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BANDED KARYOTYPES OF *PEROMYSCUS SITKENSIS* FROM BARANOF ISLAND, ALASKA

Peromyscus sitkensis is a geographically peripheral taxon of the *P. maniculatus* group occurring on some oceanic islands of the Pacific Northwest (Hooper, 1968). Both the range of *P. sitkensis* and its taxonomic relationship with *P. maniculatus* are uncertain (McCabe and Cowan, 1945; Cowan and Guiguet, 1956; Foster, 1965; Hooper, 1968; Thomas, 1973). We follow Hall (1981) in considering *P. sitkensis* allopatric from *P. maniculatus* and restricted to certain outer islands of the Alexander Archipelago, southeastern Alaska (but also see Thomas, 1973; Honacki et al., 1982). Hsu and Arrighi (1968) and Thomas (1973) published standard (i.e., homogeneously stained) karyotypes of *P. sitkensis*, but based them on *Peromyscus* from island populations in British Columbia. In this note we present G- and C-banded karyotypes of *P. sitkensis* from the type locality of the species—Sitka, Baranof Island, Alaska (Merriam, 1897).

We captured two male and two female *P. sitkensis* in April 1982, approximately 9 km N and 2 km W of Sitka (57°08'N, 135°21'W). G- and C-banded chromosome preparations were made from bone marrow of these specimens by the method of Lee and Elder (1980; and references cited therein). We also destained some trypsin G-banded slides in two rinses of methanol and subsequently stained them for C-bands by modifying the $Ba(OH)_2$ technique of Sumner (1972). This procedure enables unequivocal matching of G- and C-banded chromosomes. Our most satisfactory sequentially banded preparations were done with 2.5% (rather than 5%) $Ba(OH)_2$ and all solutions at 20°C. We used Robbins and Baker (1981) as the primary reference for determining chromosomal homologies with the standardized *Peromyscus* karyotype (Committee, 1977). Voucher study skins and skulls of the specimens are deposited at the University of Alaska Museum (UAM). The specimens are referred to here by their UAM catalog numbers.

A sequentially G- and C-banded karyotype and a directly C-banded karyotype from a female specimen are presented in Figs. 1 and 2, respectively. Partial karyotypes showing polymorphic autosomes and male sex chromosomes are presented in Fig. 3. As in all previously studied *Peromyscus* (Robbins and Baker, 1981), the diploid number was 48. All chromosomes except pairs 4, 6, and 7 were biarmed in all specimens. Chromosome 4 is polymorphic for the presence or absence of short heterochromatic arms (Fig. 3b): UAM 14712 and UAM 14715 were heterozygous at 4, whereas UAM 14714 and UAM 14717 were homozygous for the acrocentric 4. Chromosomes 6 and 7 carry floating pericentric inversions (Fig. 3a): UAM 14712 was homozygous for the biarmed 6 and 7, UAM 14714 was homozygous for the acrocentric 6 and 7, UAM 14715 was homozygous for the acrocentric 6 and heterozygous for the inversion at 7, and UAM 14717 was heterozygous for both pairs. Heterochromatin is restricted to the centromeric region in eleven autosomes (pairs 1, 2, 3, 5, 7, 9, 10, 13, 14, 20, and 23), but in six biarmed autosomes (pairs 8, 12, 15, 16, 17, and 21) heterochromatin constitutes most of one arm. Heterochromatin is also present as an interstitial band in pair 6 (at the center of the arm when acrocentric; Fig. 3a), as telomeric segments in one arm of pairs 11 and 18, and as a paracentromeric segment in one arm of pair 22. One arm of chromosome 19 shows a segmented C-band pattern—there is a large distal heterochromatic segment and, between this and the centromere, a euchromatic segment with a small interstitial heterochromatic band. Additionally, one chromosome of pair 19 in UAM 14712 had a terminal euchromatic segment on the arm described above (Figs. 1, 2).

Chromosomal evolution in *Peromyscus* involves pericentric inversions and heterochromatic additions (Robbins and Baker, 1981). In this context, the karyotypes of *P. sitkensis* differ from the proposed primitive karyotype of the *P. maniculatus* group (Greenbaum and Baker, 1978) by at least seven pericentric inversions (at pairs 5, 10, 11, 13, 14, 18, and 19) and eleven heterochromatic additions (to pairs 6, 8, 11, 12, 15, 16, 17, 18, 19, 21, and 22). The interstitial heterochromatic bands present in pairs 6 and 19 are of interest because, of the 18 other species of *Peromyscus* for which C-band data exist, interstitial heterochromatic bands have been observed only in *P. leucopus* (Robbins and Baker, 1981). The polymorphisms at pairs 4, 6, and 7 also involve rearrangements that are derived relative to the proposed primitive karyotype. As such, the karyotypes of the Baranof Island *P. sitkensis* are more derived than any of those yet described for other populations from the *maniculatus* group (cf., Robbins and Baker, 1981, Fig. 4). The highly derived karyotype of this peripheral isolate is inconsistent with the application by Greenbaum et al. (1978) of the "centrifugal speciation" model (Brown, 1957) to chromosomal evolution in the *maniculatus* complex; the centrifugal model predicts that peripheral isolates will be more primitive than central populations.

Despite the apparently unique karyotypes of the Baranof Island population, we are reluctant to comment on the taxonomic status of *P. sitkensis*. Any conclusions based on karyotypic evidence concerning its status must await additional data on chromosomal variation in *Peromyscus* of the Northwest. The fundamental

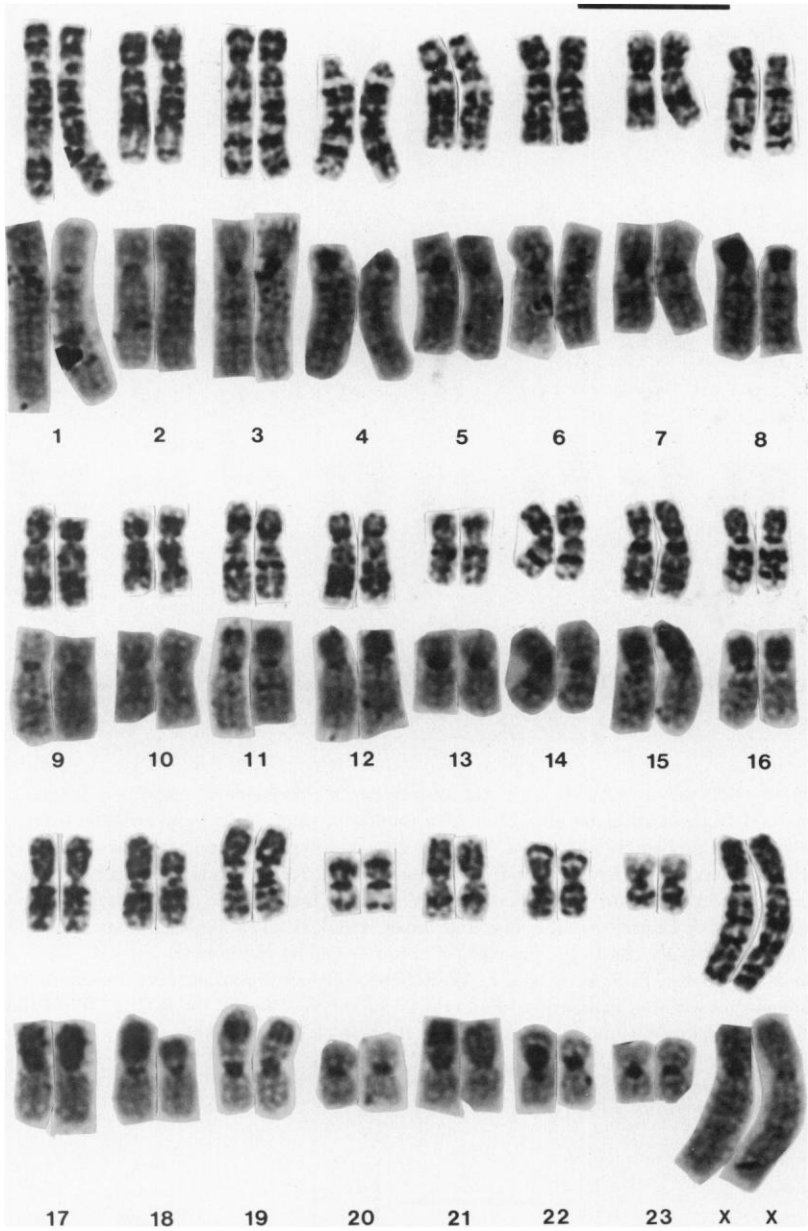

FIG. 1.—Sequentially G- and C-banded karyotype of *Peromyscus sitkensis*, UAM 14712. Upper rows show G-bands, lower rows show C-bands of same chromosomes. Bar equals 10 microns.

numbers of our specimens (86, 88, and 91) equal or exceed those in the standard karyotypes of British Columbia *Peromyscus* assigned to *sitkensis* by Hsu and Arrighi (1968) and Thomas (1973). The variation we report here, however, illustrates the inadequacy of standard karyotypes and fundamental numbers in such comparisons and emphasizes the need for population studies based on G- and C-banded karyotypes.

Some recent models of chromosomal evolution (e.g., Lande, 1979) assume that pericentric inversions have only the effect of negative heterosis. The inversion polymorphisms of two chromosome pairs in this insular

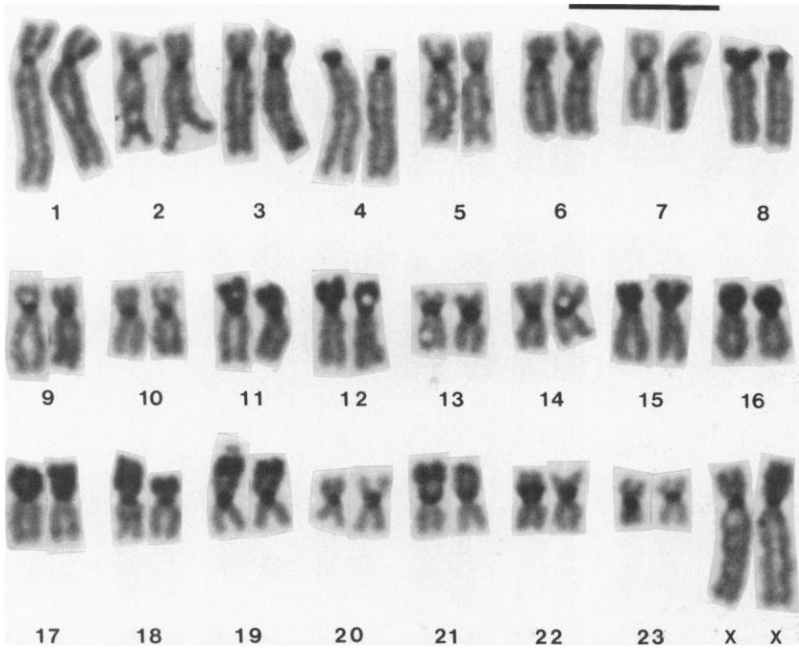

FIG. 2.—Directly C-banded karyotype of *Peromyscus sitkensis*, UAM 14712. Bar equals 10 microns.

population are difficult to reconcile with that assumption; maintenance of negatively heterotic polymorphisms by subdivision of an island population seems unlikely, whereas drift and isolation from immigrants would enhance the probability of fixation. We have also karyotyped single specimens of *Peromyscus* from Admiralty, Coronation, and Kruzof islands in the Alexander Archipelago and found two of these heterozygous for the inversion in pair 7. As pericentric inversions are important in the karyotypic variation among and within species of *Peromyscus* (Robbins and Baker, 1981), detailed analyses of such intrapopulational variation on islands might clarify the processes of chromosomal evolution in the genus.

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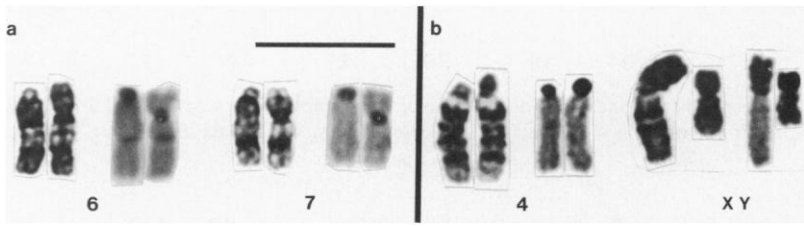

FIG. 3.—G- and C-banded partial karyotypes of: (a) *Peromyscus sitkensis*, UAM 14717, showing heterozygous condition for pericentric inversions in pairs 6 and 7; (b) *P. sitkensis*, UAM 14715, showing heterozygous condition for presence and absence of heterochromatic short arms in pair 4 and sex chromosomes of a male. C-banded chromosomes are to the right of G-banded chromosomes. Bar equals 10 microns.

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KARYOTYPE OF *NELSONIA NEOTOMODON*, WITH NOTES ON THE PRIMITIVE KARYOTYPE OF PEROMYSCINE RODENTS

Nelsonia is a monotypic genus of rodents, distributed sporadically in west-central Mexico at elevations above 1,800 m. Hooper (1954) concluded that *Nelsonia* might be similar to an ancestor of *Neotoma* and later (Hooper, 1960) included *Nelsonia* with *Neotoma* and *Xenomys* in one of his four major divisions of *Neotoma* and allied genera. Hooper and Musser (1964: fig. 4) placed *Nelsonia* at a branchpoint near the base of the peromyscine lineage in their phylogeny of neotomine-peromyscines. Carleton (1980) regarded *Nelsonia* as the most primitive neotomine. Because of its apparent basal cladistic relationship to peromyscines, *Nelsonia* should be an ideal outgroup with which to test hypotheses concerning chromosomal evolution in the lineage.

G-band patterns can be used in phylogenetic reconstruction when primitive and derived chromosomal states can be determined. Chromosomal banding data are available for some species of the peromyscine genera *Baiomys, Neotomodon, Ochrotomys, Onychomys, Peromyscus,* and *Reithrodontomys* (Baker et al., 1979; Baker and Barnett, 1981; Engstrom and Bickham, 1982; Robbins and Baker, 1980, 1981; Yates et al., 1979). Despite considerable variation in numbers of autosomal arms (FN), euchromatic G-band patterns are remarkably conservative among at least some species of each genus except *Ochrotomys* (Engstrom and Bickham, 1982), a genus in which linkage groups apparently have been rearranged extensively. Diploid numbers and G-band patterns also have been altered extensively among several species of *Reithrodontomys* (Robbins and Baker, 1980); however, the G-band pattern of *R. fulvescens* appears largely homologous to