

NESTING HABITS OF THE BLACK THROATED
BLUE WARBLER.¹

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(Plates XII–XIII.)

THE following material has been accumulated during the past four years from the records of fifteen nests of the Black-throated Blue Warbler (*Dendroica c. caerulescens*) in Holderness, New Hampshire. The data regarding nesting sites and materials used is true of this region—but with different geographical surroundings or climate many variations might occur. Mountain laurel (*Kalmia latifolia*) grows abundantly on the heavily wooded slope overlooking Lake Asquam, where the Black Throated Blue Warblers breed. Every nest was built in a crotch of laurel. Twelve in dense laurel well concealed from view, and three in sparse laurel. Five nests were within twenty-five to seventy feet of the lake and the rest at varying distances further up the hillside—not exceeding a quarter of a mile.

Banding Record. Since 1926 I have banded twenty-six Black-throated Blue Warblers, twenty-one fledglings and five adults (four males and one female). Using the young as decoys, after they had left the nest, the adults were caught in a chardonneret trap. From this group I have had one “return”—a female whose nest I found in 1926 and again in 1927 about a mile from the previous site. She had a new mate in 1927.

Description of Nest. Height nine to fifteen inches. Inner diameter two inches. Outer diameter two and a quarter to two and a half inches. Inner depth one and a half inches. Outer structure: Usually built of thin strips of white birch bark and shredded inner bark fibres. Occasionally built entirely of shredded inner bark. Inner wall: Always composed of newly shredded inner bark fibres. Lining: Always made of fine black rootlets, with horse hairs when available. Skunk fur is used freely as a substitute and sometimes pine needles or bits of moss.

¹ Read at the Salem Meeting of the A. O. U. October 22, 1930. I am greatly indebted to Mr. A. C. Bent for taking the photographs of the female Black-throated Blue Warbler and nest.



Photos by A. C. Bent.

BLACK-THROATED BLUE WARBLER.
UPPER.—FEMALE INCUBATING.
LOWER.—FEMALE FEEDING YOUNG.

Nest Building. June 8, 1927, 12 M. As I was pushing my way through dense mountain laurel, five feet high in places, I saw a female Black-throated Blue Warbler fly into a small laurel bush ahead of me carrying a piece of birch bark. Focusing my eight power Zeiss field glasses, I saw a number of birch bark strips hanging between two prongs of the laurel bush. The female carefully arranged the new piece and flew off. On the slope overlooking the nesting site I found an excellent observation post, where I watched the progress of the nest from a distance of about twenty feet.

12.10 P.M. The male lit in the laurel bush and began shaping the nesting materials, using his feet and body. During the next half hour he made five trips, worked on the nest each time and twice brought cobwebs for it. When he was not at the nest he sang near by and guarded the area closely. He drove off another male Black-throated Blue Warbler from the vicinity with great fury.

The female worked constantly on the nest using great quantities of cobwebs, which she laced around the prongs of laurel supporting the nesting materials. She also used cobwebs freely in holding the strips of birch bark in position. When bringing cobwebs she averaged a trip every minute—but more time was needed to secure the strips of birch bark. Examined the partially built nest at 1 P.M. The bottom was composed of a thick layer of curling strips of white birch bark and half of one side (also of birch bark) was well shaped. No other materials except the cobwebs were visible at this stage.

3.45 P.M. Returned to my observation post. The female made fifteen trips in twenty-five minutes bringing cobwebs, which she used as before. She used her feet and body each time to shape the nest. The male did not approach the nest again while I was watching it until the young hatched although a male Black-throated Blue Warbler sang frequently in that vicinity.

From 4.30 to 5.05 P.M. the female made trips on an average of one a minute bringing cobwebs. She tilted forward at a sharp angle while working on the nest, and used her feet with a kicking motion. When disturbed by an unusual sound she remained motionless until it ceased. Examined the nest. The frame-work of the lower portion was well shaped. Inside the birch bark foundation was a firm inner wall of newly shredded, creamy, buff inner

bark which must have been built during my absence. There were quantities of cobwebs around the prongs of the laurel bush and in the nest.

June 9, 11 A.M. Examined the nest. The cup was definitely shaped and the inner wall of bark fibres had been thickened.

11.05 A.M. The female brought cobwebs then, withdrawing into the bottom of the nest with only her bill and tail showing, she revolved her body slowly in a horizontal plane pausing at ninety degree intervals to work and gaining leverage each time by pressing her tail down firmly, outside the rim of the nest.

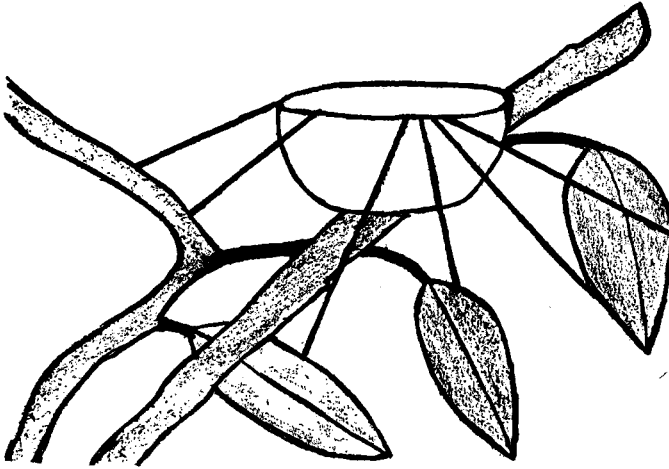


Diagram showing cobweb mooring lines holding nest in position during construction.

This operation was frequently repeated during the construction of the nest and I will refer to it in future as "boxing the compass." The female usually completed 360° sometimes pausing at ninety degree intervals and sometimes at sixty degrees. Two more trips were made for pine needles and shredded bark. At twelve o'clock, her usual feeding time, she stopped work. Examined the nest. The rim was quite firm but a glimmer of leaves could still be seen through the further wall. Quantities of cobwebs covered the entire upper part of the nest and the prongs of laurel supporting it formed a noticeable white film. The cup of the nest was still

pliable and bent in if pressed. Shredded bark was criss-crossed in the bottom of the nest.

June 9, 4 P.M. Between four and five o'clock the female made only three trips bringing cobwebs and "boxed the compass" four points each time. Examined nest. The female had begun to line it with fine black rootlets. The prongs of laurel had been freshly smeared with cobwebs and held the nest firmly in place. Cobwebs were also used as mooring lines, running from the rim of the nest to the leaves and laurel stems near by. It seemed as if they were used to hold the pliable nest in position while in the process of construction. Some cobwebs were two inches long and several four inches. As I bent over the nest I saw a puzzling brown hair hanging over the edge. Wishing to identify it I pulled and pulled until fifteen inches had uncoiled before my astonished eyes. It was mine! Much amused I hung it over a branch and went back to my post. A moment later the female returned to the nest, immediately noticed her lost prize and worked it into the lining again. Between 5.15 and 5.45 P.M. the female made six trips carrying bark fibres and rootlets.

June 10. Between 7.20 A.M. and 8.20 A.M. the female made nine trips bringing pine needles, rootlets and cobwebs. Examined nest, which was wet from last night's rain. The inner wall was much firmer than yesterday. The lining contained pine needles and black rootlets. It seemed about half finished. The cobweb mooring lines were still attached to the neighboring laurel stems and branches. New ones had been added and there were more on one side of the nest than the other. The nest was now a soft tone of creamy-buff and as I looked down from the slope above the lining of black rootlets made a dark oval like a shadow. Left my observation post at 8.30, having spent seven hours in watching the different stages of nest construction.

June 11. The nest appeared to be completed at 11 A.M. and was well lined with black rootlets and skunk fur. A number of spears of fox red moss with tiny club heads were also in evidence.

Incubation Period. After the nest building, which occupies about three days and a half, there is usually an interim of at least twenty-four hours before the first egg is laid. The female lays the eggs at intervals of twenty-four hours—frequently early in the morning.

So far I have never found a clutch containing either more or less than four eggs. There is considerable variation in both the coloring and marking of different clutches, as well as in individual eggs belonging to the same clutch. The eggs are ivory white with a blotched wreath of sorghum brown (Ridgway) chiefly around the larger ends.

On the morning of the fourth day when the clutch is complete the female commences incubating. The male sings constantly in the vicinity of the nest and sometimes alights on the rim and feeds her. She usually leaves the nest for at least half an hour soon after sunrise, between 12 M. and 1 P.M., and between 4.30 and 5.30 P.M., circling the nest as she feeds. Between these periods she often leaves the nest for brief intervals.

While incubating she varies her position—is very restless at times, moving her head constantly from side to side—or may remain almost motionless for a considerable period. She appears to turn the eggs with her feet.

I do not know whether the Black-throated Blue Warblers raise one or two broods, as we always leave camp on July 1. The first clutch of eggs is completed by June 5-9.

I also have a number of records of clutches completed on June 20-26. These are probably the second nests of birds whose nests have been robbed of eggs or young. The period of incubation is usually from twelve to thirteen days. One clutch of eggs hatched in eleven days.

CLUTCH OF BLACK-THROATED BLUE WARBLER'S EGGS
WEIGHT CHART FROM 6TH TO 10TH DAY, 1928.

<i>Sixth</i>	<i>Seventh</i>	<i>Eighth</i>	<i>Ninth</i>	<i>Tenth</i>
<i>June 12</i>	<i>June 13</i>	<i>June 14</i>	<i>June 15</i>	<i>June 16</i>
<i>Grains</i>	<i>Grains</i>	<i>Grains</i>	<i>Grains</i>	<i>Grains</i>
21	21	21½	21½	20½
21	20	21	20½	20
20	20	21	20	19
20	20	20½	19½	19

Hatching and Care of Young. When the young hatched I have seen two females dispose of the eggshells by crushing and eating them without leaving the nest— while a third female carried them away. A year ago I watched a female eat a cracked egg and its

highly incubated contents. The same female, aided by the male, disposed of a newly hatched dead fledgling in the same way. (Bull. Northeastern Bird Banding Ass'n., V, 1929, pp. 77-80). At nest No. 8 the young were three hours old before the male began feeding them. At nest No. 6 the young had been hatched six hours before the male appeared. At nest No. 2 the young were hatched at 6.30 A.M. and the male began feeding them at 8 A.M.

Type of Food. As soon as the young hatch the female begins feeding them. I have seen no evidence of regurgitation. She thoroughly crushes caterpillars, etc., between her mandibles before giving them to the young. Their food for the first day consists of small insects, soft white grubs and a large number of half inch, smooth, green caterpillars, which are found on hemlock trees. From the second to the eighth day their diet consists chiefly of small green caterpillars, insects, white grubs and an occasional may-fly or gray and cream colored caterpillar without spines. On the ninth and tenth day their diet still includes white grubs and green caterpillars, but dragon flies and may-flies are the chief staples. Slugs, winged ants, white cabbage butterflies and moths are also on the menu.

Disposal of Faeces. From the time the young hatch until they are five days old the parents swallow the faecal sacs. After that they carry them away from the nest and place them on the branches of neighboring trees—frequently using dead branches. I have watched four pairs of Black-throated Blue Warblers consistently dispose of the faeces in this manner—so it seems to be a fairly well established habit.

Signal System. The male's usual song is "Zwi-Zwi-Zwi" with an ascendant note on the last syllable. Both adults give the following alarm note, "thck-thck-thck" repeated in rapid succession when danger threatens the nest. There also seems to be a method of communication between mated birds. Sometimes while on the nest, the female gives a low pitched vibrant call "ss-hss-ss-hss" repeated quickly six to eight times. The male, although not within sight, will answer and come immediately to the nest. Occasionally feeding her, but not usually. He lights on the rim of the nest and they appear to "talk" to each other by opening their beaks very wide then closing and opening them again. At this time the

"ss-hss" call is not given and no sound whatever is perceptible to me at a distance of fifteen feet. This is also a fairly frequent occurrence when both birds arrive at the nest at the same time and have fed the young.

On one occasion the first time a male appeared at the nest after the young had hatched, he seemed to talk to the female before leaving the nest. The young gave a low buzzing call, when seven or eight days old, and from the ninth to the tenth day made a chattering sound when hungry.

NEST LIFE OF EIGHT DAY OLD BLACK-THROATED BLUE WARBLERS.

Date	Time Eastern Standard	Number of times fed by		Number of times brooded by		Times faeces removed by	
		Female	Male	Female	Female	Male	
	A.M.						
June 26	4.16- 5.16	8	8	3	3	1	
1927	5.16- 6.15	9	7	2	1	2	
	6.15- 7.15	8	5	1	1		
	7.15- 8.15	6	5	1	1		
	8.15- 9.15	6	4	1		1	
	9.15-10.15	12	10	2	1	3	
	10.15-11.15	9	9	2	1	3	
	11.15-12.15M	8	8	4	1	1	
	P.M.						
	12.14- 1.15	2	2	1		1	
		—	—	—	—	—	
Total	9 hours	68	59	17	9	12	
		127 times			21 times		

Plumage Development. June 19. The natal down of the newly hatched young was a quarter of an inch in length on the capital, spinal, crural and alar tracts. The color of their bodies was ochraceous buff. Their eyes were not open.

June 20. A few wisps of natal down were now visible in the caudal tracts of the day old young. The linings of their mouths and bills were ochre. Their eyes were not open.

June 21. The two day old nestlings were strong and active. Their eyes were not open and the color of the protuberant eye pouches was pea green. The natal down was still in evidence in the feather tracts. The developing feather sheaths were now

visible beneath the semi-transparent skin of the spinal tract resembling a double row of small evenly spaced dark blue splinters.

A similar "Blue Splinter" pattern had appeared in the upper portion of the ventral tract and a "Yellow Splinter" pattern in the lower portion of the ventral tract. The color of the wings was pea green and the posterior outline was slightly serrate.

June 22. The eyes of the three day old young were not open. Traces of natal down was still visible. The wings and spinal tract were pea green. The tips of the pin feathers of the primaries were separately defined. The outline of the secondary area had become serrate. The length of the extended wing measured one inch and an eighth.

The "Splinter patterns" in the spinal and ventral tracts were more obvious than yesterday and a similar blue pattern was also visible on the fledglings' legs above the tarsal joint.

June 23. The eyes of one of the four day old young were partly open. The natal down was nearly gone except for a few light wisps. No pin feather tips had appeared in the capital tracts. The pin feathers in the crural and ventral tracts were now separately defined.

The upper portion of the ventral tracts was pea green and the lower portion ochre yellow. The color of the spinal tracts and of the wings was pea green. The feather tips of the primaries and secondaries, which had burst through the skin appearing like miniature paint brushes were slate gray. The color of the wing quills was plumbeous. The color of their bodies and legs was ochre.

June 24. The eyes of all the five day old fledglings were open. Light wisps of natal down were still visible. Slate black feather tips were now unsheathed in the crural and caudal tracts. The wing bases were still pea green. The quills of the primaries were a quarter of an inch in length and the feather tips three eighths of an inch. The pin feathers of the secondaries were well developed. Also the feather tips of the greater wing coverts, which were slate black.

The feather tips of the ventral tracts were now unsheathed. The color of the upper portion was sepia and the lower portion Naples yellow.

June 25. The eyes of the six day old fledglings were well opened—but did not seem to focus properly. Faint wisps of natal down were

still visible. The feather tips in the capital and spinal tracts were now sepia, those in the crural tracts Naples yellow. The feather tips in the caudal tract were not yet unsheathed. The sepia feather tips of the primaries, secondaries and greater wing coverts were half an inch long. There was still a bare area of skin between the ventral tracts.

This was the last day I could handle the young without having them leave the nest. Their sense of fear seemed fully developed on the seventh day.

June 26. Examined the young from a distance of six feet. The four fledglings were very alert and lively, constantly flexing and vibrating their wings. The developing wing coverts and primaries still resembled minute paint brushes. The secondaries overlapped and partially concealed the bases of the primaries. The sepia feather tips of the caudal tract were now in evidence.

June 29. Tenth Day. The young left the nest. Examined them carefully. Their coloring was exactly the same, the only difference being that one of the brood was more fully feathered than the others.

BLACK-THROATED BLUE WARBLER FLEDGLINGS, WEIGHT CHART, 1929.

<i>Newly</i>							
<i>Hatched</i>	<i>Day old</i>	<i>Second</i>	<i>Third</i>	<i>Fourth</i>	<i>Fifth</i>	<i>Sixth</i>	<i>Tenth</i>
<i>June 19</i>	<i>June 20</i>	<i>June 21</i>	<i>June 22</i>	<i>June 23</i>	<i>June 24</i>	<i>June 25</i>	<i>June 29</i>
<i>Grains</i>	<i>Grains</i>	<i>Grains</i>	<i>Grains</i>	<i>Grains</i>	<i>Grains</i>	<i>Grains</i>	<i>Grains</i>
22	34	45½	66	89	107	131½	
24	36½	52½	76	95½	125	147	135
22	34	47½	70½	90	111½	141	142
	28	39½	62	76½	107		

BLACK-THROATED BLUE WARBLER FLEDGLINGS,
MEASUREMENT OF LENGTH, 1929.

<i>Newly</i>							
<i>Hatched</i>	<i>Day old</i>	<i>Second</i>	<i>Third</i>	<i>Fourth</i>	<i>Fifth</i>	<i>Sixth</i>	<i>Tenth</i>
<i>June 19</i>	<i>June 20</i>	<i>June 21</i>	<i>June 22</i>	<i>June 23</i>	<i>June 24</i>	<i>June 25</i>	<i>June 29</i>
<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
1⅛	1¼	1¼	1½	1¾	2	2	
		1½	1½	1¾	2	2¼	2½
		1½	1½	1¾	1⅞	2	2¼
		1½	1½	1⅞	1¾		



Photos by A. C. Bent.

NEST OF THE BLACK-THROATED BLUE WARBLER (*Dendroica c. caerulescens*).

Description of Plumage. Eyes; pupil dusky blue, iris blackish brown; line over eye straw color; mandibles straw color; mouth lining and tongue venetian pink; head and back brownish olive; upper breast and throat buffy olive; lower portion of breast Naples yellow; belly Naples yellow; undertail coverts Naples yellow; primaries fuscous black; secondaries brownish olive; greater wing coverts brownish olive; length of extended wing one and a half inches; length of primaries including quill and feathertip one and a quarter inches; length of feather tip three quarters of an inch; length of quill half an inch; tail brownish olive a quarter of an inch long; legs and feet flesh color.

Young Leaving the Nest. June 27. Entered the blind at 2.45 A.M. expecting the nine day old fledglings to leave soon after day-break. Stayed there until 2.30 P.M. when it rained heavily until dark.

June 28. Entered the blind at 5.30 A.M. The four ten day old fledglings were very active flexing their wings and preening their feathers.

6.10 A.M. The male fed the young, hopped on to a horizontal dead laurel branch, which partially supported the nest and flew off. A fledgling on the rim of the nest watched his departure closely, then followed suit by hopping on to the same branch and fluttering to the ground (a distance of twelve inches). The male convoyed it through the dense laurel. The female continued feeding the other three.

6.40 A.M. While hunting parasites in the bottom of the nest, the female pushed the young aside and crowded one of them on to the edge of the nest. It hopped on to the same branch used by the first youngster and sat there for several minutes looking back at the nest as if uncertain whether leaving home was such a good idea after all. Finally it gave a little hop, overbalanced, hung with one wing over the branch for an instant, then dropped to the ground.

6.56 A.M. The female brought food and lit on a branch just out of reach of the young. They jostled each other on the rim of the nest, until the boldest one hopped on to the branch, received the food and fluttered to the ground. I picked up this youngster and took the last one out of the nest for examination of plumage and

weighing. So, after three years efforts, I finally succeeded in watching a brood of Black Throated Blue Warblers leave the nest under natural circumstances.

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