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Occurrences of Small Mammal Species in a Mixedgrass Prairie in Northwestern North Dakota,

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NOTES

OCCURRENCES OF SMALL MAMMAL SPECIES IN A MIXED-GRASS PRAIRIE IN NORTHWESTERN NORTH DAKOTA -- Documentation is limited for many species of vertebrates in the northern Great Plains, particularly northwestern North Dakota (Bailey 1926, Hall 1981). Here we report relative abundances of small (< 450 g) species of mammals that were captured incidental to surveys of amphibians and reptiles at Lostwood National Wildlife Refuge (LNWR) in northwestern North Dakota from 1985 to 1987 and 1999 to 2000. Our records include a modest range extension for one species. We also comment on relationships of small mammals on the refuge to vegetation changes associated with fire and grazing disturbances.

LNWR encompassed 109 km^2 of rolling to hilly moraine in Burke and Mountrail counties, North Dakota (48°37'N; 102°27'W). The area was mostly a native needlegrass-wheatgrass prairie (*Stipa-Agropyron*; Coupland 1950) interspersed with numerous wetlands ($\bar{x}$ = 40 basins/km^2) and patches of quaking aspen trees (*Populus tremuloides*; $\bar{x}$ = 0.4 ha/patch and 4.8 patches/km^2; 1985 data in Murphy 1993:23), with a semi-arid climate. Broad ecological changes associated with fossil fuel development seemed imminent at LNWR, including threats to class I air quality on the refuge's 2257 ha Wilderness Area, yet the area lacked basic inventories for most vertebrate fauna (Murphy et al. 2006). Therefore, amphibians and reptiles were surveyed via pitfall traps and funnel traps set along drift fences (Murphy et al. 2006). In spring 1985, five trapping sites were established in representative mesic prairie communities, 0.8 to 1.4 km apart across the center of LNWR. Each site included two 30-m arrays of drift fences that were parallel to and between borders of nearby (2 to 25 m away) xeric prairie and a seasonal or semipermanent wetland. Each array consisted of partly buried, 0.6-m tall aluminum flashing with a 0.3 x 0.3 x 0.8-m long, 0.6-cm mesh funnel trap in the center and a total of eight 20-liter pitfall traps with funnel rims (modification of Fig. 17b in Vogt and Hine [1982]).

Arrays of drift fence were checked every 2 to 3 days from mid-May through early-July. We maintained 3 to 6 cm of water in pitfall traps because we anticipated mostly captures of amphibians and sought to release these (Murphy et al. 2006). Indeed, few amphibians were killed (R. Murphy, unpublished data), but many small mammals were captured in pitfall traps and drowned despite availability of small slabs of wood placed in bottoms of traps. We acknowledge that drowning in pitfall traps is no longer considered an acceptable means of kill-trapping small mammals (American Society of Mammalogists 1998), but felt it important to convey the findings regardless. We suggest in future studies that pitfall traps are checked

more often (e.g., twice daily), although most shrews captured likely still will die. Live mammals, mostly ground squirrels (*Spermophilus* spp.) in funnel traps, were released uphill from fences. Nearly all remaining mammals were salvaged, identified by using standard keys (Wiehe 1978, Junge and Hoffman 1981), and were deposited in natural history collections at the University of North Dakota and North Dakota State University. For each species of small mammal and year, we calculated relative abundance as the mean number of captures/100 drift fence days, where one drift fence day represented 15 m of a drift fence array open for 24 hr (Vogt and Hine 1982; n = 1000 drift fence days per year for 1985 to 1987 and n = 900 and 860 drift fence days for 1999 and 2000, respectively). Annual abundances for each of the 1985 to 1987 and the 1999 to 2000 sampling periods were then averaged.

Fourteen species of small mammals were captured. Species and mean capture rates for the two sampling periods were: Arctic shrew (*Sorex arcticus*), 3.4 and 0.8; cinereus shrew (*Sorex cinereus*), 6.5 and 14.4; American pygmy shrew (*Sorex hoyi*), 0.5 and 1.9; short-tailed shrew (*Blarina brevicauda*), 0.1 and < 0.1; southern red-backed vole (*Myodes gapperi*), 0.4 and 0; meadow vole (*Microtus pennsylvanicus*), 10.0 and 7.7; North American deermouse (*Peromyscus maniculatus*), 1.1 and 0.9; western harvest mouse (*Reithrodontomys megalotis*), 0 and < 0.1; jumping mouse (*Zapus* spp.), 16.1 and 10.3 (71.0% of *Zapus* spp. captured were identified to species level and of these, 91.9% were the western jumping mouse [*Z. princeps*] and 8.1% were the meadow jumping mouse [*Z. hudsonius*]); Franklin's ground squirrel (*Spermophilus franklinii*), 0.2 and 0.2; thirteen-lined ground squirrel (*S. tridecemlineatus*), 0.4 and 0.1; Richardson's ground squirrel (*S. richardsonii*), < 0.1 and 0; and least weasel (*Mustela nivalis*), 0.1 and 0.

The community of small mammals in mixed-grass prairie at LNWR was characterized mainly by species that typically associate with relatively dense plant cover, such as the cinereus shrew, meadow vole, and western jumping mouse (Jones et al. 1983). These three species were common during both sampling periods, although the abundance of the cinereus shrew increased and the abundance of western jumping mouse decreased in the second period. The southern red-backed vole and northern short-tailed shrew were uncommon to rare, likely related to their affinities for wooded habitats or adjacent areas (Higgins et al. 2000). The North American deermouse was uncommon, perhaps because the species prefers relatively drier, more open grassland than the mesic prairie sampled in our study (Jones et al. 1983, Higgins et al. 2000). Indeed, the North American deermouse and meadow vole were about equally represented in 1,800 snap-trap nights on xeric prairie at LNWR in 1987 (2.3 and 2.6 captures/100 trap nights, respectively; J. Albertson and U.S. Fish and Wildlife Service, Kenmare, North Dakota, unpublished data). The single western harvest mouse captured in 1999 represents a roughly 50-km range extension north of the previously published distribution (Hall 1981:638, Jones et al. 1983:189). We did not detect the northern grasshopper mouse (*Onychomys leucogaster*) and olive-backed pocket mouse

(*Perognathus fasciatus*) even though these were documented, albeit rarely, as prey in nests of great horned owl (*Bubo virginianus*) in the area (Murphy 1997).

Ground squirrels captured included thirteen-lined, Franklin's, and Richardson's. Previously, the westernmost record for Franklin's ground squirrel was the Des Lacs River Valley, 27 km east of LNWR (Bailey 1926:56, Hall 1981:398, Jones et al. 1983:135). A single Richardson's ground squirrel was captured, which suggested the species currently is rare at LNWR. This colonial ground squirrel typically occupies relatively open and heavily-grazed grasslands with well-drained soils suitable for burrowing (Higgins et al. 2000). Historically, Richardson's ground squirrel was conspicuously abundant and widespread in the northern Great Plains (Jones et al. 1983). The species was common at LNWR when the refuge was established in the 1930's, but in recent decades has only been observed in heavily-grazed, privately-owned prairie on the refuge periphery (Murphy 1993:35).

A prescribed fire-grazing regime was implemented widely at LNWR from the late 1980's through mid-1990's, between our 1985 to 1987 and 1999 to 2000 sampling periods. This regime was characterized by a renovation phase of three prescribed fires in alternating years then a longer term, maintenance phase of three consecutive years of rotation grazing during summer (stocking rates 0.6-1.2 ha/AUM) and a fire frequency of 5 to 7 years. This regime altered mesic prairie at LNWR mainly by reducing vegetation height, accumulated plant litter, and coverage of woody vegetation, while increasing grass cover (Madden et al. 1999, Danley et al. 2004). However, abundances of small mammals in mesic, mixed-grass prairie throughout the center of LNWR did not seem to change markedly between sampling periods, except for that of the cinereus shrew and western jumping mouse.

R. Danley, A. Fossum Coveny , and P. Knupp Moore helped monitor drift fences. W. Bleier, N. Kadrmas, and R. Seabloom verified many specimen identifications, and we consulted R. Wrigley on the distinguishing features of Zapodidae. K. Geluso, D. Kaufman, R. Seabloom, and two anonymous reviewers provided helpful comments on drafts of the manuscript.--*Robert K. Murphy[1], Richard A. Sweitzer, and Joy D. Albertson[2]. United States Fish and Wildlife Service, 8315 Hwy 8, Kenmare, ND 58746 (RKM); Department of Biology, University of North Dakota, Grand Forks, ND 58202 (RAS); and Department of Zoology, North Dakota State University, Fargo, ND 58105 (JDA). [1]Corresponding author. Current address: Department of Biology, University of Nebraska at Kearney, Kearney, NE 68849. E-mail address: murphyrk@unk.edu [2]Current address: United States Fish and Wildlife Service, P. O. Box 524, Newark, CA 94560.*

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Editor's note: Neither the associate editor, editor, nor The Prairie Naturalist *advocates or condones the method of trapping for this study. We accepted the manuscript because the study followed a historic trapping method, the captures were incidental to trapping for other taxa, and the information is valuable to science. We encourage readers to visit the website of the American Society of Mammalogists under the Animal Use and Care Committee to see current methods of trapping small mammals. -- Elmer J. Finck and Brock R. McMillan*