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FIELD OBSERVATIONS ON THE ROSE-BREASTED GROSBEAK.

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Twice in the spring of 1914, we located a nest of the Rose-breasted Grosbeak (*Zamelodia ludoviciana*) with the purpose of studying the nesting habits; but each time we were disappointed, owing to the persistent activities of small boy egg collectors. For this reason we were delighted to find a nest conveniently located, which had escaped their notice, and safely hatched. This nest, which was discovered on June 25, contained two young about four or five days old. It was located about six feet from the ground in a small elm and was the usual flimsy affair. The blind was erected immediately. When we entered, we found the nest to be so high that we could not see into it. But cutting out a small section of the trunk and binding the top of the tree firmly to the stump left for that purpose, the nest was lowered to within three feet of the ground. It was otherwise left undisturbed, save for the cutting away of such small twigs as interfered with the view.

The blind was entered for observation work on June 26 at 5:20 a. m. From then until the morning of July 2, my wife and I alternated in the blind for as much time each day as possible. Raymond Jarvis spent part of one day in the blind and we were grateful to him for the relief. The first

table will show the amount of time spent in the blind each day and also the time spent by the grosbeaks in brooding.

TABLE I.

Date.	Time in blind.	Brooding.
June 26—5:20 A. M.-4:20 P. M.	11 hrs.	1 hr. 53 min.
June 27—7:15 A. M.-4:30 P. M.	9 hrs. 15 min.	3 hrs. 16 min.
June 28—5:15 A. M.-7:00 P. M.	13 hrs. 45 min.	6 hrs. 54 min.
June 29—9:00 A. M.-4:45 P. M.	7 hrs. 45 min.	1 hr. 49 min.
June 30—9:40 A. M.-4:20 P. M.	6 hrs. 40 min.	38 min.
July 1—5:45 A. M.-4:40 P. M.	10 hrs. 55 min.	1 hr. 19 min.
	59 hrs. 20 min.	15 hrs. 49 min.

The brooding time from the twenty-sixth to the twenty-ninth was distributed throughout the day in periods averaging about nine minutes each. During these days, with one exception, the brooding position was practically unchanged. The weather was moderate and we could remain in the blind without discomfort. This position (Fig. 1) was assumed to be as a protection from the cold. Once, on June 26, the female brooded through a rain storm. Her position was nearly the same as the one illustrated, the only noticeable difference being a more pronounced settling into the nest.

On June 29, during the heat of the day a change was noticed. The nestlings were restless and continually crowded from under her. She commenced at this time to stand in the bottom of the nest and spread her wings slightly. Fig. 2 illustrates this shading instinct at its highest development in this individual. It is very imperfect when compared with some birds of other species, although better than the average individual which has come to my notice. On some occasions the wings were slightly spread and the feathers of the head and back were perceptibly elevated, while at other times a barely noticeable spreading of the wings testified to an attempt to furnish the shade which the young needed. On the last two days the covering of the young by this method constituted the entire brooding practice. Only seven periods were recorded on these two days and they averaged almost 17 minutes each. As soon as the surrounding vegetation

shaded the nest the brooding ceased. The male took no part in the work, and only once or twice did he show any evidence of possessing this instinct. On these occasions he straddled the nest awkwardly with his body drawn into a bunch. His position afforded no protection to the nestlings and was never maintained long enough to be accurately timed.

METHOD OF FEEDING.

It has been stated that the Black-headed Grosbeak (*Zamelodia melanocephala*) feeds its young by regurgitation* and



Rose-breasted Grosbeak.
Fig. I.—♀ Brooding.

one would naturally expect that *ludoviciana* would do the same. We watched these birds carefully from a distance of three to five feet for a period of nearly sixty hours and did not see a single feeding that was clearly regurgitative.

Both the male and female took part in the feeding of the nestlings and their actions were exactly alike. On account of the large size of the beak the feeding act differed somewhat from that observed in other passerine birds. In other

* Food Habits of the Grosbeaks. McAtee. Bul. 32. Biological Survey. Pp. 75.

forms with which I am acquainted, the food is thrust into the nestling throat by the parent. With the grosbeaks this did not seem to be possible and the following method was used much of the time. In order to convey to the reader the picture of this process it will be necessary to explain that in the Grosbeak's bill the cutting edges of the mandibles (especially the upper one) are slightly turned inward toward the median line so that when the mandibles are brought together a shallow longitudinal depression is formed. The beak of the parent was brought into the nestling mouth in such a manner that the tip of its (the nestling's) mandibles are in this depression. When this was accomplished the parent began a slight movement of the mandibles as if chewing. The effect of this was to allow the morsel to slip down into the nestling mouth. As the nestlings became older this action was hastened by their action of closing the mandibles over the ends of the food projecting on each side of the beak. At times the morsel was carried into the mouth of the young bird in such a position as to lodge there. When this occurred the parent seized it, placed it crosswise of his or her beak and the entire process was repeated. Out of the 459 observed feedings 274 were of this nature. That is the food was projecting from the beak as they approached the nest, which was certain indication that regurgitation was not being practiced on these visits. The above process was almost invariably carried out even if it required considerable maneuvering on the part of the parents.

With these 274 feedings disposed of there remain 185 feedings, during which regurgitation might have been practiced. At first sight some of these feedings seemed to be of a regurgitative nature, but continued observation convinced us that nothing of the kind occurred during our study of this pair. During the first seven feedings nothing was visible in the parent's beak and this might have been taken as regurgitative feeding but for a chance observation. The nest was located in a small elm in the midst of a willow thicket and, on these willows the fruiting aments were not quite ripe.

They hung all around the nest, and while waiting for the parents to recover from their fright and commence feeding the nestlings, I noticed that they began feeding on these seeds. They seized an ament in their beaks and by a rapid motion of the mandibles shelled off the outer scales and cotton, retaining the seeds in their mouth. Suddenly the female, who had been gradually coming nearer the nest, shelled some of



Rose-breasted Grosbeak.
Fig. II.—♀ Shading the Young.

the seeds, hopped to the nest and fed one of the nestlings. This instantly raised the question, was that nestling fed by regurgitation? A close watch was kept for a repetition of the performance to see if any action of swallowing could be detected or any throat action, such as one might expect in regurgitative feeding, be noted. During the observations willow seeds were brought in this way eleven times and the seeds of an anemone (*Anemone canadensis*) once. We actually saw them pick these seeds and bring them to the nest. When they were feeding we many times saw them pick the seeds and swallow them and were close enough to readily detect this motion. The significant thing was that we could not de-

tect any swallowing action when the seeds were carried to the nest, nor could we detect any muscular acting of the throat, which would indicate regurgitation.

The second item in the food table is seeds which are recorded fifty-three times. This represents the number of feedings in which we were positive seeds were fed, but when the grosbeaks were not seen to gather them. They were secured out of sight of the blind and brought to the nest, where they were shelled and fed to the nestlings. Those recorded under the term unidentified were presumably largely seeds, but as we neither saw them garnered nor shelled we could not be positive. The significant thing about these feedings was this: no food was visible in the beak, and yet at a distance of three feet we could detect no regurgitative action of the muscles, but, on the contrary, we noted that the beak moved exactly as in the feeding of insect food. As we were close enough to see the parents swallow the lice and other small objects picked from the nest, it would seem that any regurgitative action could have been detected.*

It is possible that the grosbeaks feed by this method in the first day or two of the nestling period and it is also possible that such action as is described above would be called regurgitation by some writers. It does not seem proper to me, however, to call actions such as the carrying of berries in the throats by waxwings regurgitative, or to class them with the performance of a bittern or heron in feeding its young. In the case of the grosbeaks as we observed them there was even less reason for placing them in such a class.

Briefly, the facts on which we base our belief that the nestlings were not fed by regurgitation on the 185 feeding visits, when no food was visible in the beak, are these:—

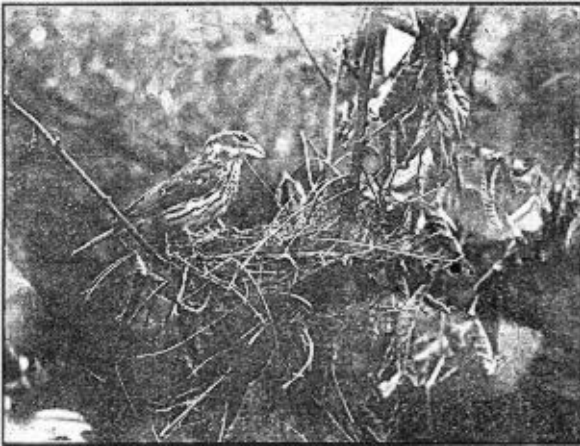
* In so small a bird as the Ruby-throated Hummingbird (*Archilochus colubris*) Bradford Torrey has described the regurgitative feeding as a "frightful looking act" (Chapman's Handbook of Birds. Pp. 242). This description certainly applies to all the birds which we have noted in this act, and it would seem that in the case of the grosbeak there would at least be action enough to be detected at so short a distance.

A. On 12 of these visits (11 with willow seeds and 1 with anemone) they were seen to pick the seeds, bring them to the nest and feed the nestlings without swallowing them.

B. On 53 visits they came to the nest with seeds in their mouths, shelled them and fed them to the nestlings.

C. On 120 visits the food was not visible at any time; but every feeding action was the same as on other visits.

D. At no time during the 459 feedings did we detect the slightest muscular action, such as might be expected in regurgitation.



Rose-breasted Grosbeak.
Fig. III.—♀ Inspecting the Nest.

One of the most interesting features of this method of feeding was the ease and dexterity with which the grosbeaks used their clumsy looking beaks in extracting the meats from the seeds. Although we watched them many times, we could not determine exactly how it was accomplished. The notch in the beak and the tongue played the important part in the work, which was carried on with such rapidity that a miniature shower of discarded material fell to the ground as they worked over a beak full of seeds.

TABLE II *

FOOD	Variety of Nestling Food											Totals									
	Food of A						Food of B						Nestling fed not determ'd								
	June 26	June 27	June 28	June 29	June 30	July 1	June 26	June 27	June 28	June 29	June 30			July 1	Total for B						
Willow Seeds	5	1	1	3	3	2	4	1	1	1	2	1	1	3	1	11					
Seeds	...	...	...	...	...	14	39	...	...	...	...	...	...	26	1	53
Anemone Seeds	...	...	...	...	...	1	...	...	...	...	...	...	...	1	...	1
Mulberries	...	...	...	...	...	3	...	...	...	...	...	...	...	3	...	5
Measuring Worms	8	16	4	9	2	6	7	11	3	1	5	1	8	3	18	45					
Hairy Caterpillars	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	2
Wireworms	2	...	...	...	...	1	...	...	...	...	...	...	...	...	...	2
Larvae	8	10	7	17	2	8	5	5	35	8	1	6	9	2	57	118					
Large Larvae	3	12	7	7	13	3	8	1	4	3	5	4	3	4	19	42					
Cabbage Butterfly	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Moths	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7
Flies	4	...	...	...	...	2	...	...	...	...	...	...	...	...	...	13
May Flies	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	6
Crickets	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Lady Beetles	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
Potato Beetles	...	...	...	...	...	6	...	...	...	...	...	...	...	...	...	8
Grasshoppers	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Spiders	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10
Animal Matter	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Unidentified	22	20	13	24	24	16	17	16	10	14	15	10	9	12	17	120					
Beetles	1	1	1	1	1	2	1	...	...	...	...	...	...	...	...	5
Totals	54	61	111	74	69	90	40	42	33	60	42	59	276	14	25	57	45	41	50	232	6,450

* A few explanations of this table may be in order. The totals for the first six columns are given in the last column to the right. Reading from left to right the number of any item for A plus the number of that item for B is equal to the total in the right hand column except in the following instance: The total of the items, seeds, willow seeds, anemone seeds, and unidentified, represents the number of visits to the nest with that food material, and as both nestlings were often fed on each visit the total feedings for both exceeds the number of visits. Under the term animal matter is included feedings which were recognized as animal rather than vegetable, but not otherwise identified.

FEEDING.

The bulk of the determined insect food was largely divided into two groups, larvæ, and large larvæ. The terms are self-explanatory. Among the latter were several resembling tomato worms and, once or twice, we thought we could recognize partly grown cecropia larvæ. Among the former we occasionally recognized an army worm when it had to be withdrawn from the nestling mouth, but for the most part



Rose-breasted Grosbeak.
Fig. IV.—♂ Approaching with Food.

they were either too badly macerated or too well concealed in the beak of the parent to be identified. Geometrid larvæ were dangling from the twigs in abundance and probably many entered simply as larvæ belonged here. They were entered as measuring worms only when the parents were actually observed to secure them. Most birds, when they bring worms or larvæ, carry them crosswise in the tip of the beak and consequently almost the entire length is visible to the observer, but the present species carried them far back in the beak in such a manner as to render only the ends visible.

The three larval items total 205 out of the 459 feedings or 44.66% of the counted total; seeds (first three items in the table) were fed 65 times or 14.11%; unidentified forms 120 times or 26.14%; and a variety of insect forms 15.09%. Computing it in another way; vegetable food, including the mulberries, was 15.25%; insect food 58.61%; and unknown 26.14%. Only four potato bugs were fed and few grasshoppers, although the latter were abundant.

The grosbeaks confined their foraging to the small timber belt described in the Red-winged Blackbird paper.* The Red-

*The Red-winged Blackbird. Ira N. Gabrielson. Wilson Bulletin, June, 1915.

wing nest was not twenty feet away, but the parents never came into the timber. We had here two birds nesting on the line between two regions of plant growth, but each confining themselves to distinct areas. A circle drawn about a point between the two nests would have enclosed an area which would have been almost equally divided between the two species, as a hunting ground.

The distribution of the food to the nestlings was as nearly equal as could be expected, although A, the larger, received a greater part than B. It was a clear case of his overreaching B and getting more than his share, but the feedings came so often that B still received sufficient food. The table shows the daily distribution of food to the two nestlings and also the total received by each. Both the male and female took part in the feeding, but the latter was much more active, 283 visits out of 382 being credited to her.

SANITATION.

Table III. Disposition of the Excreta.

Date.	C. away	Dev.	C. away	Dev.	C. away	Dev.	Exc.
June 26	0	4	3	3	3	8	11
June 27	5	9	0	8	5	17	22
June 28	9	5	7	3	16	8	24
June 29	8	1	5	2	13	3	16
June 30	2	0	7	3	9	3	12
July 1	2	0	5	0	7	0	7
Totals	26	19	27	20	53	29	92

Table III shows the disposition of the excreta and also the number of times it was taken by each parent. This work was more equally distributed than that of feeding. In the early part of the study the sacs were largely devoured by the parents, but after the twenty-seventh the number so disposed of exhibited a tendency to decrease, and on the last day all were carried away.

MISCELLANEOUS.

The male was more devoted to his family than is usual in the individuals of his sex with which we have become acquainted. One of the parents was always at or near the nest and the male especially spent much time perched in a willow watching it. If neither were to be seen at the nest a glance around invariably revealed him on guard eight or ten feet



Rose-breasted Grosbeak.
Fig. V.—♀ Feeding.

above it. The female when on guard duty sat on the edge of the nest, but the male preferred the more distant perch.

The male spent much time in an effort to drive the male Red-wing away from his chosen perch on the other side of

the same tree and, while he generally succeeded in driving him off, the blackbird was usually back to his perch by the time the Grosbeak was settled comfortably at his nest. Once they united forces against a Bronzed Grackle and drove him away.

Only two visitors appeared directly at the nest: a Crested Flycatcher, to which they paid no attention; and a male Baltimore Oriole, which was quickly driven away by the female.



Rose-breasted Grosbeak.
Fig. VI.—♂ Feeding.