LETTERS

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DIET OF BREEDING NORTHERN GOSHAWKS IN THE COAST RANGE OF OREGON

Northern Goshawks (*Accipiter gentilis*) were not known to breed in the Coast Range of western Oregon until June 1995, when two breeding pairs were reported (Thrailkill and Andrews 1996, *J. Raptor Res.* 30:248–249). Research suggests that Northern Goshawks generally nest in areas with high prey densities, that they forage opportunistically, and that their diets reflect the diversity of available prey species (Opdam 1975, *Ardea* 63:30–54; Hantage 1980, *J Ornithol.* 121:200–201; Widen et al. 1987, *Oikos* 49:233–235; Kenward and Widen 1989, Pages 561–567 *in* B.-U. Meyburg and R.D. Chancellor [EDS.], Raptors in the modern world. World Working Group on Birds of Prey and Owls, London, U.K.; Boal and Mannan 1994, *Stud. Avian Biol.* 16:97–102). Thirty or more species of birds and mammals are known to be preyed upon by nesting Northern Goshawks; however, no dietary information exists for the Coast Range of Oregon (Block et al. 1994, *Stud. Avian Biol.* 16). The rarity of nesting goshawks in the Coast Range may be attributed to the dense vegetative structure of the area and its negative influence on prey availability (DeStefano and McCloskey 1997, *J. Raptor Res.* 31:34–39). We believe, therefore, it is important to document the diet of these goshawk pairs.

We studied two goshawk nests that were approximately 16.1 km apart. There were three young in one nest and two young in the other. We collected prey remains (i.e., fur, feathers, skeletal parts) from plucking posts (stumps and tree branches in the nest stands), and nests from 7 June through mid-July 1995. Remains were combined and analyzed as a single sample for each nest site. Skeletal keys (Verts and Carroway 1984, Keys to the mammals of Oregon, 3rd Ed. Oregon State Univ. Book Stores Inc., Corvallis, OR U.S.A.) and museum collections (Dept. of Fisheries and Wildlife, Oregon State University, Corvallis, OR U.S.A.) were used to identify prey.

We identified 39 prey items, of which 84% were birds and 16% were mammals. Ruffed grouse (*Bonasa umbellus*) remains comprised 45% of total prey and 64% of bird prey items. Other bird species included Steller's Jay (*Cyanocitta stelleri*) (13%), American Robin (*Turdus migratorius*) (13%), Ring-necked Pheasant (*Phasianus colchicus*) (8%), and Mountain Quail (*Oreortyx pictus*) (5%). Mammalian species included Douglas' squirrel (*Tamiasciurus douglasii*) (13%) and mountain beaver (*Aplodontia rufa*) (3%). We made no attempt to calculate biomass composition of the prey.

Our data were consistent with that of other investigations. The variety of prey species was similar to other goshawk studies in the western United States. Avian prey comprised >50% of the diet during the breeding season. Our sample contained a relatively large percentage of avian prey, as much as 20% greater than some other studies (Meng 1959, *Wilson Bull.* 71:169–174, Opdam 1975; Reynolds and Meslow 1984, *Auk* 101:761–779; Bloom et al. 1986, Calif. Dept. Fish and Game, Wildl. Manage. Branch, Adm. Rept. 85-1; Widen et al. 1987; Bull and Homann 1994, *Stud. Avian Biol.* 16:103–105; Reynolds et al. 1994, *Stud. Avian Biol.* 16:106–113; Watson et al. 1998, *J. Raptor Res.* 32:297–305)

We opportunistically collected prey items from plucking posts and nests after fledging took place, but we did not use direct observations to identify prey delivered to nests. The latter method can indicate a larger proportion of mammals in goshawk diets (Boal and Mannan 1994). The most accurate assessment of raptor diets is accomplished through a combination of direct visual observations and collection of prey remains (Marti 1987, Raptor food habit studies, Pages 67–80 *in* B.G. Pendleton, B.A. Millsap, K.W. Cline, and D.M. Bird [EDS.], Raptor management techniques manual. Nat. Wild. Fed., Sci. Tech. Ser. No. 10). Thus, our results may overestimate the proportion of avian prey.

We suggest that the Ring-necked Pheasant in the diet of one of the two pairs of goshawks studied demonstrates the opportunistic foraging behavior of the goshawk. Although it was not observed, we suspect goshawks may have also foraged in agricultural/pastureland approximately 1.2 km from their nest where a hunting club released pheasants. We occasionally observed pheasants on forest roads near the site, so it is possible the pheasants were captured in the forest. Studies conducted in Europe show that pheasants are important goshawk prey. Habitat there consists of small woodlots surrounded by agricultural fields and pastures where pheasants are released (R. Kenward and P. Widen 1989).

The relative absence of breeding goshawks from the Coast Range is well-documented (DeStefano and McCloskey 1997). They suggested three hypotheses to explain the absence of breeding goshawks from the Coast Range of Oregon. The hypothesis we believe most plausible is that the structure of the vegetation may limit prey availability to goshawks and thus prevent nesting, despite potentially suitable nesting substrate and adequate populations of prey. Two observations support this hypothesis. First, the similarity in the variety of prey species we found in this sample

relative to other studies suggests that prey diversity is not a factor which precludes Northern Goshawk nesting in the Coast Range. Second, our field observations and those of other researchers indicate that dense understories are common throughout the Coast Range (Franklin and Dyrness 1973, Natural vegetation of Oregon and Washington. USDA For. Serv. Tech. Rep. PNW-8, Portland, OR U.S.A.; Reynolds and Meslow 1984; DeStefano and McCloskey 1997). This dense understory may decrease prey vulnerability to Northern Goshawks, reducing foraging efficiency and breeding success. We suspect that the hypothesized lack of suitable foraging habitat may be a limiting factor contributing to the low breeding density of goshawks in the Coast Range of Oregon.

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FIRST DARK MORPH BROOD OF MONTAGU'S HARRIERS (*CIRCUS PYGARGUS*) IN 14 YEARS IN ITALY

The dark morph of the Montagu's Harrier (*Circus pygargus*) is rare in Eurasia and its ecology and adaptive value is unclear. From 1986–99 (14 yr), I studied an Italian population of Montagu's Harriers in a 120 000 ha study area on the eastern slopes of the Central Apennines. It is the southernmost population on the Adriatic coast with the nearest population 70–80 km to the north. The size of this population has varied between 12–32 pairs annually ($\bar{x}$ = 21.7 pairs).

The dark (melanistic) morph of Montagu's Harrier is relatively frequent in the western portion of the European range. In France and Spain, it varies between 2–5% of all individuals in the passage at Gibraltar (Clarke, 1996, Montagu's Harrier, Harlequin Press, Chelmsford, Essex, U.K.) and, in a population in the province of Burgos in northern Spain, as much as 10% of the population (88 nests examined in 1994–96, Sancho and Ansola Aristondo, 1998, Regulación del carácter "plumaje oscuro" en una población de Aguilucho cenizo (*Circus pygargus*), Abstract, 5° Reunión Ibérica sobre Aguiluchos, Evora, Portugal:11) is melanistic. The same is true in Portugal where as much as 20% of the population is the dark morph in Castroverde (Franco pers. comm.). Dark morphs occur less frequently in eastern and central Europe. Shirihai (1996, The birds of Israel, Academic Press, London, U.K.), for example, reported only 10 dark morphs among thousands of Montagu's Harriers migrating through Israel in the 1970s and 1980s. We have no data for the number of dark morphs migrating at the Messina Strait but, in the migration along the Adriatic coast, no melanistic birds have been observed in three years of observations nor have they been observed at the neighboring Monte Conero site where 286 Montagu's Harriers have ben observed (Pandolfi et al., 1998, Migrazione primaverile dei rapaci diurni nel Parco Naturale Regionale del San Bartolo (PS), "59° Congresso Nazionale dell'U.Z.I.," Abstract:43).

The Italian breeding population of Montagu's Harriers appears to belong to the eastern portion of the range in this respect. Indeed, in 13 yr of observations through 1999, I encountered only one melanistic male in 1989, and it was not a breeder but a vagrant seen only for a few days in a breeding site of three pairs. During this time, >1000 adult and young Montagu's Harriers were observed in about 280 nests where nearly 400 young fledged. About 20% of these were nonbreeders and each observation/year was independent. Nevertheless, only this single case of a dark morph was observed (<0.1%).

In the 1999 breeding season, while on a late visit to band and tag harriers, three melanistic, young Montagu's Harriers were observed at a nest on 17 July at Monte della Mattera near Mombaroccio, a known breeding site occupied by the harriers almost every year since 1987. The parents of the three melanistic young were light morphs but all three young in the brood were completely dark, smokey brownish-black, except for the upper tail coverts, which were white as in normal brown juveniles and adult females. This last feature, a white mark at the upper end of the tail, is not normally depicted nor described in most field guides or general ornithological books. Indeed, even the two recent books (Clark, 1999, A field guide to the raptors of Europe, the Middle East and North Africa, Oxford Univ. Press, Oxford, U.K. and Forsman, 1999, The raptors of Europe and the Middle East, T. & A.D. Poyser, London, U.K.), make no mention of this white mark on the upper tail coverts.

Sancho and Ansola Aristondo (1998 and pers. comm.) found no melanistic young produced from normal plumage adults. For this reason, they felt the dark plumage character was dominant. Sage (1962, *Br. Birds* 55:201–225) felt