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DIET AND FEEDING ACTIVITY AT A FLAMMULATED OWL NEST IN IDAHO

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The Flammulated Owl (*Otus flammeolus*) is a small, cavity-nesting species that feeds on a wide variety of nocturnal arthropods (Marshall 1957, Johnson and Russell 1962, Ross 1969). Various studies throughout western North America during the breeding season have found species in the order Lepidoptera (moths and their larvae) and/or Orthoptera (crickets and grasshoppers) to constitute the majority of this owl's diet, with Coleoptera (beetles), Dermaptera (earwigs), Araneae (spiders), Chilopoda (centipedes), and miscellaneous insects making up a smaller percentage (Goggans 1986, Reynolds and Linkhart 1987, Powers et al. 1996). The male Flammulated Owl is the sole provider of food to the nest during incubation and for a good portion of the nestling period, until the female begins to share feeding responsibilities. The rate of food delivery varies in intensity through the nesting period, increasing as the nestlings mature and food demands are higher (Hayward 1986, McCallum et al. 1995).

From June through August 1992, Leon Powers and I monitored the activity of a pair of Flammulated Owls in Eyrie Canyon, located in the Sublett Mountains of Cassia County, south-central Idaho; our work was part of a larger study that investigated the species' nesting biology and food habits from 1991 to 1994 (Powers et al. 1996). The top photo on the back cover shows an adult with orthopteran prey just prior to a delivery at the nest on 7 July 1992; the bottom photo shows an adult delivering a moth directly to the young at the cavity entrance on 28 July 1992. Following are selected details of observations on diet, feeding activity, and behavior of this pair.

On 26 June we discovered the female occupying a nest cavity in a snag of Quaking Aspen (*Populus tremuloides*). Forest vegetation within the study area was predominantly aspen and Douglas Fir (*Pseudotsuga menziesii*). Other vegetation types in the area were mountain shrubs (including Ninebark, *Physocarpus malvaceus*) sagebrush-grass and riparian with scattered forbs. The diameter of the nest tree at breast height was 29 cm, the nest cavity's height was 5.4 m, and the orientation of cavity was 40° (northeast). On the basis of a known fledging date, and using mean incubation and nestling periods of 22 days each (Goggans 1986, Reynolds and Linkhart 1987), we concluded that the nest was in the early stages of incubation when found. We made partial-night observations on 3, 8, 9, 13, 14, 24, and 29 July and all-night surveillances on 23 and 28 July. Visual observations were made by skylighting the nest entrance to record the number of nest visits. The nest successfully fledged two young, which we found approximately 125 m from the nest on 3 August.

During incubation and the early nestling stage the owls began feeding after sundown at approximately the same time each night (mean 2129 hours, $n = 7$), beginning with the female leaving the cavity briefly, followed shortly by the male delivering food items. The last feeding at the nest occurred just before sunrise (mean 0558 hours, $n = 2$). The adult owls made the food exchange to the young either by flying directly to the nest or by perching first on a small branch of an adjacent tree about 2 m away. On several occasions the adult used its bill and talons to subdue larger orthopteran prey, and possibly to remove appendages (see top photo), before flying to the nest. Early in the nestling period, the adults disappeared into the cavity at each food delivery, but a few days before fledging the young were able to peer out of the cavity entrance (see bottom photo), at which time the food exchange was made at the nest entrance. We did not observe delivery of more than a single prey item per visit.

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We counted 133 nest visits on 23 July and 81 visits on 28 July, with both adults making food deliveries to the developing young; the previous high count for nest visits in a single night was 121 by McCallum (1995). Such high counts (>100) likely correspond to times when nestling growth rates are highest and may suggest that the young are 9–12 days old (see Figure 3 in Reynolds and Linkhart 1987). Nightly feeding rates were consistent with those reported elsewhere (e.g., Hayward 1986, McCallum 1995), peaking shortly after sunset and then again just before sunrise. On 23 July we recorded 35 food deliveries between 2115 and 2215, an hourly rate higher than reported elsewhere.

To determine prey type, we used a 35-mm camera to photograph the adults before or during a food delivery. Examination of 65 photographs taken during the nestling period (including those on the back cover) permitted us to identify 63% as pertaining to one of three categories: 28 orthopterans, five coleopterans, and eight lepidopterans, including two larvae. Lepidopterans predominated at other nests within the larger study area in prior and subsequent years, but our data help to demonstrate the Flammulated Owl's ability to feed opportunistically, adjusting diet composition to insect availability locally, geographically, and seasonally. In Oregon, Goggans (1986) found that diets shifted from noctuid moths during the summer to orthopterans later, and the high number of orthopterans delivered by owls at our nest site may reflect the increased availability of these insects relatively late in the season. The high number of hourly and nightly visits recorded during the peak of breeding season attests to the amazing ability of these owls to utilize an important food source in a forest ecosystem.

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