BOOK REVIEW

EDITED BY JEFFREY S. MARKS

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Ecology of Boreal Owls in the Northern Rocky Mountains, U.S.A. By Gregory D. Hayward, Patricia H. Hayward, and Edward O. Garton. 1993. *Wildlife Monographs,* No. 124. 59 pp., frontispiece, 6 figures, 19 tables, 1 appendix. ISBN 0084-0173. Paper, $4.75.—The authors studied habitat choice, diet composition, breeding density, and reproductive success of boreal owls (*Aegolius funereus*; Tengmalm's owl outside North America) in the northern Rocky Mountains, Idaho, U.S.A. from January to August during 1984–88. The study sites were pristine boreal coniferous forests at high elevations (1580–2400 m), where snow depths reach 50–150 cm and snow does not melt until May. Therefore, the living conditions of owls were adverse. I also understood that the working conditions of researchers were harsh, especially in winter and early spring. Considering these environmental restrictions, Hayward et al. have done respectable work. I wonder, though, whether it would have been possible to find study sites with higher owl densities so that the great study effort could have produced more data and more convincing results about breeding parameters.

The best part of the monograph is on the habitat choice of boreal owls, an aspect of the owl's biology that appeared to be very interesting. By far most of the owl breeding (hooting) territories in mountains of Montana, Idaho, and northern Wyoming were located in subalpine fir (*Abies lasiocarpa*) habitats, and no owls were detected below 1290 m elevation. In the authors' study sites, owls bred in mixed-conifer, spruce-fir, Douglas fir (*Pseudotsuga menziesii*) and aspen (*Populus tremuloides*) stands. The most common vegetation type in the area, lodgepole pine (*Pinus contorta*) forest, was largely avoided by the owls. Roosting habitat also differed between winter and summer. Winter roost sites were chosen in relation to their availability, whereas summer roosts were in dense forests with greater canopy cover and tree density. Therefore, during summer owls appeared to select sites with a cool microclimate for roosting. The most productive foraging habitat was found in old spruce-fir stands where prey population densities were also higher. The owls seemed to face conflicting needs in choosing their nesting, foraging, and roosting habitat, and therefore they used large home ranges ($\bar{x}$ = 1450 ha in winter and 1200 ha in summer).

The primary foods of boreal owls were red-backed voles (*Clethrionomys gapperi*), but in winter northern flying squirrels (*Glaucomys sabrinus*) were frequently captured by female owls but not by males. In summer, northern pocket gophers (*Thomomys talpoides*), yellow-pine chipmunks (*Tamias amoenus*) and western jumping mice (*Zapus princeps*) served as most important alternate prey. The dietary separation between sexes in winter was a fascinating observation, and the reader easily sees its implications to the reversed size dimorphism of birds of prey. In Tengmalm's owls, the degree of intersexual size dimorphism is very high in comparison to other European owl species (Korpimäki 1986).

Data on breeding success were limited because the owl breeding density was low and finding nests was not easy. Egg laying did not start until late April to May. This apparently was attributable to difficulties that males had in courtship feeding because of extreme environmental conditions, and that females were slow to gain weight for egg production. Mean clutch size over 5 yr was 3.1 eggs (11 nests during 1984–88), and the mean number of fledglings produced in successful nests was 2.3. Nesting failure rate was high; 10 of 16 nesting attempts failed. All these values are extremely low so that they are only comparable to values of poor vole years in Fennoscandian Tengmalm's owl populations. For example, in my study area in western Finland (63°N), the yearly median laying dates ranged over 44 d (between 14 March and 27 April) and the yearly mean clutch size from 4.0–6.7 during 1973–89 (Korpimäki and Hakkarainen 1991). The data of Hayward et al. suggest that the breeding habitat of the boreal owls they studied was poor, and the reader may be left wondering whether the low breeding parameters recorded also are valid for other North American boreal owl populations.

On the basis of a limited number of radio-tagged owls, the authors estimated the annual mean adult survival as 46%, but, radiotags may reduce the survival of owls. The wide confidence interval (95% CI = 23-91%) of their estimate may result in a source of error in population growth models where this survival estimate was later used as a central parameter. These models suggested that the study population declined during the 5-yr study. In any case, the authors could have compared their adult survival estimate with Finnish conspecifics and found that their mean estimate appears to be lower than that for Finnish owls. Based on the 281 Finnish band recoveries of Tengmalm's owls found as dead and calculated by maximum likelihood method, the estimates of mean annual survival were 50% (95% CI 43-57%) during the first year of life and 67% (61-75%) thereafter (Korpimäki 1992). Of course, I am well aware that all survival estimates based on band recoveries may include their own shortcomings.

Despite some weaknesses, I find this monograph provides a good basis for further studies on boreal owls in North America. The results probably also serve as the core information for the conservation of this species in North America. I would like to suggest studies on the species in better habitats and in nest boxes where the nests are easier to find and parent owls could be trapped (although it seems that nest boxes are not accepted to the same degree as in Fennoscandia).

In my opinion, this monograph is enjoyable to read and is of high quality. It should probably belong in the library of any researcher who is studying owls, especially hole-nesting owl species. It is also valuable to all those who are interested in raptors and habitat selection of uncommon species in North America. Therefore, it should be available in most university and other public libraries.—**Erkki Korpimäki, Laboratory of Ecological Zoology, Department of Biology, University of Turku, FIN-20500 Turku, Finland.**

LITERATURE CITED

KORPIMÄKI, E. 1986. Reversed size dimorphism in birds of prey, especially in Tengmalm's Owl *Aegolius funereus*: a test of the "starvation hypothesis." *Ornis Scand.* 17:309–315.

———. 1992. Fluctuating food abundance determines the lifetime reproductive success of male Tengmalm's owls. *J. Anim. Ecol.* 61:103–111.

——— AND HAKKARAINEN, H. 1991. Fluctuating food supply affects the clutch size of Tengmalm's owl independent of laying date. *Oecologia* 85:543–552.