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Cytogenetics and Sperm Morphology as Tools of Systematic Value: The Example of *Saimiri boliviensis* (Primates: Platyrrhini)

In December 2005, Eliana Ruth Steinberg defended her undergraduate thesis (tesis de licenciatura) analyzing sex chromosomes and sperm morphology in the squirrel monkey, *Saimiri boliviensis*. It was presented at the School of Exact and Natural Sciences at the University of Buenos Aires (FCEyN – UBA), Argentina. Her supervisor was Marta Dolores Mudry, Associate Professor in the Department of Ecology, Genetics and Evolution. This research was funded by MDM CONICET PIP 2450, UBACyT X031 and ERS Sigma Xi Grant 3040277. The following is a summary of her thesis.

Accurate systematic information is essential to mammal conservation, both in captivity and in the wild, and taxonomic, phylogenetic and biogeographic analyses are indispensable tools. The geographic origin of many animals held in zoos and conservation breeding centers is often unknown, obscured by the exchange of individuals between institutions. The challenge, then, is to generate accurate identifications for animals with uncertain provenance.

Phenotypic and morphometric characters have been traditionally employed for systematic diagnosis, but the wide variety of phenotypes and polymorphisms may cause confusion when designing programs for *ex situ* maintenance. This may result in the unintentional assembly of mixed groups, with the possible consequence of loss of variability due to endogamic depression. In this context, genetic tools such as karyotyping and DNA analysis take on a new importance, and have been employed in the last decade in many breeding centers. Mitotic parameters in particular have been widely used in the past decade to accurately typify individuals. However, only meiotic data allow a confirmation of sex determination, and are thus essential for guiding breeding efforts.

Sperm from different species of mammals may clearly differ in their morphology and dimensions. This is important for the successful implementation of biotechnological techniques, such as cryopreservation of gametes and assisted reproduction, in *ex situ* conservation programs in zoos and in breeding and research facilities. In this thesis, cytogenetics and sperm morphology were used for the first time for taxonomic diagnosis in the Ceboidea, using the squirrel monkey, *Saimiri* sp., as an experimental model.

Species and subspecies of squirrel monkeys may be distinguished by their coat coloration, but this is often difficult for the untrained eye and may be ambiguous in backcrossed animals. However, species of *Saimiri* differ in their karyotypes by pericentric inversions, resulting in differences in the ratio of acrocentrics to non-acrocentrics. This allows a clear identification of species and hybrids both in captivity and in the wild. This study examined male squirrel monkeys held at the Corrientes Biological Station (EBCo) and females from the Buenos Aires Zoo and the Córdoba Zoo, all in Argentina.

This study found a diploid number of 2N = 44, XX/XY, in all specimens analyzed, with a fundamental number FN = 75. The karyotype included five metacentric chromosome pairs, 10 submetacentric pairs and six acrocentric pairs. The X chromosome is submetacentric and the Y is a small acrocentric. In the meiotic analysis, the presence of 22 bivalents with a distinctive XY bivalent was observed in late diakinesis/Met I. The G banding patterns agreed with those previously published for *S. boliviensis boliviensis*.

As a result of this analysis, the animals held at the Buenos Aires and Córdoba Zoos, previously assigned to *Saimiri sciureus*, are now recognized as *S. b. boliviensis*. In addition, the morphometric characterization and comparison with other cebids demonstrated that the spermatozoa of *Saimiri b. boliviensis* are distinguished by a larger midpiece. The different variables analyzed here support genetic characterization in this and other New World primate genera in the "total evidence" framework accepted for modern taxonomic studies.

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Reference

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