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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.

Carmem Maria Leitão Barroso, Departamento de Genética, Centro de Ciências Biológicas, Universidade Federal do Pará, Campus do Guamá, 66075-900 Belém, Pará, Brazil.

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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.

Francisco D.C. Mendes, Departamento de Psicologia Experimental, Universidade de São Paulo, Av. Prof. Mello Moraes, 1721, Caixa Postal 66.261, 05508-900 São Paulo, São Paulo, Brazil.

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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