OBSERVATIONS OF THE NESTING HABITS OF THE BLACK AND WHITE WARBLER

By WENDELL P. SMITH

ON May 17, 1932, we noticed a female Black and White Warbler (*Mniotilta varia*) pulling off loose shreds of bark from a frost grape vine. Considerable energy was expended at times in accomplishing this, but the efforts were continued until a sufficient number of pieces were secured to constitute a "load." The work was carried on without respite during the hour in which the bird was under observation. Six trips to the nest and back were made in twenty-five minutes, and one round trip consumed only three minutes. The male, meantime, took no part in these activities but busied himself in feeding and singing, the latter being indulged in very often.

By watching the line of flight, an approximate idea of the site of the nest was obtained, and it was found after a little search. A steep bank, covered by a mixed forest growth, although deciduous trees only grew in the immediate vicinity, provided the location. This was one hundred and fifty feet distant from the source of the nesting material. A deep depression in the ground had been lined with vegetable matter of which grapevine bark formed a large proportion. A bed of dead oak leaves, left from the preceding fall, flanked the nest on the upper side and several of large proportions overhanging the structure served admirably as a roof. As the bird was first seen carrying material at noon and as the nest was completed before 4.00 P.M. of the same day, the time required for its construction is not known.

The discovery of the nest provoked the first display of interest in the work noted in the male, as he flew about scolding vigorously.

The first egg was laid on May 19th, and an egg was added on the 20th and 21st, but none was laid on the 22d. Egg-laying was resumed on May 23d, and the clutch of five was completed on the 24th. Incubation began a day earlier, on the 23d. The eggs differed greatly in size, the last two being much smaller than those laid earlier. The largest measured 21½ by 17 millimeters, while the smallest was only 17 by 13¼ millimeters. The ground color of the eggs was pale creamy white, spotted, especially about the larger end, with lavender and buffy brown, color designations being taken from Ridgway's "Color Standards and Color Nomenclature." The spots on the smaller eggs were less numerous and were chiefly lavender.

The male was not observed to take any part in incubation. Rarely he was heard singing softly near the nest. The female was a close sitter, permitting me to look into the nest on the side from a distance of three feet without moving. When flushed she fluttered rapidly over the ground with wings half dragging, uttering a note perhaps best described as between a hiss and a scream.

The female's method of approach to and departure from the nest was watched a number of times. Approach was not always from the same direction, although a tree-trunk, three and a half feet distant, frequently formed a pathway. Creeping down some trunk or branch near the nest, the bird would pause to look about several times and suddenly fly directly to the nest. In leaving she simply emerged from the leaves, flying to some tree or shrub in the immediate vicinity. During incubation the female fed near the nest, only once being seen at a distance of sixty feet and several times securing food from trees within four or five feet.

No detailed study of the activities of the female could be undertaken while incubation was in progress, but such observations as nest-leaving at 11.08 A.M. on May 30, 11.15 A.M. on the 31st, 11.28 A.M. on June 1st, 2.45 P.M. on May 31st, 2.30 P.M. on June 1st, 4.46 on May 31st, and 4.52 on June 1st may indicate some approach to a schedule. Judging from numerous disconnected observations, feeding occurred almost hourly. These absences were timed, the shortest being four minutes, the longest twenty minutes, and average eleven minutes and twenty seconds.

On June 5th two eggs hatched. The time when this occurred is not known definitely but was probably between 2.30 and 2.55 P.M. At the earlier hour the female left, and the nest was examined and the eggs were found intact. At 2.45 the female returned, and ten minutes later the male appeared with food in his bill, flew to the nest, where he remained for one minute, and left without the food. At 3.30 P.M. the female left the nest again, and during her absence the presence of the two young was discovered. The male came again with food at 4.16 P.M., and in some way the female evidently became aware of his approach, as she left, passing her mate on a near-by tree-trunk. The male remained on the nest for three minutes, and his departure, as well as his approach, was observed to be more cautious than those of his mate. The female returned at 4.30 P.M. and was still on the nest when we left at five o'clock.

A third egg hatched between the hours of 6.00 A.M. and 12.30 P.M. on June 6th. This was one of the two smaller of the clutch.

Sometime during the night of the 5th or early morning of the 6th, one of the older fledglings had disappeared from the nest. We can only speculate on the cause, but as the three eggs and the other nestling and the nest and its surroundings were undisturbed, it seems unlikely to have been a bird or mammal. Perhaps a snake was the marauder.

Only one hour could be spent in watching the schedule of activities at the nest during the next few days, and that was between 1.59 and 2.59 P.M. on June 8th. I had previously been examining the young while both parents waited with food in their bills. One minute after I withdrew, or at 2.00 P.M., both birds flew to the nest. The female remained until her mate came again with food at 2.17 P.M., when she left. The male spent two and one half minutes on the nest, leaving 30 seconds before the return of the female with food at 2.20 P.M. She brooded until 2.44, left and returned at 2.49, and was still on the nest when I discontinued my watch ten minutes later. While the male fed the young less often, he brought noticeably larger amounts of food each time.

Absence from home during the period of June 10th–14th interrupted further observations, but a late return on the latter date allowed sufficient time for banding, numbers F98877–78 being affixed. Unfortunately the young left the nest immediately, as the young of this species are apt to do when disturbed. They spent the following night in some shrubbery thirty feet away, and were seen there at 7.30 A.M. on the 15th. They were not seen again, and probably fell victims of some predator.

The male was heard singing on the 15th, 16th, and 17th, and frequently on the two latter dates. He seemed to have shifted his territory slightly, being most often seen some hundred feet eastward of the former nesting-site. No evidence of a second nest could be found, although search of the area was made several times.

To summarize my observations of this pair during the breeding season:

Only the final work of nest-building was seen, but in that the male took no part. Egg-laying did not begin until the second day after completion of the nest. Incubation seemed to be wholly the work of the female. Of five eggs only three hatched, and of the three nestlings but two survived to leave, and those two probably perished within twenty-four hours. Frequent singing by the male immediately following the failure of the first attempt to reproduce might indicate a second nesting, but no further evidence of this could be found.

Observations of the behavior of this species after nest-leaving had been made several years earlier. The nest, located in the side of a steep bank and not near stump or tree-trunk, was without any protection from the weather. The small opening at the top; its position on the hillside amid deep shadows—for it was located under coniferous trees—and the material of which it was constructed being identical with that of the forest floor, gave effective concealment. When discovered the three young were nearly ready for nest-leaving. Band numbers C1506–08 inclusive were attached, and the birds left immediately. Flight was possible only over short distances, and the wings were mainly of use in aiding the feet in progression. On June 30th they were seen on the ground near the nest and still unable to fly well. On July 1st, my notes contain only the comment that the male was singing often in the vicinity. At least two of the young were seen on July 2d, with their parents, about one hundred and fifty feet from the nest. At this time the young could fly well. On the 3d the family were located one hundred and twenty-five feet from the nest in the opposite direction, and the distance had increased to two hundred feet on the 4th. The 5th witnessed a return to the area occupied on the 2d, and there they remained during the 6th. On the 8th they were seen in the vicinity of the nest. On the 13th the family, consisting of parents and three young, were seen about two hundred feet from the nest, and the young were still being fed. Subsequent search failed to locate them. After July 3d the young kept above the ground, being seen in the smaller growth at heights varying from ten to twenty-five feet.

Some observations of the development of the 1932 brood were made, measurements being taken and changes in the color of plumage and soft parts noted. Daily while at home the young birds were compared with the color charts of Ridgway's "Color Standards and Color Nomenclature."

No. F98877, the older and larger of the two, measured 43 millimeters in length with tarsus of 7 millimeters and culmen of 5 millimeters when twenty-four hours old. F98878 had a length of 32 millimeters, culmen of 3½ and tarsus of 4 millimeters on the first day. The ninth day showed an increase in F98877 to 101 millimeters in length, or an average gain of 7½ millimeters daily, while the period of June 6th–14th (eight days) in F98878 gave an increase in length to 73 millimeters, or a daily average of 5.12 millimeters. As the period was broken, no twenty-four-hour period of greatest gain can be given with certainty. Partial records show F98877 to have made the greatest gain in length on the fourth day, an increase

of 10 millimeters. As the birds escaped before measurements were completed on June 14th, it is perhaps better not to give the fragmentary records of the growth of culmen and tarsus.

Changes in color and feather development noted were as follows: F98877 had feet pale ochraceous salmon on June 6th, pale salmon color on the 7th, pale cinnamon pink on the 8th, light Congo pink to buff pink on the 9th, and buff vinaceous on the 10th. The feet and tarsi of F98878 during the same period passed from light ochraceous salmon through light vinaceous cinnamon, light Congo pink to vinaceous fawn. The commissure of the older nestling changed from sea-shell pink on June 6th to white on the 8th, with no further change, while in the younger the change was from warm buff on June 7th through cream buff on the 8th and 9th, to ivory-yellow on the 10th. Changes in the culmen were less extensive, ranging from light drab on June 6th, to wood brown on the 7th, in the case of F98877 and a change to wood brown from a slightly lighter shade in F98878 during the same period. On June 8th, when three days old, F98877 showed follicles of the primaries beginning to break through the skin. The capital, spinal, humeral, and alar pterylæ showed as dark areas. The ventral tract at this time was slightly visible, the caudal and crural tracts were barely visible. The younger showed less development with caudal tract invisible. The eyes opened on the third day.

The most unsatisfactory feature of observations of the nesting habits of birds is usually their fragmentary character. It is also a stimulus to further observation, however, and chiefly for this reason the foregoing partial record is offered.

Wells River, Vermont, September 4, 1933.