ltda., Rua Sete de Setembro 111 - 16° Andar, 20050-002 Rio de Janeiro, Rio de Janeiro, Brasil. Tel: (021) 221-5340, Fax: (021) 507-1991.

Extinction Rates, edited by John H. Lawton and Robert M. May. 1995, xii + 233 pp. Oxford University Press, Oxford. Paperpack price £17.95. An empirical review of extinction with 14 chapters including: Assessing extinction rates - R. M. May, J. H. Lawton and N. E. Stork; Extinctions in the fossil record - D. Jablonski; Population dynamic principles - J. H. Lawton; Estimating extinction from molecular phylogenies - S. Nee, E. C. Holmes, R. M. May and P. H. Harvey; Biological models for monitoring species decline: the construction and use of data bases - C. R. Margules and M. P. Austin; Classification of threatened species and its role in conservaion planning - G. M. Mace; The scale of human enterprise and biodiversity loss - P. R. Ehrlich. Available from: Oxford Univiersity Press, Saxon Way West, Corby NN18 9ES, England, UK. Tel: 01536 741519, Fax: 01536 746337.

STUDBOOKS

Aden, D. D. 1995. *1993-94 Update for the North American Regional Studbook - Pygmy Marmoset.* Folsom Children's Zoo & Botanical Gardens, Lincoln, Nebraska..

Frampton, T. 1995. *1993-1994 Update to The North American Regional Studbook for the White-Faced Saki* (Pithecia pithecia). Roger Williams Park Zoo, Rhode Island.

ARTICLES

Adams-Curtis, L. and Fragaszy, D. M. 1995. Influence of a skilled model on the behavior of conspecific observers in tufted capuchin monkeys (*Cebus apella*). *Am. J. Primatol.* 37(1): 65-71.

Agoramoorthy, G. and Hsu, M. J. 1995. Population status and conservation of red howling monkeys and white-fronted capuchin monkeys in Trinidad. *Folia Primatol.* 64: 158-162.

Alves, G., Canavez, F., Seuánez, H. and Fanning, T. 1995. Recently amplified satellite DNA in *Callithrix argentata* (Primates, Platyrrhini). *Chromosome Research* 3(4): 207-213.

Anderson, J. R. and Wolf, P. 1995. Successful mother- and group- rearing of a newborn capuchin monkey (*Cebus capucinus*) following emergency major surgery. *Animal Welfare* 4(3): 171-182.

Andrews, M. W. and Rosenblum. L. A. 1995. Location effects of social partner on experimental foraging in the squirrel monkey. *Am. J. Primatol.* 36(3): 175-183.

Anonymous. 1995. Howler research. *Baboon Update* Fall/Winter, 6(2): 1. Community Conservation Consultants, Howlers Forever, Inc., Gays Mills, WI.

Archaga, V. L. 1995. El sistema nacional de áreas protegidas de Honduras (SINAPH). *Flora Fauna y Areas Silvestres*, 9(21): 3-7. Oficina Regional de la FAO para América Latina y el Caribe, Santiago.

Ávila-Campos, M. J., Roque de Carvalho, M. A. Veiga-Damasceno, C. A. and Cisalpino, E. O. 1994. In vitro activity of two beta-lactam antibiotics against strains of the *Bacteroides fragilis* group isolated from humans and from *Callithrix penicillata* marmosets. *Rev. Latinoamericana de Microbiologia* 36(3): 159-162.

Baker, H. and Ridley, R. 1994. Marmoset neuropsychology. *European Marmoset Research Group Newsletter* 2: 5-8.

Balmford, A., Leader-Williams, N. and Green, M. J. B. 1995. Parks or arks: where to conserve threatened mammals? *Biod. Conserv.* 4(6): 595-607.

Bicca-Marques, J. C. and Calegaro-Marques, C. 1995. Locomotion of black howlers in a habitat with discontinuous canopy. *Folia Primatol.* 64:55-61.

Bigatti, M. P., Lamberty, L. Crovella, S. and Ardito, G. 1995. Baseline and mitomycin C (MMC)-induced sister chromatid exchanges in XX and XY cells of *Callithrix jacchus* chimeric twins. *Mutation Research* 347(3-4): 157-162.

Berack, M. and Schroepel, M. 1995. *Angiostrongylus costaricensis* in a black-eared marmoset. *Trop. Geog. Medicine* 47(3): 136-138.

Braun, J. K. and Martes, M. A. 1995. The mammals of Argentina: an etymology. *Mastozoologia Neotropical* 2(2): 173-206.

Brown, L., Shumaker, R. W. and Downhower, J. F. 1995. Do primates experience sperm competition? *Am. Nat.* 146(2): 302-306.

Butchart, S. H. M., Barnes, R., Davies, C. W. N., Fernandez, M. and Seddon N. 1995. Threatened mammals of the Cordillera de Colán, Peru. *Oryx* 29(4): 275-281.

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): 1-4.

Caine, N. 1995. The ever vigilant marmoset. *Zoonoz* (December): 8-13.

Caine, N. G., Addington, R. L. and Windfelder, T. L. 1995. Factors affecting the rates of food calls given by red-bellied tamarins. *Anim. Behav.* 50(1): 53-60.

Ceballos, G. and Brown, J. H. 1995. Global patterns of mammalian diversity, endemism, and endangerment. *Conservation Biology* 9(3): 559-568.

Chiarello, A. G. 1995. Role of loud calls in brown howler, *Alouatta fusca*. *Am. J. Primatol.* 36(3): 213-222.

Clark, A. S. and Boinski, S. 1995. Temperament in nonhuman primates. *Am. J. Primatol.* 37(2): 103-125.

Cooper, R. D. 1995. Susceptibility of Guyanan *Saimiri* monkeys to a chloroquine-sensitive and chloroquine-resistant strain of *Plasmodium vivax* from Papua New Guinea. *J. Parasitol.* 81(4): 640-641.

Dietz, J. M., Baker, A. J. and Allendorf, T. D. 1995. Correlates of molt in golden lion tamarins (*Leontopithecus rosalia*). *Am. J. Primatol.* 36: 277-284.

Digby, L.J. 1995. Infant care, infanticide, and female reproductive strategies in polygynous groups of common marmosets (*Callithrix jacchus*). *Behav. Ecol. Sociobiol.* 37(1): 51-61.

Digby, L.J. 1995. Social organization in a wild population of *Callithrix jacchus*: II Intragroup social behavior. *Primates* 36(3): 361-375.

Diniz, L. S. M. and Costa, E. O. de. 1995. Health problems of *Callithrix jacchus* in captivity. *Brazil. J. Med. Biol. Res.* 28(1): 61-64.

Dixson, A. F. 1995. Sexual selection and ejaculatory frequencies in primates. *Folia Primatol.* 64: 146-152.

Dukelow, W. R. and Whitehair, L. A. 1995. A brief history of the regional primate research centers. *Comparative Pathology Bulletin* 27(3): 1-2.

Dunbar, R. I. M. 1995. The mating system of callitrichid primates: I. Conditions for the coevolution of pair bonding and twinning. *Anim. Behav.* 50: 1057-1070.

Dunbar, R. I. M. 1995. The mating system of callitrichid primates: II. The impact of helpers. *Anim. Behav.* 50: 1071-1089.

Ellis, S. and Seal. U. 1995. Tools of the trade to aid decision-making for species survival. *Biodiversity and Conservation* 4(6): 553-572.

Erwin, J. M., Blood, B. D., Southwick, C. H. and Wolfle, T. L. 1995. Primate conservation. In: *Nonhuman Primates in Biomedical Research.* B. T. Bennett, C. R. Abee and R. Henrickson (eds.), pp. 113-128. Academic Press, San Diego.

Fedigan, L. M. and Rose, L. M. 1995. Interbirth interval variation in three sympatric species of Neotropical monkeys. *Am. J. Primatol.*, 37(1): 9-24.

Fehrenbach, A, Einspanier, A., Niksch, E. and Hodges, J. K. 1995. Assessment of tissue integrity, ultrastructure and steroidogenic activity of corpora lutea of the marmoset monkey, *Callithrix jacchus*, following in vitro microdialysis. *Tissue and Cell* 27(4): 467-481.

Garber, P. A. and Pruetz, J. D. 1995. Positional behavior in moustached tamarin monkeys: effects of habitat on locomotor variability and locomotor stability. *J. Hum. Evol.* 28(5): 411-426.

Gilchrist, R. B. Nayudum, P. L., Nowshari, M. A. and Hodges, J. K. 1995. Meiotic competence of marmoset monkey oocytes is related to follicle size and oocyte-somatic cell association. *Biol. Reprod.* 52(6): 1234-1243.

Hall, T. T., Oliver, J.-A. and Rowe, J. 1995. Behavioural changes in cotton-top tamarins *Saguinus oedipus*, when placed in a mixed class exhibit. *Australian Primatology* 10(1): 2-11.

Harcourt, A. H., Purvis, A. and Liles, L. 1995. Sperm competition: mating system not breeding season, affects testes size of primates. *Functional Ecology* 9(3): 468-476.

Hartwig, W. C. 1995. Effect of life history on the squirrel monkey (Platyrrhini, *Saimiri*) cranium. *Am. J. Phys. Anthropol.* 97(4): 435-449.

Hearn, J. P., Wong, J., Nomura, T., Reid, C. S. W., Townsend, P., Morton, D. B., Hamm, T. E., Jr., Dell, R. B. and Van Sluyters, R. C. 1995. Laboratory animal care policies and regulations: Canada, Japan, New Zealand, United Kingdom & United States. *ILAR Journal* 37(2): 55-78.

Heistermann, M. 1995. Dominance status and behaviour of captive-housed female cotton-top tamarins (*Saguinus oedipus*) in motherless families. *Primate Report* 42: 65-78.

Hendricks, A. G. and Dukelow, W. R. 1995. Breeding. In: *Nonhuman Primates in Biomedical Research.* B. T. Bennett, C. R. Abee and R. Henrickson (eds.), pp.335-374. Academic Press, San Diego.

Hendricks, A. G. and Dukelow, W. R. 1995. Reproductive biology. In: *Nonhuman Primates in Biomedical Research.* B. T. Bennett, C. R. Abee and R. Henrickson (eds.), pp.147-191. Academic Press, San Diego.

Heymann, E. W. 1995. Urine washing and related behaviour in wild moustached tamarins, *Saguinus mystax* (Callitrichidae). *Primates* 36(2): 259-264.

Heymann, E. W. 1995. Sleeping habits of tamarins, *Saguinus mystax* and *Saguinus fuscicollis* (Mammalia; Primates; Callitrichidae), in north-eastern Peru. *J. Zool., Lond.* 237: 211-226.

Hunt, D. M., Cowing, J. A., Patel, R., Appukuttan, B., Bowmaker, J. K. and Mollon, J. D. 1995. Sequence and evolution of the blue-cone pigment gene in Old and New World primates. *Genomics* 27(3): 535-538.

Hutchison, D. W. and Cheverud, J. M. 1995. Fluctuating asymmetry in tamarin (*Saguinus*) cranial morphology: intra- and interspecific comparisons be-

tween taxa with varying levels of genetic heterozygosity. *J. Hered.* 86(4): 280-288.

Jacobs, G. H. 1994/1995. Variations in primate color vision: mechanisms and utility. *Evol. Anthropol.* 3(6): 196-205

Jacobs, G. H. 1995. Monkeys in the gloom: a handbook on the *Aotus* monkey. A review of "The Owl Monkey", J. F. Blair *et al.* eds. San Diego, Academic Press, 1994. 380pp. *Am. J. Primatol.* 36(3): 251-253. (Book review).

Janson, C. H. and Goldsmith, M. L. 1995. Predicting group size in primates: foraging costs and predation risks. *Behav. Ecol.* 6(3): 326-336.

Jones, C. B. 1995. Dispersal in mantled howler monkeys: a threshold model. *Mastozoologia Neotropical* 2(2): 207-211

Jones, C. B. 1995. Howler monkeys appear to be preadapted to cope with habitat fragmentation. *Endangered Species Update* 12(7/8): 73-75.

Jurke, M. H., Pryce, C. R. Hug-Hodel, A. and Döbeli, M. 1995. An investigation into the socioendocrinology of infant care and postpartum fertility in Goeldi's monkey (*Callimico goeldii*). *Int. J. Primatol.* 16(3): 453-474.

Kleiman, D. G. 1995. *Marmosets and Tamarins: Systematics, Behaviour and Ecology*, edited by Anthony B. Rylands. Oxford University Press, Oxford, UK. 1993. xv + 396pp. *Int. J. Primatol.* 16(3): 575-576. (Book review).

Küderling, I., Evans, C. S., Abbott, D. H., Pryce, C. R. and Epple, G. 1995. Differential excretion of urinary oestrogen by breeding females and daughters in the red-bellied tamarin (*Saguinus labiatus*). *Folia Primatol.* 64: 140-145.

Kudo-Hirotani, H. and Yoshimura, T. 1993. Communal care of offspring in captive marmosets and tamarins. *Bull. Kanagawa Prefect. Mus. Nat. Sci.* 22: 69-80. In Japanese with English summary.

Leigh, S. R. 1995. Socioecology and the ontogeny of sexual size dimorphism in anthropoid primates. *Am. J. Phys. Anthropol.* 97(4): 339-356.

Lemelin, P. 1995. Copmparative and functional myology of the prehensile tail in New World monkeys. *J. Morph.* 224(3): 351-368.

Lewicka, K., Breniere-Campaña, S. F., Barnabe, C., Dedet, J.-P. and Tibayrenc, M. 1995. An isoenzyme survey of *Trypanosoma cruzi* genetic variability in sylvatic cycles from French Guiana. *Experimental Parasitology* 81(1): 20-28.

Lourenço-de-Oliveira, R. and Deane, L. M. 1995. Simian malaria at two sites in the Brazilian Amazon. I. The infection rates of *Plasmodium brasilianum* in non-human primates. *Mem. Inst. Oswaldo Cruz, Rio de Janeiro* 90(3): 331-339.

Lyons, D. M., Ha, C. M. G. and Levine, S. 1995. Social effects of circadian rhythms in squirrel monkey pituitary-adrenal activity. *Hormones and Behavior* 29(2): 177-190.

Manson, J. H. 1994/1995. Female mate choice in primates. *Evol. Anthropol.* 3(6): 192-195.

Mendes, S. L. 1995. Importância dos remanescentes de mata Atlântica no estado do Espírito Santo para a conservação de primatas. *Cadernos de Pesquisa da UFES*, Vitória, (4): 1-14. Universidade Federal do Espírito Santo, Vitória.

Natori, M. 1994. Craniometrical variations among eastern Brazilian marmosets and their systematic relationships. *Primates* (35(2): 167-176.

Passamani, M. 1995. Field observations of a group of Geoffroy's marmosets mobbing a margay cat. *Folia Primatol.* 64: 163-166.

Passamani, M. and Passamani, J. A. 1995. Losses of re-introduced Geoffroy's marmoset. *Australian Primatology* 10(1): 12-13.

Pereira, M. E. 1995. Development and social dominance among group-living primates. *Am. J. Primatol.* 37(2): 143-175.

Phillips, K. A. 1995. Resource patch size and flexible foraging in white faced capuchins (*Cebus capucinus*). *Int. J. Primatol.* 16(3): 509-519.

Pinheiro, E. S., Simon, F., Cassaro, K. and Soares M. E. G. 1995. Outbreak of diarrhoea due to *Campylobacter jejuni* in lion tamarins (*Leontopithecus* spp.) in captivity. *Erkrankungen der Zootiere* 35: 159-161.

Pontes, A. R. M. and Monteiro da Cruz, M. A. O. 1995. Home range, intergroup transfers, and reproductive status of common marmosets *Callithrix jacchus* in a forest fragment in north-eastern Brazil. *Primates* 36(3): 335-347.

Pryce, C. R., Schwarzenberger, F., Döbeli, M. and Etter, K. 1995. Comparative study of oestrogen excretion in female New World monkeys: an overview of non-invasive ovarian monitoring and a new application in evolutionary biology. *Folia Primatol.* 64: 107-123.

Purvis, A., Nee, S and Harvey, P. H. 1995. Macroevolutionary inferences from primate phylogeny. *Proc. Roy. Soc. Lond.* B260(1326): 329-333.

Rabb, G. and Sullivan, T. 1995. Coordinating conservation: global networking for species survival. *Biodiversity and Conservation* 4(6): 536-543.

Reed, K. E. and Fleagle, J. G. 1995. Geographic and climatic control of primate diversity. *Proc. Acad. Sci. U.S.A.* 92(17): 7874-7876.

Rosenberger, A. L. 1995. "Marmosets and tamarins: systematics, behavior, and ecology", A. B. Rylands ed. New York, Oxford University Press, 1993. 396pp. *Am. J. Phys. Anthropol.* 97(4): 457-458. (Book review).

Rosenblum, L. A. and Andres, M. W. 1995. Environmental enrichment and psychological well-being of

non-human primates. In: In: *Nonhuman Primates in Biomedical Research*. B. T. Bennett, C. R. Abee and R. Henrickson (eds.), pp.101-112. Academic Press, San Diego.

Ryder, O. and Feistner, A. T. C. 1995. Research in zoos: a growth area in conservation. *Biodiversity and Conservation* 4(6): 671-677.

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 in captivity. *Zoo Biol.*, 14(5), 441-452.

Schaffner, C. M., Shepherd, R. E., Santos, C. V. and French, J. A. 1995. Development of heterosexual relationship in Wied's black tufted-ear marmosets (*Callithrix kuhli*). *Am. J. Primatol.* 36(3): 185-200.

Seyfarth, R. M. and Cheney, D. L. 1994. The evolution of social cognition in primates. In: *Behavioral Mechanisms in Evolutionary Ecology*, L. Real (ed.), pp.371-389. University of Chicago Press, Chicago.

Silva-López, G. and Rumiz, D. 1995. Los primates de la Reserva Río Bravo, Belice. *La Ciencia y el Hombre, Revista de la Universidad Veracruzana* 7(20): 49-64.

Simula, A. P., Amato, F., Faast, R., Lopata, A., Berka, J. and Norman, R. J. 1995. Luteinizing hormone/chorionic gonadotropin bioactivity in the common marmoset (*Callithrix jacchus*) is due to a chorionic gonadotropin molecule with a structure intermediate between human chorionic gonadotropin and human luteinizing hormone. *Biol. Reprod.* 53(2): 380-389.

Stuart, M. D. and Strier, K. B. 1995. Primates and parasites: a case for a multidisciplinary approach. *Int. J. Primatol.* 16(4): 577-593.

Torre, S. de la, Campos, F. and Vries, T. de. 1995. Home range and birth seasonality of *Saguinus nigricollis graellsi* in Ecuadorian Amazonia. *Am. J. Primatol.* 37: 39-56.

Vermeer, J. 1994. Notes on the management of the woolly monkey in captivity. *Int. Zoo News* 41(6): 8-13.

Westergaard, G. C. 1995. The stone-tool technology of capuchin monkeys: possible implications for the evolution of symbolic communication in hominids. *World Archaeology* 27(1): 1-9.

Westergaard, G. C., Greene, J. A., Babitz, M. A. and Suomi, S. J. 1995. Pestle use and modification by tufted capuchins (*Cebus apella*). *Int. J. Primatol.* 16(4): 643-651.

Whitehead, M. 1995. Saying it with genes, species and habitats: biodiversity education and the role of zoos. *Biodiversity and Conservation* 4(6): 664-670.

Williams, B. A. and Kay, R. F. 1994/1995. The taxon Anthropoidea and the crown clade concept. *Evol. Anthropol.* 6(3): 188-190.

Williams, L. E. and Bernstein. I. S. 1995. Study of primate social behavior. In: *Nonhuman Primates in Biomedical Research*. B. T. Bennett, C. R. Abee and R. Henrickson (eds.), pp.77-100. Academic Press, San Diego.

Wyss, A. R. and Flynn, J.J. 1994/1995. "Anthropoidea:" a name not an entity. *Evol. Anthropol.* 6(3): 187-188.

Yeager, C., Isbell, L. and Young, T. 1994/1995. Primate behavior and conservation: missing links? *Evol. Anthropol.* 3(6): 191.

Zhang, S.-Y. 1994. Sleeping habits of brown capuchin monkeys (*Cebus apella*) in French Guiana. *Am. J. Primatol.* 36(4): 327-335.

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(3): 489-507.

ABSTRACTS

Aprile, G., Bertonatti, C., Carpinetti, B. y Tito, G. 1995. Rehabilitación y reintroducción de monos caraya (*Alouatta caraya*) en la Provincia de Corrientes. In: *Resúmenes. X^a Jornadas Argentinas de Mastozoologia*, p.4. Sociedad Argentina para el Estudo de los Mamíferos, 14-17 November 1995, La Plata, Argentina.

Avellanada, S. 1995. El uso de los primates en investigación son imprescindibles? In: *Resúmenes. X^a Jornadas Argentinas de Mastozoologia*, p.73. Sociedad Argentina para el Estudo de los Mamíferos, 14-17 November 1995, La Plata, Argentina.

Bertonatti, C. 1995. El comercio de primates y sus consecuencias. In: *Resúmenes. X^a Jornadas Argentinas de Mastozoologia*, pp.73-74. Sociedad Argentina para el Estudo de los Mamíferos, 14-17 November 1995, La Plata, Argentina.

Crook, G. A. 1995. An atypical mating strategy in the common marmoset *Callithrix jacchus*. *Australian Primatology* 9(4): 2-3.

Einspanier, A., Ivell, R. and Hodges, K. 1995. Localization of oxytocin and its receptor in the marmoset ovary in different cycle stages. *Biol. Reprod.* 52(suppl. 1): 92.

Gilbert, K. A. 1994. Endoparasitic infection in red howling monkeys (*Alouatta seniculus*) in the central Amazonian basin: a cost of sociality? 1994. *Diss. Abstr. Int.* A55(12): 3901. Order information: #AADAA-19511470. University Microfilms, Inc., Ann Arbor, Michigan 48106.

Jorgensen, M. J. 1995. Investigating the antecedents of self-recognition using a video-task paradigm in capuchins (*Cebus apella*) and chimpanzees (*Pan troglodytes*). 1994. *Diss. Abstr. Int.* B55(12): 5553. Order information: #AADAA-19513172. Univer-

sity Microfilms, Inc., Ann Arbor, Michigan 48106.
Laska, M., Huebner, F. and Hudson R. 1995. A study of odor learning capacity and odor memory in squirrel monkeys. *Chem. Senses* 20(1): 79.
Lopata, A. Nelson, A., Oliva, K., Bowes, L., Watkins, W. and Yamamoto, Y. 1995. Recovery of uterine embryos in marmoset monkeys. *Australian Primatology* 9(4): 3-4.
McDaniel, P. S. 1995. The social behavior and ecology of the black-handed spider monkey. *Diss. Abstr. Int.* B56(5): 2432. To order: #AADAA-19531413. University Microfilms, Inc., Ann Arbor, MI 48106, USA.
Morrell, J. M., Hodges, J. K., Houghton, A. D., Hobson, G. S. *et al.* 1995. Motility fluctuations of marmoset sperm. *J. Androl.* (suppl.): P52.
Norcross, J. L. 1995. Social and hormonal influences on the behavior of the common marmoset, *Callithrix jacchus*. *Diss. Abstr. Int.* B56(4): 1883. To order: #AADAA-19526275. University Microfilms, Inc., Ann Arbor, MI 48106, USA.
Porter, T. A. 1995. The development and maintenance of a heterosexual pair association in cotton-top tamarins (*Saguinus oedipus oedipus*). 1994. *Diss. Abstr. Int.* B55(11): 5120. Order information: #AADAA-19503902. University Microfilms, Inc., Ann Arbor, Michigan 48106.
Stonerook, M. J. 1995. The response of cotton-top tamarin (*Saguinus oedipus*) to environmental stressors as a model for idiopathic colitis. 1994. *Diss. Abstr. Int.* B56(1): 116. Order information: #AADAA-19517083. University Microfilms, Inc., Ann Arbor, Michigan 48106.

In: *Primate Eye* (57), October 1995. Abstracts of the Primate Society of Great Britain (PSGB) Winter Meeting "Biology and Conservation of New World Primates", November 29, 1995.

Barnett, A. and Brandon-Jones, D. The ecology and biogeography of *Cacajao*. pp.10-11.
Box, H. O. Behavioural gender differences among marmosets and tamarins (Callitrichidae): new perspectives in an under-explored area. p.6.
Buchanan-Smith, H. M. and Hardie, S. M. Why do tamarins form mixed species groups? Tests of predictions. pp.7-8.
Heymann, E. W. Ecological and evolutionary considerations of mixed species troops in the genus *Saguinus*. pp.8-9.
Peres, C. A. Effects of selective hunting and forest types on the structure of Amazonian primate communities. pp.11-12.
Pryce, C, Goeldi's monkey and captive evidence for a monogamous social organisation: a psychobiological experiment in phylogenetic context. p.5
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Strier, K. B. Sex and reproduction in muriquis (*Brachyteles arachnoides*). p.4
Visalberghi, E. and Fragaszy, D. The opportunistic lifestyle in *Cebus*. p.7.

In: *Primate Report*, Vol. 42, 1995.

Carla-Campa, M. C. Ardito, G., Crovella, S., Montagnon, D. *et al.* Comparative analysis of alphoid DNA restriction patterns in selected species of New and Old World primates. p.4.
Guidi, C. and Visalberghi, E. Play behavior in juvenile tufted capuchin monkeys (*Cebus apella*). pp.8-9.
Melotto, S., Poffe, A. and Gerrard, P. A. Flight behaviour of the captive common marmoset (*Callithrix jacchus*) in different social situations. pp.11-12.
Poffe, A., Melotto, S. and Gerrard, P. A. Comparison of four environmental enrichment strategies in captive common marmosets (*Callithrix jacchus*). pp.24-25.
Poleschuk, V. F., Balayan, M. S., Sobol, A. V., Gulyaeva, T. V., Titova, I. P. and Dokin, V. P. A breeding colony of common marmosets (*Callithrix jacchus*) for experiments with viral hepatitis. pp.79-81.
Riviello, M. C. The use of a feeding board as an environmental enrichment device for tufted capuchin monkeys (*Cebus apella*). pp.23-24.
Schnell, C. R., Scott, L. and Pryce, C. R. The European Marmoset Research Group: an example of interdisciplinary communication. p.21.
Valente, M., Limongelli, L. and Visalberghi, E. Feeding alone and feeding in groups: When does company make a difference? pp.10-11.
Vitale, A. and Santamaria, F. Response to a novel object by socially-housed common marmosets (*Callithrix jacchus*). pp.15-16.

In: *Folia Primatologica* 64(1-2), 1995.

Araujo, A. and Arruda, M. F. Dispersion in *Callithrix jacchus* (Callitrichidae, Primates) at Nísia Floresta, north-east Brazil. pp.73-74.
Chalmeau, R. Gallo, A. and Visalberghi, E. Do capuchin monkeys learn a cooperative task? p.77.
Deputte, B. L., Vrot, M., Pierre, G., Bellec, S. *et al.* Development and manipulation in a brown capuchin raised in an human family: changes in social facilitation with age. p.77.
Dixson, A. F. Neuro-endocrinology and sexual behaviour. p.95.
Dunbar, R. I. M. A general theory of primate social systems: The Osman Hill Lecture, 1994. pp.95-96.
Hardie, S. H. Do individuals in mixed species groups of tamarins benefit from increased foraging efficiency? p.100.

Ludes, E. and Anderson, J. R. Use of different foraging substrates by captive white-throated capuchins (*Cebus capucinus*). pp.84-85.

MacLarnon, A. M. and Ross, C. Allometry and ecology of infant growth rates and alloparenting. p.97.

Yioulatos, D. Preliminary observations on the locomotion and postural behaviours of the red-handed tamarin (*Saguinus midas midas*) in French Guiana. p.94.

Meetings

1995

Workshop "The Implications of Non-Invasive and Remote Monitoring Techniques for Non-Human Primate Research and Husbandry", 6-8 December 1995, Deutsches Primatenzentrum (DPZ), Göttingen. Sponsored jointly by the European Primate Research Network (EUPREN), and the European Marmoset Research Group (EMRG). Includes symposia and poster sessions on non-invasive methods and remote monitoring, and demonstrations on transponder identification/temperature monitoring - Plexx (NL), activity monitoring - Octec (UK), telemetry - Data Sciences Int. (USA), and behavioural recording - Noldus (NL). Contact: L. Scott, Medical Countermeasures, CBDE, Porton Down, Salisbury, SP4 0JQ, UK, Fax: +44 (0)1980 613741, or C. R. Schnell, CIBA, Klybeckstrasse 141, K-125.2.08, CH-4002 Basel, Switzerland, Fax: 061 696 62-42.

1996

XXI Congresso Brasileiro de Zoologia, 5-9 February 1996, Porto Alegre, Rio Grande do Sul. Organized by the Brazilian Zoological Society. Contact: Secretaria Executiva, Departamento de Zoologia, Instituto de Biociências, Universidade Federal do Rio Grande do Sul, Avenida Paulo Gama 40, 90040-060 Porto Alegre, Rio Grande do Sul, Brazil. Tel: (051) 228-1633 x 3108 or 3126, Fax: (051) 226-7191 or (051) 227-5529, e-mail: buckup@vortex.ufrgs.br.

II Encontro de Mastozoologia, 5-9 February 1996, Porto Alegre, Rio Grande do Sul. Organized by the Brazilian Mammal Society, as part of the activities of XXI Congresso Brasileiro de Zoologia. Contact: Thales Renato O. de Freitas, Departamento de Genética Instituto de Biociências, Universidade Federal do Rio Grande do Sul, Caixa Postal 15053, 91501-970 Porto Alegre, Rio Grande do Sul, Brazil. Tel: (051) 336-8399 x 6733, Fax: (051) 336-2011, e-mail: trof@if1.if.ufrgs.br.

Workshop - Disseminating Biodiversity Information, 24-27 March 1996, organised by the European Science Foundation (ESF) - Systematic Biology Network, The Institute of Systematics and Population Biology (University of Amsterdam), and the Expert Center for Taxonomic Identification (ETI-UNESCO), Amsterdam. Key theme: Organisation and subsequent world-wide dissemination of information on the earth's biological diversity. Contact: UvA Conference Office, Spui 21, 1012 WX Amsterdam, The Netherlands, Tel: +31 20 525 2946, Fax: +31 20 525 4799, e-mail: congres@bdu.uva.nl, or Wouter Los, Zoological Museum Amsterdam, PO Box 94766, 1090 GT Amsterdam, The Netherlands, Tel: + 31 20 525 6499, Fax: + 31 20 525 5402, e-mail: los@bio.uva.nl.

1st International Symposium on Tropical Savannas, VIII Simpósio sobre o Cerrado, , 24-29 March 1996, sponsored by EMBRAPA - Brazilian Agricultural Research Corporation, CPAC - Cerrados Agricultural Research Center, Brasília, Brazil. The program will consist of lectures, discussion panels and poster sessions on the central theme of "Biodiversity and Sustainable Production of Food and Fibers in the Tropical Savannas". For more information: 1st International Symposium on Tropical Savannas/VIII Simpósio sobre o Cerrado, Att. Ms. Luciene M. Andrade, EMBRAPA - CPAC, Caixa Postal 08.223, Planaltina, DF 73301-970, Brazil. Tel: +55 (61) 389-1171, Fax: +55(61)3892953, e-mail: simpcer@sede .embrapa .br.

Population and Community Dynamics in the Tropics, 1-3 April 1996, British Ecological Society Annual Symposium, Cambridge University, Cambridge, U. K. Contact: Dr. D. M. Newbery, Unit of Tropical Forest Ecology, Department of Biological and Molecular Sciences, University of Stirling, Stirling FK9 4LA, Scotland, UK. Tel: + 44 (0)1786 467809, Fax: + 44 (0) 1786 46 68 93, e-mail: d.m.newbery@ stirling.ac.uk.

ASAB General Spring Meeting, 2-3 April 1996, Association for the Study of Animal Behaviour, Bolton Institute Primate Research Team, Bolton Institute, UK. Organized by Geoff Hosey and other members of the Primate Research Team. Offers of papers and posters invited, send title plus rough stetement of content. Further information: Marie Jacques, Primate Research Team, Division of Psychology and Biology, Bolton Institute, Deane Road, Bolton BL3 5AB, Lancashire, UK, Tel: 01204 528851, ext. 3145, Fax: 01204 399074, e-mail: mjl@bolton.ac.uk.

New World Primate Taxon Advisory Group, 19 May 1996. Denver, Colorado, USA. Focus: New World primate genetics. Contact: Jean Dubach, Brookfield Zoo, Department of Conservation Biology, Laboratory of Genetics, 3300 Golf Road, Brookfield, IL 60513, USA. Tel: 1 708 485-0263, ext. 502, Fax: 1 708 485 3532, e-mail: bzconbio@ix.netcom.com.

Changing Images of Primate Societies: The Role of Theory, Method, and Gender, 15-23 June 1996, Hotel Rosa dos Ventos, Teresópolis, Rio de Janeiro, Brazil. Supported by The Wenner-Gren Foundation for Anthropological Research, Inc., New York. Organized by Shirley C. Strum (University of California, San Diego) and Linda M. Fedigan (University of Alberta). Session topics: Primate studies: influence of theory, method, and gender; Comparative perspective: psychology, animal behavior, cultural anthropology, paleoanthropology, archeology; Larger context: science studies, feminism., and popular culture. For more information, please contact: Shirley C. Strum, at Tel: (619) 944-3453, Fax: (619) 944-2809/534-5946, or Linda M. Fedigan at Tel: (403) 492-5899, Fax: (403) 492-5273, e-mail: linda.fedigan@ualbert.ca, or Wenner-Gren Foundation, 220 Fifth Avenue, 16th Floor, New York, NY 10001, USA, Tel: (212) 683-5000, Fax: (212) 683-9151.

ASAB Summer Meeting - Individual Behaviour and Population Processes, 24-26 July 1996, University of East Anglia, Norwich, UK. Organized by W. Sutherland and J. Reynolds. The meeting will focus on the relationship between animal behaviour and population ecology, including the role of individual decisions in foraging, predator avoidance, territoriality, and breeding behavior in determining spatial patterns of habitat use and temporal changes in populations. Discussions on both empirical and and theoretical research.will contribute to provide a synthesis between animal behaviour and population biology with implications for management and conservation. Contact: Bill Sutherland or John Reynolds, School of Biological Sciences, University of East Anglia, Norwich NR4 7TJ, UK. Tel: 01603 592266, Fax: 01603 592250; e-mail: w.sutherland@uea.ac.uk or reynolds@uea.ac.uk.

XVIth Congress of the International Primatological Society & 19th Conference of the American Society of Primatologists, 11-16 August 1996, University of Wisconsin, Madison, hosted by the Wisconsin Regional Primate Research Center. Contact: Edith Chan, Coordinator/Information, Wisconsin Regional Primate Research Center, 1220 Capitol Court, Madison, Wisconsin 53715-1299, USA. Tel: (608) 263-3500, Fax: (608) 263 4031, e-mail: ipsasp-info@primate.wisc.edu.

Meeting of the Association of Primate Veterinarians, 16-17 August 1996, University of Wisconsin, Madison. Contact: Edith Chan, Coordinator/Information, Wisconsin Regional Primate Research Center, 1220 Capitol Court, Madison, Wisconsin 53715-1299, USA. Tel: (608) 263-3500, Fax: (608) 263 4031, e-mail: ipsasp-info@primate.wisc.edu.

Ecological Summit 96, 19-23 August 1996, Copenhagen, Denmark. Organized by Elsevier Science, Journal Editors Robert Costanza (*Ecological Economics*), Sven E. Jorgensen (*Ecological Modelling*), William J. Mitsch (*Ecological Engineering*) and David Rapport (*Ecosystem Health*). In collaboration with the International Society of Ecological Modelling, International Ecological Engineering Society, International Society of Ecosystem Health, International Society of Ecological Economics, SAS Institute Denmark, and International Lake Environmental Committee. For information contact: Ecological Summit 96, Conference Secretariat, Elsevier Science Ltd., The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, UK. Tel: +44 (0)1865 843643, Fax: +44 (0)1856 843958, e-mail: g.spear@elsevier.co.uk.

6th International Behavioural Ecology Congress, 29 September - 4 October 1966, Canberra, Australia. Details from: Andrew Cockburn, Division of Botany and Zoology, Australian National University, Canberra ACT 02000, Australia. Fax: 61 6249 5773, e-mail: andrew.cockburn@anu.edu.au.

III Congresso de Ecologia do Brasil, 6-11 October 1995, Centro de Convenções Ulysses Guimarães, Brasília. Deadline for submitting preliminary abstracts: 30 March 1996. Deadline for submitting final version of abstracts: 30 June 1996. Contact: Comissão Organizadora, III Congresso de Ecologia do Brasil, Departamento de Ecologia, Universidade de Brasília (UNB), Caixa Postal 04355, 70919-970 Brasília, D. F., Brasil. Tel: +55 (0)61 348-2326, 348-2592, & 348-2282, Fax: +55 (0)61 272-1497 & 273-4571. E.mail: congecol@guarany.cpd.unb.br.

68th IUCN Species Survival Commission - Full Meeting, 11-12 October 1996, Montreal, Canada. Theme: Communicating the value of the SSC - its worldwide presence, scientific knowledge, expert advice, and ongoing work, and its relevance to the conservation of biodiversity. Plenary sessions: SSC advice to intergovernmental boides; Biodiviersity conservation information system; SSC Specialist Group Reports. Round table discussion: SSC at the regional and country levels. Workshops: IUCN categories of threat; SSC communications strategy;

Fund-raising strategies. Registration fee $25. For more information: World Conservation Congress Coordinator, IUCN, Rue Mauverney 28, 1196 Gland, Switzerland, Fax: + 41 22 999 0020.

IUCN World Conservation Congress, 13-23 October 1996, Montreal Conference Centre, Montreal, Canada. Four distinct parts: Special Members' Session (13-14 October) to consider revised statutes - accredited delegates of IUCN voting members; Members' Business Session (15-16, 22-23 October) to discuss and approve IUCN's future strategy, programme and budget, elect the officers and Council of the Union, and debate and adopt resolutions and recommendations - invited observers may also attend; Open Session of Workshops (17-18, 20-21 October) under the overall theme of "Caring for the Earth" - open to the public; A major environmental exhibition - open to the public. 19 October set aside for excursions. Registration fee $50 if paid before 31 July 1996, $100 after that date. Contact: John Burke, Director of Communications, IUCN The World Conservation Union, 28 rue Mauverney, 1196 Gland Switzerland. Tel: +41 22 999 0123.

Biodiversity, Conservation and Management at the Beni Biosphere Reserve, Bolivia, 3-6 December 1996, La Paz, Bolivia. Organized by the Beni Biological Station, Bolivian Academy of Sciences, and the Smithsonian/MAB Biodiversity Program. The objective is to provide a complete overview of the last ten years of research on biodiversirty, conservation and management at the reserve. Papers and posters are requested. Proceedings will be published. For additional information, contact: Carmen Miranda, Academia Nacional de Ciencias de Bolivia, Av. 16 de Julio 1732, Casilla 5829, La Paz, Bolivia. Tel./Fax: (591-2) 350612, e-mail: cmiranda@ebb.bo, or Francisco Dallmeier, Smithsonian/MAB Biodiversity Program, 1100 Jefferson Drive SW, Suite 3123, Washington, D. C. 20560, USA. Tel: (202) 357 4793, Fax: (202) 786 2557, e-mail:zicfgd@ic.si.edu.

Australian Primate Society Annual Meeting, 6-8 December 1996, Wellington Zoo, Wellington, New Zealand. Conference Organizer: Graeme Strachan, Wellington Zoo. Contact: Graeme Crook, CSIRO Division of Human Nutrition, Animal Services, Majors Road, O'Halloran Hill, South Australia 5158. Tel: +61 82 98 03 36, Fax: +61 83 77 0 004, e-mail: graemec@dhn.csiro.au.

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, figures, maps, tables and references, but please keep them to a minimum.

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