

probably does not imply more than 2 pericentric inversions. It is, however, striking to realize that there are more karyotype differences between these 2 species than between *Marmosa robinsoni* and *Caluromys derbianus*, which seem to differ only in the X chromosome, acrocentric in the latter, metacentric in the former. Karyotype changes appear not to run parallel to phylogeny in the evolution of these taxa¹³.

Resumen. Los cromosomas de *Marmosa fuscata* (subgénero *Marmosops*), estudiados por cultivo de tejidos en base a 4 individuos de la Cordillera de la Costa en el norte de Venezuela, resultaron diferir de los de *Marmosa robinsoni* sólo en el quinto y sexto par de autosomas, metacéntricos en la primera y subtelocéntricos en la segunda

especie. Con todo, se encuentran mayores diferencias entre los cariotipos de estas 2 especies que entre los de *M. robinsoni* y *Caluromys derbianus*.

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¹³ We thank PABLO KIBLISKY and OMAR LINARES for assistance in field work.

Isomorphic Sex-Chromosomes in Two Venezuelan Populations of the Spiny Rat, Genus *Proechimys* (Rodentia, Caviomorpha)

The spiny rats (family Echimyidae) of the genus *Proechimys* are common inhabitants of the forests of the lowlands and mountain slopes of tropical South America and of southern Middle America. They are typical members of the suborder Caviomorpha of Neotropical rodents, representing one of the generalized, rat-like groups of the caviomorph radiation¹. The species of *Proechimys* proved to be highly variable and therefore very difficult to classify²⁻⁴.

Purporting to contribute to clarification of the taxonomy of the genus, the senior author started to gather chromosome information from samples of different Venezuelan populations of *Proechimys*. In this routine work, he became surprised to discover that one female and one male individual, caught by himself in the gallery forest near La Esmeralda, Amazonas Territory, Venezuela (upper Orinoco River), showed exactly the same karyotypes of 26 chromosomes without morphologically distinguishable X and Y chromosomes in the male (Figure 1). Unfortunately, only 2 individuals were available from this locality. The skins and skulls are deposited in the collection of mammals of the Institute of Tropical Zoology, Central University of Venezuela (♂, MBUCV 1-1716; ♀, MBUCV 1-1790). 18 karyotypes were constructed of the female, and 29 of the male, from a total of 100 studied cells from bone-marrow, prepared with the well-known colchicine-hypotonic pretreatment technique^{5,6}. The karyotypes were consistent in all the cells studied, and in none of the male cells was a heteromorphic pair observed which could be ascribed to the usual XY sexual system.

Due to the fact that the locality of La Esmeralda is located very far away in a rather isolated part of the Orinoco jungle, it was impossible until now to get more specimens from this population. In order to compare these results, we studied slides from our files of specimens of *Proechimys* from Aragua State in northern Venezuela, currently classified as *Proechimys guyannensis guairae* Thomas^{2,7,8}. We had preparations from bone-marrow cells of 3 individuals of this taxon: 1 female (MBUCV 1-1760) and 1 male (MBUCV 1-1642) from Bahía de Cata, Ocumare de la Costa, Aragua, and 1 female from La Horqueta, near Tiara, Aragua, deposited in the United

States National Museum (USNM 395261). We examined 60 cells of these individuals, and found that the diploid number is $2n = 46$ chromosomes. The male also proved not to have distinguishable X and Y chromosomes, so that the female and the male karyotypes were identical, repeating the situation found in the sample from La Esmeralda (Figure 2).

Comparing the karyotypes of the 2 forms studied, it becomes obvious that they are markedly different. The specimens from La Esmeralda have 1 pair of large subtelocentric, 1 pair of large metacentric, a gradually decreasing series of 7 pairs of metacentric of medium and small size, and 4 pairs of telocentric chromosomes (1 of medium size and 3 of small size). The karyotype of the specimens from Aragua has 1 pair of large metacentric, a series of 11 pairs of acrocentric and telocentric (3 medium sized and the remainder small sized) and a decreasing series of 11 pairs of medium and small sized, meta- and submetacentric chromosomes. More detailed comparisons, involving measurements and idiogram constructions are certainly required, but it is equally obvious that these 2 karyotypes could hardly be thought of as belonging to the same species.

However, the specimens from La Esmeralda are not distinguishable from a series of the same locality in the American Museum of Natural History referred by TATE⁹ to *P. guyannensis guyannensis* (misspelled *P. cayennensis cayennensis* in his paper). The fact that 2 forms formally considered as subspecies of the species *P. guyannensis* show such different chromosome complements, suggests

¹ B. PATTERSON and R. PASCUAL, Q. Rev. Biol. 43, 409 (1968).

² J. R. ELLERMAN, *The Families and Genera of Living Rodents* (British Museum, Nat. Hist. 1940), vol. 1, p. 689.

³ P. HERSHKOVITZ, Proc. U.S. natn. Mus. 97, 125 (1948).

⁴ J. MOOJEN, Univ. Kans. Pubs., Mus. nat. Hist. Zool. 1, 301 (1948).

⁵ E. H. R. FORD and D. H. M. WOOLAND, Stain Tech. 38, 271 (1963).

⁶ C. F. NADLER and M. H. BULK, Chromosoma 13, 1 (1962).

⁷ G. H. H. TATE, Bull. Am. Mus. Nat. Hist. 68, 295 (1935).

⁸ G. H. H. TATE, Zoologica 32, 65 (1947).

⁹ G. H. H. TATE, Bull. Am. Mus. Nat. Hist. 76, 151 (1939).

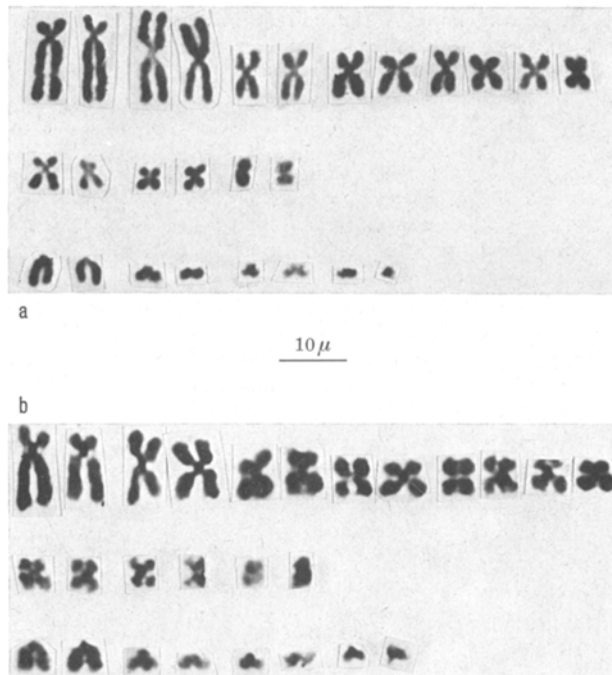


Fig. 1. Karyotypes of (a) female specimen MBUCV 1-1790; (b) male specimen MBUCV 1-1716. Sample from La Esmeralda, Amazonas Territory, Venezuela, referred to as *Proechimys cherriei*. Bone marrow C-metaphases; acetic-orcein stain.

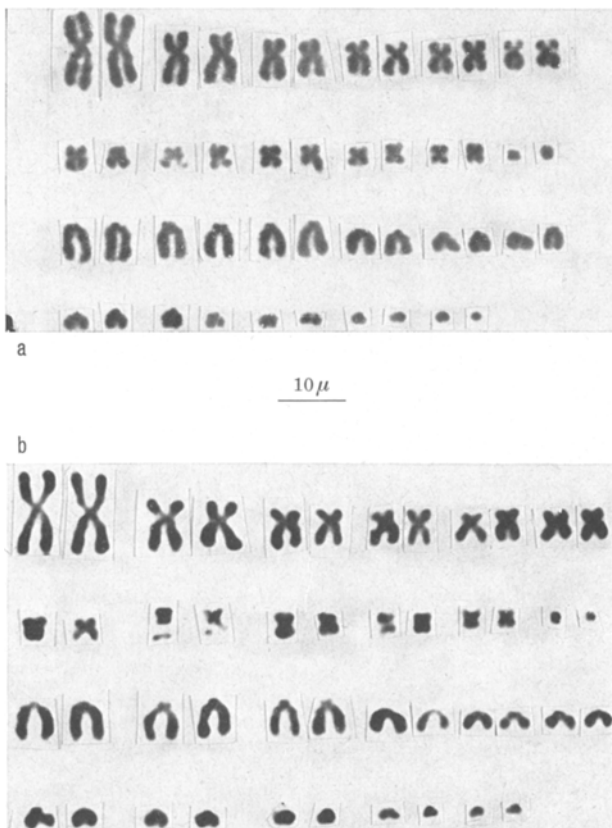


Fig. 2. Karyotypes of (a) female specimen MBUCV 1-1760; (b) male specimen MBUCV 1-1642. *Proechimys guyannensis guairae*, Bahía de Cata, Ocumare de la Costa, Aragua, Venezuela. Bone marrow C-metaphases; acetic-orcein stain.

that the latter is a composite species, as advocated by HERSHKOWITZ³ and also indicated by parasitological evidences¹⁰. The problem of the species name of the La Esmeralda population therefore needs to be clarified. THOMAS (1899) described *Echimyus cherriei* from a locality close to La Esmeralda (Munduapo, Upper Orinoco River). ALLEN and THOMAS referred later this species to *Proechimys*⁷, and TATE⁹ synonymized it with *P. guyannensis guyannensis*. MOOJEN⁴ erected the subspecies *P. semispinosus amphichoricus* from specimens of La Esmeralda and other localities. The senior author was unable to find clear-cut distinctions in skull and skin characters among the 2 specimens of La Esmeralda reported here, the series from the same locality referred by TATE to *P. g. guyannensis* and the type specimen of *P. s. amphichoricus*, also from La Esmeralda, and he supposes that all of them are conspecific. As this form is distinct enough in karyotype from *P. guyannensis guairae* from Aragua to suggest distinct species status, we propose that the name *Proechimys cherriei* be applied to the La Esmeralda population, until a thorough revision of the Venezuelan forms of the *guyannensis* group proves another solution to be necessary.

Isomorphic sex chromosomes are exceptional in mammals¹¹⁻¹³ and it is significant to find this peculiarity in 2 species of the same genus. However, the occurrence of isomorphic sex chromosomes is not to be considered as a characteristic of *Proechimys* as a genus, since PATTON and GARDNER¹⁴ have unpublished karyotypes of different species of *Proechimys* from Peru which show the typical heteromorphic sexual pair. In these cases, the X is a medium-sized telocentric and the Y a small-sized telocentric, suggesting that we have to look from the sexual chromosomes in the species studied by us in one of the pairs of medium-sized telocentric chromosomes¹⁵.

Resumen. Un macho y una hembra de *Proechimys* del Alto Orinoco (La Esmeralda) referidos a *P. cherriei* resultaron poseer cariotipos idénticos de $2n = 26$ cromosomas, sin que sea posible distinguir morfológicamente el X y el Y en el macho. Un macho y 2 hembras de *Proechimys guyannensis guairae* del Estado Aragua, proporcionaron un cariotipo de $2n = 46$ cromosomas, también sin par heteromórfico en el macho. Se discuten las implicaciones taxonómicas de estos hallazgos, que sugieren que *P. guyannensis* es una especie compleja.

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Caracas (Venezuela), 5 September 1969.*

¹⁰ G. H. E. HOPKINS, Proc. zool. Soc. London 119, 492 (1949). I am indebted to Prof. BRYAN PATTERSON for this reference.

¹¹ G. YERGANIAN, Cytologia 24, 66 (1959).

¹² G. YERGANIAN and S. PAPOYAN, Hereditas 52, 307 (1964).

¹³ N. N. VORONTZOV and S. I. RADZHAULI, Цитология, Академия наук СССР 9, 848 (1967).

¹⁴ J. L. PATTON, personal communication.

¹⁵ We thank P. SORIANO, O. LINARES and E. GARGÍA LARRALDE for help in field work, and Dr. J. L. PATTON for comments and information.