

## NOTES ON THE BARN OWLS OF THE SAN FRANCISCO BAY REGION

By CLARENCE F. SMITH and CRANSON L. HOPKINS

This paper presents the results of studies of the nesting and food habits of the Barn Owl (*Tyto pratincola*) made from 1931 to 1934 in Marin, Contra Costa, Alameda, and San Mateo counties, in the San Francisco Bay region of California. Both authors have examined and analyzed pellet material and in addition have contributed numerous field notes. We are indebted to the Audubon Association of the Pacific, the members of which initiated the study, for the use of pertinent material gathered by them, and to Dr. Seth B. Benson, of the University of California, for assistance in the identification of difficult mammalian specimens.

NESTING.—The well-known tendency of Barn Owls to inhabit buildings erected by man gave rise to speculation concerning habits of these birds in the absence of buildings. Also, the question arose whether the owls would accept nest boxes placed for their use in suitable localities. In places where there were no buildings, the owls commonly were found to use cavities made by the weathering of earth banks. At one particularly suitable situation several pairs of birds nested in such close proximity as to suggest colonial habit. A typical burrow had an opening about 10 inches in diameter and was 3 to 4 feet deep. The floor of the tunnel usually had only a gentle gradient, without turns. During the winter season many of these nest cavities were closed by dirt slides or were washed away by the rains, but new sites always were resorted to. It was not determined whether the owls dug out some of the openings, or whether they used only what chance offered them. Evermann (Ornith. and Ool., vol. 7, 1882, p. 109), in his study of southern California Barn Owls, was “. . . convinced that the owls themselves make many of them” by hollowing out a slight hole or crevice with their claws. Rock ledges, wherever available, also are used by the owls, and these sites are much less affected by weathering processes than are the earthen ones. One such ledge, occupied for nesting purposes during at least two seasons, was situated about 4 feet above ground and formed a triangular cave 4 feet high at the apex by 3 feet in greatest depth. There was a narrow crevice at the rear that led into a pocket into which the parent owl often crept when the nest was visited. This cavity also was used as a roosting place by the mate of the brooding bird. Protection afforded the owls when inside the shelter was almost perfect, as there appeared to be but the one opening into it.

In natural situations the eggs are laid in a crude shallow cup formed among the broken-up pellets which serve as a nest. In hay lofts the eggs often are laid on the surface of the hay, with little or no attempt at nest building, which habit often results in accidental damage to the eggs by persons working in the barn.

Boxes were placed at a number of known nesting and roosting sites in a great variety of situations; some were in barns and others were in trees. Those in barns were utilized for nesting purposes *in every case*. This apparently unknown tendency may assist those interested in the birds in providing them with safe and suitable retreats; for such sites, either “natural” or in buildings, seem to be at a premium. Ordinary apple boxes are effective and should be completely enclosed at the ends and on three sides. The open side should be partially closed by a board 2 to 3 inches wide nailed along the bottom of the box in order that the eggs or nesting material may not be pushed out by accident. Ordinary straw makes an acceptable floor, although nest material is not actually necessary.

The localities studied during the investigations are distributed as follows: Marin County, 4; Contra Costa County, 2; Alameda and San Mateo counties, 3 each. Both

the Contra Costa nests were in Moraga Valley, near the town of Moraga. One bird nested in a box placed by Hopkins for that purpose inside a barn, and the other made its nest in a narrow space between the barn wall and stored bales of hay. The San Mateo County nests were all in "natural" sites, one being in a crevice of a rock about 8 feet above ground near Half Moon Bay, the other two in natural cavities in dirt banks near Colma, both being somewhat higher above the level of the ground. Three of the Marin County nests were in Elk Valley and one at Point Bonita. All these nests were in boxes set up for the purpose, either in barns or at regular roosts. Information from Alameda County pertains to roosts, one of which has at times been used as a nesting locality by the owls. Hopkins later found many burrows in Corral Hollow, Alameda County, in hard conglomerate formation.

FOOD.—Although there has been some controversy concerning the reliability of pellet analysis as a method of determining the diet of predatory birds, observations and direct experiments have established beyond doubt that, at least for Barn Owls, data obtained from the analysis of such pellets are highly reliable as an index to the full range of food items.

The material here presented is based upon examination of 87 pellets or pellet samples from 12 nesting or roosting sites of the Barn Owl. Hopkins collected and examined 46 pellet samples, representing approximately 100 pellets from 10 of the nests, and he and Smith collected 41 pellets from 2 other nests. Smith analyzed the latter and also verified the identifications of the pellet samples examined by Hopkins. Examinations were made by separating skulls, feathers, or other diagnostic items from the rest of the pellet material. Microscopic examinations of the remainder were not made.

Remains of at least 338 vertebrates were found, but only two of these, amounting to 0.6 per cent of the entire food, were birds. No remains of lower vertebrates were found, the remaining 99.4 per cent of the diet consisting exclusively of mammals. These and subsequent percentage figures represent only the frequency of occurrence, and do not take into account the size or bulk of the prey.

Three mammalian orders were represented. By far the greatest number of individuals, 323, were rodents, and they comprised more than 96 per cent of the food. Insectivores were represented by only 8 individuals, and the rabbits (*Lagomorpha*) by 5.

Of the insectivores, moles (*Scapanus latimanus*) occurred twice in pellets from Alameda County and once in those from Marin County. Shrews (*Sorex* sp.) were represented twice in the material from Contra Costa County, and *S. vagrans* three times in that from San Mateo County. Rabbits had been taken in two counties, the remains of 3 specimens of *Sylvilagus* sp. being noted from Marin County and 2 specimens of *S. bachmani* from San Mateo County.

The California meadow mouse (*Microtus californicus*) formed the predominant element of Barn Owl diet, except in Marin County where the pocket gopher ranked first. Remains of at least 168 individual meadow mice were noted and these comprised more than half the entire number of vertebrate individuals found. Seventy pellets or samples contained the remains of this mouse. In compiling the data by counties, it was found that the meadow mouse constituted 72 per cent of the food of the Barn Owls from San Mateo County, 36 per cent of those from Contra Costa County, 67 per cent of birds from Alameda County, and 28 per cent of those from Marin County.

Throughout the region as a whole, the pocket gopher (*Thomomys bottae*) was next in importance, being represented by at least 72 individuals. Only in Marin and Alameda counties, however, does this animal appear in numbers. In Marin County, 57 pocket gophers were taken; in Alameda County 10; in Contra Costa County 3; and in San Mateo County, 2.

Remains of 46 deer mice (*Peromyscus* sp.) were noted, 25 in pellets from Marin County, and 21 in those from San Mateo County.

Other rodents were represented by a combined total of 35 occurrences: the harvest mouse (*Reithrodontomys megalotis*) was recorded 14 times; house mouse (*Mus musculus*), 12; wood rat (*Neotoma fuscipes*), 4; jumping mouse (*Zapus orarius*), 4; pocket mouse (*Perognathus* sp.), 1.

Eleven of the harvest mice occurred in material from Marin County, and 3 in that from San Mateo County. Of the house mice, 6 were recorded from the owls in Contra Costa County, 5 from those of Alameda County, and 1 from San Mateo County owls. Wood rats were noted twice in pellets from Marin County, and once each in those from Alameda and San Mateo counties. The jumping mice were all from one nest in Marin County, and the pocket mouse was from Contra Costa County.

Other food items included one specimen each of the Western Sandpiper (*Ereunetes mauri*) and the Western Meadowlark (*Sturnella neglecta*), both from Marin County. Jerusalem crickets (*Stenopelmatus longispina?*) may be considered to occur regularly in the food of the Barn Owl, as is indicated by their presence in many of the pellets from each of the counties concerned. Although some of the pellets contained remains of Diptera and Lepidoptera, the association was such that it seemed improbable that these insects had been taken as food.

The food tendencies of the Barn Owl indicated here compare favorably with similar examinations made in other parts of the country and again demonstrate the highly stereotyped character of this bird's diet. It will be noted that 241 of the 338 vertebrate individuals recorded, composing more than 70 per cent of the entire food of Barn Owls, were meadow mice and pocket gophers. These two rodents are among the species most destructive to orchard and field crops in regions where they occur, and consequently their presence in cultivated areas is undesirable. The remaining 30 per cent of the food consisted chiefly of species that have little direct effect upon man's economic interests. Only the shrews and the meadowlark can be considered economically beneficial to man.

The complete absence of ground squirrels in the food of the owls is worthy of special mention inasmuch as they are recorded by Evermann (*op. cit.*, p. 97) as being one of two principal food items of this bird in southern California some 55 years ago. Ground squirrels (*Citellus beecheyi*) are not uncommon in some of the areas represented in this report, and although they are diurnal, it seems as though the percentage taken by Barn Owls should remain more or less constant where both occur. The other important food item found by Evermann was the pocket gopher, still important as food for the owls in at least part of the San Francisco Bay area. It is also noteworthy that no house rats (*Rattus* sp.) occurred in the material analyzed. The relationship of Barn Owls to other birds is well shown in a report quoted by A. K. Fisher (Hawks and Owls of the United States in their Relation to Agriculture, U. S. Dept. Agr. Bull. 3, 1893, p. 135), which indicates that domestic pigeons (*Columba livia*) and Barn Owls have nested together in the same hay loft without harm to the pigeons. Other records from all parts of the Barn Owl's range substantiate the conclusion that birds are preyed upon only under unusual circumstances.

An interesting side light was the discovery of the jumping mouse (*Zapus orarius*) from a new area: in Elk Valley, Marin County. Previously this mouse had not been known south of the Point Reyes peninsula in Marin County. This record shows a secondary value of pellet analysis in determining the distribution of other animal life in an area.

Bureau of Biological Survey, Washington, D. C., and 920 McKinley Avenue, Oakland, California, March 29, 1937.