

FOOD HABITS OF NESTING GOLDEN EAGLES IN NORTHEAST CALIFORNIA AND NORTHWEST NEVADA

by

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Abstract

Between 1976 and 1981, 1,156 prey items representing 37 species were collected from Golden Eagle (*Aquila chrysaetos*) nests in the western Great Basin. The 4 most frequently encountered prey species were the black-tailed jackrabbit, mountain cottontail, yellow-bellied marmot, and Chukar. These species accounted for 90% of all prey items; the remains of livestock comprised less than 1%. Lagomorphs comprised 91% of the prey biomass; no other prey category species accounted for more than one percent of the total biomass.

Introduction

The food habits of the Golden Eagle have been widely studied. Available data from North America were summarized by Olendorff (1976). We present data from an unstudied population of Golden Eagles in the western Great Basin of northeast California and northwest Nevada.

Golden Eagles have been persecuted throughout the western United States for their alleged depredations on domestic livestock. The discovery of large numbers of dead Golden Eagles in Wyoming during the early 1970's (Christopherson 1972) illustrated how severe this can be. As Olendorff (1976) points out, "eagles do, in fact kill livestock". However, the number of calves and lambs actually killed (versus scavenged) and the proportion that these animals represent in the diet should be considered when discussing the significance of Golden Eagle predation. Frequently overlooked, but perhaps of even greater significance to ranchers, is the proportion of lagomorphs and sciurids in the diet of Golden Eagles, because these major prey sources are competitors with livestock for available range forage (Vorhies and Taylor 1933).

Study Area

The study area was a 13,800-km² portion of the western Great Basin and included parts of eastern Lassen and Modoc Counties of California, and western Washoe County, Nevada. Topography consists of north-south

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running ridges and isolated mountains separated by broad, flat valleys frequently containing dry alkali lake beds. It ranged from 1,220 m in the lowest valleys to 2,290 m on the highest peaks. Elevation of nest sites where prey remains were collected ranged from 1,295 to 1,905 m.

Primary natural vegetation associations are sagebrush steppe (*Agropyron-Artemisia*), saltbush-greasewood (*Atriplex-Sarcobatus*), and juniper steppe (*Juniperus-Artemisia-Agropyron*) woodland (Kuchler 1964). In addition to native forbs and grasses, introduced grasses, cheatgrass (*Bromus tectorum*) and medusa head (*Taeniatherum asperum*) are common.

Methods

Food habits data were collected at nests in occupied eagle territories, 1976–1981 (Table 1). While food items found in nests are predominantly those brought to nestlings, some may also be remains of food consumed by adults. Collection of prey remains occurred between late April and mid-July each year. From a possible total of 59 territories, an average of 20 nests were sampled each year (Table 1). In most instances, the same territories were rechecked each year, but some were frequently inactive. When this occurred, adjacent territories were checked. In those cases where the eagles returned to the same territories each year, some nests were sampled for 5 of the 6 years. Most nests were examined only once per season. All prey remains, except carcasses representing fresh food for the nestlings, were removed.

To assess the dietary intake over the 6 year study period, prey biomass was totalled in a given year and the proportional contribution of individual prey species was calculated. Further, a combined figure of prey remains biomass and frequency is provided (Table 1).

Mammalian weights used in the estimation of biomass are reported in U.S. BLM (1979), Burt and Grossenheider (1976), Mitchell (1971), and Morrison (1945). Avian weights are provided by Dunning (MS), and reptile weights are reported in U.S. BLM (1979). Immature mammals for which no weights could be found were assigned weights based on probable identity and their approximate size. Although calves reportedly weigh an average of 30.6 kg (Morrison 1945), we used a figure of 4.13 kg (or the approximate weight that could be attributed to 1 to 2 feedings by a Golden Eagle), since the entire weight could not be carried to the nest. The 4.13 kg figure was used also because earlier scavenging by mammalian predators was evident. Because in most cases sex of the prey remains could not be determined, we used the mean of the two sexes, when presented separately in the literature, for our weight estimates of individual species. Domestic sheep were assumed to be young lambs for the purpose of biomass calculations (see Results).

Since frequency and biomass figures are derived from one nest visit (instead of repeated samples) they should be regarded as approximations. The number of items found in each nest ranged from 0 to 30 thus, other sources of bias may be present such as adults removing uneaten prey remains, or prey items being entirely consumed. However, in other studies (U.S. BLM 1979) the relative proportions of prey items found in 5 Golden Eagle nests were the same as those brought in during observations from a blind.

Results

A total of 1,156 prey items representing 37 prey species were collected over a 6 year period (Table 1). Mammals made up 92% while birds and reptiles composed 6% and 2%, respectively. Over 90% of the diet of Golden Eagles consisted of lagomorphs and sciurids. The 4 most common prey species were the black-tailed jackrabbit (76%), mountain cottontail (9%), yellow-bellied marmot (3%), and Chukar (2%). All other species combined accounted for less than 6% of biomass.

Five of the 6 coyotes listed in Table 1 were young pups, and 3 were found in the same nest. The antelope and mule deer remains were all of animals estimated to be less than 2 weeks old. The 2 domestic cows reported were both calves, and 1 of 3 was clearly scavenged as evidenced by a crushed metapodal bone. Since Golden Eagles cannot crush even substantially smaller bones (i.e., the diameter of a human finger pers. obs.) it seems likely that the crushed metapodal suggests the calf died from trauma other than eagle predation. Sheep in the diet was inferred from the presence of wool in the nest, and the age of the individuals could not be determined. The Mountain Bluebird and Brewer's Blackbird, which frequently mob Golden Eagles, were presumably taken while harassing flying eagles.

	4	3	1	1	-	-	-	-	-	7	(+)	8	(1)
Mallard	-	-	-	-	-	-	-	-	-	-	-	1	(+)
Cinnamon Teal	3	1	-	-	-	-	1	+	-	2	(+)	1	(+)
American Coot	-	-	+	-	-	-	-	-	-	4	(+)	2	(+)
unidentified duck	-	-	+	-	-	-	-	-	-	1	(+)	1	(+)
Western Grebe***	-	-	+	1	-	-	-	-	-	1	(+)	1	(+)
Barn Owl	1	+	-	-	-	-	-	-	-	1	(+)	+	(+)
Long-eared Owl	-	-	+	+	+	-	1	+	-	5	(+)	1	(+)
Great-horned Owl	-	-	-	-	-	-	-	-	1	1	(+)	1	(+)
American Kestrel	-	-	+	+	-	-	-	-	-	1	(+)	+	(+)
Brewer's Blackbird***	1	+	-	-	-	-	-	-	-	1	(+)	1	(+)
Long-billed Curlew***	1	+	-	-	-	-	-	-	-	1	(+)	1	(+)
Black-billed Magpie	1	1	-	-	+	+	-	1	+	5	(+)	1	(+)
Common Flicker	-	-	-	-	+	+	+	+	-	3	(+)	+	(+)
Mourning Dove	-	-	-	-	-	-	+	-	-	1	(+)	+	(+)
Mountain Bluebird***	-	-	-	-	-	-	+	+	-	1	(+)	+	(+)
unidentified passerine	-	-	-	-	+	-	-	+	-	2	(+)	+	(+)
western yellow-bellied racer	1	+	-	-	-	-	-	-	-	1	(+)	+	(+)
desert striped whipsnake***	1	+	-	-	-	-	-	-	-	1	(+)	+	(+)
gopher snake	-	-	3	+	1	+	1	+	+	11	(1)	2	(+)
unidentified snake	-	-	+	+	+	+	1	-	-	5	(+)	1	(+)
Total Number of Individuals	129	171	224	237	284	111	1,156	1,567					
Total Number of Species	19	15	14	12	14	8	37	-					
Number of Nests Examined	12	21	17	23	28	18	119	-					

° Percent of annual total: Individuals (I%), Biomass (B%), kg.

•• See Appendix 1 for scientific names.

*** Prey species previously unreported in the literature reviewed by Olendorff (1976).

+ Less than 1 percent.

Discussion

The predominance of lagomorphs (85%) in the diet is nearly identical to that reported for the eastern Great Basin of Utah (87%) by Smith and Murphy (1979), and compares closely with the 91% reported by Craig (1974) for Colorado. Similarly, the percent biomass was highest for lagomorphs (91%) as was reported by Smith and Murphy (99%, 1979) and in southwest Idaho (70%, U.S. BLM 1979).

The low frequency of lagomorphs (54%) reported in Idaho (U.S. BLM 1979) is probably attributable to shifts in predation to locally abundant alternate prey species such as Ring-necked Pheasants (12%).

Some suggestions may be offered to account for annual differences in the number of prey species taken: (1) population fluctuations in key prey species, as shown by Smith and Murphy (1979), (2) individual adult or pair prey selectivity, and (3) yearly variation in extent of wetland habitat in the form of ephemeral dry lakes within eagle home ranges. In dry years the contribution of wetlands-associated prey, such as muskrat and ducks would be expectedly lower, thus influencing overall prey composition for those years.

The strongest case can be made for the influence of changes in major prey species availability. When jackrabbit intake was lowest (74% in 1976) overall species diversity in the diet was highest. Also in 1976, atypical prey such as the coyote and mule deer accounted for 9% of the total biomass. Conversely, when jackrabbit intake was highest (94% in 1981) annual prey species diversity was lowest. An overall pattern can be seen in the course of this study in which combined use of the 4 principal prey species decreased. Since annual biomass of jackrabbit prey varied by 20% between 1976 and 1981, and biomass of other principal prey items only varied 1 to 4% between high and low years, it is clear that jackrabbit availability has the strongest influence on annual prey item diversity. In years of low jackrabbit availability Golden Eagles apparently widen the diversity of prey items taken rather than increase the rate of predation on other key prey species such as cottontails and marmots. In Utah Golden Eagles similarly diversified their diets in years of low jackrabbit availability, but also proportionately increased their use of the other principal prey item, cottontails (Smith and Murphy 1979: Table 1).

While our data do not reflect the food habits of Golden Eagles throughout the year, they do span a substantial portion when young livestock are on the range. During the spring seasons in which this study was conducted, there was an average of ca. 9,000 sheep and 24,100 cows on the range each year (Schultz and Delaney pers. comm.); lambs and calves accounted for 64 and 44%, respectively, of these totals. Although we did not visit all Golden Eagle nests in the area, we believe our food habits data are representative of the eagles of the western Great Basin. Accordingly, our data show that for this area, the livestock portion of Golden Eagle diets are insignificant. In fact, in the western Great Basin where lagomorphs are competitors with livestock for range resources (Vorhies and Taylor 1933), Golden Eagles appear to exert a positive, rather than negative, influence on the livestock industry.

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Appendix 1

Common and scientific names of the vertebrates listed in Table 1 are: mountain cottontail, *Sylvilagus nuttallii*; black-tailed jackrabbit, *Lepus californicus*; yellow-bellied marmot, *Marmota flaviventris*; unidentified ground squirrel, *Spermophilus* sp.; Belding's ground squirrel, *Spermophilus beldingi*; California ground squirrel, *Spermophilus beecheyi*; unidentified kangaroo rat, *Dipodomys* sp.; bushy-tailed woodrat, *Neotoma cinerea*; montane vole, *Microtus montanus*; muskrat, *Ondatra zibethicus*; porcupine, *Erethizon dorsatum*; coyote, *Canis latrans*; badger, *Taxidea taxus*; mule deer, *Odocoileus hemionus*; pronghorn, *Antilocapra americana*; Mallard, *Anas platyrhynchos*; Cinnamon Teal, *Anas cyanoptera*; Canvasback, *Aythya valisineria*; American Coot, *Fulica americana*; Chukar, *Alectoris graeca*; Ring-necked Pheasant, *Phasianus colchicus*; Sage Grouse, *Centrocercus urophasianus*; Mourning Dove, *Zenaidura macroura*; American Kestrel, *Falco sparverius*; Barn Owl, *Tyto alba*; Long-eared Owl, *Asio otus*; Great Horned Owl, *Bubo virginianus*; Common Flicker, *Colaptes auratus*; Black-billed Magpie, *Pica pica*; Brewer's Blackbird, *Euphagus cyanocephalus*; Mountain Bluebird, *Sialia currucoides*; western yellow-bellied racer, *Coluber constrictor*; desert striped whipsnake, *Masticophis lateralis*; gopher snake, *Pituophis melanoleucus*.