



Adult male Prairie Falcon and young at a typical Mojave Desert nest-site. Artwork by N. John Schmitt.

# PRAIRIE FALCON PREY IN THE MOJAVE DESERT, CALIFORNIA

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**ABSTRACT** — Twenty-five species of birds, 9 species of mammals, 5 species of reptiles and 1 species of insect were represented in prey remains and castings from 19 Prairie Falcon (*Falco mexicanus*) nests in the Mojave Desert, California, during 1977 and 1978. Reptiles represented a greater proportion in the diet than is reported in most other Prairie Falcon food studies in the western United States. The Horned Lark (*Eremophila alpestris*), Mourning Dove (*Zenaidura macroura*), Valley Pocket Gopher (*Thomomys bottae*) and Desert Woodrat (*Neotoma lepida*) were found in over 50% of the nests. Eighty-four percent of the prey weighed less than 150 g. The mean prey weight was 107 g and equals 20% of the weight of male Prairie Falcons.

The Prairie Falcon (*Falco mexicanus*) is considered a generalist in prey selection (Bent 1938: Part 2). Mammals and birds are the most common prey taken, with specific prey frequencies varying regionally (Tyler 1923; Fowler 1931; Enderson 1964; Brown and Amadon 1968; Leedy 1972; Ogden 1973; Denton 1975; Haak 1982). Reptiles and insects are rarely recorded as prey (Table 1), although Snyder and Wiley (1976) reported an unusual reliance on insects for food. Types of prey selection by Prairie Falcons nesting in the Mojave Desert contrast sharply with prey previously recorded for this area. Pierce (1935) and Fowler (1935) reported a nest in the Mojave Desert where young Prairie Falcons were raised entirely on a diet of reptiles — mainly Chuckwalla (*Sauromalus obesus*) and occa-

sionally Collared Lizard (*Crotaphytus collaris*), while Bond (1936) reported exclusively mammalian prey in 41 castings at another Mojave Desert nest. Because little is known about food habits of Prairie Falcons in the Mojave Desert, I studied this aspect of their biology.

## METHODS

Prey remains and castings were collected from 19 falcon nests throughout the Mojave Desert (34° N 116° W) between March and June 1977 and 1978 in order to provide a qualitative summary of Prairie Falcon food habits. Prey remains and castings were also collected from immediately below the nest site when known to have come from no other raptor. Prey remains were identified in the field or compared with specimens at Humboldt State University, Arcata, California. Fresh weights for prey items were obtained from the Museum of Vertebrate Zoology, University of California, Berkeley, California. I used an adjusted weight

Table 1. Frequency (%) of birds, mammals, reptiles and insect prey remains in Prairie Falcon nests in the western United States.

SOURCE	LOCATION	MAMMALS	BIRDS	REPTILES	INSECTS
Fowler (1931)	California	30 <sup>c</sup>	70	0	0
McKinley unpubl. <sup>a</sup>	Colorado	55	45	0	0
Marti and Braun (1975)	Colorado	39	61	0	0
Ogden (1973)	Idaho	53	33	14	trace
S.R.B.P. <sup>b</sup> (1979)	Idaho	22	72	6	0
Platt (1974)	New Mexico	37	54	9	0
Voelker unpubl. <sup>a</sup>	Oklahoma	8	92	0	0
Porter and White (1973)	Utah	8	92	0	0
Smith and Murphy (1973)	Utah	31	50	0	19
This Study	Mojave Desert	52	38	10	trace

<sup>a</sup>data from Sherrod (1978:96, 97)

<sup>b</sup>Snake River Birds of Prey annual report 1979

<sup>c</sup>rounded to nearest 1%

of 500 g for rabbit species in Table 2 because, from the available information, it is unlikely Prairie Falcons are capable of carrying anything heavier (see discussion below).

Quantifying prey remains and castings collected from hawk nests during the nesting season is biased and unreliable (Errington 1932; Craighead and Craighead 1956). Some castings and prey remains may be deposited by falcons before nesting begins and persist until collection during the nesting season. Furthermore, Fowler (1931) reported that adult Prairie Falcons remove uneaten prey and castings from nests. Haak (1982) reported that a larger variety of prey was found at nests than was hunted, suggesting over-representation of uncommonly used prey at nests; however,

observations of encounters with some prey species may be difficult to make. Prey remains may also underestimate the numbers of small rodents and birds actually captured (Cade 1960). Because of numerous potential biases, food habits reported here are qualitative not quantitative.

Delineation of the Mojave Desert boundaries closely parallels the outer distributional limits of the Joshua Tree (*Yucca brevifolia*) (Jaeger 1957). Creosote (*Larrea divaricata*) and Burro Bush (*Fanseria dumosa*) are also characteristic desert flora. Alkali sinks, creosote bush scrub, shadscale scrub, Joshua Tree woodland, and Pinyon-Juniper woodland form the major Mojave Desert floral communities (Munz and Keck 1959).

Table 2. Prey items identified at Prairie Falcon nests in the Mojave Desert.

SPECIES	No. <sup>a</sup> NESTS	% <sup>b</sup> NESTS	ESTIMATED WEIGHT (g)
<b>MAMMALS</b>			
California Ground Squirrel ( <i>Spermophilus beecheyi</i> )	2	10.5	565
Mojave Ground Squirrel ( <i>Spermophilus mohavensis</i> )	5	26.0	177
Whitetail Antelope Squirrel ( <i>Ammospermophilus leucurus</i> )	4	21.0	113
Valley Pocket Gopher ( <i>Thomomys bottae</i> )	12	63.0	88
Pocket Mouse ( <i>Perognathus</i> sp.)	5	26.0	19
Kangaroo Rat ( <i>Dipodomys</i> sp.)	5	26.0	41
Deseret Woodrat ( <i>Neotoma lepida</i> )	11	58.0	105
Black-tailed Jack Rabbit ( <i>Lepus californicus</i> )	2	10.5	500
Desert Cottontail ( <i>Sylvilagus audubonii</i> )	2	10.5	500
<b>BIRDS</b>			
Chukar ( <i>Alectoris chukar</i> )	3	15.8	500
Western Sandpiper* ( <i>Calidris mauri</i> )	1	5.3	27
Rock Dove ( <i>Columba livia</i> )	2	10.5	393
Mourning Dove ( <i>Zenaidura macroura</i> )	8	42.1	109
White-throated Swift ( <i>Aeronautes saxatalis</i> )	1	5.3	36
Western Kingbird ( <i>Tyrannus verticalis</i> )	2	10.5	41
(Table 2 continued)			

(Continuation of Table 2)

**BIRDS (cont'd)**

Say's Pheobe*			
( <i>Sayornis saya</i> )	1	5.3	25
Horned Lark			
( <i>Eremophila alpestris</i> )	12	63.2	28
Cactus Wren*			
( <i>Campylorhynchus brunneicapillus</i> )	1	5.3	37
Rock Wren			
( <i>Salpinctes obsoletus</i> )	3	15.8	11
Sage Thrasher*			
( <i>Oreoscoptes montanus</i> )	1	5.3	44
LeCont's Thrasher*			
( <i>Toxostoma lacontei</i> )	1	5.3	62
Mountain Bluebird			
( <i>Sialia currucoides</i> )	1	5.3	2.7
Loggerhead Shrike			
( <i>Lanius ludovicianus</i> )	1	5.3	45
European Starling			
( <i>Sturnus vulgaris</i> )	2	10.5	77
Black-headed Grosbeak*			
( <i>Pheucticus melanocephalus</i> )	3	15.8	46
White-crowned Sparrow			
( <i>Zonotrichia leucophrys</i> )	1	5.3	2
Western Meadowlark			
( <i>Sturnella neglecta</i> )	5	26.3	103
Red-winged Blackbird			
( <i>Agelaius phoeniceus</i> )	2	10.5	56
Brewer's Blackbird			
( <i>Euphagus cyanocephalus</i> )	3	15.8	58
Scott's Oriole*			
( <i>Icterus parisorum</i> )	2	10.5	38
Northern Oriole*			
( <i>Icterus galbula</i> )	1	5.3	27
Western Tanager			
( <i>Piranga ludoviciana</i> )	4	21.1	31
House Sparrow			
( <i>Passer domesticus</i> )	4	21.1	27
House Finch			
( <i>Carpodacus mexicanus</i> )	1	5.3	20

**REPTILES**

Desert Iguana*			
( <i>Dipsosaurus dorsalis</i> )	1	5.3	56
Chuckwalla			
( <i>Sauromalus obesus</i> )	4	21.0	235
Zebra-tailed Lizard*			
( <i>Callisaurus draconoides</i> )	1	5.3	2
Desert Horned Lizard			
( <i>Phrynosoma platyrhinos</i> )	4	21.0	22
Western Whiptail			
( <i>Cnemidophorus tigris</i> )	2	10.5	1

<sup>a</sup>The number of nests in which a species was recorded.<sup>b</sup>The number of nests in which a species was found divided by the number of nests examined (N = 19); times 100 and reported as a percentage.

\*Species not previously recorded in the literature as Prairie Falcon prey.

## RESULTS AND DISCUSSION

Thirty-nine species representing 3 vertebrate classes were present in prey collections from 19 nests (Table 2). Twenty-five species of birds, 9 species of mammals and 5 species of reptiles were identified. Insect parts were rarely noted and only 1 species, Armored Stink Beetle (*Eleodes armata*) was identified. The Horned Lark, Valley Pocket Gopher and Desert Woodrat were present in over 50% of the nests. The Mourning Dove was present in 48% of the nests.

Although the number of avian species captured outnumbered mammals by almost 3 to 1, the mean weight for birds (76 g) was half of the mean weight for mammals (179 g) suggesting greatest energetic return results from capturing mammals. Analysis of 214 pellets provides further evidence that mammals might be captured more often than birds or reptiles. Mammals were present in 72%, birds in 24% and reptiles in 4% of the pellets examined.

In contrast to Pierce (1935) and Bond (1936) I found no instance where all or nearly all prey items were from just one vertebrate class. No single species appears as primary prey on a desert-wide basis (Table 2). Some species were infrequent in prey remains desert-wide but were locally frequent. For example, the Black-headed Grosbeak (*Phaeocephalus melanocephalus*) was collected from 3 nests located along the east side of the Sierra Nevada Mountains but nowhere else in the desert. One nest had 8 grosbeaks present.

**Mammals.** The Valley Pocket Gopher and Desert Woodrat were found in over 50% of the nests. They were seldom seen except very early in the morning or late in the evening when temperatures were cooler. Their high abundance in the prey remains suggests that they were captured at these times. Harmata et al. (1978) found that Prairie Falcons forage primarily during early morning and late afternoon in the Mojave Desert.

Blacktailed Jackrabbit (*Lepus californicus*) and Desert Cottontail (*Sylvilagus audubonii*) feet were found in falcon nests. Adult Blacktailed Jackrabbit (2,590 g) and Desert Cottontail (1,700 g) weigh 3 to 5 times as much as adult male Prairie Falcons (554 g, Enderson 1964), making it unlikely that they carried them to their nests. It is probable that only very young rabbits or portions of them were carried to nests. Porter and White (1973) noted that Prairie Falcons prey on White-faced Ibis (*Plegadis chihi*, 519 g) in Utah. However, since White-faced Ibis were

not found at Utah nests, they concluded that White-faced Ibis were too heavy for Prairie Falcons to carry. Adult Chukar (*Alectoris chukar*) and California Ground Squirrel (*Spermophilus beecheyi*) weigh between 500-565 g and were the next largest prey items found in eyrie samples and may have been brought to the nest by the female (863 g, Enderson 1964).

**Birds.** The Horned Lark and Mourning Dove were found in 63 and 42% of the nests, respectively. The presence of a Western Sandpiper (*Calidris mauri*) (Table 2) demonstrates the opportunistic hunting nature of Prairie Falcons. The Mojave River flows through the desert but is subterranean for much of its length. Sandpiper remains were found at a falcon nest 3.2 km from one of the few points where the river surfaces. The sandpiper was the only prey item not observed in the field.

**Reptiles.** Most Prairie Falcon food studies show that reptiles are infrequently reported as prey (Table 1); however, reptiles did constitute a relatively high proportion of the prey in this study (9.5%). Desert Horned Lizard (*Phrynosoma platyrhinos*) and Chuckwalla were found at 20% of the nests. Reptile remains, however, were recorded in only 4% of the pellets. Reptile scales were found mixed with mammal hair in castings but no castings contained both scales and feathers. It seems likely most reptile scales are so thin that they are digested and not cast. Usually, the only indication that reptiles were being used was the presence of heads and tails found around the margin of the nest. Although only lizards were represented in prey remains I did observe a male falcon leave its perch on a power pole and capture a snake.

**The 20% Rule.** Male falcons usually hunt for family groups during the nesting season (Newton 1979). Harmata et al. (1978) found that male Prairie Falcons hunted more frequently than females in the Mojave Desert. In this study 84% of prey captured weighed less than 150 g and the mean weight was 107 g, or 20% of the weight of male Prairie Falcons. A mean prey weight 20% of mean adult male falcon weight is also common in other species of falcons. I noted a high correlation ( $r = 0.98$ ) between mean prey weight during the breeding season and male falcon body weight for 5 species of falcons (Table 3). Because male falcons are restricted to a definite nesting territory during the breeding season, and are less restricted in movement during the remainder of the year, it seems

Table 3. Mean weight (g) of male falcons selected to show a weight range and the mean weight of their prey captured during the nesting season.

SPECIES	MALE WEIGHT	PREY WEIGHT ( $\bar{x}$ )	SOURCE
<i>Falco columbarius</i>	187	26	Laing 1984
<i>Falco eleonora</i>	350	62	Walter 1979
<i>Falco mexicanus</i>	554	143	This Study
<i>Falco peregrinus pealei</i>	750	199	White 1973
<i>Falco rusticolus</i>	1,170	475	Roseneau 1972

probable that characteristics of prey vulnerability and density (during the breeding season) have evolutionarily dictated male falcon size. To test this hypothesis one needs to compare weight of prey captured by females when they begin to hunt after brooding is completed with that caught by males. An alternative hypothesis is that selection pressure is highest during winter months and not during the breeding season. If this were true male and female falcons should show significant differences in the weight of prey captured during winter.

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