A STUDY OF TWO NESTS OF THE OVENBIRD.

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Seiurus aurocapillus is the most abundant of the eleven species of warblers that nest at Grey Rocks, Pelham, Massachusetts. It is well distributed through all the woods, both hard woods and white pines and hemlocks.

The Songs. The flight song is heard chiefly late in the day and after sundown, but on several occasions I have recorded it in the morning—at 10.40[1] July 8, at 10.08 July 9, at 10.52 July 11, and at 9.15 July 19. The last flight songs were heard July 24, 1925, July 19, 1927, July 23, 1928 and July 24, 1929. In 1927 it was also noted August 19, 22, and 26, and in 1928 August 4 and 9.

The *teacher* song is given constantly through June and after that with diminishing zeal until mid July. The last songs have been noted July 15, 1921, July 17, 1925, July 14, 1927 (except for a single instance July 27), and July 20, 1928. Although I have listened carefully during six seasons for a recrudescence of this song in August, I have never heard it.

This song is not given steadily but in sudden bursts of enthusiasm. Numbers of songs in what might be called complete series have ranged from 16 to 24 in both Massachusetts and Ohio, but any smaller number may occur. A bird may sing for 9 minutes or so at a time, but usually his outburst is shorter. As to the intervals between series and the numbers of songs given per hour, I have few data, since both the nests I watched were so belated that the males had practically ceased singing. On June 15, 1928 in Black Lick woods east of Columbus, Ohio an Ovenbird gave 9 song series at the following times between 7.37 and 10.37: 7.40, 8.11, 8.35, 8.55 (19 songs), 9.30 (24 songs), 9.37 (16 songs), 9.47 (18 songs), 10.08 (few), 10.25 (few). In the hour between 8.50 and 9.50 77 songs were uttered in 4 series.

The length of individual songs varies considerably; the shortest that I have timed lasted 1.3 seconds, the longest 4.2 seconds, both from the same bird in succeeding series. The intervals between

[1] All hours are given in Eastern Standard Time.

beginnings of songs may or may not be fairly regular. A Pelham Ovenbird July 5 at 6.30 A. M. sang with the following intervals between every other song as measured by stop watch: 28, 27, 26, 23, 48, 25, 24.5, 27.5, 25.3, 21.7; average 27.6 seconds. Four song series of three different birds at Grey Rocks June 23 between 10.30 and 11.00 gave varying results. The first showed the longest intervals: 36, 28, 31.5, 33, 33.5, 26, 30, 36, 33; average 31 seconds. The second bird sang at much shorter intervals with one exception: 18.5, 20.2, 20, 38, 18.7, 21.5, 22.5, 20, 20, 23, 17.5; average 21.8 seconds. The intervals in the first series of the third bird were uniformly short: 22, 24, 24.5, 23, 22, 23, 21, 18, 23.2, 23.5, 19, 22.7; average 22.2 seconds. In his other series I noted the length of each alternate song as well as the intervals, the length being shown in parentheses: 14, (2.2) 15, (2.2) 17, (2.9) 14, (1.3) 14.5, (2.7) 19.5, (3.2) 19.8, (2.8) 20.2, (2.8) 18.4, (2.7) 14, (2) 19.7, (3) 18; average 17 seconds.

Nesting Data. Five nests of this species have been found by us in Pelham: 4 eggs June 14, 1925; 3 eggs July 7–14, 1927; 2 newly hatched young July 11, 1927; 3 half grown young and an egg July 18, 1921; 2 newly hatched young and an egg July 16, 1928. These sets are smaller than those given in the books, where 5 or 6 eggs are often mentioned.

The second nest was in an unusual situation—an open space in a brook valley; since the bird had built in the usual Ovenbird manner with dead materials gathered in the vicinity, the dome of dead leaves and grasses among green leaves and grass was strikingly conspicuous; it was robbed by some animal before the eggs hatched. The third and fifth nests, which are the subjects of this study, were typical structures of dead leaves and white pine needles in woodland where they harmonized well with their surroundings.

Chronicle of the 1927 Nest. On July 11 as I was walking through the woods, I heard violent scolding and saw an Ovenbird on a branch with an insect in his bill; ten feet from me was the nest and beside it the mother staring up at me absolutely motionless. Inside were two very small young, blind and naked except for a little down. I retired to a partly concealed spot 20 feet away, but the commotion kept up unabated, assisted by neighbors of five different species. The female rather mildly drove off another pair of Ovenbirds, but paid no attention to the other birds.

Fifteen minutes after my arrival, the male with an insect in his bill descended to the ground, flew up again, scolded and scolded with the characteristic raising of the crest and jerking of the tail; then descended again and ran along the ground towards the nest still objecting. The female became frantic with alarm, apparently warning her mate from such rash conduct. He reconsidered, flew up above the nest, ate his insect and devoted himself to protests at the rate of 77 *tchucks* a minute.

After a half hour's wait, seeing that my situation was untenable, at 9.48 I moved to a seat 40 feet away across the brook behind a small hop hornbeam; at once the chorus of objections died down and in two minutes the mother went to the young to brood them. At 10.00 the male came to the nest on a runway from the south; the female slipped out and stood quietly waiting; he fed a large insect and then flew up to a branch above while she returned to brood. After chipping a few times he disappeared. The female brooded for 33 minutes and then left walking to the south. Seventeen minutes later she returned with a sizeable meal, fed, inspected and brooded for 38 minutes. The male appeared with a caterpillar, started to run towards the nest, lost confidence and flew up on a branch; in a minute or two he disappeared. After an absence of 24 minutes his mate returned with food and resumed brooding.

In the afternoon from 3.33 to 5.33 the male failed to appear at all, while the female fed twice and brooded twice. The first brooding was peculiar, for, after she had been on the nest for 17 minutes, she peered out, slowly stepped out and, turning around, stood perfectly still by the entrance; after 10 minutes of this quiet watch she went in again and brooded 14 minutes longer.

On July 12 from 8.00 to 12.00 the female fed six times and the male once. She brooded after five of the feedings, but after one she sat, puffed out and content, for 22 minutes upon a bush a few feet from the nest. There was the most extraordinary regularity in her visits this morning; in one case the intervals between feedings was 36 minutes, but in the other four it was exactly 48.

In the afternoon from 2.45 to 4.45, she fed three times, one interval being 47 minutes, the other 69. After the first feeding she walked away instead of brooding or watching; after the second she brooded for 46 minutes—the longest time I recorded,—but after

the third she again walked away although a great storm was threatening.

The mornings of the next two days showed the same general features as before—long intervals between feedings and only mild interest on the part of the male. On July 13 the female brooded 13 and 44 minutes after her two feedings, but on the 14th she brooded 9 minutes after the first meal, 6 minutes followed by a watch of 17 minutes on a nearby bush after the second meal, and walked away after the last two feedings. The male (who, despite the statement of most books to the contrary, was noticeably brighter on the back and crown than his mate) had been an almost negligible factor in the family economy. He had given one meal each morning on the 11th, 12th and 13th, and two meals on the 14th; on the afternoon of the 12th he had accompanied his mate on one of her journeys to the nest. He had done no watching and almost no proclaiming of territory.

The afternoon of the 14th showed a number of changes. The female gave up brooding (not even watching during this session); she fed once every 39 minutes instead of once every 54 which had been the average up till now. The male, wonderful to relate, brought 4 meals, thus feeding once in 44 minutes in contrast to his former record of once in 201 minutes; he also watched for the first time, once for 11 minutes, later for 16.

During the next two days the male fed even more than his mate, 16 times to her 11 in 9 hours of observation. He watched only twice—for two minutes on the 15th and 17 on the 16th. She, on the other hand, watched 6, 16, 20, 0, and 8 minutes after her 5 feedings on July 15, and 10, 10, 10, 0 and 16 minutes after the 5 the following morning, but leaving directly after the single meal she brought during the afternoon session. The parents now spent a much shorter time in delivering each meal than formerly; instead of standing there for about two minutes they usually finished with a feeding quickly.

Although the female did not mind my scrutiny when she was at the nest, twice when I happened to catch sight of her on her secretive journeys to her home, she froze instantly, once standing motionless for four minutes except for two momentary jabs at passing insects, until finally reassured by my putting away the glasses and retiring as much as possible behind my meagre cover.

On July 17 as I was nearing the nest I heard loud objections and there was mother with her crest and tail up, walking in much agitation up and down a branch and uttering 150 *tchucks* a minute. I went directly to the nest and found it empty. On a chance I returned to my seat and everything at once calmed down; soon it was evident that one little bird was only a yard from the nest and that the other was 30 feet off in the ferns, the female caring for the first, the male the second. Each fed its charge three times in two hours, the first baby in the meantime travelling a considerable distance.

When I went to the ferns, the male protested mildly and left. All at once I heard a shrill *peep peep peep;* I followed the sound and found the baby sitting on a dead branch and looking like a little brown leaf. The crop of long down on top of his feathers gave him a very odd appearance. He could not have flown, but his legs were strong. I gently picked him up, and in a minute he went to sleep in my hand.

A loud *tchip* was uttered by the male who appeared with a caterpillar, but to my surprise he simply left with no more demonstration of alarm. A mosquito started to bite the little bird near the tail, he preened in that direction; the mosquito tried again higher up, the bird preened there. The insect flew near the baby's bill and the little fellow pecked at it. Another mosquito alighted on his wing and sucked itself full of blood, the bird paying no attention to it. (I had thought that I saw mosquitos occasionally hovering in front of the nest.) A mosquito started to bite my hand; I brought it before the little bird as a small tidbit, but he did not peck at it until it flew.

The poor little thing was getting very hungry and called and called, a high peep—16 to a minute. He peeped more and more insistently on my finger, so I returned him to his twig and went back to my old post. He called *peep peep-peep peep-peep*, then *peep-peep-peep* and every now and then a shrill heart-rending cry that might be rendered *hee hee hee.* One minute's calls were as follows (p standing for *peep*):

P p-p p-p p p-p p-p-p-p—hee hee hee p p-p p-p p p-p
p-p p p-p p-p p-p p-p p-pp-p p-p p p-p p-p-p p p p-p-p-p p-p

The little bird called almost constantly and still there was no

sign of a parent. It was time for me to leave; as I went past the fern bed, I stepped on a dead branch that snapped; on the instant the cries stopped.

Discussion. The most striking feature of the nest life of these birds was its extreme deliberateness—the protracted broodings, the very long intervals between feedings and even the slow motions of the parents when at the nest. All their actions about their home were quiet and unobtrusive, quite different from the jerkiness we associate with Ovenbirds. With these birds it was evident that the fewness of the meals was compensated for by their extra size—astonishingly large amounts of food being given at each trip. The excreta also were very much larger than those of most small birds.

Table I gives a summary of the nesting activities of the pair.

The nesting cycle seemed to fall into two periods—the early one from July 11 through the morning of July 14, the second from the afternoon of the 14th to the end. The early period was characterized by very long intervals between meals, by brooding by the female, by little interest on the part of the male. The second showed a shortening of the intervals between feedings, the substitution of watching for brooding, and greater zeal in feeding on the part of the male than the female.

During the first period the female fed 19 times in 16¾ hours or once in every 54 minutes; the male fed 5 times or once in every 201 minutes; both together fed once in 42 minutes. During the later period the female fed 19 times in 14¼ hours or once in 45 minutes the male 23 times or once in 37 minutes—once in 20 minutes for both. The female did not change her rate of feeding much; the marked difference between the two periods is due to the active part taken by the male during the last half of nesting life.

The intervals between feedings by the female during the early period ranged between 36 and 85 minutes, averaging 67.6. During the later period they ranged (except for an atypical one of 10 minutes) between 22 and 70 minutes, averaging 40. The male's intervals were as follows: July 14—47, 62, 63; July 15—52, 25, 32, 21, 37; July 16—27, 28, 60, 29, 16, 34, 30 minutes.

The regular routine of nest life consisted in a feeding followed by brooding or watching in the early period and often by watching in the later period, and afterwards a time when the parents defi-

TABLE I.—NESTING ACTIVITIES OF A PAIR OF OVENBIRDS IN 1927.

Date	Time	Hours	Number of times fed by female	male	Av. rate of feeding in minutes once in	No. of times brooded	Time brooded in minutes	Times faeces eaten female	male	Times faeces removed by female	male
July 11	9.50–11.50 A. M.	2	2	1	40	3	75	?	0	0	0
	3.33–5.33 P. M.	2	2	0	60	2	70	?	0	0	0
July 12	8.05–12.05 A. M.	4	6	1	34	4	78	?	0	0	0
	2.45–4.45 P. M.	2	3	0	40	1	46	?	0	0	0
July 13	7.27–9.45 A. M.	2¼	2	1	45	3	80	?	0	0	0
July 14	7.07–11.37 A. M.	4½	4	2	45	2	15	?	1	0	0
	2.15–5.30 P. M.	3¼	5	4	22	0	0	1	1	0	1
July 15	8.09–11.39 A. M.	3½	5	7	17.5	0	0	2	0	0	4
July 16	7.58–11.58 A. M.	4	5	6	22	0	0	4	1	0	2
	3.27–4.57 P. M.	1½	1	3	22.5	0	0	1	0	0	2
July 17	7.55–9.55 A. M.	2	3	3	20	0	0	0	0	0	0
Total	.....	31	38	28	28	15	364	8	3	0	9

nitely left the nesting site, going so far away that visits to the nest could safely be made without their knowledge. The periods spent away from the nest by the female during the first three and a half days varied from 17 to 80 minutes, averaging 34.5; during the last two and half days they varied from 14 to 55 minutes and averaged 36.3. Only once was the absence omitted, when the female on July 16 caught a moth from her perch, fed it to the young 10 minutes after the last meal and resumed her watch for another 10 minutes. During the early period the female brooded or watched after 15 of her 19 feedings, i. e., 79 per cent; during the later period she watched after 7 of 16 feedings or 44 per cent. The male watched after four of his 25 feedings—16 per cent.

During the first day the periods of brooding lasted 33, 38, 41, and 29 minutes, an average of 35; during the second day they lasted 29, 12, 25, 12 and 46 minutes, averaging 25 minutes; on July 13, 13 and 44 minutes; on July 14, 9 and 6 minutes. The average duration of these 13 complete broodings was 25.7 minutes. Two incomplete broodings bring the total to 364 minutes thus spent in the first 16¾ hours, or 36.2 per cent of the time.

There was much variation in the methods of approach and departure. Only three times was the female visible in the trees before she fed; two of these occurred July 15 when the vegetation was very wet. Almost always she walked under cover for quite a long distance either from the east or west; once she approached from the north and once from the southwest. In leaving, she walked away to the east and west about equally often, usually passing behind the nest, but once in front of it. On July 15 she flew directly to a bush after feeding, four other times she flew up to guard after walking a few feet (instead of her usual custom of walking to the bush and hopping up from branch to branch); only once (July 16) did she fly directly away from the nest out of sight—the stimulus here might have been the fact that the male had just flown from in front of the nest.

The male's favorite pathway led from the south; 18 times he used this route, coming from the west twice and south once. On six occasions he appeared in the shrubbery in the vicinity immediately before feeding. His usual method of departure was to fly directly to the west, but eight times he walked away to the west,

south and southwest. He left on foot once on the 13th, five times on the 14th and twice on the 16th.

The male was never seen to drive off any other bird, but was himself chased by a Hermit Thrush three times when he came to feed on July 13. He was heard singing only 12 times—eight *teacher* songs on the 12th, and two on the 13th; on the 14th he gave two flight songs.

Chronicle of the 1928 Nest. The next summer a well concealed nest containing three eggs was found July 14 half a mile to the west of the one studied in 1927; the female flew off with no special demonstration. The next morning at 8.45 the male scolded as I approached, while his mate darted off and then turned back, all the time in a peculiar attitude with back hunched, wings dragging, tail fan-shaped and body feathers puffed out; she did not simulate lameness, but made herself conspicuous and possibly terrifying to a small animal.

At 7.00 A. M. July 16 two young had hatched. At 7.45 I returned to watch, taking a position about 20 feet away under a small hemlock; fortunately neither parent had known of my visits to the nest on this day. At 8.11 I noticed a bird in the large hemlock to the south; she flirted her tail but uttered no sound. In three minutes she had gone to the nest where she fed a large insect and then started to brood. Unfortunately the male felt differently about my presence. At 8.27 I began to hear objections—at first in a high pitched *tchip,* then with a few *tchucks* mixed in, at last all *tchucks.* He scolded at the rate of 34 to 36 *tchucks* a minute for 22 minutes, his rate then falling to 25, to 21 and finally to 16, when he left after a full half hour of protesting. I moved 30 feet from the nest to no avail, so finally settled upon a post 25 feet away under a spreading hemlock.

The first period of brooding was longer than any I observed with the bird of the previous year, namely 54 minutes. After that the female surprised me by the short periods that she stayed away from the nest—10 minutes the first time, 8 and 9 the next times, but 32 the last that morning. Her periods of brooding (after the first) lasted 12, 23 and 26 minutes. During four hours in the afternoon she brooded from 18 to 48 minutes and stayed away from 12 to 24. Once she came out after brooding 14 minutes, stood a half minute

in front of the nest, stepped in as if cleaning the nest, and then brooded again for 15 minutes.

The next morning the third egg had hatched. Eight hours showed much the same picture as the day before, the female feeding 11 times and brooding after every meal. She showed some regularity in her first three periods away from the nest in the morning; these intervals were 19, 18.5 and 18 minutes, the last two being 23 and 15. The male did not come near.

On July 18 brooding was omitted after two of the six morning feedings and after six of the eight afternoon meals. In the morning at 10.58 the male was heard scolding for a few minutes to the north. At 4.18 he came to the tree above the nest giving a few *tchucks*, then the softer *tchip*, and finally a new sound something like the *chicoree* of a Goldfinch only much fainter; he stood there with his bill full of food, his crest up, his wings fluttering. His mate suddenly dropped down right in front of the nest—an unprecedented manner of approach—and fed the young while the male continued to object; she raised her crest as she turned around, the only time I saw this sign of agitation in her. The male then protested till 4.52 on or near the ground a little north of the nest.

The next day the female was brooding when I arrived at 7.30; she left after 8 minutes. She brooded once again in the morning for 10 minutes after the 9.52 meal, and was on the nest when I arrived at 1.40 in the afternoon. Periods away from the nest varied from 13 to 63 minutes.

As with the 1927 nest, the afternoon of the fourth day showed several changes. In both cases the young were fed twice as rapidly as they had been before, but this time the improvement was entirely due to the female since the male did not appear at all. There were also other innovations. Instead of always leaving immediately after feeding as had been her habit when she did not brood, on five occasions she browsed about in front of the nest catching small insects for herself. Always before this she had left on foot; today at 2.38 and 3.10 she flew directly from the nest. Instead of always eating the excreta as the 1927 female had done, at 2.38 she carried away a sac as she flew.

On the morning of July 20 I noticed on the way to the nest that big mushrooms had been gnawed by some animal, perhaps a fox.

The nest was empty and beside it lay five wing feathers. During the many hours spent in watching this nest, I had come to regard the brave and devoted little mother with admiration and affection, so that the disaster brought a sense of personal loss, as well as disappointment at the cutting short of the study.

Discussion. A summary of the main features of the four days is given in Table II.

When brooding the bird faced south sitting sidewise to the entrance, except on three occasions when she faced north. The first day she brooded 62 per cent of the 8 hours, the next day 52 per cent, the next 25 and the last 5 per cent—37.4 per cent of the time during all four days. If only complete periods of brooding are considered, there were 8 on the first day lasting from 12 to 54 minutes and averaging 28.6; on the second 9 periods lasting from 16 to 47 minutes and averaging 27.1; on the third day 5 lasting from 14 to 29 averaging 21.8, while on the last day there was but one of 10 minutes. The average of all 23 was 27.1 minutes. This figure and the percentage of time spent in brooding during the first three and a half days are very much the same with both females.

With one exception the female always walked some distance to the nest; 35 times she came from the south and 17 from the north. She left 31 times to the north and 17 to the south. The time spent at the nest in feeding was measured by stop watch in 24 cases. Seven instances on the first day varied from 50 to 205 seconds averaging 90; 9 on the second day ranged from 61 to 120 seconds averaging 80; 5 on the third day ranged from 70 to 205 averaging 126; 3 on the fourth day ranged from 53 to 72 averaging 62. There was no watching by the nest as with the other female, but possibly this might have appeared later, although this year there were no convenient bushes at hand as had been the case the year before.

Some of the meals this bird brought to her brood were moderate in size but others seemed enormous—sizeable moths, great brown caterpillars and several other creatures at one trip. During the first day intervals between meals ranged from 22 to 76 minutes averaging 50 minutes; during the second from 28 to 70 minutes, averaging 48 minutes; during the third from 7 to 56 minutes, averaging 36, during the fourth from 8 to 48 averaging 22 minutes. The average interval during July 16 and 17 was 47 minutes, during

TABLE II.—NESTING ACTIVITIES OF A FEMALE OVENBIRD IN 1928.

Date	Time	Hours	Number of times fed	Average intervals between meals	Number of times brooded	Minutes brooded	Percent of time brooded	Time faeces eaten	Time faeces removed
July 16....	7.45–11.45 A. M.	4	5	45.5	5	143	60	?	0
	1.34–5.34 P. M.	4	5	55.3	5	153	64	?	0
July 17....	7.12–11.12 A. M.	4	6	46.2	6	137	57	?	0
	1.30–5.30 P. M.	4	5	50.2	4	115	47	?	0
July 18....	7.20–11.20 A. M.	4	6	37.8	5	106	44	?	0
	1.10–5.10 P. M.	4	8	31.7	2	39	16	?	0
July 19....	7.20–11.50 A. M.	4½	8	31.0	2	18	8	2	0
	1.40–5.10 P. M.	3½	11	16.7	1	8	3	4	1
Total...		32	54	35.5	30	719	37	6	1

July 18 and the morning of July 19 33 minutes, on the afternoon of July 19 16.7 minutes. Therefore the feeding during the fourth afternoon was twice as rapid as that during the day and a half preceding and three times the rate for the first two days.

The time spent away from the nest during the first three and a half days varied from 6 to 62 minutes averaging 22; during the last afternoon from 7 to 26 minutes, averaging 14. Since she brooded as much as the other bird it was necessary for her to shorten her individual absences in order to achieve the large amount of feeding necessary; the 1927 female fed once in 50 minutes during the first four days, this bird once in 35.5 minutes.

The female of this pair was unusually tame for an Ovenbird, the male strikingly timid. Three times during the 32 hours of watching he came near and scolded; the one time I could see him he had food. In 1927 it was not until the afternoon of the fourth day that the male took an active interest in his brood, so it is possible that this male might have behaved differently during the last half of nest life. As for singing, I recorded 80 *teacher* songs and 7 flight songs; all of the latter and 21 of the former were delivered in fairly close proximity to the nest, so probably came from the male in question, but because of the presence of another pair of Ovenbirds in the vicinity, I do not know how many of the other *teacher* songs were given by this bird.

Comparison of Three Nests. Mr. H. Mousley ('The Auk,' XLIII, 1926, pp. 184–199) watched a pair of Ovenbirds with two young near Hatley, Quebec from July 1 to 8. His birds fed at longer intervals than mine, the female brooded longer—once 130 minutes —and both were timid. During the first half of nest life the young were fed once in every 44 minutes, during the last once in every 32 minutes. His male fed as much as the female and sang 215 times during the 48 hours of observation. The young left at the age of 8 days.

The female at my second nest had greater demands upon her than the other two females, for she had to assume all the feeding of three young, whereas they had the assistance of their mates in the care of two young. If we calculate the rate of feeding of each nestling, we find during the first half of nest life that Mr. Mousley's young birds were each fed once every 88 minutes, each of my 1927

brood once every 82 minutes and each of the 1928 brood once every 117 minutes. During the last half of nest life each of the Canadian nestlings received food once every 64 minutes, each of the two in my first nest once every 50 minutes, while during the fourth afternoon each of the three in my second nest once every 57 minutes. There is evidently something of an adjustment between the rate of feeding and the needs of the young.

It will be interesting to learn of the home life of other ground nesting warblers. Do Black and White and Nashville Warblers practice the short periods of brooding and rapid succession of small meals in vogue with all members of the family so far studied except *Seiurus aurocapillus?* Possibly the nesting habits of other members of its genus—the Water-Thrushes—will be found to follow the slow rhythm of the Ovenbirds.

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