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LATE PLEISTOCENE MICROTINE RODENTS FROM SNAKE CREEK BURIAL CAVE, WHITE PINE COUNTY, NEVADA

Christopher J. Bell1,2 and Jim I. Mead3

ABSTRACT—A total of 395 microtine rodent specimens recovered from Snake Creek Burial Cave (SCBC) are referred to Microtus sp. and Lemmiscus curtatus. Radiocarbon and Uranium series dates indicate an age for these fossils of between 9460 ± 160 yr B.P. and 15,100 ± 700 yr B.P. The sample of lower first molars of Lemmiscus includes 4-, 5-, and 6-closed triangle morphotypes. Earlier reports of the 4-closed triangle morphotype are from Irvingtonian deposits in Colorado, Nevada, and New Mexico and from early Rancholabrean deposits in Washington. The morphotype is not known in living populations of Lemmiscus. SCBC specimens constitute the youngest record of the 4-closed triangle morphotype and are the only specimens reported from the late Rancholabrean. The time of disappearance of Lemmiscus with this molar morphology is unknown, but populations with this morphotype possibly became extinct at or near the end of the Pleistocene.

Key words: Lemmiscus, Microtus, Pleistocene, extinction.

Terrestrial vertebrate faunas of the Rancholabrean mammal age (late Pleistocene) from the central Great Basin have, for the most part, been discovered via exploration and excavation of cave deposits (Grayson 1993). Many of these localities are from relatively high elevations; fewer low-elevation sites have been discovered and consequently less is known of the Rancholabrean faunal history at lower elevations. Excavations in Snake Creek Burial Cave (SCBC), a natural trap cave from the southern Snake Range in White Pine County, Nevada, resulted in the recovery of an extensive vertebrate fauna consisting of over 30,000 skeletal elements (Mead and Mead 1989). The cave is formed in a small Devonian limestone ridge (separated from the mountains by a broad alluvial fan) at 1731 m elevation and is one of the few lowland sites in the Great Basin that has produced a late Pleistocene fauna.

Preliminary sampling in 1984 from the profile of a trench excavated by cavers produced a small vertebrate assemblage indicative of late Pleistocene age (Mead and Mead 1989). More extensive excavations were undertaken in 1987 when 4 contiguous 1 x 1-m test pits were excavated using arbitrary 10-cm stratigraphic levels to a depth of approximately 1 m below the present surface (2 m below an established datum point in the cave). Fossils recovered from the upper 25 cm (Unit I) are secondarily deposited as a result of digging activities by cavers. A bat guano layer (Unit II = level 3) marks the beginning of undisturbed deposits in the sequence. The highly fossiliferous Unit III (encompassing levels 4–10) produced the majority of vertebrates and is the presumed source of materials recovered from Unit I backdirt. The top of Unit III is radiocarbon dated at 9460 ± 160 yr B.P. (radiocarbon years before 1950; dated material was bat guano), and a Uranium series date on an Equus (horse) phalanx from near the bottom of the excavation gave an age of 15,100 ± 700 yr B.P. (Mead and Mead 1989).

Preliminary discussion of the fauna and more extensive treatments of reptilian and numerous mammalian mustelid carnivore remains were published previously (Mead and Mead 1985, Mead et al., 1989, Mead and Mead 1989). Many additional components of the small mammal fauna are under study now, and our purpose here is to document microtine rodents from the site.

A total of 395 specimens are referred to the 2 microtine rodent genera Microtus (voles) and Lemmiscus (sagebrush voles), both of which have rootless molars with a relatively complex

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occlusal surface. The lower 1st molar (M/1), lower 3rd molar (M/3), and edentulous dentaries of these genera are usually readily identifiable and constitute the basis for this report.

**Descriptive Accounts**

All specimens are curated into the collections of the Laboratory of Quaternary Paleontology, Quaternary Studies Program, Northern Arizona University (NAUQSP). Elements listed below are followed by the specimen number (or range of numbers). Dental terminology follows Repenning (1992).

**Microtus** sp. Schrank, 1798


**Diagnosis.**—Primary wings on the lower 1st molar of Microtus species (in the restricted sense of Repenning 1987, 1992) are well developed and form triangles 4 and 5; secondary wings are usually present. In some extinct early North American representatives of this genus (placed in the species *M. paroperarius*) and the extant *M. oecomonus*, the lingual primary wing (triangle 5) of the lower 1st molar is generally open and broadly confluent with the anterior cap on which only a single secondary wing may be developed (Hibbard 1944, Youngman 1975, Hall 1981). In most other North American species, the lingual primary wing is closed, and development of secondary wings and morphology of the anterior cap are highly variable. For this reason specific identification of isolated teeth of Microtus species is problematic (Zakrzewski 1985). Multivariate statistical methods were shown to be useful in discriminating isolated molars of several species from the southwestern United States (Smartt 1977), but no comprehensive study of this kind that includes all North American species has yet been published. In the absence of such a study, reliable identification of many Microtus species remains impossible. Most of the lower 1st molars from SCBC have 5 closed triangles (Fig. 1A), but 4 individuals have a closed labial secondary wing (triangle 6) as well. Upper 3rd molars of most species have an anterior loop and at least 3 alternating triangles with a posterior portion that varies in complexity; no Microtus specimens show an elongated posterior extension of M3/ as in Lemmiscus. Only 3 closed dentine fields are present on the 3rd lower molars referred to Microtus. Grayson (1983) noted that the position of the mandibular foramen can be used to differentiate edentulous dentaries of Microtus and Lemmiscus. In Microtus this foramen is on or slightly dorsal to the ridge of bone encapsulating the posterior portion of the lower incisor and is clearly visible when the dentary is laid flat on its labial surface. In Lemmiscus the foramen is situated on the anterodorsal portion of this encapsulating ridge and is not distinctly visible in a direct lingual view.

**Lemmiscus curtatus** (Cope, 1868)

**Material.**—Left dentary with I, M/1–2: 7755; left dentary with I, M/1: 7794; left dentary fragment with M/1: 7828; right dentary with M/1: 7741, 7749, 7802, 7830; isolated M/1: 7735–7740, 7742–7748, 7750–7754, 7756–7793, 7795–7801, 7803–7827, 7829, 7831–7836, 7875; isolated M3/: 7895–7932; isolated M3/: 7847–7871; left edentulous dentary: 7940–7982; right edentulous dentary: 7983–8018.

**Diagnosis.**—In living Lemmiscus curtatus the lower 1st molar has a posterior loop and 5 closed, alternating triangles (similar to that in Fig. 1B); a 6th triangle is present and may be broadly confluent with the anterior cap, nearly closed (Fig. 1C) or completely closed. Generally, only the labial secondary wing is well developed, although a weak lingual secondary wing may be developed. In the earliest known populations of Lemmiscus, the lingual primary wing (triangle 5) is widely confluent with the anterior cap (Fig. 1D; see discussion). M3/s assigned to Lemmiscus curtatus have an anterior loop, 2 alternating triangles, and an elongate and uncomplicated posterior loop (Repenning 1992). M3/s referred to Lemmiscus have 4 closed dentine fields. Edentulous dentaries were identified based on the position of the mandibular foramen (see discussion under Microtus, above).
Fig. 1. Occlusal view of left M1 of microtine rodents from Snake Creek Burial Cave: A, Microtus sp. (NAUQSP 7683); B, typical Lemmiscus curtatus morph from SCBC (NAUQSP 7738); C, a 'complex' morph of Lemmiscus curtatus (NAUQSP 7747) in which the 6th triangle is nearly closed; D, 4-closed triangle morph of Lemmiscus curtatus (NAUQSP 7734). Scale bars = 1 mm.

**Discussion**

Today only 2 species of Microtus (M. montanus and M. longicaudus) are found in the central Great Basin, including the area around SCBC (Hall 1946); 2 other species (M. pennsylvanicus and M. richardsoni) presently inhabit regions bordering the Great Basin (Hall 1981). Microtus is reasonably well represented in late Pleistocene faunas of the Great Basin. M. montanus and M. longicaudus are usually reported as questionable identifications (see summary in Heaton 1985), but these reports appear to be based largely upon modern geographic distribution of taxa. Although 3 specimens from the Tule Springs site in southern Nevada were identified as Microtus cf. M. californicus by Mawby (1967), no discussion was provided to indicate how the identification was made, and comparisons with other Microtus species may not have been adequate. A single specimen from Crystal Ball Cave was tentatively identified as M. pennsylvanicus (Heaton 1985). Eleven M2’s (NAUQSP 8075–8085) from SCBC show distinct development of a posterolingual dentine field similar to that seen in living M. pennsylvanicus. Although some authors consider this feature to be unique to M. pennsylvanicus, it is reported to occur at least occasionally in several other species of Microtus (Zakrzewski 1985) and is almost universally present in M. californicus (personal observation). It is not known to occur in Lemmiscus. Until a complete survey of the development of this feature in Microtus species can be completed, we hesitate to refer these specimens to any given species, but note their presence in the fauna so that future considerations of this problem may take them into account. Despite its contributing little else to our knowledge of Microtus in the Great Basin, the material from SCBC does provide further documentation of the presence of this genus at lower elevations during the Pleistocene.

Although Lemmiscus is reported from numerous Pleistocene and Holocene localities outside the Great Basin (FAUNMAP Working Group 1994), surprisingly few reports have been published from within this region, where it is widespread today (Hall 1946). The earliest known occurrence in the Great Basin is in Irvingtonian (early to middle Pleistocene) deposits in Cathedral Cave, located about 40 km north of SCBC (Bell 1995). We identified Lemmiscus molars recovered from excavation backdirt in Smith Creek Cave (northern Snake Range) that is presumably Pleistocene in age (possibly from the reddish brown silt unit; see discussion in Mead et al. 1982). Its occurrence in the late Pleistocene was documented at Crystal Ball Cave in Utah (Heaton 1985) and Owl Cave, Nevada (Turumire 1987); it also is known from Pleistocene-Holocene deposits in Rock Springs Cave (Jefferson et al. 1994) and from several Holocene deposits within the Great Basin (FAUNMAP Working Group 1994).
TABLE 1. Stratigraphic distribution of M/1 of Lemmiscus morphotypes from the 1987 excavations in SCBC. Number of specimens of each morphotype, total number of specimens, and relative percent of 4-closed triangle morphotypes are provided for each stratigraphic level. Only levels excavated in primary deposits are included. 4T = 4-closed triangle morphotype; 5T = 5-closed triangle morphotype; 6T = specimens in which a 6th triangle is well developed but not completely closed.

<table>
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<th>Stratigraphic level</th>
<th># 4T Lemmiscus</th>
<th># 5T Lemmiscus</th>
<th># 6T Lemmiscus</th>
<th>Total # of specimens</th>
<th>% 4T morphotypes</th>
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Most molars assigned to Lemmiscus from SCBC are indistinguishable from those of living L. curtatus, but 4 notable exceptions occur: NAUQSP 7734, 7788, 7806, and 7833 are lower 1st molars in which the lingual primary wing is widely confluent with the anterior cap (Fig. 1D). This relatively primitive morphology is not known to us to occur in living L. curtatus. It is the only morphology present in the SAM Cave fauna in New Mexico, with an estimated age of 875,000 yr. B.P. (Repenning 1992). Both 4- and 5-closed triangle forms are reported from the same stratigraphic levels in the Pit locality in Porcupine Cave, Colorado (a sequence dated to between 365,000 and 478,000 yr. B.P.; Wood and Barnosky 1994, Barnosky et al. 1996), and Cathedral Cave, Nevada, also considered to be Irvingtonian in age (Bell 1995). In the Pit locality the relative abundance of the 4-closed triangle forms decreases in successively younger stratigraphic levels, with a concomitant increase in relative abundance of 5-closed triangle forms (Wood and Barnosky 1994). A similar pattern was documented at the Kennewick Roadcut in Washington, where both 4- and 5-closed triangle specimens were reported (Rensberger et al. 1984, Rensberger and Barnosky 1993), with the primitive morphology found predominantly in the lower part of the section. The age of the Kennewick fauna is not precisely known, but a full review of data pertaining to the age of the Kennewick section was provided by Rensberger and Barnosky (1993), who concluded that the lowermost sections probably do not extend back into the Irvingtonian.

A total of 57 M/1s of Lemmiscus curtatus from the 1987 excavations in SCBC can be reliably placed in the stratigraphic sequence; of these, 3 are 4-closed triangle forms and 4 are relatively complex morphotypes in which the 6th triangle is nearly closed (Fig. 1C). Four-closed triangle specimens are evenly distributed in the middle of the stratigraphic sequence (see Table 1) but are absent from the oldest deposits; this pattern may be a result of low sample size for each stratigraphic level.

The taxonomic status of the 4-closed triangle Lemmiscus is uncertain, and for the present we refer these specimens to Lemmiscus curtatus. Specimens from SCBC represent the youngest known occurrence of this morphology and demonstrate a persistence of this form into the late Rancholabrean. The precise time of disappearance of Lemmiscus with this molar morphology is unknown, but its absence in the living fauna and its presence in SCBC suggest the possibility that populations of Lemmiscus with this morphology went extinct at the end of the Pleistocene, perhaps in response to climatic changes occurring during the glacial-Holocene interglacial transition.

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LITERATURE CITED


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