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Source: The Southwestern Naturalist, 54(1):87-90. 2009.

Published By: Southwestern Association of Naturalists

DOI: <http://dx.doi.org/10.1894/MH-28.1>

URL: <http://www.bioone.org/doi/full/10.1894/MH-28.1>

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RODENTS NEW TO THE DIET OF THE WESTERN BURROWING OWL  
(*ATHENE CUNICULARIA HYPUGAEA*)

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ABSTRACT—The northern pygmy mouse (*Baiomys taylori*), fulvous harvest mouse (*Reithrodontomys fulvescens*), and Merriam's pocket mouse (*Perognathus merriami*) are new to the diet of the western burrowing owl (*Athene cunicularia hypugaea*). All three species were identified from remains in regurgitated pellets collected from roost sites of burrowing owls in southern Texas over a period of 4 winters. Together, northern pygmy mice and fulvous harvest mice represented 58% of mammals identified in 182 pellets regurgitated by western burrowing owls. Merriam's pocket mouse accounted for only 4% of identified mammalian prey. Frequency of occurrence in pellets was 16% for northern pygmy mice, 11% for fulvous harvest mice, and 3% for Merriam's pocket mice. The primary reason for absence of these species in previous studies of foods of western burrowing owls is that most were conducted in latitudes north of these southern-distributed species of mammals.

RESUMEN—El ratón enano norteno (*Baiomys taylori*), el ratón de cosecha (*Reithrodontomys fulvescens*), y el ratón de abazones de Merriam (*Perognathus merriami*) son especies nuevas en la dieta del tecolote llanero (*Athene cunicularia hypugaea*). Las tres especies se identificaron a través del análisis de regurgitados alimenticios colectados de dormitorios del tecolote llanero en el sur de Texas durante un período de cuatro inviernos. Juntos, los ratones enano y de cosecha representaron el 58% de todos los mamíferos identificados en 182 regurgitados alimenticios del tecolote llanero. El ratón de abazones de Merriam representó solamente el 4% de las presas que fueron identificadas. La frecuencia de ocurrencia en los regurgitados alimenticios fue de 16% para el ratón enano norteno, 11% para el ratón de cosecha, y 3% para el ratón de abazones Merriam. La razón principal por la ausencia de estas tres especies en estudios anteriores del alimento del tecolote llanero es que la mayoría se realizó en latitudes al norte de la distribución de estas especies sureñas de mamíferos.

The western burrowing owl (*Athene cunicularia hypugaea*) is widespread throughout much of the western United States, south-central Canada, and northern Mexico. Northern populations of the western burrowing owl are migratory and winter in southern Texas and Mexico (Rappole and Blacklock, 1985; Haug et al., 1993). The burrow-

ing owl is an opportunistic predator that consumes a wide range of invertebrate and vertebrate prey, including a variety of rodents from the families Muridae and Heteromyidae (Haug et al., 1993). Murids that have been recorded as prey of the western burrowing owl include North American deermice and cactus

TABLE 1—Number and frequency of occurrence (%) of mammalian species identified from pellets ( $n = 182$ ) regurgitated by western burrowing owls (*Athene cunicularia hypugaea*) collected in southern Texas during winter 1999–2004. Frequency of occurrence was determined by dividing number of pellets containing a given prey type by total number of pellets dissected.

Species	Number of individuals	Frequency of occurrence (%)
<i>Baiomys taylori</i>	38	16
<i>Reithrodontomys fulvescens</i>	31	11
<i>Peromyscus</i>	16	7
<i>Cryptotis parva</i>	15	6
<i>Mus musculus</i>	13	6
<i>Perognathus merriami</i>	5	3
<i>Sigmodon hispidus</i>	2	1

deermice (*Peromyscus maniculatus* and *P. eremicus*), house mice (*Mus musculus*), voles (*Microtus* and *Lagurus*), hispid cotton rats (*Sigmodon hispidus*), grasshopper mice (*Onychomys*), and harvest mice (*Reithrodontomys*; Thomsen, 1971; Marti, 1974; Conroy and Chesemore, 1987; Green et al., 1993; Rodríguez-Estrella, 1997). Heteromyids consumed by burrowing owls include kangaroo rats (*Dipodomys*) and pocket mice (*Chaetodipus* and *Perognathus*; Jaksić and Marti, 1981). Here we report identification of remains of the northern pygmy mouse (*Baiomys taylori*), fulvous harvest mouse (*Reithrodontomys fulvescens*), and Merriam's pocket mouse (*Perognathus merriami*) as prey of the western burrowing owl. None of these species had been identified as prey until the winter diet of burrowing owls in southern Texas was examined (Littles et al., 2007).

Regurgitated pellets ( $n = 182$ ) of western burrowing owls were collected from roost sites in southern Texas over 4 winters (1999–2000 and 2001–2004) to determine composition of diet in winter. Six species of rodents and one species of shrew were identified from the pellets (Table 1). The two most abundant species in pellets were the northern pygmy mouse and the fulvous harvest mouse, of which we identified 38 and 31 individuals, respectively. Combined, the number of these two species represented 58% of all mammals that we identified. These species also showed the greatest frequencies of occurrence in pellets (Table 1). Merriam's pocket mouse was a smaller component of the diet, representing only 4% of identified mammals and occurring in 3% of pellets.

We were unable to locate a documented occurrence of any of these three species as prey of western burrowing owls, aside from our study of winter foods (Littles et al., 2007). While extensive literature exists on diet and foraging ecology of western burrowing owls (Haug et al., 1993; Clark et al., 1997), nearly all studies have been conducted north of the known ranges of these three species. Although several studies were conducted within the ranges of these small mammals, not all rodents were identified to species (Best, 1969; Rodríguez-Estrella, 1997; Valdez Gómez, 2003).

The northern pygmy mouse is restricted largely to southern and coastal Texas and Mexico (Eshelman and Cameron, 1987; Jones and Jones, 1992). Pygmy mice often are consumed by barn owls (*Tyto alba*) in Texas and Oklahoma (Baker, 1991; Kittredge et al., 2006; McDonald et al., 2006) and by great horned owls (*Bubo virginianus*) in southwestern Oklahoma (Kittredge et al., 2006; McDonald et al., 2006). In our study, pygmy mice occurred most frequently in pellets of burrowing owls from agricultural areas. The northern pygmy mouse may be especially vulnerable to predation by burrowing owls in farmlands, because fields in southern Texas are plowed in autumn after crops are harvested and sporadically thereafter throughout winter, which could force pygmy mice to disperse into other areas during winter (Olson et al., 2001). Other studies have shown that harvesting and plowing increase predation by owls on rodents (de Villanfañe et al., 1988; Bellocq, 1997).

The fulvous harvest mouse, widespread across Louisiana, most of Arkansas, most of Oklahoma (except for the northwestern panhandle), much of Texas, and most of Mexico (Spencer and Cameron, 1982; Stangl et al., 1992), is the only species of *Reithrodontomys* in southern Texas (Schmidly, 2004). Fulvous harvest mice, as with northern pygmy mice, are important prey in the diet of barn owls in Texas (Baker, 1991) and Oklahoma (Kittredge et al., 2006; McDonald et al., 2006). Harvest mice have been identified previously in the diet of burrowing owls, but most studies did not identify remains to species (Errington and Bennett, 1935; Marti, 1974; Lohofener and Lohofener, 1982; Tyler, 1983; Valdez Gómez, 2003), probably because some species are difficult to differentiate (McDonald et al., 2006).

Merriam's pocket mouse is distributed throughout much of western and southern Texas,

southeastern New Mexico, extreme southwestern Oklahoma, and northeastern Mexico (Best and Skupski, 1994). Absence of Merriam's pocket mouse in other studies of diet of burrowing owls is explained partly by its geographical range. Butts (1973) conducted his study in the Oklahoma Panhandle outside the range of Merriam's pocket mouse, and Tyler (1968) did not recover the remains of pocket mice. Best (1969) and Tyler (1983) identified remains of pocket mice but did not identify them to species.

In our study, Merriam's pocket mice were a minor component of diet of burrowing owls, but pocket mice often are important prey for burrowing owls. Behavior of pocket mice in winter may have influenced their low occurrence in our study. Merriam's pocket mouse is less active in winter and rarely is trapped then (Chapman and Packard, 1974; Ruthven et al., 2003). In contrast, Valdez Gómez (2003) noted that the silky pocket mouse (*P. flavus*) was the second most important vertebrate prey of burrowing owls in winter in central Mexico; however, the climate in Guanajuato is tropical, with few periods of cold weather, which may allow this species to be active most of the year.

The northern limit of the range of the northern pygmy mouse was restricted to southern and southeastern Texas in the 1950s (Nowak, 1999), but since the 1980s, this species has extended its range into northern and western Texas, including the southern Panhandle (Choate et al., 1990), southern Oklahoma (Stangl et al., 1992; Stuart and Scott, 1992; McDonald et al., 2006), and New Mexico (Tumlison et al., 1993). New distributional records have been recorded also for the fulvous harvest mouse in northern Texas (Goetze et al., 1995; Smith et al., 1998) and western Oklahoma (Wallace and Stangl, 2003; Braun and Revelez, 2005; McDonald et al., 2006).

Additional studies in the southern portions of the range (i.e., southwestern United States and Mexico) of the western burrowing owl likely will reveal a greater use of northern pygmy mice and fulvous harvest mice as prey than has been documented previously. This includes those locations (New Mexico, northern Texas, and Oklahoma Panhandle) where intensive investigations of burrowing owls (Best, 1969; Butts, 1973; Ross, 1974; Tyler, 1983) have been conducted prior to recent northern range expansions of small mammals. We suggest also that regurgitated pellets at roost sites of burrowing owls and barn owls in the

anticipated zones of continued range extensions be collected and assessed. Owl pellets are an excellent way of sampling small mammals that are difficult to trap (Smith, 1993; Torres et al., 2004) and are useful for documenting range extensions of small mammals.

Thanks are extended to C. Littles, J. Keppers, R. Batey, E. McCarthy, K. Miller, K. Landaberde Brink, and B. Chen for assistance in the field and in the laboratory. J. Brown provided access to local museum specimens. We are grateful for helpful comments from two anonymous reviewers of the manuscript. The Spanish translation of the abstract was provided by M. Mora and E. Valdez.

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Submitted 2 October 2006. Accepted 19 May 2008.

Associate Editor was Michael S. Husak.