

## OBSERVATIONS ON THE NESTING OF THE BLUE-GRAY GNATCATCHER

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The Blue-gray Gnatcatcher offers a most attractive subject for study because of the ease with which nests can be found during construction, the differences in plumage of male and female, and the tameness of the birds at all times. Yet, strangely enough, almost nothing has been published on the home life of this charming bird. My own observations of *Polioptila caerulea caerulea* have been hampered by limited time and the distance of the nests from my home, the nearest being situated from 3 to 17 miles away. In no case did I use a blind, but sat in full sight of the birds about 20 feet from the nests.

**Voice.** The real song appears to be given only at the beginning of the nesting cycle. In Oklahoma, I recorded it on April 6, 7 and 24, 1926, on March 29 and 30, on April 5, 9 and 10, 1927, and on June 6, 1929; in Ohio, on June 15, 1929. It is an ecstatic, warbling, high-pitched song, so high-pitched indeed that some of it is often inaudible to human ears. One example that I timed lasted four seconds. I did not hear it from any of the birds I studied; either it had been dropped after nest building was well under way, or possibly it was confined to the early morning hours.

Both birds give the characteristic *spee* with tireless energy. It may be that this constant utterance serves the purpose of proclaiming territory after the early disappearance of the song. I have heard only two other notes from females—a chatter on April 5, 1927, and what appeared to be a courting note, *pee pee-pee*, June 15, 1928.

Males, besides the elaborate song and the three notes mentioned above, have a great variety of utterances. Various little songs have been heard during nest building, an explosive note of anger, and at least ten other expressions, some quite musical, others with more of a sputtering quality.

**Nest building.** Never were there more enthusiastic nest builders than these little birds, the male in particular bubbling over with excitement. My first nest, 20 feet up in a leafless persimmon south of Norman, Oklahoma, appeared about half done on April 24, 1926. The female uttered *spee* at five of her 12 trips, being silent the rest of the time, while the male gave a number of these notes at every one of his 15 trips (once delivering 17 while in the nest) and also little songs at 7 different times. Both birds sometimes moulded the nest so strenuously that they nearly fell out of it.

The second nest was found a half mile distant April 10, 1927, 10 feet up in a chittim wood; this also was half finished. From 9:40 to 10:10 each parent made 11 trips with tiny shreds; the female was entirely silent, but the male said *spee* every time and once gave a brief song. A Tufted Titmouse alighted two feet from the nest; the male Gnatcatcher dashed at him with an angry sputter and the female also darted at him, but he refused to budge, whereupon the pair left.

Two Ohio nests were nearly completed when found. Nest 5, 40 feet up in a small oak in southern Ohio, was watched from 1:00 to 2:00 p. m., on May 13, 1928. The female made 23 trips, the male 17; she was almost entirely silent, while he *speed* a little and twice gave other notes in the trees but never uttered anything on

the nest. He drove off a Red-eyed Vireo, but made no impression on a Summer Tanager.

Two days later, nest 6, 30 feet from the ground in a small elm in Black Lick woods ten miles east of Columbus, was watched from 9:00 to 10:00 a. m. The female made 20 trips, *speeing* at four of her visits. The male alighted on the edge of the nest but once, immediately flying away; however, he accompanied his mate, *speeing* in the vicinity whenever she was busied with the nest and departing with her on her absences.

At the three nests where both birds were building, trips were made on an average of once in 2.2, 1.8 and 1.5 minutes, respectively; at nest 6 the female averaged a trip every 3 minutes. The close bond between the pair is evident, for in practically every case both were building or both were absent. The male labored equally with his mate until near the end. He never hurried away at the approach of his mate as did a male Bell Vireo (*Vireo belli belli*) whose nest I studied (see Condor, 1929, xxxi, pp. 13-18).

**Incubation.** In the Arbuckle Mountains in Oklahoma I watched nest 3 for an hour, April 23, 1927; it was placed 12 feet up in a winged elm. The male left the nest at 10:50 as his mate alighted on a branch; she went directly to the eggs. At 11:05 he relieved her, joining her when she returned at 11:24 and both flying off together. The next minute he returned and took charge for 7 more minutes, when she came and incubated until his arrival at 11:50. Thus the female incubated 15 minutes, the male 19, then 7, the female 18. Both birds were comparatively vocal in the home tree, but silent on the nest. These birds were more restless sitters than either of the pairs observed later, and their shifts were shorter. The date would indicate an early stage of incubation.

Nest 4, 20 feet up in a dying elm south of Norman, was unusual in the fact that it did not harmonize with its surroundings. It was watched from 7:00 to 8:00 a. m. May 14, 1927, near the end of incubation. At 7:03 the female approached with several *spees* and the male slipped off with a twitter. At 7:25 there were continued *spees* and the next minute they exchanged places. At 7:55 the female returned with no warning; the male sang *toowy toowy* on a branch two feet below the nest and flew away. Here the female incubated for 22 minutes, the male 29.

On June 2, I spent two hours at nest 6 during the last half of incubation. At 9:05 the female was on; no sound was heard from her mate until 9:31 when a series of *spees* was audible from the northeast, continuing for three minutes and gradually coming nearer. At 9:34 she left and her mate took her place. At 10:08 he flew to the west and immediately afterwards I heard two *spees*. The eggs were left uncovered until 10:12 when the female appeared with three *spees* and settled on the nest. At 10:51 there was another series of *spees* that came nearer and nearer; the female moved about, stood up, stepped on the nest rim, stood there an instant, but slipped down again on the eggs, looked about and then left, saying *spee spee* about 100 feet away. The male stopped his outburst as he reached the home tree and went quickly to the nest. These birds incubated for much longer periods than either of the Oklahoma pairs, the female for more than 29 minutes, the male 34, the female 40. They were also quieter than the others had been.

Although all the birds were somewhat vocal in the vicinity, not a single one gave any note on the nest itself, quite in contrast to Gnatcatcher behavior while building.

It would be of great interest to know much more of the routine of incubation. Is there a geographical difference in habits? Is the day shared fairly equally, or does

one sex assume a larger part? Which bird incubates at night? Is there much variation in the conduct of different pairs? Do the periods change in length as incubation progresses? The whole matter of incubation routine is a fascinating and much neglected subject.

Care of the young in the nest. Two brief periods were spent at nest 4 in Oklahoma, when it had newly hatched young and again three days later. Nest 6 was watched for six hours when the young must have been nearly half grown, three hours the next day and three hours three days later when they were nearly ready to leave. A summary of the chief events at both nests is given in table I.

TABLE I  
CARE OF YOUNG IN TWO BLUE-GRAY GNATCATCHER NESTS

| Nest No. | Date    | Hours       | Times fed by |     | Rate of feeding in minutes |      | both | Times brooded | Time brooded | Percent of time brooded | Excreta removed by |    |    |
|----------|---------|-------------|--------------|-----|----------------------------|------|------|---------------|--------------|-------------------------|--------------------|----|----|
|          |         |             | ♀            | ♂   | ♀                          | ♂    |      |               |              |                         | ♀                  | ♂  |    |
| 4        | May 17  | 4:53- 5:53  | 1            | 4   | 2                          | 15   | 30   | 10            | 5            | 37                      | 61.7               | 0  | 0  |
| 4        | May 20  | 4:08- 5:23  | 1¼           | 2   | 7                          | 38   | 10   | 8.3           | 3            | 37                      | 50.6               | 0  | 0  |
|          |         | Total       | 2¼           | 6   | 9                          | 22.5 | 15   | 9             | 2            | 74                      | .....              | .. | .. |
| 6        | June 11 | 9:00-12:00  | 3            | 20  | 29                         | 9.0  | 6.2  | 3.6           | 8            | 67                      | 37.2               | 3  | 4  |
| 6        |         | 12:00- 3:00 | 3            | 28  | 34                         | 6.4  | 5.3  | 2.9           | 4            | 14                      | 14.2               | 7  | 0  |
| 6        | June 12 | 9:15-12:15  | 3            | 35  | 55                         | 5.4  | 3.4  | 2.1           | 0            | 0                       | 0                  | 2  | 6  |
| 6        | June 15 | 7:37-10:37  | 3            | 46  | 59                         | 3.9  | 3.1  | 1.7           | 0            | 0                       | 0                  | 3  | 3  |
|          |         | Total       | 12           | 129 | 177                        | 5.7  | 4.1  | 2.4           | 13           | 81                      | .....              | 15 | 13 |

The parents at the Oklahoma nest were far quieter than they had been while incubating. Although some *spees* were heard in the vicinity, with one exception they were given in a subdued tone. The first day the male twice gave a soft *tingler tingler tee*. During this hour the female fed four times and brooded five times in periods of 8, 7, 5, 10 and 7 minutes. The male fed only twice and brooded three times in periods of 3, 1, and ½ minutes, on each occasion being interrupted by the arrival of his mate. Once a Plumbeous Chickadee began to manifest much interest in the household as the female Gnatcatcher was feeding a tiny insect to the babies; it came closer and closer till the mother left the nest and retired a distance of about a foot. Just as the visitor reached the nest the father of the family darted down and drove it off.

Three days later the female was on at 4:08 p. m. and stayed on the nest till 4:26, the male in the meantime bringing an insect which he gave to her and which she passed on to the young. (Neither of the Gnatcatcher mothers ever ate the food given them by their mates, as the Bell Vireo female often did.) The male fed three times before the female returned to feed and brood after an absence of 26 minutes. She then brooded for 18 minutes, the male giving two meals to her. Once he tried to drive off a Wood Pewee, but the latter turned the tables by chasing him. The female's last brooding lasted less than a minute, while the male did not brood at all.

During three hours in the morning of June 11 the female at nest 6 brooded 37 per cent of the time in 8 periods ranging from 3 to 17 minutes. From 12 m. to 3:00 p. m. she brooded for 10, 2, 4 and 2 minutes only. Sixteen times the male passed the food to her while she brooded. In the afternoon on four occasions they brought food to the nest at the same time; twice he gave it to her, twice he fed it himself. Most of the insects brought by both parents were small, but once the male

gave a comparatively large creature to his brooding mate, whereupon she arose, left the nest, manipulated it with her bill, then flew to a dead branch where she beat it and beat it, eventually flying away with it.

On June 12 the behavior of the parents was much the same as on the previous day except that brooding had been given up, feeding was 76 per cent more rapid and the female had become more vocal. On June 11 she had uttered *spee* after only one-tenth of her feedings, but this day she did so after a third. The male gave this note on both days after about a half of his trips. Seven times they came to the nest together, on three of which occasions the male gave the food to his mate.

Three hours on June 15 showed the fastest feeding I have witnessed with any birds—an average of a meal every 1.7 minutes; but from 9:37 to 10:37, when the female made 20 trips and the male 23, the rate rose to once every 1.4 minutes. The male fed more than the female even after brooding was given up, his rate of feeding for all three days being once every 4.1 minutes, her's once every 5.7 minutes. Forty-four of his meals were given at one minute intervals and 106 or 64 per cent of the total at intervals between 0.5 and 3 minutes. The female brought 12 meals at one minute intervals, and 73 or 60 per cent of her total at intervals between 1 and 4 minutes. A possible explanation of this rapidity of feeding would seem to lie in the very small size of most of the offerings; never did I see more than one insect given at a time and many of the creatures were minute.

On June 15, I measured by stop watch the number of seconds spent at the nest on 7 occasions by the female and 10 by the male. The former were: 8.5, 7, 13, 7, 2.9, 6.5, and 6.9, the median being 7. The latter were: 4.5, 7, 4, 5, 5, 3, 2.5, 4.6, 3.7, and 10, the median being 4.5. Twelve times the parents met at the nest, but the male always gave his food to the young.

On June 12 the young had sometimes uttered a note *jee jee jee* when fed, but on this day they squealed at nearly every meal. By 8:30 they began to give their eager calls before I could see the approaching parent.

One of the greatest changes lay in the parents themselves, for instead of being comparatively quiet they were exceedingly vociferous, giving a great many *spees* after practically every meal and also uttering a new note, *pee pee-pee*, which I took to be a courting note, since the male showed courting behavior on four occasions and the female on six. It may be that much of this vociferousness was due to their beginning a new nesting cycle. However, some birds show an increase of vocal activity the last day or two before the young leave the nest (this has been true in my experience with Song Sparrows, and Magnolia, Myrtle and Black-throated Green warblers). It is possible that both factors were at work.

**Periodicity.** This species shows a marked periodicity in its activities. Both in building the nest and in feeding young, a number of trips in rapid succession are followed by an absence. The periods of attention and inattention are analyzed in table II. (On June 11 the brooding of the female is disregarded, the data being based entirely on feeding.)

If we consider the three days' records of feeding we find in the attentive periods a steady increase in the total percentage, and a marked increase in the length of periods, but only a moderate increase in the rate of feeding within the periods. In the inattentive periods there is a steady decrease in the total percentage. Comparing the 11th and 12th we find the same number of periods on both days, but a decided shortening of the average time spent away on the second day. On the 12th and 15th these periods are much of the same length, but the number is almost halved on the

TABLE II  
PERIODICITY IN GNATCATCHER ACTIVITY

| Nest No. | Date    | Hours | Attentive Periods |         |                | Inattentive Periods |         |         | Rate of trips<br>in minutes<br>once in | Total time |                | Length |         |
|----------|---------|-------|-------------------|---------|----------------|---------------------|---------|---------|----------------------------------------|------------|----------------|--------|---------|
|          |         |       | Minutes           | Percent | No. of periods | Range               | Average | Minutes |                                        | Percent    | No. of periods | Range  | Average |
| Building |         |       |                   |         |                |                     |         |         |                                        |            |                |        |         |
| 1        | Apr. 24 | 1     | 34                | 58      | 6              | 1-9                 | 5.8     | 1.2     | 26                                     | 43         | 6              | 3-6    | 4.3     |
| 2        | Apr. 10 | ½     | 27                | 90      | 2              | 9-18                | 13.5    | 1.2     | 3                                      | 10         | 1              | .....  | 3.0     |
| 6        | May 15  | 1     | 26                | 32      | 4              | 1-13                | 6.5     | 1.2     | 34                                     | 58         | 3              | 4-22   | 11.3    |
| Feeding  |         |       |                   |         |                |                     |         |         |                                        |            |                |        |         |
| 6        | June 11 | 6     | 151               | 41.9    | 38             | 1-19                | 4.0     | 1.5     | 209                                    | 58.1       | 37             | 3-14   | 5.7     |
| 6        | June 12 | 3     | 113               | 62.8    | 18             | 1-12                | 6.3     | 1.3     | 67                                     | 37.2       | 18             | 3-6    | 3.7     |
| 6        | June 15 | 3     | 137               | 76.2    | 11             | 1-38                | 12.4    | 1.2     | 43                                     | 23.8       | 10             | 3-6    | 4.3     |

last day. During these two days the birds were never away from the nest for more than six minutes at a time.

There are three records available for building, although that of nest 2 is so brief it is of little value except in the rate of trips. Interestingly enough, this is exactly the same in all three examples and also the same as the fastest rate of feeding, namely, a trip every 1.2 minutes during attentive periods. The average length of the attentive periods on April 24 and May 15 is much the same as those on June 12. The inattentive periods on April 24 are the same in length—both the extremes and the average—as those on June 15. On May 15 they average much longer than on any of the other days; perhaps this was due to the fact that the nest was almost completed.

It is of interest to note how Gnatcatcher activity follows much the same pattern both in building and in feeding young. The greater rapidity of feeding as the young grow older comes partly from speeding up the rate of trips, but mostly from a lengthening of the periods of attention. At both these stages in the cycle, male and female are almost constantly together. On April 24 only one attentive period involved the female alone; on April 10 and May 15 both parents were present or absent at the same time. June 15 cannot well be analyzed because of the disturbing factor of the female's brooding. On June 12 during 15 attentive periods both parents were present, and at only 3 did the female come alone. On the last day they both fed during every single attentive period.

In incubation a different rhythm is adopted. There is as much periodicity as ever but the periods are longer and the birds perforce have to be separated. Still the shifts are comparatively short as would be expected from Gnatcatcher temperament.

The intense activity of these diminutive birds is everywhere apparent. Infinitesimal shreds of nesting stuff and tiny insects are brought one by one with none of the labor-saving methods adopted by many birds, of gathering whole mouthfuls of material or food at a time. It would be entirely out of character for the male to sit still and sing for long periods at a time; indeed a ten minute session would be quite unthinkable for him.

I hope that some one with leisure and favorable opportunities will devote himself or herself to a thorough study of the home life of these exquisite birds from the time they arrive in spring to the leaving of the young.

*Columbus, Ohio, October 29, 1931.*