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Activity Pattern of a Pair of Nesting Flammulated Owls (*Otus flammeolus*) in Idaho

Abstract

A single flammulated owl (*Otus flammeolus*) nest was monitored during late incubation and early nestling period to determine the pattern of nest visits by foraging adults. Visits to the nest by adults began each evening 10 to 30 minutes after sunset and ended during the hour before sunrise. The foraging adults were most active in early evening and just before dawn, although they visited the nest throughout the night. The number of nocturnal nest visits increased linearly during the nestling period from 22 visits per night recorded prior to hatching, to 97 visits per night when the oldest of three young was 15 days old. This increase was accomplished by shortening the intervals between delivery bouts during the middle of the night. There was no evidence of diurnal foraging.

Introduction

A complete understanding of the role a species plays in a community requires information on use of space, food, and time. Nesting flammulated owls (*Otus flammeolus*) occupy stands of ponderosa (*Pinus ponderosa*) or Jeffrey pine (*P. jeffreyi*) in the Transition zone of western North America (Marshall 1939, Bull 1978, Bloom 1983, and others). Specific characteristics of sites used for nesting can not be defined from current information (Bull 1978, Richmond *et al.* 1980). Casual observations indicate flammulated owls are nocturnal and insectivorous (Johnson and Russell 1962, Johnson 1963, Marshall 1939). As such, the species appears to exploit resources utilized by few other nocturnal vertebrates (bats and Caprimulgiforms).

To define the role flammulated owls play in a coniferous forest community, the timing of the owls' daily foraging activity, species composition of its prey, and numbers of prey consumed must be determined. Although limited, data collected at a single flammulated nest in 1982 quantitatively describe the daily activity period of a nesting pair and suggest the magnitude of prey numbers consumed by the owls.

Study Area

On 16 June 1982 I found a flammulated owl nest cavity 1.5 m high in a 2.5 m ponderosa pine stub. The nest was located on the Boise Basin Experimental Forest, Boise County, Idaho, in an unharvested stand of old growth ponderosa pine—Douglas fir (*Pseudotsuga menziesii*) forest about 25 m from a seven-year-old clearcut. The approximately 35 ha forest stand varied in structure from open, overmature, ponderosa pine with little understory to a multilayered, closed canopy of mixed ponderosa pine and Douglas fir, to mature timber with a dense understory of ninebark (*Physocarpus spp.*). Based on two 1000m^2 plots located within 200 m of the nest, Pregitzer (1983) classified the stand as *Pseudotsuga menziesii/Spireae betulifolia—Pinus ponderosa* phase (Steele *et al.*1981). Forest cover for trees over 10 cm dbh was 60 percent ponderosa pine and 40 percent Douglas fir, averaged 580 live trees per ha and 40 snags per ha. Sixty trees per ha were over 35.6 cm (14 in) dbh and included 50 trees per ha over 30.5 m (100 ft) with the largest tree measuring 136.5 cm (53.7 in) dbh and 49.1 m (161 ft) tall.

Immediately around the nest the overstory was overmature ponderosa pine with an understory of Douglas fir saplings. The nest cavity faced a clearing approximately 7 m diameter. Bull (1978) described four nest sites, all in similar two or three layered oldgrowth ponderosa pine stands.

Methods and Results

Prior to 14 July, I visited the nest only at dawn or during daylight. During 20 visits between 16 June and 14 July an adult owl was always present within the nest cavity. At 0807 on 14 July and at 1400 on 15 July, an adult was not present. It was not apparent what role male and female owls played in incubation.

On 30 June one egg hatched, and one unhatched egg was visible beneath the brooding bird. On 5 July the young owls called with weak peeping sounds. On 13 July one young began clapping its bill when I visited the nest. On 14 July, three downy young were visible, each with patches of emerging darker contour feathers.

In an attempt to determine diets, I photographed prey deliveries during the first one-half hour of activity on two nights (14, 15 July). Seven photographs had recognizable prey; two noctuid moths (likely *Catocala* spp.), a camel cricket (likely a predominantly ground dwelling form in the family Gryllacrididae), two moth larvae (one possibly *Catocala* spp.), an unidentified moth, and an unidentified beetle or spider.

Using a Bacharach 24-hour clock and event recorder I monitored adult nest visits from 27 June to 14 July 1982. The event recorder, triggered by a small perch attached to an electric switch placed across the lower side of the cavity entrance, recorded the time of day for all nest visits. Observations at this nest and two boreal owl (*Aegolius funereus*) nests (author's unpublished data) indicate the nest cannot be entered, or a prey delivery made, without triggering the perch. The recorder is not activated when an owl leaves the cavity.

Observations and photographs indicated that the adult owls did not enter the cavity during feeding visits, but perched at the entrance and placed only their head into the cavity. Feeding visits usually lasted less than five seconds. Because visits were brief, and the owls did not enter the cavity, only one mark was registered on the event recorder per visit. Each mark on the recording paper was therefore considered a nest visit. The total number of events for any one night, however, should be considered conservative since two visits within a minute of one another may not be distinguished as two records. This assumption was especially important late in the nesting period when both adults were foraging and feeding the young.

The clock appeared to have run slowly the night of 30 June. Although the number of events could be counted, the events could not be assigned a particular time for that night. Since the recorder was not attended from 2-5 July records on the graph were too dense to count accurately but the earliest evening record and latest morning record for this period were ascertained.

The owls generally showed a burst of nest visits 10-30 min. after sundown, which lasted 30-40 min., and again 45-75 min. just before dawn (Figure 1). During 17 days of recording, only one visit occurred during daylight hours. Early in the nesting period, when fewer visits were recorded, the events throughout the night were clumped, with visiting bouts followed by 15 to 90 min. breaks. Eleven days after hatching (on 10 July), 64 visits were recorded during the night with six breaks of 15 min or longer and one break over 30 min. For five of these seven breaks, at least three deliveries occurred in the 15 min preceding or following the break.

To evaluate the distribution of nest visits throughout the night, I recorded the number of visits by 30 min periods over 13 days (excluding 30 June and 2-5 July, Figure 1). A test of the hypothesis that nest visits were distributed uniformly throughout the night was rejected ($x^2 = 82.65$, $df = 16$, $p < 0.0001$) due to the concentrated activity in early evening and dawn. When an hour of activity at dawn and dusk were excluded, a chi-square test was not significant ($X^2 = 18.91$, $df = 12$, $p = 0.091$).

The time of onset and cessation of activity were consistent over the 17-day recording period (Figure 1). Time of the first visit each evening varied by 41 min but 10 of 13 recorded first visits began within 20 min (2140-2200). The time when activity commenced each morning varied by 51 min, however, 8 of 12 recorded final visits occurred between 0540-0600 (Figure 1).

Total number of nest visits each night changed through the nesting period (Figure 1). While feeding the brooding adult and young during the early nestling stage, the foraging adult presumably uses cues from its dependents to adjust the feeding rate to their needs (Welty 1975:341-342). Later in the nesting cycle, both parents feed the developing young; the incubating adult will begin to assist in foraging when food being supplied fails to meet its needs. Johnson and Russell (1962), Marshall (1939), and my photographs, indicate flammulated owls are insectivorous and consequently consume prey of a relatively consistent size class. Therefore, the pre-hatching total nightly visitation should indicate the food requirements of the brooding owl (assuming prey is delivered at each visit). The rate of increase in the number of deliveries each night

should reflect the growing food requirements of the young.

The number of nest visits showed a significant linear relationship ($y = 28.4 + 3.7x$) with the period of the nesting cycle. For the linear regression analysis, the night prior to the night the first egg hatched was designated day 1 (28 June) and the nesting cycle numbered sequentially. A random distribution of residuals, a high r^2 (0.84), and significant F test on the overall regression ($p < 0.01$), indicate that the relationship was linear over the period studied. A 95 percent confidence interval (2.58 to 4.88) for the slope, indicates an average rate of increase between three and five visits each night, or about one visit per nest occupant per night.

The number of nocturnal nest visits progressively increased by shortening the intervals between feeding bouts during the middle night and extending the periods of feeding activity in evenings and mornings. The rate of visits during the first and last 30 min of the active period did not change through the nesting period (Figure 1).

Seven photographs taken on two nights showed one insect being carried at each visit. If this is the norm, an incubating owl requires about 22 insects a day as indicated by the pre-hatching visitation rate (presuming the incubating owl did not leave the nest to forage). Over a 49-day incubation and nestling period, the nest occupants consumed an estimated 2314 insects. The estimate assumes 22 insects a day for the incubating owl during 25 days of incubation (Eckert and Karalus 1974) and estimates the consumption by nest occupants after hatching based upon the regression equation and a 24-day fledging period (I limited the level of consumption to that of day 20 for days 20 to 24). My estimate of insect consumption probably overestimates consumption late in the nestling period, underestimates that of the incubating owls, and provides no estimate of consumption by foraging owls. However, it indicates the magnitude of insects one nest of flammulated owls may consume in 49 days.

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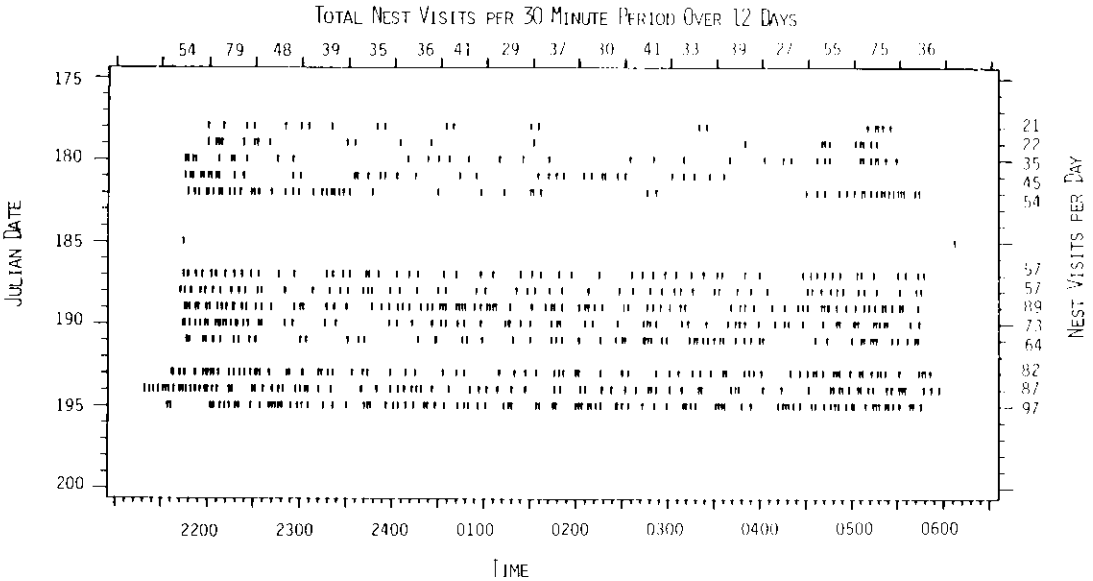

Figure 1. Nocturnal activity pattern of a pair of nesting flammulated owls recorded at a nest cavity in Boise County, Idaho. On 30 June (181) a slow clock prevented recording accurate times of activity for that night. Because the recorder was not serviced from 2-5 July (183-186) only the earliest and latest records for this period could be used. On 11 July (192) a recorder malfunction prevented recording of activity.

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