

## USE OF TUNDRA HABITATS BY PRAIRIE FALCONS IN COLORADO

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The Prairie Falcon (*Falco mexicanus*) is considered by most authorities to be primarily a bird of the plains and low foothills, with occasional wanderings into adjacent habitats. There are, however, scattered observations of this species in mountainous terrain at much higher elevations (Bent 1938, Williams 1942, Webster 1944, Bailey and Niedrach 1965, Pattie and Verbeek 1966). We could find no records of Prairie Falcons nesting or otherwise spending substantial periods of time above tree line, thus making the observations herein described noteworthy.

During intensive studies of White-tailed Ptarmigan (*Lagopus leucurus*) in Colorado from April 1966 through the present, numerous observations of Prairie Falcons were made, with at least one eyrie being located. This eyrie in Rocky Mountain National Park, Larimer County, Colorado, at 12,100 ft elevation, was used by at least one Prairie Falcon each year from 1966 through 1973. The site was approximately midway between top and bottom of a sheer volcanic headwall overlooking a glacial cirque. Successful nesting was documented here only in 1968 when three young were banded on 26 June. This appears to be the highest recorded nest site of Prairie Falcons. Bent (1938) listed possible eyries in Colorado at 10,000 ft and in California at 11,000 ft.

Regurgitated pellets and debris were collected below the Rocky Mountain National Park nest and several nearby roosts on five dates in June and July 1968. Eighty-nine prey individuals were identified

from these materials (table 1). The diet included the most common prey species in the area and differed from most other reported summer diets of Prairie Falcons in the high proportion of small birds. Two of the White-tailed Ptarmigan taken were chicks, but the third was an adult male banded 21 May 1966 and reobserved in 1967 and as late as 10 May 1968. Braun and Rogers (1971) reported that the Prairie Falcon was the most important predator on White-tailed Ptarmigan in Colorado. Prairie Falcons were observed frequently to harass and occasionally to take small passerine birds in tundra areas.

The most frequent mammalian prey was the pika (*Ochotona princeps*), an abundant diurnal inhabitant of the area. Krear (1965), who studied pikas in Colorado, never saw any avian predator take one although he suspected that the Prairie Falcon was a likely predator of pikas. The marmot (*Marmota flaviventris*) remains were those of a very small juvenile.

Observations of Prairie Falcons were made at a number of alpine locations in Colorado at elevations of 11,300 to over 14,000 ft. Noteworthy observations are from throughout the Front Range, Mosquito Pass and Weston Pass in the Mosquito Range, Independence Pass in the Collegiate Range, Mesa Seco and Cinnamon Pass in the San Juan Mountains, and Taylor Pass in the Elk Mountains. The earliest date of occurrence was 17 April (1967) and the latest was 18 December (1971); most recorded observations (143 of 153; 94.1%) were from May through September. Packard (1946) reported Prairie Falcons foraging about the tree line in Rocky Mountain National Park in August, with departure from the Park in September and early October. Our observations in September and October support his findings in that a noticeable decrease in sightings above the tree line occurred in late September. However, the lack of observations of Prairie Falcons above the tree line in October and November may reflect lack of observer activity in alpine areas after late September. While Webster (1944) reported that it was unusual to see Prairie Falcons at 11,000 to 12,000 ft in Colorado, our observations indicated that during the period studied, Prairie Falcons were not uncommon summer residents and/or migrants in alpine areas throughout Colorado. Most tundra habitats have not been extensively studied and further investigation may show the Prairie Falcon to be more abundant above the tree line than formerly believed.

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TABLE 1. Prey of tundra-dwelling Prairie Falcons in Colorado.

Species	Number	Percent of total number
<b>Mammals</b>		
<i>Ochotona princeps</i>	23	25.8
<i>Thomomys talpoides</i>	4	4.5
<i>Spermophilus lateralis</i>	2	2.2
<i>Marmota flaviventris</i>	1	1.1
<i>Microtus longicaudus</i>	3	3.4
<i>Peromyscus maniculatus</i>	2	2.2
Subtotal	35	39.2
<b>Birds</b>		
<i>Lagopus leucurus</i>	3	3.4
<i>Eremophila alpestris</i>	8	9.0
<i>Sialia currucoides</i>	5	5.6
<i>Anthus spinoletta</i>	3	3.4
<i>Leucosticte australis</i>	19	21.4
Unidentified small birds	16	18.0
Subtotal	54	60.8
Totals	89	100.0

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## THE OCCURRENCE OF TWIN WATERFOWL EMBRYOS

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Twin avian embryos occur rarely and little is known of the causes of this phenomenon. Passerine twins have been reported for the American Goldfinch (*Spinus tristis*) and the Song Sparrow (*Melospiza melodia*) by Berger (1953), and for the Brown Thrasher (*Toxostoma rufum*) by Cartright (1939). Olsen and Haynes (1948) found three cases of twins in 1153 eggs of the domestic fowl (*Gallus domesticus*). In anserines, Kear (1965) discovered twin embryos in a single unsuccessful Muscovy Duck (*Cairina moschata*) egg out of 833 eggs of various waterfowl species that she examined.

The purpose of this note is to record twinning in Mallard (*Anas platyrhynchos*) and in Giant Canada Goose (*Branta canadensis maxima*) embryos and to hypothesize that exposure to low temperature prior to incubation is the teratological agent.

Twin Mallard embryos were found during an experiment that examined the effect of cold on this species' eggs (Batt and Cornwell 1972). Unincubated eggs were subjected to 0, 4, or 8°C temperatures for periods of 5-10 days in an environmental chamber immediately after collecting and prior to artificial incubation. Each treatment contained 70 fresh eggs from which 10 controls were selected randomly and put directly into the incubator. The remaining eggs were then exposed to one of the three treatment temperatures. Ten eggs were selected at random and

TABLE 1. Occurrence of twin embryos in Mallard eggs.

Exposure temperature (C)	Length of exposure (days)	Age at death (days)	Type of twin	Sex <sup>a</sup>
0	7	12	normal	female
0	5	10	normal	—
0	6	18	joined	male
4	10	12	normal	female
4	10	22	normal	female

<sup>a</sup> Determined by examination of the syrinx (Beer 1963).

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moved to the incubator after either 5, 6, 7, 8, 9, or 10 days, respectively. This procedure was repeated at all three temperatures and the entire experiment was replicated three times. Five pairs of twins occurred in the 251 treated eggs that failed to hatch, while none occurred in the 33 unhatched control eggs (table 1). Four of the pairs were "normal" twins, while one pair was joined at the head and neck region. In each case the embryos shared the same yolk sac. One of us (B.D.J.B.) has examined approximately 2000 unhatched Mallard embryos in the past few years and has never observed another set of twins.

The twin Canada Goose embryo was found during a field study conducted by Cooper. Nest records of 3005 eggs resulted in the discovery of a single egg containing normal twins. The egg was the first of a clutch of six and was moved to an artificial incubator 92 hr after being laid. During the intervening time, this egg was exposed to air temperatures ranging from -6.1 to 13.3°C, with 25 hr below 0°C. Both embryos died at 21 days development (27 days needed for hatching in the incubator) and were also attached to a single yolk sac.

Sturkie (1946) experimentally increased the incidence of twins in White Leghorn Chickens (*Gallus domesticus*) by inducing hypothermia in laying hens and thereby affecting normal development during the early stages of cleavage. Our observations show that normal cleavage can be interrupted by low temperatures to produce twins even after oviposition.

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