

TERRITORIAL BEHAVIOR OF THE FLAMMULATED SCREECH OWL

WITH ONE ILLUSTRATION

By JOE T. MARSHALL, JR.

I had the good fortune to observe the Flammulated Screech Owl (*Otus flammeolus*) during the summer of 1938 at two localities, both in the Sequoia National Forest of the Sierra Nevada, in Tulare County, California. The first locality is the vicinity of Whitaker's Forest (property of The University of California) on the west slope of Redwood Mountain. The life-zone is Transition, consisting of open forest of yellow pine, white fir, incense cedar, and black oak which lies just below the heavy stands of big tree, *Sequoia gigantea*. The results of observations made here from May 20 to July 9 and from August 6 to 15 are summarized on the accompanying map (fig. 26) and table (p. 73). I found at least eighteen males, of which six were collected. Their territories, shown on the map, fall within an area of about two square miles between the altitudes of 4850 feet and 5800 feet. Females were heard or seen in five of these territories. One juvenal was obtained from campers near Whitaker's Forest. The dates of observation (both successful and attempted) of each individual are listed in the table.

The second locality is in the Canadian zone timber (Jeffrey pine, lodgepole pine and red fir) at Big Meadow, 7659 feet altitude, five miles east of Whitaker's Forest. Four males were collected and one female was heard on July 10. These were found within an area of fifty acres. The female was heard there again on August 15. The eleven specimens from both localities are now numbers 74629-39 in the California Museum of Vertebrate Zoology.

Success in locating, collecting, and observing the Flammulated Screech Owls depended on the use of a special method; namely, attracting them by uttering imitations of their hoots. Males readily answered these calls; but their shyness and their habit of concealing themselves in high, dense trees allowed no glimpse of them until their curiosity or antagonism was aroused by a long "conversation." Then they would follow me, uttering their curious "protest calls," and would allow themselves to be led into low trees and watched with the aid of a flashlight.

The eye-shine of this species of owl varies in color from pinkish at middle distances to white at long range. At close range, no eye-shine is visible because the bird's pupil contracts when a bright light falls upon it. I watched one bird at a distance of six feet, and noticed that a full eye-shine was visible for but a moment when the light was first turned on. Almost immediately, the pupils contracted; thereafter only two very small points of light were reflected. When the bird turned toward the darkness, a pinkish glint was reflected through the now widened pupil of the one visible eye.

The single hoot of the male Flammulated Screech Owl is uttered at regular intervals, constant in each individual but varying from a little over two seconds to more than eight seconds in different birds. The hoots are short, uninflected vowel sounds like *oo* in *hoot*. Their approach to a staccato effect can be represented by the words *poop*, *poop*, *poop*. Their pitch, fairly constant in all males, is about B above middle C. A male begins hooting with very soft notes a little lower than the usual pitch (B-flat or even A); he gradually raises the pitch and increases the intensity until the full, mellow tones are reached at B. The hoot, although not loud, is resonant and penetrating; it can be heard up to a distance of two hundred yards. Its baffling ventriloquial quality is noticeable when the birds call overhead. The outstanding feature of the call is its almost endless repetition. The first male met with at Whitaker's Forest (my number 377 in territory E) hooted almost continuously throughout the night of May 20. It maintained an interval of a

little more than two seconds, and paused as if listening for an answer after every fifteen to twenty-five hoots. The bird was silent for several minutes after moving from one perch to another, and was silent also for fifteen minutes before its last calls shortly after dawn. It was probably foraging in these intervals.

All males vary this simple call pattern by alternating a long series of single hoots with a succession of the same calls each preceded by two shorter notes. These shorter notes are slightly over a half step lower than the accented main hoot, from which they

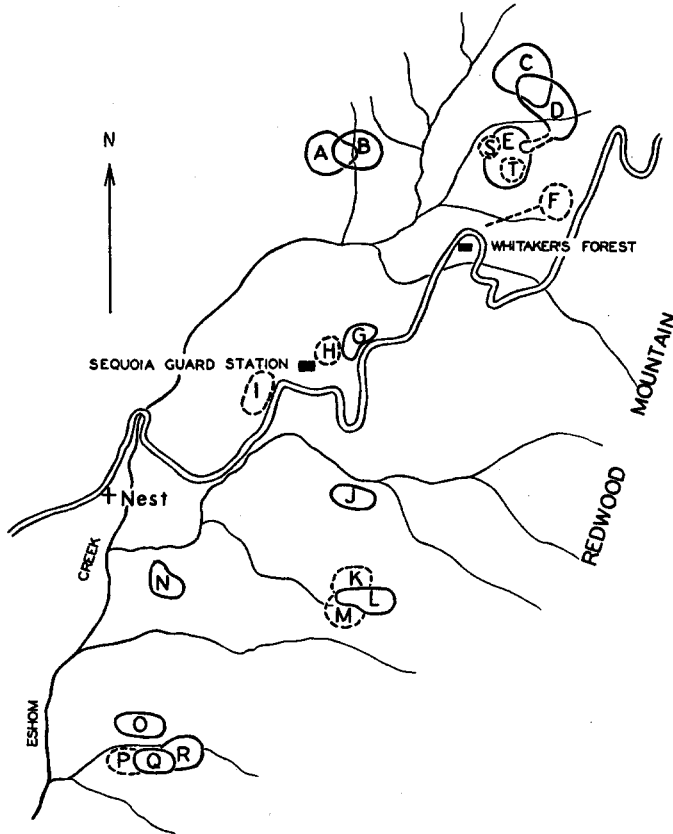


Fig. 26. Territories of Flammulated Screech Owls in vicinity of Whitaker's Forest, west slope Redwood Mountain, Sequoia National Forest, Tulare County, California. The full lines indicate actual boundaries of permanent summer territories where each respective owl has been observed many times on one or several nights. Those areas represented by broken lines indicate places where the owls have been heard on one or more occasions but the actual boundaries of their territories have not been worked out. Except for F, S, and T, the areas are assumed to be within the permanent summer territories of those owls. Scale approximately $1\frac{3}{4}$ inches = 1 mile.

are separated by a definite break in rhythm. In no way do they interfere with the pitch and timing of the main hoot. The entire call can be represented by *boot-ooø, pooø*; *boot-ooø, pooø*. Some birds, as indicated in the table, utter one or three of these "grace notes" instead of the usual two. Such variations are useful in distinguishing individuals, and they are represented as follows: *boot, pooø*; *bootle, pooø*; *bootle-ooø, pooø*.

A third call uttered by the males is merely a change in the quality of the tones described above. In a series of these calls, the tone of the usual note is gradually lost and is replaced by a hoarse, breathy, rushing sound, similar in quality to the sound made by a nighthawk in its nuptial dive. A male utters this call when a male from another territory alights near him. It is also uttered by males whose antagonism to my calls and close approach has been aroused by a long "conversation" and pursuit. I regard the note as a protest or intimidation call designed to keep intruding males away from the song perch and immediate forage area. I know of but one instance of strikingly similar behavior in another species, the Great Horned Owl. On the night of July 15, 1938, I was owl-hunting in the Canadian zone timber bordering Haskin's Meadow, 5150 feet, near Buck's Lake in the Plumas National Forest, Plumas County, California. My calls attracted a low-voiced Great Horned Owl, presumably a male, to the top of a red fir near me. I approached this bird, all the time uttering imitated hoots of the same pitch as his. He continued to answer in the typical full voice until I was within twenty-five yards of his tree. Then he suddenly changed the quality of his hoots to a terrifying, hoarse, rushing sound. The syllables and tempo of his original calls were kept intact.

Territory	Sex	Catalog number J. T. M., Jr.	Dates of observation	Distinguishing notes
A	male	.....	June 22, 27; August 9, 10	.....
	female	.....	June 22; August 9	Double inflection
	No owls heard June 28, August 8, 11.			
B	male	.....	June 11, 13, 15, 22, 27; July 9	.....
	female	.....	June 11, 13	Falling inflection
	No owls heard here June 28, August 8, 11.			
C	male	.....	June 4, 8; July 9; August 6, 13, 15	<i>bootle-ooø, pooø</i>
	female	.....	August 6	.....
D	male	.....	June 8, 11; August 6	<i>bootle, pooø</i>
	This may be one of the males heard in E on August 13 and 14.			
E	male	377	May 20, 21	.....
F	male	.....	June 20	Unusually loud notes
G	male	413	June 7	.....
H	male	.....	June 10	.....
I	male	.....	June 12, 27	.....
J	male	.....	June 10	.....
K	male	.....	June 3, 10	.....
L	male	410	June 3	.....
M	male	.....	June 3	.....
	Last 3 not found during storm, June 7.			
N	male	432	June 12	<i>boot, pooø</i>
O	male	430	June 12	.....
	female	.....	June 12	.....
P	male	.....	June 12	.....
Q	male	431	June 12	.....
R	male	.....	June 12, 27	.....
	female	.....	June 12	.....
S	male	.....	August 13, 14	.....
T	male	.....	August 13	.....

In the early part of the summer, male Flammulated Screech Owls promptly responded to my calls at any time of night and at dawn and dusk. After June 27, however, it became increasingly difficult to "call up" the owls at Whitaker's Forest. Those which did answer after much coaxing called only softly and intermittently. This may indicate that voice in this owl is correlated with the mating period, and this may be waning by the latter part of June in the Transition zone. The owls were still calling normally, however, on the night of July 10 at Big Meadow, in the Canadian zone. This

can be explained by the later arrival of spring in the higher zones. In August, no males were found at Big Meadow, and I had varying degrees of difficulty in finding them at Whitaker's Forest. Curiously enough, one new male was found (territory S), who called steadily and was easily approached at each time of observation.

The earliest time that a male was heard was about twenty minutes after sunset on June 15, when one answered my calls in territory A. The bird was sitting motionless in a dense clump of young white firs. I was reminded of similar habits in common Screech Owls, which come from their roosting places at sundown and sit quietly in the shadows until it is dark enough to forage. On only one occasion were males heard calling of their own accord much before dark. Even those answering my calls at dusk hooted a short time only, then remained silent as they foraged actively until dark. Most of their spontaneous hooting was done in the hours of darkness. One male (my number 413 in territory G) was hooting normally during a violent windstorm on the night of June 7.

With the exception of a curious "mating duet" (to be described later), the notes mentioned above are the only ones uttered by the males which I have observed. On a few occasions, however, another note was heard in several of the territories of males, often at the same time that males were calling. The pitch of this note is three and one-half steps higher than that of the male's call. Since the females of Screech Owls, Great Horned Owls, and Spotted Owls have higher calls than the males of those species, I infer that the female Flammulated Screech Owl gives the call mentioned above. It is a single, inflected *ooooo*, softer and longer than the clear-cut *poop* of the male. On only two occasions did I hear it more than two or three times in an entire evening. Although I collected no females, I believe that the following four observations provide evidence that the female alone utters this distinctive note.

At dusk on June 13, I arrived at territory B where a male was already hooting. Presently the hooting stopped and I heard from the same area a series of gurgling notes uttered apparently by two birds during a flight of about fifty yards through the trees. Following this, the male began hooting at the new location, and a female also called several times. Her calls had a pronounced falling inflection. It is probable that the gurgling notes comprise a "mating duet" performed by both sexes.

Two males were following in territories A and B on June 22. One was finally located in a clump of young cedars where he continued to hoot in answer to the other male. A silent bird was also in the clump of cedars and was within five feet of the male. A short time before, when both males had been in the same tree, the first had uttered typical protest calls. Now he was hooting normally—perhaps an indication that his silent companion was a female.

The third observation of an assumed female was made at Big Meadow, late on the night of July 10, when one gave a prompt answer to my imitated male hoots. It was very shy, and I was unable to see it although I followed it for three hours. During the course of my "conversation" with the female, two males were attracted at different times, and each was easily approached and collected. The female, however, allowed no approach within thirty yards, and remained so well concealed in the upper parts of the denser Jeffrey pines and red firs that no eye-shine could be seen. (In spite of her shyness, she was undisturbed by my wild shots fired at owl-like stubs and glistening drops of pitch.) Her note, uttered with a rising inflection and at intervals of from two to fifteen minutes, was almost as loud as that of a male. It had a muffled, whining quality. This female ranged through an area of about three acres, and I heard her twice there on August 15. No nest was found.

My fourth observation of a supposed female was made in territory A on August 6. This time the bird was both seen and heard. Its note, apparently uttered in alarm, was

heard in answer to both real and imitated Spotted Owl hoots, and it had a double inflection (rising, then falling). A male, hooting in the same territory, was silent while the Spotted Owl called. I have found that other males "freeze" and remain silent when Spotted Owls hoot; therefore, I believe that the alarm note is uttered only by a female.

I was unable to find any occupied nests of Flammulated Screech Owls at Whitaker's Forest. None of the many males heard or watched for long periods of time was ever seen to engage in nesting activities. The fact that they always could be "called up" in their respective territories indicates that they could not be incubating. Apparently the female alone raises the brood. Her secrecy and extreme shyness confirm this. It is possible that the note of the female is uttered only on those rare occasions when the bird is alarmed about the nest. The only positive indication of nesting at Whitaker's Forest is furnished by the juvenal, my number 511, which I obtained from campers on August 6. It had been taken two weeks before from a cavity in a rotted pine stub felled for firewood. The stub had stood in the open, thirty yards from a highway. Its location is indicated on the map. Two other young in the nest had been killed by the fall. Several flying squirrels and their nest were also in the stub, according to the campers. The one live, though injured, owl had been kept in captivity until it died a week later. Its wing and tail feathers were fully grown and were identical in color with those of an adult. The juvenile body feathers were transversely barred with gray and white; there was no indication of rufous color on them.

With the exception of the birds in territories F, S, and T, each Flammulated Screech Owl at Whitaker's Forest was always found within the same area or territory. As shown on the map, these territories are not evenly distributed. They occur singly or in small groups here and there throughout the more open forests, on flat or moderately sloping ground. None is found in deep canyons or in the dense stands of big tree farther up Redwood Mountain. The territories are small; the birds seldom range through an area more than three hundred yards in diameter.

A mild and unaggressive territorial behavior is evidenced by the males. Each advertises his territory by incessant hooting from "song perches" established in tall, densely foliated conifers. Adjacent territories overlap to a certain extent—an indication of the mildness of territorial restriction on the part of the males. A male utters the "protest call" only when an intruding male alights in the same tree or group of trees where he is perched. Even at that time, no actual conflict arises. This overlapping of territories occurs when several birds from adjacent territories are simultaneously aroused by my hoots. My observations on single males, of which the following example is fairly typical, lead me to believe that under natural conditions, their calls usually suffice in keeping intruders away. This example is unique in that the male was far from his own territory (F) when first heard on June 20. His speedy withdrawal upon hearing my imitated hoots seemingly indicated that he was allowing himself to be driven out of the supposed territory of another bird. He was followed with great difficulty (he kept almost beyond hearing distance) directly uphill for five hundred yards, along a route indicated by the dashed line leading to territory F on the map. Here, apparently within his own territory, he stood his ground and soon came down into a dense group of young cedars where I was hooting. His ensuing actions in fluttering about my head and peering in all directions indicated that he was looking for an intruding owl. Finally he faced me and uttered for a long time the hoarse "protest calls." This series of responses to my imitated calls is paralleled by males found within their own territories. Upon hearing my hoots, they retreat deeper into their territories. If followed to one of their central "song perches," they descend and look for the supposed intruder, meanwhile keeping up a continuous volley of their intimidating "protest calls."

One peculiarity in the territorial relations of the owls was noted on August 13. Three males were heard in territory E, which had been unoccupied since May 21 when male number 377 was collected there. (Their territories are indicated on the map by S, T, and an extension of D into E.) Two were heard on the following night. The one bird which was observed closely seemed perfectly at home in its new and well-defined territory (S), and was found in the same group of trees on both nights. It was seen at a distance of six feet and was found to be in adult plumage. These birds are not included in the count of males at Whitaker's Forest because they may have come from some of the territories worked out earlier in the season. Possibly the owls move around somewhat in the late summer. It is difficult to check the territories at that time, because many of the birds no longer respond readily to imitated hoots.

All the territories except F, S, and T were worked out between May 20 and June 13. During that time at least, each owl was found in the same small area every time that the area was visited (except June 7, when there was a violent windstorm). Furthermore, I made checks on the birds to make sure that the same one was not being found in all the territories. One check consisted in recognizing differences in the notes of certain birds—as mentioned previously. Each bird with a distinctive note was found always in the same territory. Checks were made on neighboring birds by first "calling up" each in its particular territory, then hearing them all hoot in unison. I accounted for birds in widely separated territories by "calling them up" one after another. Each successive owl was left while it was still hooting, and its calls faded in the distance as I proceeded to the next. Thus on the night of June 12, six males were heard in territories I, N, O, P, Q, and R, respectively. Three were collected, and the remaining three were heard afterward in their respective places.

A "conversation" with a male terminates when the bird finally "loses interest" and ceases to hoot. Often on such an occasion the bird can be watched foraging in the lower parts of trees. A male in territory B was thus watched in a black oak on June 11. It perched on bare branches or stubs in the lower and middle parts of the oak and remained at a given perch for a minute or more, peering from side to side and upward and downward with rapid movements of the head. Apparently it was scrutinizing the branches for insect food. After fixing its gaze on a particular branch, it would fly rapidly to it, often picking up and swallowing something.

This occasional night foraging is leisurely compared with that at dusk. Furthermore, at night the birds hoot for long periods without moving about, and they are sometimes seen in a resting position, crouched low and motionless, with feathers fluffed out. Probably the greater amount of foraging is done at dusk (also at the equivalent silent period before the last hooting at daybreak).

The forage behavior of the Flammulated Screech Owl at dusk is a remarkable demonstration of agility and power of flight, as the following observations indicate. A male in territory C responded to my calls soon after sunset on June 8. It called for a short time only, then flew to a grove of young cedars. As long as it was seen, it continued to dart with great rapidity among these trees. Many large flying insects were in the air at the time, and the owl was apparently catching them in its beak while on the wing. Once he flew swiftly out of the grove, darted suddenly upward, made an abrupt turn, then flew back into the trees. He had obviously caught an insect on the wing and had done it in an accelerated poor-will or flycatcher style. Similar behavior was noted on June 10 at territory J, where a male was foraging high in an open grove of tall yellow pines. He flew with direct, swift flight from tree to tree, and perched close to the trunk and high in each tree. This bird also made a rapid insect-catching flight; he flew out from his

perch, poised a moment, then turned abruptly and alighted again at the same perch. Male number 430 at territory O, in a comparatively dense forest, was foraging on June 12 with long, zig-zag, bat-like flights through the tops of the trees.

In addition to arboreal and open-air feeding, these owls also feed to a certain extent on the ground. Male number 377 was perched three feet above the bare earth under some small cedars when he was collected May 21 in territory E.

The stomach contents, which were saved from all the specimens collected, furnish ample evidence that the Flammulated Screech Owl feeds mainly on flying insects, at least in summer. Dr. E. C. Van Dyke, of the Department of Entomology at the University of California, examined nine stomachs and found them to be filled with moths, among them several large hawk moths, which can be caught only by a bird of unusual powers of flight. The absence of birds and mammals from the stomachs indicates that the small size, weak feet, and rapid flight of this owl favor a diet of insects rather than one of vertebrates. Besides the great preponderance of moths in the nine stomachs, there were also the remains of the following invertebrates which could have been caught on the ground or in trees: 1 beetle, several spiders, a few grasshoppers, and several centipedes.

A striking feature in the behavior of the Flammulated Screech Owl is its habit of concealment. Males, when hooting from their "song perches" in the highest and densest trees within their territories, remain in the upper parts of the trees (never at the top) and close to the trunks, where they are well concealed by the peripheral foliage. Even foraging birds alight in the interior parts of the trees, and their swift flight cuts their time of exposure in the open to a minimum. The color pattern blends remarkably well with the trunks of conifers and with the gnarled branches of black oaks. These facts lead to a consideration of the possible nocturnal enemies of the Flammulated Screech Owl. It is to be expected that larger owls might feed on them. The only large species of owl at Whitaker's Forest is the Spotted Owl, and it is significant that no Flammulated Screech Owls have territories within a large area east and south of Whitaker's Forest, all of which is occupied by a pair of Spotted Owls. Males are silenced by Spotted Owl hoots; the alarm note of the female in response to them has been described.

The Flammulated Screech Owl is remarkably agile and quick in its movements. When looking about, it moves its head very rapidly, often in a circle in the frontal plane. This peculiar movement permits an object to be viewed from all possible angles and against a changing background. The bird stands rather high and in a sub-vertical posture from which it can take instant flight. Often, however, the take-off is preceded by a moment of hesitancy during which the bird assumes a horizontal position and faces in the direction of the flight which is to follow. In taking off, the bird does not jump from its perch, but gets under way entirely by wing action. The wings beat rapidly and regularly, producing straight, not undulating flight. In hooting, the bird does not noticeably open its mouth; with each note, the flanks are pressed in and the throat bulges out.

The plumage of the Flammulated Screech Owl is compressed except when the bird is in the resting position (described previously). It gives the bird a trim, tapering outline. The feathers of the "ear" tufts are not much longer than the other feathers of the crown, but the tufts are very conspicuous when they are erect and the other feathers are depressed. I have on only one occasion seen the tufts erected at night. Male number 494, only slightly wounded when shot at Big Meadow on July 10, was retrieved from a red fir bough where it had been sitting with head held high, wings and feathers pressed close to the body, and the "ear" tufts fully erect and pointing straight upward. In this posture it presented a fierce, cat-like expression. It is significant that the same posture

was assumed by this bird when it roosted the next day. In either circumstance, both when the bird is in grave danger at night and when it is sleeping in the daytime, it takes on a fierce, intimidating expression which may be effective in protecting it. The concealment afforded by this posture was demonstrated by the captive bird when it roosted in a lodgepole pine. It elongated itself against the trunk of the pine in such a way that it resembled a knob of bark rather than a bird. Furthermore, its plumage blended so perfectly with the color of the bark that the outline of the owl was almost indistinguishable.

It is evident from this short discussion of the behavior of the Flammulated Screech Owl that many questions are unanswered. Do the birds migrate down the mountain in winter? What is their food in winter? Do the males maintain their territories throughout the year? How does territorial behavior under natural conditions compare with the artificial behavior stimulated by imitated calls? What is the behavior of the nesting female and young? Does the territory of the male coincide with the nesting area used by the female? Light will be thrown on many of these problems after more nests are found, and after the birds are observed in winter. I look forward with great pleasure to the opportunity of making these further observations on this fascinating little owl.

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