

# BURROWING OWLS WINTERING IN THE OKLAHOMA PANHANDLE

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I conducted approximately 15 months of intensive research on the biology of western Burrowing Owls (*Speotyto cunicularia hypugaea*) in 1970-71 in the Oklahoma Panhandle, where Burrowing Owl populations were concentrated in black-tailed prairie dog (*Cynomys ludovicianus*) colonies or prairie dog towns. One objective of my study was to determine the wintering status of Burrowing Owls that summer in the Panhandle.

The study area encompassed 5114 sq km in Beaver and eastern Texas Counties, Oklahoma, or approximately the eastern third of the Oklahoma Panhandle, including part of the High Plains, breaks in the plains, erosional uplands, valleys, and sand dunes (U.S. Dept. Agr. 1962). Approximately 50 to 60% of the area is cultivated, and the remainder is used primarily for cattle grazing. The locality is mesothermal and semi-arid, with summer temperatures often in the 90's and occasionally exceeding 100°F. Occasional subzero winter temperatures, often combined with the usually brisk wind, sometimes lower the wind-chill index to -30 to -40°F. Average annual precipitation is 49 cm, and mean annual snowfall is 43 cm (U.S. Dept. Commerce 1969). Severe blizzard conditions occur regularly, particularly in January and February.

## METHODS

Burrowing Owls wintering in prairie dog towns of the study area were censused 11 to 16 February and 3 March 1971. All prairie dog towns except four, which contained 28 adult owls the previous June, were censused when temperatures were higher than 50°F and wind velocities less than 10 mph. Wintering owls were also searched for in the vicinities of five of the six nest burrows found outside prairie dog towns in 1970. Increases in owl numbers in 11 prairie dog towns were monitored during March 1971 (Table 1). Approximate dates could thus be determined for the initial appearance of Burrowing Owls in spring.

I tried to catch and band Burrowing Owls that were wintering in the study area to ascertain if they were permanent residents or migrants. Catching methods were by hand, after excavating burrows in which owls had found shelter or sought escape, and with weakened and padded size-0 steel traps (jaws wrapped with foam rubber). The steel traps were concealed around the entrance to burrows showing signs of frequent owl use. Owls were marked with USFWS metal leg bands and colored plastic leg bands.

During February and early March 1971, 19 burrows were excavated in six prairie dog towns to search for inactive owls and to collect data on burrows used by wintering owls. Indicators of recent owl use, including owl feathers, droppings, or

TABLE 1  
 APPARENT CHANGES IN BURROWING OWL NUMBERS IN 11 PRAIRIE DOG  
 TOWNS, OKLAHOMA PANHANDLE, MARCH 1971

Dog town	No. over-wintering	Number of owls seen on dates in March											
		8	9	10	11	12	15	16	23	24	25	26	29
A	1	-	0	-	2	-	3	5	-	4	-	7	12
B	1	1	1	-	4	5	5	-	8	-	-	-	15
C	1	-	-	2	-	-	2	-	-	2	-	-	-
D	1	-	0	-	5	-	-	5	-	-	-	-	-
E	1	-	1	2	6	-	-	10	-	-	-	-	-
F	1	-	-	-	-	-	-	8	-	5	-	-	-
G	0	0	-	-	-	0	-	-	-	-	20+	-	-
H	0	0	-	-	-	1	-	-	5	-	-	6	-
I	0	1	-	-	-	0	-	-	5	-	-	-	-
J	0	-	-	-	0	-	-	-	-	-	-	0	-
K	0	-	-	-	1	-	-	0	-	-	-	-	3
TOTALS													
Towns													
checked	11	4	4	2	6	4	4	4	3	3	1	3	3
Owls seen	6	2	2	4	18	6	18	20	18	11	20+	13	30

pellets, were at the entrances of all 19 burrows. These burrows represented approximately 75% of those evidently being used by wintering owls.

#### RESULTS AND DISCUSSION

*Winter populations.*—The Burrowing Owl population wintering in the approximately 688 ha of prairie dog towns in the study area in 1970–71 apparently consisted of six birds. This was less than 1% of the owl population inhabiting those same prairie dog towns in late July 1970, or less than 0.5% of the summer owl population in the entire study area. No Burrowing Owls were known to winter outside prairie dog towns, but I made no systematic search for wintering owls beyond the vicinities of nest burrows occupied the previous summer.

Personnel of the Oklahoma Cooperative Wildlife Research Unit have conducted winter surveys of Burrowing Owl populations in prairie dog towns of the Oklahoma Panhandle and adjacent areas since completion of my studies and have also found a small number of owls. A survey of Burrowing Owl populations in 396 ha of prairie dog towns in early January 1972 in Beaver and Texas Counties, including most prairie dog towns where owls wintered the previous winter, revealed two and possibly three wintering owls (Lewis pers. comm.). An estimated six owls wintered in 327 ha of prairie dog towns in Dallam County, Texas (approximately 100 miles southwest of my study area) in 1972–73. This was 2.7% of the estimated Burrowing Owl population there in late July 1972 (Lewis pers. comm.).

*Burrow characteristics.*—In winter Burrowing Owls used burrows that varied in structure. The ends of burrows were from 23 to 132 cm below the ground surface, and 14 of 19 were 90 cm or less deep. Ten of the 19 tunnels were less than 213 cm long, but one continued an unknown distance past 460 cm. Only four tunnels contained turns sharper than 90 degrees. One burrow contained a nest in 1970. Tunnels were 10 to 23 cm high, averaging 14 cm, and were 10 to 20 cm wide, averaging 13 cm. Characteristics of four burrows used by Burrowing Owls in the winter of 1971–72 in the Oklahoma Panhandle were very similar to those I excavated (Lewis pers. comm.).

Active prairie dog burrows were not excavated to determine if burrows used by Burrowing Owls, either for nesting or winter shelter, were typical prairie dog burrows. Most burrows I excavated were shallower and less extensive than those credited to prairie dogs by other biologists (Wilcomb 1954, Henderson et al. 1969, Sheets and Linder 1969), but Smith (1967) indicated that prairie dog burrows vary widely, depending on soil types, moisture, and other factors.

Signs of occupancy by Burrowing Owls (pellets, droppings, prey remains) were found within 17 of the 19 burrows excavated. This material was in the first 122 cm of the tunnels, with most concentrated in the first 75 cm.

Temperatures within burrows were not thoroughly investigated in this study. My limited observations and Wilcomb's (1954) studies indicate that in Oklahoma, where the frost line usually is shallow, temperatures in prairie dog burrows at least 150 cm from the burrow mouth and under the frost line probably seldom fall below 40°F.

*Food storage and consumption within burrows.*—Agersborg (1885) found large food caches, one consisting of 43 dead mice and several "shore" [= horned] larks, in burrows occupied by Burrowing Owls in winter in southeastern South Dakota. I found no evidence that Burrowing Owls hoarded large amounts of food in caches in Oklahoma during winter, nor did winter excavation of four owl burrows in the Oklahoma Panhandle in 1971–72 reveal such caches (Lewis pers. comm.).

In three instances I found a dead rodent in the first 45 to 60 cm of burrows used by wintering Burrowing Owls. Two rodents, a plains harvest mouse (*Reithrodontomys montanus*) and a hispid cotton rat (*Sigmodon hispidus*), were each being eaten by an owl when the owls were flushed from their burrows in late evening before dark. A plains harvest mouse was found at 0930 in a burrow from which an owl was flushed. All three rodents were cold but undeteriorated. Burrows containing the harvest mice were excavated, one immediately following discovery of the mouse and the other 4 days later. Neither contained other food items.

Rodent remains found in burrows represented food items captured recently by Burrowing Owls and apparently were not part of a larger cache. The presence of bird remains, blood, and insect fragments in winter burrows was additional evidence that owls sometimes consumed prey in the shelter of burrows.

*Hibernation, torpor, or simple fasting.*—I did not determine conclusively if Burrowing Owls overwintering in my study area ever hibernated or entered a torpid state. One Burrowing Owl I excavated from a burrow during cold weather (28°F, wind 15 mph) on 20 February 1971 was quite inactive and docile, much more so than other owls similarly handled including two that were excavated during comparable weather conditions. This lethargic state was particularly interesting because a blizzard struck the area the night of 20 February, depositing drifts 3 to 6 m deep.

Literature sources do not describe any state of torpor or hibernation for Burrowing Owls, although Agersborg (1885) indicated that they remain underground for several days during winter. J. D. Ligon (1968: 24) described comatose behavior for female Elf Owls (*Micrathene whitneyi*) removed from their nest cavities soon after they had started incubating. This behavior was not a torpid state, but was in response to the invader. Screech Owls (*Otus asio*) removed from Wood Duck (*Aix sponsa*) nest boxes in winter in northern Alabama are sometimes very lethargic, but physiological torpidity has not been verified (Atkinson pers. comm.). J. D. Ligon (1969) failed to induce physiological manifestations of torpor in Whiskered Owls (*Otus trichopsis*), Elf Owls, or Screech Owls when he deprived them of food for 3 to 4 days at ambient temperatures of 44 to 59°F.

Burrowing Owls may be capable of fasting for several days in winter. Heavy snow and ice cover during the blizzard in February 1971 made it very unlikely that owls could have escaped their burrows for at least 3 days. Yet an owl burrow excavated only hours before onset of the blizzard contained no food cache. The small owls deprived of food in J. D. Ligon's (1969) study remained healthy in spite of 16 to 24% losses in body weight.

*Migration.*—Field observations indicated that most Burrowing Owls in my study area were migratory. The owl population increased from 6 on 3 March to an estimated 527 during early June 1971. The tremendous increase in numbers of Burrowing Owls seen locally during March and early April probably indicated the return of owls that wintered elsewhere, presumably to the southward.

The sporadic nature of increases in Burrowing Owl numbers in various prairie dog towns (Table 1), some still without owls on 26 March, also probably indicated migratory movements. If all owls present in spring

had overwintered, they presumably would have become active at approximately the same time and many more than six would have been seen during winter.

Excavation of approximately 75% of the burrows showing evidence of use by wintering Burrowing Owls yielded only three owls. In addition, the mild weather conditions during most of the winter census, mentioned previously, increased the likelihood that other owls would have been observed if they had overwintered. J. S. Ligon (1961) and Ross and Smith (1970) also found more Burrowing Owls above ground in winter as the temperature increased.

The most tangible proof of migration was a band recovery. A female Burrowing Owl banded as a nesting adult in Beaver County, Oklahoma, on 26 June 1970 was shot by a hunter near Zapotlanejo, Jalisco, Mexico, 1 November 1971.

Results of my winter banding efforts indicated that the small wintering population of Burrowing Owls were permanent residents and not migrants from more northern areas. All three banded owls that definitely overwintered and two owls banded 10 March 1971, and thus possibly winter residents, remained to breed and nest in the same prairie dog towns where they were banded. This situation contrasts with that in the Imperial Valley of southern California where Coulombe (1971) assumes at least a part of the wintering Burrowing Owl population consists of migrants.

In summary, only a few Burrowing Owls are permanent residents in the Oklahoma Panhandle; most migrate. This conclusion is supported by other biologists including Lewis (pers. comm.), Sutton (pers. comm.), and Tyler (1968).

A recent comprehensive study by Martin (1973) involving banded individuals in a small population of Burrowing Owls in central New Mexico revealed several striking similarities in the wintering status of Burrowing Owls in our respective study areas. Most of the summering owl population apparently migrated from the area before winter with only 1 to 3% remaining, the few wintering owls were not migrants from other areas, and owl numbers increased tremendously in March, from 2 to 17 between 15–21 March (Martin 1973). Martin's findings cast doubt on the validity of J. S. Ligon's (1961) belief that Burrowing Owls in northeastern New Mexico are permanent residents. Data from other areas adjacent to the Oklahoma Panhandle, including the Texas Panhandle (Ross and Smith 1970) and Colorado (Bailey and Niedrach 1965), indicate that most of the summer populations of Burrowing Owls migrate although a few linger through the winter.

The wintering status of Burrowing Owls nesting in the Dakotas may also, at least in times past, have included both permanent residents and

migratory individuals. Eleven Burrowing Owls banded in the Dakotas in June and July, 1931 through 1936, were recovered in central Texas and adjacent parts of Oklahoma and Arkansas between 15 October and 3 April (Brenckle 1936, Cooke 1941). Three Burrowing Owls banded in the summer in Manitoba and the Dakotas were recovered in Nebraska and Kansas in late September and early October, presumably enroute to wintering grounds farther south (Brenckle 1936, Cooke 1941). Agersborg (1885) found as many as 20 Burrowing Owls in one burrow during winter in southeastern South Dakota, which he believed were permanent residents that foraged when weather conditions were favorable and retreated into burrows stocked with food during severe weather.

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#### SUMMARY

Apparently only six Burrowing Owls wintered in prairie dog towns of the eastern Oklahoma Panhandle (5114 sq km) in 1970-71, or approximately 1% of the population there in late July 1970. Owl populations increased very sharply but sporadically during March. No evidence of extensive winter food caches was found. Although no evidence suggested that wintering owls ever entered a state of hibernation or torpor, they may have fasted for at least 3 days during blizzard conditions without suffering mortality.

Most of the Burrowing Owls breeding in the study area migrated. At least one went as far as west-central Mexico. Results of the limited winter banding studies indicated that the small population of wintering owls were permanent residents rather than migrants from the north.

#### LITERATURE CITED

- AGERSBORG, G. S. 1885. The birds of southeastern Dakota. *Auk* 2: 276-289.
- BAILEY, A. M., AND R. J. NIEDRACH. 1965. *Birds of Colorado*. Denver, Denver Mus. Nat. Hist.
- BRENCKLE, J. F. 1936. The migration of the western Burrowing Owl. *Bird-Banding* 7: 166-168.

- COOKE, M. T. 1941. Returns from banded birds: recoveries of some banded birds of prey. *Bird-Banding* 12: 150-160.
- COULOMBE, H. N. 1971. Behavior and population ecology of the Burrowing Owl, *Speotyto cunicularia*, in the Imperial Valley of California. *Condor* 73: 162-176.
- HENDERSON, F. R., P. F. SPRINGER, AND R. ADRIAN. 1969. The black-footed ferret in South Dakota. Pierre, South Dakota Dept. Game, Fish, and Parks.
- LIGON, J. D. 1968. The biology of the Elf Owl (*Micrathene whitneyi*). *Misc. Publ. Mus. Zool., Univ. Michigan* 136: 24.
- LIGON, J. D. 1969. Some aspects of temperature relations in small owls. *Auk* 86: 458-472.
- LIGON, J. S. 1961. New Mexico birds and where to find them. Albuquerque, Univ. New Mexico Press.
- MARTIN, D. J. 1973. Selected aspects of Burrowing Owl ecology and behavior. *Condor* 75: 446-456.
- ROSS, P. V., AND D. J. SMITH. 1970. Notes on the ecology of the Burrowing Owl, *Speotyto cunicularia*, in the Texas High Plains. *Texas J. Sci.* 21: 479-480.
- SHEETS, R. G., AND R. L. LINDER. 1969. Food habits of the black-footed ferret (*Mustela nigripes*) in South Dakota. *Proc. South Dakota Acad. Sci.* 48: 58-61.
- SMITH, R. E. 1967. Natural history of the prairie dog in Kansas. *Misc. Publ.* 16, Univ. Kansas Mus. Nat. Hist., State Biol. Survey.
- TYLER, J. D. 1968. Distribution and vertebrate associates of the black-tailed prairie dog in Oklahoma. Unpublished Ph.D. dissertation, Norman, Univ. Oklahoma.
- U.S. DEPARTMENT OF AGRICULTURE. 1962. Soil survey of Beaver County, Oklahoma. Washington, D.C., Ser. 1959, No. 11.
- U.S. DEPARTMENT OF COMMERCE. 1969. Climatological data. Washington, D.C. U.S. Environ. Sci. Serv. Admin.
- WILCOMB, W. J., JR. 1954. A study of prairie dog burrow systems and the ecology of their Arthropod inhabitants in central Oklahoma. Unpublished Ph.D. dissertation, Norman, Univ. Oklahoma.

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