

## FIRST RECORDS OF DEERMICE (*PEROMYSCUS MANICULATUS*) IN THE COPPER RIVER BASIN, SOUTHCENTRAL ALASKA

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Small mammals of Alaska such as voles, mice, squirrels, shrews, and bats are some of the least known mammals in North America. Until fairly recently most of our knowledge of this fauna, although they represent more than half of the terrestrial species of Alaska, has been based primarily on field surveys conducted during the late 1800s to early 1900s (MacDonald and Cook 2009). For the past 2 decades, we and various collaborators have conducted fieldwork through the University of Alaska Museum of the North (UAM; Fairbanks) and the Museum of Southwestern Biology (MSB; University of

New Mexico, Albuquerque) to rectify this situation (for instance, Cook and others 2004, 2005; MacDonald and Cook 2007).

A recent collecting effort conducted between 28 May and 18 June 2008 involved collaboration between the University of New Mexico (SOM, RAN, YES, GDE, JAC) and the American Museum of Natural History (EW). The primary focus of this effort was elucidation of the zoogeography of mammalian ticks and tick-borne disease. Several sampling sites totaling 464 trap nights of effort were located near the Tiekel River in the Copper River basin of southcentral Alaska (Fig. 1). On 13 June, we captured 4 deermice (genus *Peromyscus*) on 2 traplines set for 1 night with Museum Special snap and pitfall traps. One line was located adjacent to the Richardson Highway near Milepost 51 (UTM: Zone 6, 590727.6 E, 6802508.7 N,



FIGURE 1. Map of the Copper River basin in southcentral Alaska showing the 1st records (star) of *Peromyscus maniculatus* that were captured on 13 June 2008. Other sites in the region previously sampled for small mammals (see Cook and MacDonald 2003), but without success in capturing deer mice, are indicated with closed circles. Inset map outlines the known distribution of *Peromyscus* spp. (shaded in gray) in northwestern Canada (after Banfield 1974; Youngman 1975; Slough and Jung 2007).

NAD27; elevation 386 m) and produced 3 deer mice (MSB 192746-192748), plus 3 Cinereus Shrews (*Sorex cinereus*), 2 Meadow Voles (*Microtus pennsylvanicus*), and 2 Northern Red-backed Voles (*Myodes rutilus*). This line was set through a well-drained meadow of emerging Cow Parsnip (*Heracleum lanatum*) and scattered thickets of High Bush Cranberry (*Viburnum edule*). A 2nd line, set 1.5 km farther south (UTM: Zone 6, 590571.5 E, 6801698.9 N, NAD27; elevation 412 m) along the dry, grassy edge of the cleared easement for the trans-Alaska pipeline, produced a 4th deer mouse (MSB 192749) and an additional Meadow Vole.

Three of the deer mice were infested with the tick *Ixodes angustus*. All 4 deer mice were tested for blood-borne pathogens. Each tested serologically IgG negative for Hantavirus and Powassan Virus, using a strip immunoblot assay for nucleocapsid (Yee and others 2003) and an envelope protein (Ebel and others 2000), respectively. Screening of host ticks tested negative for

Powassan (by PCR; Ebel and others 1999) and the apicomplexan *Babesia microti*. All were adults in breeding condition (Table 1) and, based on external body measurements, were tentatively identified as *Peromyscus maniculatus*, the North American Deermouse.

These specimens represent the 1st documented occurrence of this species in Alaska (with the exception of an introduced population recently discovered on Shemya Island in the far western Aleutian Islands; MacDonald and Cook 2009). The Tielke River specimens would be a significant range extension from native populations of deer mice found at least 400 km to the east in southwestern Yukon Territory (Fig. 1).

These new records raise 2 fundamental questions: 1) are they *P. maniculatus*; and 2) are they of natural occurrence or introduced?

To confirm our field identification of the Tielke River specimens, we used samples of dried muscle tissue to extract and sequence a diagnostic

TABLE 1. Standard measurements, sex, age, and reproductive status of *Peromyscus maniculatus* (n = 4) captured near the Tielkel River in the Copper River basin, southcentral Alaska, 13 June 2008.

MSB catalog number	Total length (mm)	Tail length (mm)	Hind foot length (mm)	Ear length (mm)	Mass (g)	Sex	Age	Reproductive status
192746	152	66	20	17	18.5	male	adult	scrotal testes
192747	158	69	21	17	19.5	male	adult	scrotal testes
192748	146	62	21	17	19.9	female	adult	placental scars
192749	149	65	21	16	16.9	male	adult	scrotal testes

DNA marker. We extracted DNA using a modified salt extraction (Fleming and Cook 2002), and then used the polymerase chain reaction with the primers L14724 (Irwin and others 1991) and CytB Rev (Anderson and Yates 2000) and the following conditions: 40 cycles alternating denaturation at 95°C for 30 s, annealing at 50°C for 25 s, and extension at 72°C for 1 min. We then sequenced this product using BigDye Terminator Cycle Sequencing Ready Reaction mix v. 3.1 (Applied Biosystems) with the amplification primers. We obtained mtDNA cytochrome-*b* sequences (1140 bp) from the 4 Tielkel River samples and the first 570 bp were used in the comparison. These sequences have been deposited in GenBank (FJ415092-FJ415095) and were compared with 6 samples of deermice from the Yukon Territory and British Columbia that were available from GenBank. Two samples

of *P. maniculatus* from Oregon and Idaho also from GenBank were included to represent the *P. maniculatus* group. With *P. leucopus* (from GenBank) serving as an outgroup, a neighbor-joining tree with bootstrap values was created using MEGA 4.0 (Tamura and others 2007). Tamura-Nei (1993) distance was used with the gamma model estimated by the composite likelihood method (Tamura and others 2004) and 1000 replicates to obtain the bootstrap values (Fig. 2).

Taxonomic relationships among *Peromyscus* spp. at the extreme northwestern portion of their ranges have proven problematic. Three discrete mitochondrial lineages (referable to *P. keeni* [Northwestern Deermouse], *P. maniculatus*, and an un-named cryptic lineage) were identified in southwestern Yukon Territory by Wike (1998) and Lucid and Cook (2007). Our limited analysis identified 2 haplotypes in the Tielkel

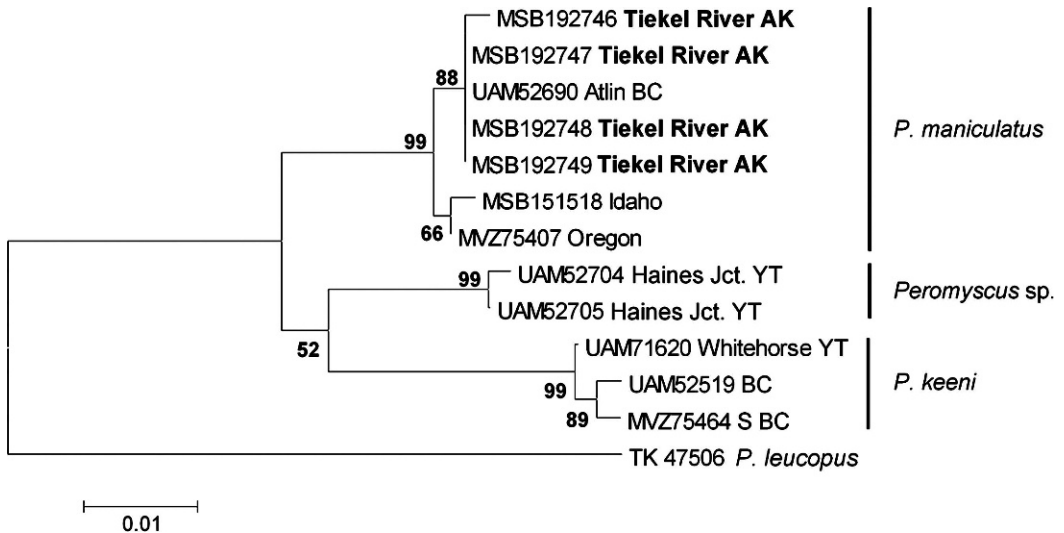


FIGURE 2. Neighbor-joining tree (with support via 1000 bootstrap replicates) used to identify the 4 *Peromyscus* sp. samples from Tielkel River, Alaska. *Peromyscus* sp. samples may represent an undescribed species from the Yukon Territory (Wike 1998; Lucid and Cook 2007). Museum acronyms are as follows: University of Alaska Museum (UAM); Museum of Southwestern Biology, University of New Mexico (MSB); Museum of Vertebrate Zoology, Berkeley (MVZ); and the Museum of Texas Tech University (TK).

River deermice and found these new Alaska specimens tightly aligned with unambiguous *P. maniculatus* sampled from over 600 km to the east near Atlin, British Columbia.

Determining whether this newly discovered population is of natural occurrence or originally transported from elsewhere by human agency presents an added challenge. This remote corner of the state has not been adequately surveyed for its small mammals. To date, limited trapping efforts, totaling over 14,000 trap nights of effort, have been completed in or near the Copper River basin (Fig. 1), but without success in capturing deermice (Laing and Anderson 1929; Cook and MacDonald 2003; McDonough and Rexstad 2005; UAM unpublished). This species is generally numerically dominant in many terrestrial habitats, even at the northwest limit of its range (Krebs and Wingate 1976). Together with the isolated nature of the Copper River basin (some of the world's largest mountains and ice fields surround the relatively young landscapes of this region; Clark and Kautz 1999), the presence of non-*maniculatus* deermice in closest proximity, and this species' proclivity to translocate as stowaways in transport vehicles (similar to House Mice, *Mus domesticus*; Baker 1994) all suggest that the Tielke River deermice were introduced, perhaps during the construction of the trans-Alaska pipeline in the mid-1970s. An expanded survey is needed, however, to more fully delineate the distribution of this newly discovered population and test the relationship of these deermice to other populations. Additional surveys also need to be carried out in a number of key areas along the Alaska/Yukon border where naturally occurring populations may already extend into the state.

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