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Observations on Small Mammals Recovered from Owl Pellets from Nebraska

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ABSTRACT -- Mammalian remains from owl pellet material collected in 24 Nebraska counties were examined. A total of 1262 individual mammals was identified from all owl pellet material and included 19 identifiable species and 21 total genera. The most commonly consumed prey by owls across the state were *Microtus* (41% of identifiable prey material), followed by *Peromyscus* (18%), and *Reithrodontomys* (11%). Significant locality information for the northern grasshopper mouse (*Onychomys leucogaster*), the southern bog lemming (*Synaptomys cooperi*), and the meadow vole (*Microtus pennsylvanicus*) are reported.

Key words: *Microtus*, Nebraska, *Onychomys*, owl pellets, *Peromyscus*, *Synaptomys*.

Owl pellet analysis serves two primary purposes. Foremost, pellet analysis serves as a nondestructive means of diet determination. Diet information obtained can include prey species eaten (e.g., Jones 1949, Jones 1952, Reed 1957, Rickart 1972, Marti 1973, Czaplewski 1976, Epperson 1976, Dinsmore and Clark 1991), preferences of prey species (e.g., Marti 1974, Hedrick et al. 1989, Gubanyi et al. 1992), and estimates of contributions of prey biomass (Zimmerman et al. 1996). Owl pellet analysis also is a useful method for gaining additional insight into small mammal communities and distributions (Fichter 1941, Long and Kerfoot 1963, Choate 1971, Rickart 1972). Occasionally, known distributional limits of small mammals can be altered on the basis of identifiable material found in owl pellets. For example, Rickart (1972) found remains of the northern pocket gopher (*Thomomys talpoides*) in great horned owl (*Bubo virginianus*) pellets at Crescent Lake National Wildlife Refuge in Garden County, Nebraska, which extended the range of this species some 64 km northeast.

Previously published reports on small mammal content from owl pellets collected in Nebraska provided data from 17 Nebraska counties distributed across the state (Fichter 1941, Jones 1949, Jones 1952, Rickart 1972, Czaplewski 1976, Epperson 1976, Gubanyi et al. 1992). Those earlier Nebraska studies documented mammalian

prey of great horned owl and barn owl (*Tyto alba*) only. We report owl pellet data from 24 counties, including 15 counties from which no previous data have been reported. We also document mammalian prey of long-eared owl (*Asio otus*) and short-eared owl (*A. flammeus*) in Nebraska, in addition to both great horned owl and barn owl.

METHODS

The University of Nebraska State Museum (UNSM) accumulated owl pellets and owl pellet debris (loose material, consisting almost solely of bones) from 24 Nebraska counties from 1980 to 1998. Additional pellet material, already in the possession of UNSM, was collected from Lancaster County, Nebraska in 1968. Pellet material came from great horned owl, long-eared owl, short-eared owl, and barn owl. Mammalian remains from owl pellets and owl pellet debris were identified primarily on the basis of cranial and dentary bones. Most material at UNSM was in the form of owl pellet debris that could be examined for cranial and dentary bones without any prior preparation. Before owl pellets were examined, they were soaked in water and teased apart with a forceps to separate hair from bones. Identification of bones was made by comparison to reference materials from UNSM and through published illustrations and skull and tooth descriptions (Banfield 1974, Schwartz and Schwartz 1981, Hoffmeister 1989, Fitzgerald et al. 1994, Verts and Carraway 1998). No attempt was made to separate species of the genera *Perognathus*, *Reithrodontomys*, or *Peromyscus* because complete skulls were never obtained, and we did not feel confident making species identifications based on partial skulls from members of those genera.

Cranial and dentary bones were tabulated for each species and genus, and the minimum number of individuals (MNI) necessary to account for the bones present was recorded. In owl pellet debris the number of dentary bones often far exceeded the number of cranial bones and, in those cases, MNI was based on dentary bones. In the case of *Microtus*, species identifications were made if maxillary bones and associated molars were present and MNI for prairie vole (*M. ochrogaster*) and meadow vole (*M. pennsylvanicus*) was therefore based on the presence of said material. The MNI reported for the genus *Microtus* was based on both cranial and dentary bones.

RESULTS

A total of 1262 individual mammals was identified from all owl pellet material. Mammalian prey in the diet of Nebraska owls comprised 19 identifiable species and 21 genera (Table 1). *Microtus* was the most commonly recovered prey in barn owl, long-eared owl, and short-eared owl pellets (Table 1). It also was the most commonly encountered genus in pellet material from unknown owl species (Table 1). In great horned owl pellets, *Peromyscus* was the most frequently recovered prey (Table 1).

Three species were recovered from owl pellet material found outside geographic

Table 1. Minimum number of individuals (MNI) of prey items found in owl pellet material collected in Nebraska from four owl species and from unknown owl sources.

Prey Items	Great horned owl (n = 109)	Barn owl (n = 235)	Long- eared owl (n = 89)	Short- eared owl (n = 16)	Unknown owl source (n = 813)
<i>Sorex cinereus</i>				1	
<i>Cryptotis parva</i>	2				
<i>Blarina brevicauda</i>	1	1	2		
<i>Blarina hylophaga</i>					10
<i>Scalopus aquaticus</i>	3				6
<i>Sylvilagus</i> spp.	10				16
<i>Lepus</i> spp.	1				1
<i>Sciurus niger</i>					2
<i>Cynomys ludovicianus</i>					1
<i>Geomys bursarius</i>	4	3			26
<i>Chaetodipus hispidus</i>	4	23			50
<i>Perognathus</i> spp.		30	1		3
<i>Dipodomys ordii</i>	12	25			61
<i>Reithrodontomys</i> spp.	17	28	23	4	68
<i>Peromyscus</i> spp.	38	38	4	4	148
<i>Onychomys leucogaster</i>	9	17			28
<i>Neotoma floridana</i>					6
<i>Neotoma cinerea</i>					1
<i>Synaptomys cooperi</i>		1			
<i>Microtus ochrogaster</i>	2	62	11	1	264
<i>Microtus pennsylvanicus</i>	2	2	25	5	26
<i>Microtus</i> spp.	1	5	22	1	92
<i>Ondatra zibethicus</i>					1
<i>Mus musculus</i>	1		1		1
<i>Rattus norvegicus</i>	2				2

ranges reported by Jones (1964) and further corroborate the range extensions reported by Benedict et al. (2000). Five northern grasshopper mice (*Onychomys leucogaster*) were found in owl pellet debris from two localities within Nemaha County in southeastern Nebraska (T5N, R15E, NE 1/4 Sec. 5 and T6N, R15E, NE 1/4 Sec. 33). One southern bog lemming (*Synaptomys cooperi*) was found in owl pellet debris from Lincoln County in south-central Nebraska (T11N, R26W, NE 1/4 Sec. 18). Finally, the remains of six meadow voles (*Microtus pennsylvanicus*) were recovered from Chase County (T5N, R37W, NE 1/4 Sec. 9), Clay County (T8N, R7E, N1/2 Sec. 31), and Dundy County (T2N, R39W, SE 1/4 Sec. 31) in southern Nebraska (Appendix 1).

Meadow voles also were recovered from owl pellet material collected in the most northwestern counties of the state, a geographic area in which they largely have been undocumented (see Jones 1964, Hall 1981, Jones et al. 1983, Freeman et al. 1993, and subsequent discussion). Remains of meadow voles were collected from owl pellet debris at the following localities: one from Box Butte County (city of Alliance cemetery), 22 from Sheridan County (Smith Lake Wildlife Management Area, approximately 21.5 mi S of Rushville), and three from Sioux County (T24N, R55W, Sec.12) (Appendix 1).

DISCUSSION

The high prevalence of *Microtus* in owl pellets has been reported in previous Nebraska studies (Jones 1949, Jones 1952, Rickart 1972, Gubanyi et al. 1992), as well as studies from Iowa (Weller et al. 1963), Kansas (Hedrick et al. 1989), South Dakota (Martin 1971), and Colorado (Reed 1957, Marti 1973, Shuster 1974). The prevalence of *Microtus* in owl pellets does not appear dependent on owl species because it occurs in great horned owls (Jones 1952, Rickart 1972, Shuster 1974), long-eared owls (Weller et al. 1963), short-eared owls (Weller et al. 1963), and barn owls (Reed 1957, Rickart 1972, Gubanyi et al. 1992). Our results generally conform to previously reported trends, except in the case of the great horned owl, where *Peromyscus* was the most commonly recovered prey. Other studies also have reported *Peromyscus* as the most frequently recovered prey (Jones 1949, Czaplewski 1976, Zimmerman et al. 1996), and the prevalence of either *Microtus* or *Peromyscus* in owl pellets likely is determined by local abundance of these two common rodent taxa.

The northern grasshopper mouse has not been recorded from Nemaha County prior to the results we report here. Our findings further corroborate the range expansion of this species reported by Benedict et al. (2000); they reported the species from Cass County, Otoe County, and Richardson County. Now a total of four counties (Cass, Nemaha, Otoe, and Richardson) in southeastern Nebraska that border the Missouri River have documented records of the northern grasshopper mouse.

Benedict et al. (2000) reported the southern bog lemming from two localities in Lincoln County, just west of the range of this species in Nebraska, as reported by Jones (1964). We add one additional locality of this species in east-central Lincoln County.

The presence of the southern bog lemming is unpredictable in Nebraska, even within its expected range. We encourage other researchers to report any new records of this species in Nebraska, in order to add to our limited knowledge of the habits of this species in Nebraska.

The geographic range of the meadow vole in Nebraska as depicted by Jones (1964), showed an absence of the species from the southern portions of the state, but also from the northwestern corner of the state. Our results add one additional county (Chase) to the list of counties now known to be occupied by the meadow vole in Nebraska and further confirm its presence in two other counties reported by Benedict et al. (2000), who described the southern expansion of the meadow vole in Nebraska in detail. Our data provide additional supporting material for this expansion. In contrast, the occurrence of the meadow vole in the northwestern corner of Nebraska has been assumed (Hall 1981, Jones et al. 1983), but only tangentially documented (Freeman et al. 1993). Jones (1964) showed the meadow vole as absent in the southern 75% of Sioux County, all of Dawes, Box Butte, and Sheridan counties, and the northern 25% of both Garden and Morrill counties. Jones (1964) cited a written record from near the turn of the century for the basis of the occurrence of the meadow vole in the northern 25% of Sioux County. In regard to that record Jones (1964) stated, "Considerable field work has been done in northern Sioux County since [Merritt] Cary's visit to the area in 1901, but only *M. ochrogaster* has been taken, and the small colony of *pennsylvanicus* found by Cary may have been extirpated since then." Hall (1981) showed the distribution of the meadow vole in Nebraska as statewide, but cited marginal records from Jones (1964) to make this claim. Jones et al. (1983) subsequently showed the species as occurring throughout the entire northern portions of the state, but provided no specific locality data to accompany the distribution map. Freeman et al. (1993) provided the first documented records of the meadow vole in northwestern Nebraska in recent time. They stated that meadow voles were captured in a wet meadow at Rush Creek, in Sheridan County, in June 1989, while surveying for Merriam's shrew (*Sorex merriami*) (Freeman et al. 1993). Now we have documented the occurrence of the meadow vole in Box Butte, Sheridan, and Sioux counties from owl pellet material (Appendix 1). We also documented the occurrence of 18 meadow voles from Garden County (Appendix 1), but the locality of this material (3.4 mi S and 1 mi W of Oshkosh) falls within the range of the meadow vole in Garden County as depicted by Jones (1964). However, based on the data already presented we have documented that the meadow vole is found throughout the entire northwestern corner of Nebraska. Additional materials (skin, skull, and alcohol specimens) housed at UNSM further confirm the presence of the meadow vole in the northwestern corner of the state (Appendix 2).

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Appendix 2. Specimens of *Microtus pennsylvanicus* (skin, skull, and alcohol) at the University of Nebraska State Museum, Division of Zoology, that confirm the presence of this species in the northwestern corner of Nebraska.

Specimens examined (82).--Dawes County: T30N, R48W, Sec. 28, Pepper Creek Outdoor Learning Center, 33 (UNSM 23282-08, 2310-2312, 23318, 24782-83); T29N, R49W, N 1/2 Sec. 23, below dam, Box Butte Reservoir, 3 (UNSM 23313-15); T31N, R50W, W 1/2 Sec. 28, East Ash Creek, 1 (UNSM 24780); T31N, R51W, SE 1/4 Sec. 25, West Ash Creek Campground, 1 (UNSM 24781). Sheridan County: T25N, R45W, NE 1/4 Sec. 4, 5 (UNSM 23377-81); 2.5 mi S Rushville, T31N, R44W, SE 1/4 Sec. 10, Dyke Ranch, 6 (UNSM 23382-85, 24797-98); 11.5 mi N, 1 mi W Hay Springs, T33N, R46W, SW 1/4 Sec. 11, Metcalf Wildlife Management Area, 4 (UNSM 23386-89); 10.5 mi N Hay Springs, T33N, R46W, SE 1/4 Sec. 13, Metcalf Wildlife Management Area, 11 (UNSM 23390-00); T25N, R45W, Sec. 4 NE 1/4, 1 (UNSM 23401). Sioux County*: 3/4 mi N, 8 mi W Crawford, Nebraska National Forest, Soldier Creek Management Unit, 10 (UNSM 17303-04, 17590-91, 17593-95, 17597-99); 5 1/2 mi N, 3/4 mi W Harrison, 1 (UNSM 17102); 1 1/2 mi N, 7 3/4 mi W Crawford, Fort Robinson Wildlife Area, 1 (UNSM 17589); 1/2 mi N, 7 3/4 W Crawford, Fort Robinson Wildlife Area, 1 (UNSM 17596); 10 mi N, 5 mi W Harrison, T33N, R57W, SW 1/4 Sec. 13, Faint Ranch, 3 (UNSM 23402-04); T32N, R56W, NW 1/4 Sec. 8, 1 (UNSM 24834).

* All records from Sioux County occur in the northern 25% of the state, within the range originally proposed by Jones (1964) on the basis of a turn-of-the-century written record.