

AUDITORY RECOGNITION OF PREDATORS

By LOYE MILLER

Through the courtesy of Mrs. Margaret Nice, my attention was called to certain recent literature on the recognition of predators that had escaped my notice. Questions were raised there that prompt me to offer some observations drawn from field experiences in the southwestern United States. Hartley (An Experimental Analysis of Inter-specific Recognition, Sympos. Soc. Exp. Biol. No. 4, 1950:313-336) has the following to say about auditory recognition (p. 334):

"The only method of recognition which has been discussed is recognition by visual clues. The possibility that auditory stimuli alone, or in conjunction with visual characters, may be clues to recognition, cannot be discussed.

"André (1904) states that plumage-hunters in Trinidad imitate the hooting of an owl, *Glaucidium phalaenoides*, to attract humming birds . . . within shot. Smith (1946) gave an account of a threat display of a willow warbler, provoked by the imitation of a cuckoo's note; and on one occasion the writer saw an assembly of clamorous mistle thrushes, *Turdus viscivorus*, and blackbirds, *Turdus m. merula* summoned by an imitation of the 'Ke-wik' note of a tawny owl. On the other hand, Nice & Ter Pelwyk (1941) found that a hand-reared song sparrow gave no response to 'excellent imitations of great horned, barred, and barn owls and also the cry of the red-shouldered hawk.'

"The recognition of predators by auditory means is a field for investigation which lies almost wholly unexplored."

Hartley's paper deals with quite extended experiments using stuffed skins or variously painted models of predators placed in the normal habitats of wild birds, and it very strongly supports the thesis that form, texture and color have much to do with predator recognition. The impression is left with the reader that at least some search of the literature had been made to discover published observations on auditory recognition. The scarcity of such records uncovered is most surprising and leads to the suspicion that other field workers, like myself, have taken too much for granted and have failed to record observations, considering them mere matters of common knowledge. Such at least explains my own negligence. A few cases where exact data can be quoted are therefore offered.

REACTIONS TO IMITATED HOOTS OF THE HORNED OWL (*BUBO VIRGINIANUS*)

Accipiter cooperii. Cooper Hawk. Santa Ana Mountain, 4500 feet, Orange County, California, May, 1938. A male bird came cackling out of forest at second hoot.

Mount Pinos, 6500 feet, Kern County, California, May 30, 1930. A male readily decoyed into close range. On May 31, 1930, I had the same result.

Pajarito Mountains, 4000 feet, Santa Cruz County, Arizona, April, 1945. A bird reacted repeatedly in the course of several days.

Many other cases have been noted for which I have less exact data.

Accipiter gentilis. Goshawk. Sequoia National Park, 7000 feet, California, July, 1928. Three hoots of the Horned Owl brought a Goshawk out of the forest "cackling" excitedly.

Falco mexicanus. Prairie Falcon. Jawbone Canyon, Mojave Desert, California, March 15, 1932. A falcon was flushed from a ledge in the cliff and started out over the open valley. At the sound of the Horned Owl note the hawk circled back and came dashing at me, having located the source of the sound immediately.

Buteo lineatus. Red-shouldered Hawk. Topanga Canyon, Los Angeles County, Cali-

fornia, April 30, 1951. A bird of this species was seen and heard as it circled above the oaks on a hillside where it finally perched. After the second hoot of the Horned Owl, the hawk launched directly toward us but veered off as it sighted us standing in the open.

The large raptors here mentioned are presumably not the prey of the Horned Owl after they have become adult but we found very strong evidence that nearly fledged young of the Zone-tailed Hawk (*Buteo albonotatus*) had been taken from the nest by a Horned Owl (Baboquivari Mountains, Arizona, May, 1945).

Otus flammeolus. Flammulated Owl. Big Pines Playground, Los Angeles County, California, May 10-11, 1934. Horned Owl notes stimulated several of these small owls in various parts of the yellow pine forest.

Chiricahua Mountains, Arizona, 8300 feet, July, 1934. Horned Owl notes roused these owls at three different stations along a stream course. When they fell silent and failed to respond, the call of the Spotted Owl brought them out again at once.

Blue Mountains, Arizona, July 6, 1934. The foregoing experiment was almost exactly duplicated here.

Mount Pinos, Ventura County, California, 7200 feet, July 25, 1936. A bird of this species was located in a small group of conifers by hooting the Spotted Owl's notes. By occasional shifts from Spotted to Horned Owl and back, the little owl was kept stimulated for an hour at a time on three different occasions in the course of two nights.

There is indisputable evidence that the smaller owls are commonly preyed upon by their larger kinsmen. They are therefore alerted by the calls of the larger species.

Cyanocitta stelleri. Steller Jay. Patagonia Mountains, Arizona, 5500 feet, October 10, 1945. These birds were extremely shy and strangely quiet. They could not be approached on the rugged hillside but when I concealed myself carefully and gave the Horned Owl notes repeatedly, they approached very cautiously, slipping silently through the thick growth to very close range. The experiment was thrice repeated in a four-day stay.

Aphelocoma ultramarina. Mexican Jay. Santa Rita Mountains, Arizona, April 27, 1931. Specimens of this jay were sought for some time but the species proved too wary to be approached. Tactics were finally reversed and I sat down under an oak to rest. A few repetitions of Horned Owl notes brought the jays to me and all the desired specimens were collected within fifteen minutes. The experiment was oft repeated in later visits to Arizona mountains, though further specimens were not sought.

Aphelocoma coerulescens. Scrub Jay. For some strange reason the desert races of the Scrub Jay seem much more shy than the representatives from coastal California. Only by resort to notes of the Horned Owl have I been able to obtain needed specimens. Among many experiments, may be noted the following:

Near Oracle, 3500 feet, Arizona, October 13 and 14, 1945. During a three-day stay jays were brought within range only by careful concealment and repeated hooting.

Joshua Tree National Monument, 4000 feet, California, December 5, 1946, and February 12, 1947. The behavior of Scrub Jays was practically identical with that noted at Oracle, Arizona.

Experiments with Scrub Jays were performed in the non-breeding season. In no instance did the birds assume the mobbing attitude but approach was always silent.

Calocitta formosa and *Cissilopha beecheii*. Magpie Jay and Beechey Jay. Near Alamos, Sonora, Mexico, February 21, 1946. Both these species of jays were found in low thorn forest which was bare of foliage at that season. Their behavior was almost identical with that of Scrub Jays. The experiment with Horned Owl notes was twice repeated with the Beechey Jay.

Pica nuttalli. Yellow-billed Magpie. Near Santa Maria, Santa Barbara County, California, January 4, 1926. In a perfectly silent open oak woods about 10:30 a.m.

a single hoot of the Horned Owl brought prompt response by the Magpies who gave their characteristic excitement notes.

Colaptes chrysoides and *Colaptes cafer*. Gilded Flicker and Red-shafted Flicker. Alamo Crossing, Bill Williams River, Arizona, September 26, 1945. Both species were repeatedly called into close quarters by the use of Horned Owl notes. Similar results were obtained at Alamos, Sonora, Mexico, on February 26, 1946.

All the preceding non-predatory species are large enough to serve as prey for the Horned Owl. Small passerine species have not, in my experience, shown any concern during these tests even when the owls themselves have been attracted and have been very active in broad daylight, seemingly searching for a rival owl which they could not recognize in the human experimenter. The small birds such as juncos, chickadees, warblers, and wrens are too small to serve commonly as prey for the Horned Owl and they showed no reaction whatever.

While the Horned Owl is predominantly a nocturnal species in the latitude of the southern United States, I have known it on a few occasions to be spontaneously active at 10:00 a.m. and at 3:00 p.m. and it is easily roused into responsive hooting at practically any daylight hour.

RESPONSES TO IMITATED NOTES OF SCREECH OWLS (*OTUS ASIO*)

The Screech Owl is seemingly more strictly nocturnal than the Horned Owl and only two species of smaller birds are recorded in my notes as reacting to its calls with any degree of consistency, the Cardinal and the Phainopepla.

At Alamo Crossing, Bill Williams River, Arizona, on September 26, 1945, Cardinals proved extremely secretive. They were, however, responsive to notes of the Screech Owl in the course of three days we spent there. Phainopeplas reacted more quickly than the Cardinals. The experiment was equally successful with Phainopeplas near Quartzite and forty miles north of Yuma along the Quartzite road in a mesquite-palo verde association at various seasons.

RESPONSE TO IMITATED NOTES OF THE PIGMY OWL (*GLAUCIDIUM GNOMA*)

This small but extremely vigorous owl is almost entirely a daylight hunter. Furthermore its food consists of the lesser passerine birds to a very great degree. It sounds its metronomic hoot at all hours of daylight but it is difficult to arouse later than the twilight period. It is to be expected then that imitation of its note would prove very effective in arousing small birds to excitement if one is working in the life-zones which it frequents, namely low Transition to Canadian. Such proves very definitely to be the case. A perfectly silent pine-oak forest may be enlivened quickly by patient repetition of the Pigmy Owl's notes.

Mt. Pinos, 6500 feet, Kern County, California, May 30, 1930. Pigmy Owl notes brought a host of scolding birds into a group of black oak trees. There were included nine Mountain Chickadees, two House Wrens, one Solitary Vireo, and two nuthatches.

Frazier Mountain, 6000 feet, Los Angeles County, California, July 8, 1946. Nine species of small birds were attracted within ten minutes.

Saragossa Spring, 7000 feet, San Bernardino County, California, June 25, 1930. Pigmy Owl notes brought one or more individuals of each of the following species: Mountain Chickadee, Oregon Junco, Audubon Warbler, White-breasted Nuthatch, Cassin Finch, Western Wood Pewee, and Pigmy Nuthatch.

Santa Ana Mountains, 5000 feet, Orange County, California, October 8, 1937. Imitation of Pigmy Owl notes brought eight species to excited activity where the woods had been silent before.

Additional and comparable experiences might be recounted by most western bird students.

DISCUSSION

I would emphasize the fact that these experiments were not conducted under laboratory conditions and therefore could not be restricted to the stimulating of one species at a time. That is, group reaction was not ruled out. On the other hand, there was the great advantage of having almost completely natural and therefore normal conditions. There was no element of artificiality other than the imitated sound. It might be said that these imitations were sufficiently accurate to deceive the owls themselves and upon occasion even the critical ornithologist. Completely free, wild birds in their natural habitat are thought then to have reacted in a completely normal fashion.

The responses might properly be classed as either primary or secondary—primary being the response directly to the predator's note and secondary, a response by contagion so to speak. The general hubbub of chickadees, juncos, and warblers was probably the factor that excited a robin, a species too large to be preyed on by the Pigmy Owl. Furthermore there seems to be an instinctive reaction by most animals to certain tone qualities in sounds that are entirely new to their experience. A half grown, albino pet rabbit which had the run of my office was immediately alerted when I imitated the alarm note of a chipmunk. At the second rendition of the sound, "Peter" scuttered to safety under a book case. He had responded to a note entirely new to his individual or his racial experience.

The owl notes employed are round and mellow notes with no distress quality whatever in them. Hence the response of prey species is held to be a primary reaction due to recognition of a predator. Small birds are not therefore stimulated by the Horned Owl note. Nor are they stimulated by Pigmy Owl notes when they are resident species in localities outside the range of that owl, except possibly through curiosity regarding a monotonous and long repeated sound.

The ready response of many owls to imitation of their own notes is presumed to be a territorial reaction toward a supposed rival invader. It therefore has no place in a discussion of predator recognition by sound.

Synopsis and deductions.—

1. Experiments were performed in the field by imitation of the calls of owls of the genera *Bubo*, *Strix*, *Otus*, and *Glaucidium*.
2. These imitations were sufficiently accurate to invoke reactions that were presumably normal.
3. Large owls invoke reactions in a species large enough to be endangered at one or another stage in its life history.
4. Small species did not react to large owls either by sight or by sound. They readily react to a small species of owl, however.
5. A species resident in an area outside the native area of the owl seldom reacts to its note.
6. Reactions may be either direct or else indirect by contagion.
7. Certain tone qualities may, in themselves, be exciting. These qualities are lacking in the owl notes employed.
8. The locus from which sound emanates is quickly determined by birds.
9. Curiosity may be a small factor entering into the experiment when the sound is repeated for a long period of time.
10. The ear is of great importance in predator recognition by birds.

Museum of Vertebrate Zoology, Berkeley, California, May 20, 1951.