Technical Report No. 27

SOME COMPARISONS OF FEEDING ECOLOGY OF FOUR SPECIES OF OWLS IN NORTH-CENTRAL COLORADO

Carl D. Marti

Colorado State University

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INTRODUCTION

Four species of owls, great horned (*Bubo virginianus*), long-eared (*Asio otus*), burrowing (*Speotyto cunicularia*), and barn (*Tyto alba*), were selected for a study of feeding ecology. These species were chosen because it was believed data adequate to determine feeding ecology could be collected for each of them in north-central Colorado. These species occupy the secondary consumer level in the food chain, consuming a wide variety of vertebrate and invertebrate prey.

Few studies have been attempted relating to owl food habits in this area, and none was a long-term study. Reed (1957) examined barn owl pellets from Larimer County, and Hamilton (1941) and Kelso (1938) made observations on the food habits of burrowing owls in Denver. Catlett, Beidleman, and Esch (1958) studied long-eared owl foods from near Boulder. Long and Kerfoot (1963) gave a brief listing of great horned owl foods from central-eastern Wyoming.

Great horned and burrowing owls appear to be the two most abundant owl species of the predominantly shortgrass areas east of the Rocky Mountain foothills in north-central Colorado. Great horned owls are permanent residents, finding a wide variety of suitable nest and roost sites ranging from rock cliffs to quite small groups of trees. Burrowing owls are migratory, spending about six months in northern Colorado. They arrive from the south beginning in mid-April and return south by mid- to late October. Abandoned mammal burrows, chiefly those of black-tailed prairie dogs (*Cynomys ludovicianus*), are sought for nesting by burrowing owls. Barn owls are less common and more local in distribution. Some may move south in winter but some remain through the year. Barn owls prefer rock cliffs or banks of ditches for nesting and roosting.

Long-eared owls are uncommon and appear to drift, being here one year and gone the next. They are attracted to low, dense coniferous or deciduous trees for nesting and roosting. This species tends to nest and roost communally. It is not uncommon to find winter roosts with six to 12 birds.

In order to determine differences and similarities which might contribute to competition for food or reduce this competition, a number of aspects will be examined. These aspects will be in the areas of physiology, morphology, and behavior. The basis for many of these comparisons will be food habits data derived from pellet analysis.

STUDY AREA

Field work was concentrated along the eastern one-fifth of Larimer County from the Buckeye-Livermore area 20 miles north of Fort Collins to a point approximately seven miles south of Fort Collins and on the Pawnee National Grassland in western Weld County. Elevation in these areas ranges from 4,800 to 6,400 ft above sea level.

Soils, climate, and vegetation are covered in other areas of this report.

OBJECTIVES

Primary objectives of this study are:

1. To analyze and compare the food habits of each owl species.
    a. Frequency of occurrence of prey species in diets.
    b. Biomass contributed to diet by each prey species.
    c. Description of the pellets and rate of production.
2. To determine behavioral differences in feeding ecology.
    a. Time of activity.
    b. Describe the hunting methods.
    c. Analyze the striking methods.
    d. Determine if territoriality exists.

3. Determine morphological differences in feeding ecology.
    a. Compare the owl body weight to prey size.
    b. Compare the owl wing loading to prey size.
    c. Measure talon size and strength.
    d. Examine for sound-muffling feather features.
4. Determine physiological differences on feeding ecology.
    a. Measure ability to see in low light.
    b. Test ability to locate prey by hearing.
    c. Measure metabolic rates.

PROCEDURES

Objective 1

Analysis and prey identification. Pellets are collected at nests and roosts only where the species of the owl can be determined. These collections are made at five 10-day intervals as long as each site remains active. Each collection is analyzed separately.

Width and length of whole pellets are measured and a sample of 50 from each owl species is air-dried and weighed. Volume is to be taken from this sample in 1969 by water displacement.

Each whole pellet is broken apart separately by hand, and remains that can be identified are separated and recorded. Broken pellets from each collection are massed and handled in the same manner. Skulls and dentaries of mammals are retained, and skulls, feet, synsacrums, sternums, and feathers of birds are saved for identification. Insect remains useful for identification are heads, jaw parts, legs, and wing covers.

Identification of remains is accomplished with the aid of reference collections and keys.

Enumeration of prey. Totals of each taxon that prey is identified to are taken separately for each collection sample. At first, all skeletal remains of small mammals were retained for enumeration. However, large numbers of long bones and dentaries never indicate larger numbers than the skulls do. Hence, skulls only are counted for small mammals. Since small prey usually are swallowed entirely whole, except in the burrowing owl, this method should provide an accurate count of their numbers. In order to determine more accurately what portion of individual prey occurred in a pellet, a sample of 50 weighed pellets is used. All characteristic bones from these pellets are separated and counted for each prey species to find the exact number or what parts of individuals are represented in the pellet.

Different problems are encountered with larger prey. Animals too large for a single meal are common only in great horned owl foods. The majority of these prey are adult cottontails (*Sylvilagus* spp.). Several alternatives are possible with large prey: (1) the owl may kill a large prey individual, eat its fill and leave the remainder, never to return; (2) a pair of owls may feed from the same kill and not return to finish it; (3) one or a pair of owls may return to a kill and finish it; or (4) large prey may be brought to the young in the nest and be completely consumed. It is evident, then, that remains of one large prey individual may be contained in one to several pellets. In order to avoid overestimating the number of these species, all skull, leg and pelvic girdle bones in each collection sample are separated, and the individuals represented are pieced together. This method probably will show slightly less than the actual number of individual prey in the case of adult owls for the first two reasons listed above, but should be quite accurate for pellets of young collected at nests. The same technique is used with modification for the

other three owls. Only small numbers of prey, however, are too large for a single meal in the other three. Almost all cottontails from their pellets are small, juvenile individuals.

Skulls, lower jaws, legs and feet, sternums, synsacrums, and feathers of birds are grouped and pieced together to estimate the number of individuals.

It was found that whole heads of most insects and jaws of grasshoppers and crickets are the best remains for counting. Wing covers and legs may be missing or too fragmented for accurate use in determining numbers of prey.

Uncommon prey (snakes, fish, crayfish, and spiders) are tabulated by assembling the available remains. Seldom is more than one individual in these categories represented in a particular sample.

When all the separate collections from one site are analyzed and tabulated, they are summed to give a collection site total. All the collection site totals then are combined for a total owl species prey list.

Estimating biomass. Average weights of prey species were estimated from specimens in Colorado State University collections, other locally-collected specimens and the literature. From these and the numbers of prey in the owl diets, total biomass and the proportion represented by each prey species can be estimated.

Captive owls of each of the four species were fed measured amounts of food and the amount eaten daily recorded. These tests were carried out in six four-week periods over the course of one year. The birds were caged outdoors during this time, and average daily temperatures (taken at two-hour intervals by the CSU Department of Atmospheric Science) were computed to compare with the daily food intake. Rate of pellet production and daily pellet weight also were noted in these tests.

Objective 2

Evaluating behavior. Several methods were used to determine the activity patterns of the owls. Field observations from blinds or with the aid of a spotting scope were made to discover the time activity began. Event recorders were installed at nests to monitor time activity began and ended and the peaks of activity. Captive owls will be placed in metabolic chambers for 24-hour periods to determine when the peak of metabolic activity controlled by internal clock mechanisms occurs.

Hunting methods will be determined by field observation and from the literature.

Laboratory analysis by flash photography is planned to describe the striking methods of each owl.

Tape recordings of owl calls are used to elicit territorial calling in resident birds. Observations are made on the diurnal activities of burrowing owl to evaluate their territorial behavior.

Objective 3

Evaluating morphology. Three owl morphological characters will be related to prey. Body size and wing loading will be compared to prey size. Talon size and strength will be measured.

Objective 4

Evaluating physiology. Captive owls will be tested in a darkened room to determine the lowest intensity of light under which they can locate dead prey by sight. The captive also will be tested in a light tight room under total darkness to determine whether they can locate live prey by hearing.

Metabolism and caloric requirements will be measured and estimated from basal metabolic rates and the information derived from contents of pellets of wild owls and feeding tests on captives.

PROGRESS TO DATE

Results presented here will be limited to those of direct interest to the Grassland Biome research. They are food habits, biomass of prey and food consumption rates of the owls.

Pellets have been collected for three years, resulting in a total collection of approximately 8,100 pellets (1,500 for 1967; 3,800 for 1968; and 2,800 for 1969). Identified from this material were nearly 15,000 individual prey. Average weights of prey species were estimated (Table 1) and used to calculate the biomass each species contributes to each owl's diet. Complete prey lists and prey biomass data are given in Tables 2 and 3 (burrowing owl pellets for 1969 have not been analyzed yet).

Six food-intake pellet formation test periods have been completed with the captive owls. These tests each lasted four weeks and were separated by four-week intervals. The results are summarized in Table 4.

FUTURE PLANS

A number of statistical tests are planned to determine significance of the prey differences. Tests to be made include comparing each owl's total prey list with the other owls', comparing the three years' prey lists with each other for each owl, and comparing different collection sites with each other, both inter- and intraspecifically. A correlation also will be run between the daily average temperatures and daily food intake from the captive bird studies.

Metabolic rates will be taken and will be available for caloric estimation.

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Table 1. Weights of prey species.

Species	Number Records	Average Weight (grams)	Source
MAMMALS			
Cryptotis parva	3	5	CSU*
Cynomys ludovicianus	?	1,200	Burt and Grossenheider, 1964
Dipodomys ordii	129	68	Desha, 1967; CSU*
Geomys bursarius	5	200	CSU*
Lepus spp.			
(adult)	15	2,800	Seidensticker, 1968; CSU*
(immature)		1,400	CSU*
Marmota flaviventris	?	3,000	Burt and Grossenheider, 1964
Microtus ochrogaster	50	40	CSU*
Microtus pennsylvanicus	50	45	CSU*
Mus musculus	15	18	CSU*
Mustela frenata	8	178	CSU*
Myotis spp.	2	8	CSU*
Neotoma spp.	15	217	CSU*
Ondatra zibethicus	10	700	CSU*
Onychomys leucogaster	38	38	CSU*
Perognathus hispidus	4	39	CSU*
Perognathus (smaller spp.)	13	8	CSU*
Peromyscus spp.	50	21	CSU*
Rattus norvegicus	14	221	CSU*
Reithrodontomys spp.	41	12	CSU*
Sylvilagus spp.			
(adult)	193	1,000	Seidensticker, 1968; Craighead and Craighead, 1956; CSU*
(immature)		400	CSU*
Thomomys talpoides	649	132	Hansen, 1960
Zapus princeps	9	25	CSU*
BIRDS			
Agelaius phoeniceus	15	55	R. A. Ryder IBP data, unpublished
Anas carolinensis	198	312	Kortright, 1943
Asio otus	3	245	Craighead and Craighead, 1956
Aythya americana	46	1,247	Kortright, 1943
Calamospiza melanocorys	16	33	R. A. Ryder IBP data, unpublished
Colaptes cafer	4	145	R. A. Ryder IBP data, unpublished
Corvus brachyrhynchos	3	461	CSU*
Eremophila alpestris	79	31	R. A. Ryder IBP data, unpublished
Phasianus colchicus	135	1,133	Craighead and Craighead, 1956
Rallia curucoides	2	45	R. A. Ryder IBP data, unpublished
Sturnella neglecta	25	94	R. A. Ryder IBP data, unpublished
Medium passerine	38	100	R. A. Ryder IBP data, unpublished
Small passerine	132	30	R. A. Ryder IBP data, unpublished

Table 1. (Continued)

Species	Number Records	Average Weight (grams)	Source
INSECTS			
Carabidae	19	0.23	Locally collected insects
Cicindelidae		0.3	Locally collected insects
Curculionidae		0.1	Locally collected insects
Diptera	4	0.25	Locally collected insects
Formicidae		0.001	Locally collected insects
Gryllidae	11	0.4	Locally collected insects
Locustidae	10	0.63	Locally collected insects
Scarabaeidae	2	0.3	Locally collected insects
Silphidae	2	0.3	Locally collected insects
Tenebrionidae	10	0.55	Locally collected insects
Vespidae	2	0.25	Locally collected insects
FISH			
Catostomidae	19	20	Seidensticker, 1968
CRUSTACEANS			
Crayfish	4	6.5	Craighead and Craighead, 1956
REPTILES			
Thamnophis spp.	9	64	Craighead and Craighead, 1956
SPIDERS			
Aranae	2	0.4	

* Specimens in Colorado State University collections collected in north-central Colorado.

Table 2. Prey species of various owls given in frequency of occurrence (percentage).

Prey Species	Great Horned Owls			Long-Eared Owls			Burrowing Owls		Barn Owls		
	1967	1968	1969	1967	1968	1969	1967	1968	1967	1968	1969
MAMMALS	(93.3)	(93.0)	(95.1)	(99.0)	(99.8)	(99.7)	(12.8)	(9.6)	(98.0)	(99.1)	(97.9)
Cryptotis parva					0.2	0.1				0.1	0.5
Cynomys ludovicianus	0.6										
Dipodomys ordii	0.6	1.4	4.0	0.6	0.1			0.1	7.4	3.1	3.5
Geomys bursarius											0.1
Lepus spp.		0.2	1.3								
Marmota flaviventris	1.1	0.1									
Microtus ochrogaster	24.7	20.1	16.3	14.6	27.8	50.7	3.4	2.1	35.4	39.4	24.6
Microtus pennsylvanicus	3.4	5.2	1.9	7.4	5.0	3.7		0.1	15.2	9.5	5.3
Mus musculus		0.3	0.4	0.5	4.0	0.7			0.1	0.7	0.4
Mustela frenata		0.1	0.1								
Myotis spp.						0.1					
Neotoma spp.	1.1	0.3	0.3						0.7		
Ondatra zibethicus	2.2	0.4	0.4								0.1
Onychomys leucogaster		0.1	2.2	5.4	0.2	0.1			0.4	0.8	1.0
Perognathus hispidus		0.9	0.3	0.1		0.1		0.1	4.3	2.9	2.0
Perognathus (smaller spp.)		1.6	0.7					0.2	3.2	3.4	7.5
Peromyscus spp.	9.0	40.9	40.0	61.7	54.9	32.8	6.0	5.8	15.0	26.2	30.2
Rattus norvegicus		0.2									
Reithrodontomys spp.	1.1	2.4	7.3	8.5	7.0	10.0	2.7	1.0	0.5	9.3	7.5
Sylvilagus spp.	12.9	11.7	15.3	0.1	0.5	0.9	1.3	0.1	1.0	1.1	2.8
Thomomys talpoides	36.5	7.1	3.9	0.1		0.4	0.7	0.1	14.7	2.7	12.8
Zapus princeps									0.1		

Table 2. (Continued)

Prey Species	Great Horned Owls			Long-Eared Owls			Burrowing Owls		Barn Owls		
	1967	1968	1969	1967	1968	1969	1967	1968	1967	1968	1969
BIRDS	(3.9)	(4.3)	(4.7)	(1.0)	(0.2)	(0.3)	(1.3)	(0.4)	(2.0)	(0.9)	(2.1)
Agelaius phoeniceus		0.3							0.2		
Anas carolinensis		0.1									
Asio otus		0.1	0.1								
Aythya americana		0.2									
Calamospiza melanocorys								0.2	0.2		
Colaptes cafer		0.7	0.3								
Columba livia			0.6								
Corvus brachyrhynchos		0.1									
Eremophila alpestris							1.3	0.1	0.2		
Phasianus colchicus		0.2	0.1								
Pica pica			0.3								
Sialia currucoides										0.04	
Sturnella neglecta			0.1							0.04	0.7
Sturnus vulgaris	0.6	0.1	0.1						0.1		
Unknown passerine	3.4	2.6	3.1	1.0	0.2	0.3		0.2	1.2	0.8	1.4
INSECTS		(2.1)					(85.9)	(89.9)			
Carabidae		0.1					53.0	48.7			
Cicindelidae							1.3	0.7			
Curculionidae							4.0	1.9			
Diptera								0.5			
Formicidae								0.7			

Table 2. (Continued)

Prey Species	Great Horned Owls			Long-Eared Owls			Burrowing Owls		Barn Owls		
	1967	1968	1969	1967	1968	1969	1967	1968	1967	1968	1969
INSECTS (Continued)											
Gryllidae							12.8	7.6			
Locustidae		0.4					4.0	12.8			
Scarabaeidae		1.5					2.0	10.3			
Silphidae							4.0	2.5			
Tenebrionidae							4.7	0.5			
Vespidae								0.1			
Unknown beetles								3.3			
FISH	(1.1)	(0.3)	(0.1)								
Catostomidae	1.1										
Cyprinus carpio			0.1								
Unidentified		0.3									
CRUSTACEANS	(1.7)	(0.3)	(0.1)					(0.2)			
Crayfish	1.7	0.3	0.1					0.2			
REPTILES								(0.1)			
Thamnophis spp.								0.1			
SPIDERS								(0.1)			
Aranae								0.1			

Table 3. Prey species of various owls given in numbers and weight.

Prey Species	Number	Weight	Percent of Total Weight	Number	Weight	Percent of Total Weight	Number	Weight	Percent of Total Weight
Prey Species for Great Horned Owls During the Year:									
	1967			1968			1969		
MAMMALS									
Cynomys ludovicianus	1.	1.200	2.8						
Dipodomys ordii	1.	.068	0.2	19.	1.292	0.7	30.	2.040	1.2
Lepus spp. (adult)				3.	8.400	4.4	14.	39.200	23.1
Marmota flaviventris	2.	6.000	14.0	1.	3.000	1.6			
Microtus ochrogaster	44.	1.760	4.1	283.	11.320	5.9	114.	4.560	2.7
Microtus pennsylvanicus	6.	.270	0.6	73.	3.285	1.7	13.	.585	0.3
Mus musculus				4.	.072	0.04	3.	.054	0.03
Mustela frenata				1.	.178	0.1	2.	.356	0.2
Neotoma spp.	2.	.434	1.0	4.	.868	0.5	2.	.434	0.3
Ondatra zibethicus	4.	2.800	6.5	5.	3.500	1.8	3.	2.100	1.2
Onychomys leucogaster				2.	.076	0.04	15.	.570	0.3
Perognathus hispidus				13.	.507	0.3	2.	.078	0.05
Perognathus (smaller spp.)				23.	.184	0.1	5.	.040	0.02
Peromyscus spp.	16.	.336	0.8	575.	12.075	0.3	274.	5.754	3.4
Rattus norvegicus				3.	.663	0.3			
Reithrodontomys spp.	2.	.024	0.1	34.	.408	0.2	49.	.588	0.3
Sylvilagus spp. (adult)	19.	19.000	44.4	90.	90.000	46.9	97.	97.000	57.1
(juvenile)	4.	1.600	3.7	74.	29.600	15.4	19.	7.600	4.5
Thomomys talpoides	65.	8.580	20.0	100.	13.200	6.9	26.	3.432	2.0
BIRDS									
Agelaius phoeniceus				4.	.220	0.1			
Anas carolinensis				1.	.312	0.2			
Asio otus				1.	.245	0.1	1.	.245	0.1
Aythya americana				3.	3.741	2.0			

Table 3. (Continued)

Prey Species	Number	Weight	Percent of Total Weight	Number	Weight	Percent of Total Weight	Number	Weight	Percent of Total Weight
Prey Species for Great Horned Owls During the Year:									
	1967			1968			1969		
BIRDS (Continued)									
Colaptes cafer				10.	1.450	0.8	2.	.290	0.2
Columba livia							4.	1.320	0.8
Corvus brachyrhynchos				2.	.922	0.5			
Phasianus colchicus				3.	3.399	1.8	1.	1.133	0.7
Pica pica							2.	.400	0.2
Sturnella neglecta							1.	.094	0.1
Sturnus vulgaris	1.	.080	0.2	1.	.080	0.04	1.	.080	0.04
Passerine (medium)	6.	.600	1.4	22.	2.200	1.1	7.	.700	0.4
Passerine (small)				14.	.420	0.2	16.	.480	0.3
INSECTS									
Carabidae				2.	.000	0.001			
Locustidae				6.	.004	0.002			
Scarabaeidae				21.	.006	0.003			
FISH									
Catostomidae	2.	.040	0.1	4.	.080	0.04			
Cyprinus carpio							1.	.800	0.5
CRUSTACEANS									
Crayfish	3.	.019	0.04	4.	.026	0.01	1.	.006	0.004

Table 3. (Continued)

Prey Species	Number	Weight	Percent of Total Weight	Number	Weight	Percent of Total Weight	Number	Weight	Percent of Total Weight
Prey Species for Long-Eared Owls During the Year:									
	1967			1968			1969		
MAMMALS									
Cryptotis parva				2.	.010	0.04	2.	.010	0.04
Dipodomys ordii	7.	.476	1.8	1.	.068	0.2	1.	.068	0.3
Microtus ochrogaster	146.	5.840	21.9	263.	10.520	38.6	348.	13.920	56.2
Microtus pennsylvanicus	74.	3.330	12.5	47.	2.115	7.8	25.	1.125	4.5
Mus musculus	5.	.090	0.3	38.	.684	2.5	5.	.090	0.4
Myotis spp.							1.	.008	0.03
Onychomys leucogaster	54.	2.052	7.7	2.	.076	0.3	13.	.494	2.0
Perognathus hispidus	1.	.039	0.1				1.	.039	0.2
Perognathus (smaller spp.)							6.	.048	0.2
Peromyscus spp.	619.	12.999	48.7	519.	10.899	40.0	237.	4.977	20.1
Reithrodontomys spp.	85.	1.020	3.8	66.	.792	2.9	72.	.864	3.5
Sylvilagus spp. (juvenile)	1.	.400	1.5	5.	2.000	7.3	6.	2.400	9.7
Thomomys talpoides	1.	.132	0.5				4.	.528	2.1
BIRDS									
Passerine (medium)							1.	.100	0.4
Passerine (small)	10.	.300	1.1	2.	.060	0.2	3.	.090	0.4

Table 3. (Continued)

Prey Species	Number	Weight	Percent of Total Weight	Number	Weight	Percent of Total Weight	Number	Weight	Percent of Total Weight
Prey Species for Burrowing Owls During the Year:									
	1967			1968			1969		
MAMMALS									
Dipodomys ordii						1.2			
Microtus ochrogaster	5.	.200	29.7			24.8			
Microtus pennsylvanicus						0.8			
Perognathus hispidus						1.4			
Perognathus (smaller spp.)						0.4			
Peromyscus spp.	9.	.189	28.0			36.0			
Reithrodontomys spp.	4.	.048	7.1			3.6			
Sylvilagus spp. (juvenile)						14.0			
Thomomys talpoides	1.	.132	19.6			4.6			
BIRDS									
Calamospiza melanocorys	2.	.066	9.8			1.4			
Eremophila alpestris						0.5			
Passerine (small)						1.6			
INSECTS									
Carabidae	79.	.018	2.7			3.3			
Cicindelidae	2.	.001	0.1			0.1			
Curculionidae	6.	.001	0.1			0.1			
Diptera						0.03			
Formicidae						0.0001			
Gryllidae	19.	.008	1.2			0.9			
Locustidae	6.	.004	0.6			2.4			
Scarabaeidae	3.	.001	0.1			0.9			
Silphidae	6.	.002	0.3			0.2			
Tenebrionidae	7.	.004	0.6			0.1			
Vespidae						0.001			
Unidentified beetles						0.3			

Table 3. (Continued)

Prey Species	Number	Weight	Percent of Total Weight	Number	Weight	Percent of Total Weight	Number	Weight	Percent of Total Weight
Prey Species for Burrowing Owls During the Year: (Continued)									
	1967			1968			1969		
CRUSTACEANS									
Crayfish						0.5			
REPTILES									
Thamnophis spp.						1.1			
SPIDERS									
Aranae						0.02			
Prey Species for Barn Owls During the Year:									
	1967			1968			1969		
MAMMALS									
Cryptotis parva				2.	.010	0.01	5.	.025	0.04
Dipodomys ordii	60.	4.080	8.8	76.	5.168	5.4	37.	2.516	4.2
Geomys bursarius							1.	.200	0.3
Microtus ochrogaster	288.	11.520	24.8	968.	38.720	40.3	267.	10.680	18.0
Microtus pennsylvanicus	124.	5.580	12.0	234.	10.530	11.8	57.	2.565	4.3
Mus musculus	1.	.018	0.04	16.	.288	0.3	4.	.072	0.1
Neotoma spp.	6.	1.302	2.8						
Ondatra zibethicus							1.	.700	1.2
Onychomys leucogaster	3.	.114	0.2	20.	.760	0.8	14.	.532	0.9

Table 3. (Continued)

Prey Species	Number	Weight	Percent of Total Weight	Number	Weight	Percent of Total Weight	Number	Weight	Percent of Total Weight
Prey Species for Barn Owls During the Year:									
	1967			1968			1969		
MAMMALS (Continued)									
Perognathus hispidus	35.	1.365	2.9	72.	2.808	2.9	21.	.819	1.4
Perognathus (smaller spp.)	26.	.208	0.4	83.	.664	0.7	82.	.656	1.1
Peromyscus spp.	122.	2.562	5.5	645.	13.545	14.1	330.	6.930	11.7
Reithrodontomys spp.	4.	.048	0.1	228.	2.736	2.8	86.	1.032	1.7
Sylvilagus spp.									
(adult)							1.	1.000	1.7
(juvenile)	8.	3.200	6.9	26.	10.400	10.8	32.	12.800	21.6
Thomomys talpoides	120.	15.840	34.1	67.	8.844	9.2	132.	17.424	29.4
Zapus princeps	1.	.025	0.1						
BIRDS									
Agelaius phoeniceus	2.	.110	0.2						
Calamospiza melanocorys	2.	.066	0.1						
Eremophila alpestris	2.	.062	0.1						
Sialia currucoides				1.	.045	0.04			
Sturnella neglecta				1.	.094	0.1	8.	.752	1.3
Sturnus vulgaris	1.	.080	0.2						
Passerine (medium)				12.	1.200	1.2	2.	.200	0.3
Passerine (small)	9.	.270	0.6	8.	.240	0.2	13.	.390	0.7

Table 4. Results of food intake-pellet formation tests.

Owl	Test Period	Average Food Eaten/day (grams)	Average Owl Weight[1/]	% of Body Weight Eaten	Pellets/ day	Average Pellet Weight/day (grams)	Average Pellet Size (millimeter)	Mean Temperature[2/]
Great Horned	1	69.72	1,409.8	4.9	1.14	4.49	22.1 x 46.0	31
	2	58.81	1,376.1	4.3	1.14			28
	3	60.6	1,311.1	4.6	1.04	1.87	17.8 x 31.1	55
	4	58.3	1,363.3	4.3	1.21	2.47	19.1 x 30.5	69
	5	57.5	1,265.0	4.6	1.29	2.62	17.5 x 30.4	67
Long-eared	1	42.75	304.3	14.0	1.65	2.47	14.1 x 33.6	31
	2	41.63	301.2	13.8	1.48			28
	3	25.45	265.5	9.6	1.04	1.12	15.5 x 27.0	55
	4	36.9	285.2	12.9	1.21	2.29	14.6 x 27.4	69
	5	35.5	303.1	11.7	1.25	1.24	14.3 x 25.6	67
Burrowing	1	29.13	177.0	16.5	1.30	1.8	10.2 x 34.6	31
	2	--	--	--	--	--	--	28
	3	19.85	167.4	11.9	1.37	0.82	10.6 x 21.4	55
	4	26.43	156.0	16.9	1.44	0.86	10.8 x 24.6	69
	5	22.6	160.0	14.1	1.43	0.85	11.4 x 23.4	67
Barn	1	72.85	661.0	11.0	2.4	5.13	18.0 x 30.4	31
	2	64.87	639.5	10.1	1.25			28
	3	46.4	542.6	8.6	1.74	2.74	18.3 x 24.9	55
	4	56.66	576.7	9.8	1.61	3.23	19.1 x 27.4	69
	5	47.3	584.5	8.1	1.32	2.70	19.3 x 26.8	67

[1/] Weights taken at the beginning, mid, and end of each test period.

[2/] Average of temperatures taken every two hours for the entire period by Colorado State University Atmospheric Science Department.