EVOLUTION, SYSTEMATICS, AND HISTORICAL BIOGEOGRAPHY OF KANGAROO MICE, GENUS *MICRODIPODOPS*

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Reprinted from
DISSERTATION ABSTRACTS INTERNATIONAL

Volume 42, Number 7, 1981

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Order No. 8200126

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This study examines the evolution, systematics, and historical biogeography of kangaroo mice, genus *Microdipodops* (Rodentia; Heteromyidae) using a synthetic approach. Four levels of evolution are examined in *Microdipodops* including: (1) genotypic expression as determined by protein analysis; (2) gene packaging as assayed by chromosomal analyses; (3) phenotypic expression as assayed by cranial and external morphometrics; and (4) the phenotype as quantified by pelage colorimetrics. In addition, environmental and climatological parameters for *Microdipodops* localities are analyzed and provide one set of constraints under which evolution at the above levels may accur. Patterns of geographic variation within each of these five data sets are elucidated and such information is used to interpret evolutionary events in relation to the historical biogeography of the group. Although each of the above methodologies applied independently has increased our understanding of evolutionary processes, few systematic studies have utilized more than one approach simultaneously. A synthetic or eclectic approach, one utilizing a variety of methodologies to examine different levels of evolution, should, in theory, permit a more complete determination of the phyletic history of the taxa under study, inasmuch as each level of evolution provides inherently different pieces of historical information.

Several nonparametric methods to quantify the patterns of concordance among the data sets are used to assess phylogenetic and environmental determinants of geographic variation. Patterns of chromosomal and morphometric variation are moderately concordant with the phylogenetic inferences based on biochemical analyses. Further, patterns of colorimetric variation were found to be associated with patterns of environmental variation, and moreover, these two data sets were judged to be discordant with those derived from protein, chromosomal, and morphometric analyses.

Two species are recognized within *Microdipodops: M. megacephalus* and *M. pallidus*. The time since divergence between these species was estimated to be two million years. Within each species, three megasubspecies are recognized. Megasubspecific differentiations appear to have occurred about one million years ago. In the process of detailing major features of evolution in kangaroo mice, I have recognized two new subspecies (one in each species) and have extended the known geographic distribution of the genus to include the state of Idaho.

Evolutionary biogeographic scenarios are presented to explain patterns of *Microdipodops* evolution in a temporal and spacial context. Such evolutionary biogeographical patterns, derived from a synthetic systematic approach, may be used as models for future studies of basin-dwelling animals in the Great Basin.