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Standardized karyotype of deer mice, *Peromyscus* (Rodentia)

The Committee for Standardization of Chromosomes of *Peromyscus*

Abstract

A standard G-band karyotype is proposed for the genus *Peromyscus*. G-banded chromosomes of *Peromyscus boylii glasselli* (NF=56), numbered and arranged according to euchromatic lengths, serve as the standard. It is suggested that rearrangements of the standard pattern which occur in other species of *Peromyscus* be described using the general methods of the PARIS CONFERENCE (1971).

Members of the genus *Peromyscus* are the most widespread and taxonomically varied of North American rodents (HALL and KELSON, 1959). The more than 50 species belonging to six subgenera comprising the genus and their ubiquitous geographic distribution in North America have made these mice the subjects of numerous studies, and, as a result, more biological information is available for certain species of *Peromyscus* than any other diverse genus of small mammals, with the possible exception of *Mus* or *Rattus* (see, for example, KING, 1968). *Peromyscus* has long been and still remains the subject of reports ranging from descriptions of behavior and ecology to molecular biology and cytogenetics. The karyotype of the genus is notable because it comprises a constant diploid chromosome number ($2n=48$) for all species thus far examined. Conventional chromosomal variation occurs by non-Robertsonian methods (HSU and ARRIGHI, 1966; OHNO et al., 1966; SINGH and McMILLAN, 1966; SPARKES and ARAKAKI, 1966; HSU and ARRIGHI, 1968; ARAKAKI et al., 1970; TE and DAWSON, 1971; DUFFEY, 1972; LEE et al., 1972; SCHMIDL and SCHROETER, 1974), which is reflected in different fundamental numbers (NF, total number of chromosome arms). For example, some species, such as *Peromyscus crinitus* and *P. boylii*, have as many as 40 acrocentrics (NF=56), while others, such as *P. eremicus*, possess all biarmed chromosomes (NF=96).

Although within some species the chromosomes may be separated into

several groups by length, identification of many chromosomes is not always possible by measurement. Recently, investigators using chromosome banding techniques (PATHAK et al., 1973; ARRIGHI et al., 1976; MURRAY and KITCHIN, 1976; GREENBAUM et al., 1977) have identified the chromosomes individually but have arranged them differently.

We feel that various analyses of the chromosomes of this genus of rodents will be increasingly valuable in studies by systematists, population biologists, ecologists, cytogeneticists, and molecular geneticists. We consider a standardized karyotype for *Peromyscus* essential for comparative purposes and, in this report, propose such a karyotype.

A standardized karyotype for the genus is feasible because G-banded chromosomes of the karyological extremes of the genus, *P. crinitus* and *P. eremicus*, are essentially the same for the euchromatic arms (PATHAK et al., 1973). We who have worked with the chromosomes of *Peromyscus* have agreed on the standard numbering system proposed here for G-banded chromosomes (figs. 1 and 2). The chromosomes are numbered and arranged according to length with the exception of the small biarmed chromosomes 22 and 23, which are placed after the smallest acrocentrics, and the sex chromosomes, which appear separate from the autosomes. The long arms of chromosomes 22 and 23, however, do follow the length convention. This arrangement of chromosomes 22 and 23 was chosen because in many cases, but not all, the short arms of *Peromyscus* chromosomes are composed of constitutive heterochromatin or C-bands (BRADSHAW and HSU, 1972; DUFFEY, 1972; PATHAK et al., 1973; ARRIGHI et al., 1976; MURRAY and KITCHIN, 1976; GREENBAUM et al., 1977). In the construction of the standard karyotype we have used trypsin G-banded chromosomes of *P. boylii glasselli* (figs. 1 and 2). We have compared chromosomes of the following species to the standard: *P. boylii rowleyi*, *P. crinitus*, *P. leucopus noveboracenses*, *P. maniculatus bairdii*, *P. melanotis*, and *P. eremicus*. The euchromatic portions of the genomes of these species appear to contain essentially the same band pattern as the proposed standard. In several, however, the standard pattern has been rearranged by pericentric inversions or minor band deletions.

We have not presented a C-banded karyotype here because it is variable from species to species, but we urge all cytogeneticists who work with *Peromyscus* chromosomes to perform C-banding with their material. Identification of euchromatic and heterochromatic short arms and other patterns of C-band distribution (interstitial, terminal) should be of importance in analyzing phylogenetic relationships.

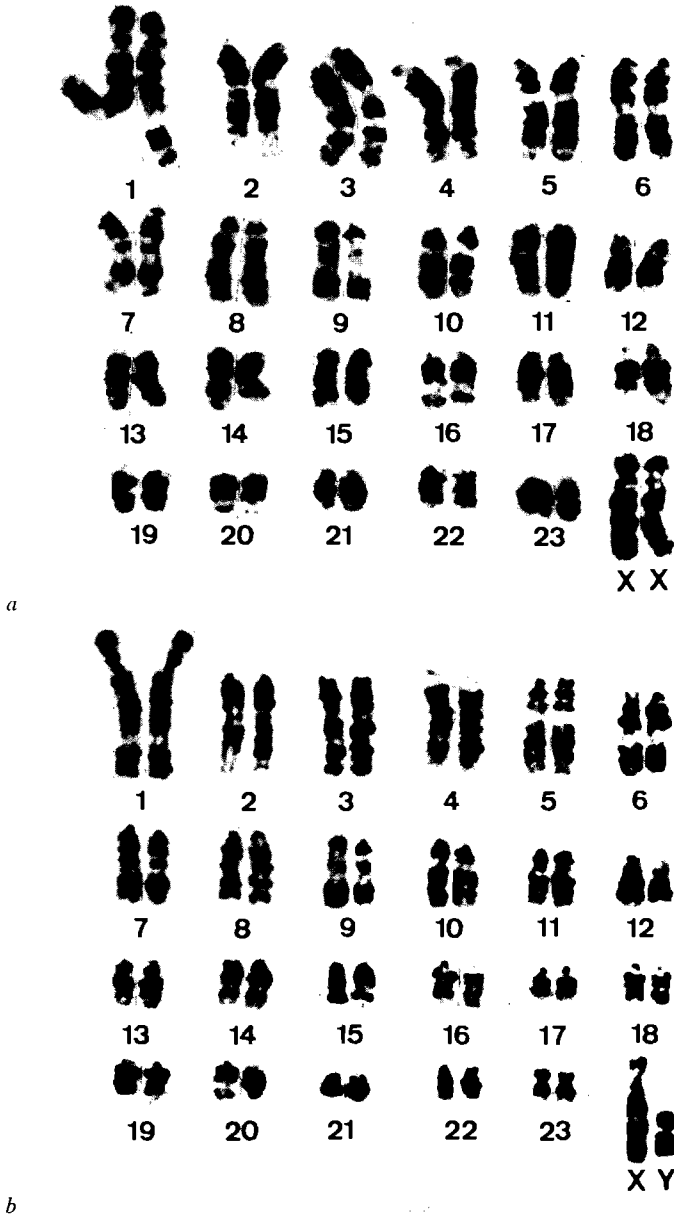


Fig. 1. Trypsin G-banded karyotype of *Peromyscus boylii glasselli*: (a) female; (b) male (prepared by O.G. WARD).

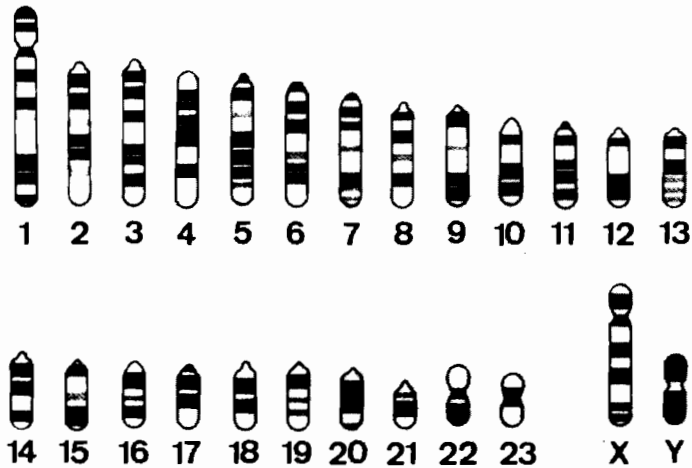


Fig. 2. Idiogram showing major (black) and minor (shaded) trypsin G-bands of *Peromyscus* chromosomes (prepared by O.G. WARD).

We suggest the methods of the PARIS CONFERENCE (1971) be used in describing chromosomal changes in *Peromyscus*. The most frequently reported of these changes to date have been pericentric inversions and added heterochromatic (C-band-positive) short arms. A pericentric inversion in chromosome 9 of the standard would be written $\text{inv } 9(\text{p}+\text{q}-)$. If the resulting short arm were C-band positive, the symbolization could be $\text{inv } 9(\text{p}+\text{q}-)\text{C}+$. A non-inverted *Peromyscus* chromosome 9 with an added C-band-positive short arm would then be designated $9\text{p}+(\text{C}+)$. As the major chromosomal landmarks in *Peromyscus* become more familiar, structurally altered chromosomes may be defined by their band compositions.

Reprints may be obtained from any member of the Committee.

Specimens examined

Specimens of *P. boylii glasselli* examined in this study were trapped live on Isla San Pedro Nolasco in the Gulf of California. Museum study skins with skulls were preserved and are deposited as field numbers

(OGW 15, 16, 54, and 55) in the Mammal Collection, The University of Arizona, Tucson.

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