

Bosque, 1900, La Plata, Argentina.

Referencias

- Ashley-Montague, M. F. 1933. The anthropological significance of the pterion in primates. *Am. J. Phys. Anthropol.* 18:159-336.
- Cabrera, A. 1958. Catálogo de los mamíferos de América del Sur, I. *Rev. Mus. Arg. Cienc. Nat. "Bernardino Rivadavia"* 4(1):1-307.
- Delson, E. y Rosenberger, A. L. 1980. Phyletic Perspectives on Platyrrhine Origins and Anthropoid Relationships. En: *Evolutionary Biology of the New World Monkeys and Continental Drift*, R. L. Ciochon y A. B. Chiarelli (eds.), pp. 445-458. Plenum Press, New York.
- Ford, S. M. 1980. Callitrichids as phyletic dwarfs, and the place of the Callitrichidae in Platyrrhini. *Primates* 21:31-43.
- Ford, S.M. 1986. Systematics of the New World monkeys. En: *Comparative Primate Biology, Vol. I: Systematics, Evolution and Anatomy*, D. Swindler y J. Erwin (eds.) pp.71-135. Alan R. Liss, New York.
- Hershkovitz, P. 1977. *Living New World Monkeys (Platyrrhini), With an Introduction to Primates, Vol. I.* Chicago University Press, Chicago.
- Kay, R. F. 1980. Platyrrhine origins: a reappraisal of the dental evidence. En: *Evolutionary Biology of the New World Monkeys and Continental Drift*, R. L. Ciochon y A. B. Chiarelli (eds.), pp. 159-188. Plenum Press, New York.
- Kay, R.F. 1990. The phyletic relationships of extant and fossil Pitheciinae (Platyrrhini, Anthropidea). *J. Hum. Evol.* 19: 175-208.
- Le Gros Clark, W. E. 1959. *The Antecedents of Man.* University of Edinburgh Press, Edinburgh.
- Meldrum D. J., Kay, R. F. y Chiu, C.-H. 1993. Phylogenetic relationships of *Cebus* and *Saimiri* inferred from mitochondrial DNA sequences and dental anatomy. *Am. J. Phys. Anthropol.* 16:144-145.
- Rosenberger, A.. L. 1977. *Xenothrix* and ceboid phylogeny. *J. Hum. Evol.* 6:461-481.
- Rosenberger, A. L. 1981. Systematics: the higher taxa. En: *Ecology and Behavior of Neotropical Primates, Vol. 1*, A. F. Coimbra-Filho y R. A. Mittermeier (eds.), pp.9-27.: Academia Brasileira de Ciências, Rio de Janeiro.
- Rosenberger, A. L., Setoguchi, T. y Shigehara, N. 1990. The fossil record of callitrichine primates. *J. Hum. Evol.* 19:209-236.
- Schneider, H., Schneider, M. P. C., Sampaio, I., Harada, M. L., Barroso, C. M. L., Czelusniak, J. y Goodman, M. 1995. DNA evidence on platyrrhine phylogeny from two unlinked nuclear genes. *Am. J. Phys. Anthropol.* suppl. 20:191.
- Simons, E. L. 1972. *Primate Evolution.* Macmillan, New York.
- Simpson, G. G. 1945. The principles of classification and a classification of mammals. *Bull. Am. Mus. Nat. Hist.* 85:1-350.
- Szalay, F. S. y Delson, E. 1979. *Evolutionary History of the Primates.* Academic Press, New York.
- Tejedor, M. F. 1995a. Descripción de nuevos restos dentarios asignados a *Homunculus patagonicus* (Primates, Platyrrhini), procedentes de la localidad de Monte Observación (Santacruzense), Provincia de Santa Cruz. *Resúmenes XI Jornadas Argentinas de Paleontología de Vertebrados*, Tucumán, Mayo de 1995.
- Tejedor, M. F. 1995b. La posición de *Aotus* y *Callicebus* en la filogenia de los primates Platyrrhini. *Resúmenes X Jornadas Argentinas de Mastozoología*, La Plata, Noviembre de 1995.
- Thornington, R. W., Jr. y Anderson, S. (1984). Primates. En: *Orders and Families of Recent Mammals of the World*, S. Anderson, S. & J. Knox Jones, Jr. (eds.), pp.187-217. Wiley and Sons, New York.

UPDATING THE TWO PLEISTOCENE PRIMATES FROM BAHIA, BRASIL

The discovery of two nearly complete skeletons of large Pleistocene primates from Bahia, Brazil, was announced in these pages three years ago (Cartelle, 1993). Preliminary analysis of these fossils is now complete, and they are identified as two different genera of very large atelines (Fig. 1). One skeleton is an adult individual referred to *Protopithecus brasiliensis* Lund, 1838 (Hartwig and Cartelle, 1996), and the other is a nearly

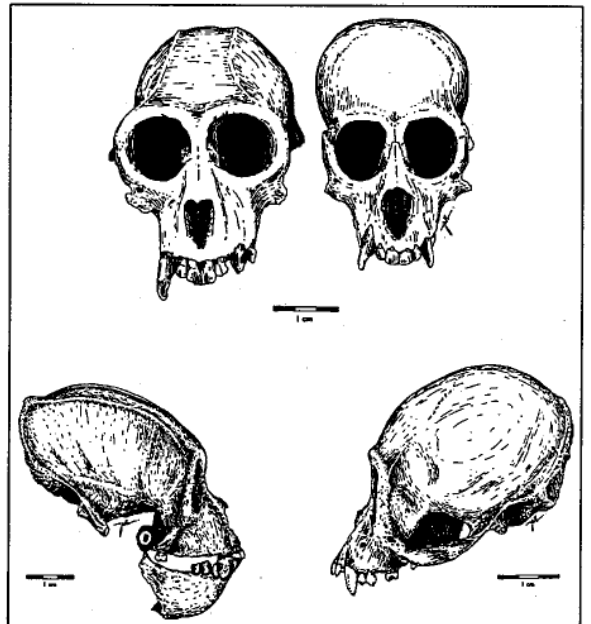


Figure 1. Frontal and lateral views of the skull of *Protopithecus* (left) and *Caipora* (right). Illustration by Humberto do Espirito Santo.

Table 1. Cranial measurements for *Protopithecus*, *Caipora*, and the four genera of living ateline New World monkeys. All measurements in millimeters.

	<i>Protopithecus</i>	<i>Caipora</i> subadult	<i>Ateles</i>	<i>Brachyteles</i>	<i>Lagothrix</i>	<i>Alouatta</i>
	n = 1	n = 1	n = 92	n = 11	n = 73	n = 25
NCL	110.1	94.1	77.9	86.6	73.7	61.2
			68.5-84.4	79.8-91.7	67.0-81.2	54.9-68.8
NCB	72.8	75.4	60.8	61.9	58.6	51.0
			54.9-65.7	57.7-65.1	53.8-63.1	47.3-56.2
TSL	150.5	131.5	114.1	114.8	104.9	107.6
			104.0-122.0	100.0-122.0	97.2-114.6	96.3-121.4
BAS-NAS	83.4	77.2	63.3	68.2	63.1	64.9
			55.4-71.9	58.2-74.4	57.9-70.0	57.6-78.2
PL	43.8	40.6	34.4	38.7	31.6	39.9
			29.9-40.7	34.2-44.1	26.2-37.4	34.7-59.9
BOB	70.8	63.3	55.6	57.3	54.0	52.3
			49.9-64.2	52.0-61.2	47.9-59.0	47.2-60.7

NCL = Neurocranial length, NCB = Neurocranial breadth, TSL = Total skull length, BAS-NAS = Basion-nasion, PL = Palate length, BOB = Biorbital breadth.

Table 2. Postcranial measurements for *Protopithecus*, *Caipora*, and the four genera of living ateline New World monkeys. All measurements in millimeters, except where indicated. Asterisk denotes incomplete growth of the fossil.

	<i>Protopithecus</i>	<i>Caipora</i> Subadult	<i>Ateles</i>	<i>Brachyteles</i>	<i>Lagothrix</i>	<i>Alouatta</i>
	n = 1	n = 1	n = 31	n = 3	n = 17	n = 25
FHD	25.0	22.9	17.9	18.2	15.0	13.4
			15.8-20.2	16.9-19.8	14.0-15.7	11.8-15.9
FND	16.2	15.2	9.9	10.3	8.3	7.9
			8.0-11.8	9.5-11.2	7.4-9.6	6.4-10.8
FL	237	216*	205.6	202.0	166.4	154.2
			190.5-226.0	186.5-212.0	157.5-176.5	139.0-171.0
BCB	45.4	38.5	31.8	29.0	27.1	23.9
			29.1-34.9	28.0-30.9	24.2-29.3	21.4-26.7
HHD	28.4	25.1	20.5	19.8	20.1	19.8
			17.8-24.1	18.2-21.6	18.6-22.2	16.9-23.1
HMST	18.5	18.5	11.0	10.4	10.2	9.5
			10.0-12.4	9.4-11.6	9.2-11.4	7.3-12.1
BIEPI	48.0	37.7	30.9	30.0	28.0	26.6
			28.5-33.2	26.7-33.0	25.6-30.0	22.5-30.8
I-I	1.04	1.06*	1.05	1.07	0.98	0.95
			1.01-1.07	1.05-1.08	0.96-1.0	0.92-0.98
FV	90 ml	70 ml	40 ml (n=1)	-	20 ml (n=1)	20 ml (n=1)

FHD = Femoral head diameter, FND = Femoral neck diameter, FL = femoral length, BCB = femoral bicondylar breadth, HHD = humeral head diameter, HMST = humeral midshaft thickness, BIEPI = humeral biepicondylar breadth, I-I = Intermembrat index (forelimb length/hindlimb length), FV = femoral volume (measured by water displacement in a graduated cylinder).

mature subadult recently described as a new genus and species, *Caipora bambuorum* Cartelle and Hartwig, 1996 (Fig. 1).

The complete skeleton of *Protopithecus* is remarkable for its large size, calculated to be approximately 25 kg based on extrapolations from postcranial measurements (Tables 1 and 2). It is further remarkable because the cranium distinctly resembles *Alouatta*, the howler monkey, while the postcranium bears the same adaptations to suspension and brachiation as *Ateles* and *Brachyteles*. The type specimen discovered in Minas Gerais by Lund in 1836 was known only from a proximal femur and a distal humerus, and from these it was assumed that *Protopithecus* was a large Pleistocene muriqui (Hartwig, 1995). The presence of a flat, posterior nuchal plane, and an extended basicranium in the skull

of the new skeleton was entirely unexpected. *Protopithecus* presents as unique mixture of size and morphology, and shows that atelines were more diverse in the recent past.

The *Caipora* skeleton resembles living spider monkeys in both cranial and postcranial details. The skull is sufficiently different from *Protopithecus* in the shape of the neurocranium and basicranium to warrant its own genus. It differs from *Ateles* in having a much wider, and thus larger braincase. The limb bones are not fully grown, but suggest that this *Caipora* individual weighed approximately 20 kg.

Together, *Protopithecus* and *Caipora* represent the largest South American primates, the most complete fossil platyrrhines, and the first substantial record of

Pleistocene primate evolution on the continent.

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References

Cartelle, C. 1993. Achado de *Brachyteles* do Pleistoceno Final. *Neotropical Primates* 1(1): 8.
 Cartelle, C. and Hartwig, W. C. 1996. A new extinct primate among the Pleistocene megafauna of Bahia, Brazil. *Proc. Nat. Acad. Sci.* 93:6405-6409.
 Hartwig, W. C. 1995. A giant New World monkey from the Pleistocene of Brazil. *J. Hum. Evol.* 28: 189-195.
 Hartwig, W. C. and Cartelle, C. 1996. A complete skeleton of the giant South American primate *Protopithecus*. *Nature, Lond.* 381: 307-311.

CHARACTERISTICS OF TWO TYPES OF HABITAT AND THE STATUS OF THE HOWLER MONKEY (*ALOUATTA CARAYA*) IN NORTHERN ARGENTINA

In Argentina the black howler monkey, *Alouatta caraya*, inhabits upland semideciduous forests, and flooded forests on the islands of the large rivers, Paraná and Paraguay (Cabrera, 1939; Brown and Zunino, 1994). Field studies done on this species in these habitats revealed differences in density, social organization, diet, and behavior, related to the floristic structure (Rumiz, 1987, 1990; Rumiz *et al.*, 1986; Zunino, 1986, 1989; Bicca-Marques, 1994; Brown and Zunino, 1994).

Currently, *A. caraya* is not considered as threatened (Emmons, 1990; Rylands *et al.*, 1995). However, in Argentina the continuous extensive deforestation for timber, land use, and dam construction, suggests a progressive degradation and reduction of the habitat available for this species. The aims of the project reported here consisted in the definition of three types of habitat occupied by *A. caraya*, evaluating as such the relation between habitat and population characteristics and the effects of alteration.

Study Site and Methods

The study was carried out in the northwest of the Corrientes Province, Argentina (27° 30'S, 58° 50'W), comprising riparian forest patches along the Riachuelo river, and flooded forest in the Paraná river.

In the Riachuelo river area, the forest is a mosaic of tall

and low patches of about 10 ha separated by grasslands. The forest patches show different degrees of alteration, some suffering a selective logging while in others most of the trees have been eliminated.

On the islands, the terrain is inundated almost yearly defining as such the floristic structure which is characterized by the presence of fast-growing tree species (Rumiz *et al.*, 1986). Occasionally, floods persist over long periods resulting in the loss of trees, and reducing dramatically the presence of howler monkeys. Due to the low quality of the timber, and the fact that the soils are not suitable for agriculture, logging is not a serious problem.

To compare the habitats, inventories of trees were carried out in three sites inhabited by the howler monkeys. On the Riachuelo river, a tall forest patch was selected which had suffered little alteration (BPA), along with a second which had been heavily exploited (BMA). The criteria used to select these sites were based on qualitative evaluations of the tallness of the canopy, the presence of species of economic importance, abundance of thin-trunked trees, and evidence of exploitation. The study of the flooded forest patch (SI) was carried out on the island of Brasileria, near the confluence of the Paraná and Paraguay rivers.

The species, height, and diameter at breast height (DBH) were recorded for all trees with a DBH greater than 10 cm. They were plotted in quadrats of 10 x 10 m. For comparisons between habitats we employed the following variables: NiH>10 m = Number of trees belonging to each species with a height greater than 10m; DBHm = Mean DBH; Nsp = Number of species; Ni/Nsp = Number of individuals of each species with respect to the total number of species; and NiDBH>20 cm = Number of individuals with a DBH greater than 20 cm. We also calculated the density, and used Shannon's index as a measure of diversity. Differences between habitats were analyzed by applying a discriminant analysis. To evaluate the effect of logging, we compared our results with previous inventories of 174 ha at BPA and BMA in 1987.

The density of howler monkeys was estimated in BPA, BMA, and SI. Daily censuses by transect were carried

Table 1. Habitat characteristics. Mean values and SD of tree density expressed as individuals per ha (Di); Total number of species (Nsp); Shannon's Index (H'); Diameter at breast height (DBH); Mean height (Hm); BPA: Unexploited forest; BMA: Disturbed forest; SI: Flooded forest.

Site	Di	Nsp	H'	DBH	Hm
BPA	500 (26.8)	20	4.61	16.68 (7.5)	6.58 (1.6)
BMA	745 (75.8)	14	1.92	19.95 (2.9)	5.99 (1.5)
SI	300 (76.5)	7	1.15	32.47 (11.4)	15.15 (3.6)