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THE TENNESSEE WARBLER IN NEW BRUNSWICK.

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Plate I.

DURING an expedition made by Messrs. T. F. Wilcox and P. B. Philipp to northern New Brunswick in 1914, two male Tennessee Warblers (*Vermivora peregrina*) were secured in breeding condition. No females were taken and no nests were found, but the birds were believed to have certainly been breeding, both because of the condition of the specimens taken, and the persistence of the males in remaining day after day in or about the small areas where they were first noted.

In June, 1915, a visit was made by the authors to the same locality for the purpose of obtaining data as to the breeding habits of the species. The number of nests found and the consequent amount of breeding data collected are thought sufficient to warrant the publication of the present notes, especially in view of the meagreness of the published accounts of the breeding habits of this none too common bird.

The region in question is particularly well adapted to the nesting requirements of the Tennessee Warbler, as we noted them during the above period. Extensive lumbering has removed the greater part of the large growth spruce and balsam timber, which forms the great bulk of the forests of this region, leaving areas of small trees, which, in the older clearings, have grown thickly, and to an



NESTS OF THE TENNESSEE WARBLER (*Vermivora peregrina*).

average height of ten feet. These are interspersed with areas of more or less open, large timber, and others where the second growth has reached little more than the proportions of somewhat scattered shrubbery. The essentially level surface is frequently scored by slight depressions which form the beds of tiny streams, bordered on either side by boggy ground, dotted with grass tussocks, bushes and small trees, and overspread with a luxuriant growth of moss. Such areas are most numerous in cleared tracts, but not infrequent in the edges and the more open portions of the woods. These are the summer home-sites of the Tennessee Warbler.

While it was natural to expect to find this bird breeding under similar conditions as its near congener, the Nashville Warbler, and while some of the scanty data suggested that it did so, certain statements were extant to the effect that the nests were to be found "in low bushes near the ground," doubtless the basis for such an assertion being one or two nests alleged to have been taken from small bushes at a height of three or four feet. The very few reliable records we have been able to find, coinciding largely with our own experience, suggest a doubt as to the correctness of identification of nests taken from such situations, and purporting to be those of the Tennessee Warbler.

This Warbler, because of its inconspicuous gray and olive green coloring, might easily escape observation, save for the singing of the males which perch high up in the large trees where they sing almost constantly. At the time of our visit to the breeding country, in the middle of June, nest building was completed and full sets of eggs had been laid. Altogether, ten nests were located, all built on the ground in substantially the same general sort of situation, and all but two were found by flushing the bird. The nest is built in the moss, usually in a wet place at the foot of a small bush, and in most cases in woods, somewhat back from the more open part of the clearings. A hollow is dug in the moss, usually beneath an overhanging bunch of grass. The nest is in nearly every case entirely concealed and it is impossible to see it from any view-point without displacing the overhanging grass. Consequently unless the bird is flushed it would be all but impossible to find it. The outer foundation of the nest is of dry grass, forming quite a substantial structure. Several nests had whisps of grass stems extend-

ing from the front rim, as noted in description of first nest below. It is lined, usually, with fine dry grass, to which in some instances the quill-like hairs of the porcupine, or white moose hairs, are added, and more rarely still, fine hair-like roots which were not identified. The females, so far as observed, do all the incubating and sit very closely,— so closely, in fact, that one was caught alive on the nest, where the exact situation had been previously marked. The nest is so carefully concealed that even when the bird is flushed it is sometimes very difficult to find it, so deeply is it buried in the moss.

This species seems to be somewhat gregarious. In 1914, in one small clearing, five males were heard singing at the same time. In 1915, in the same clearing, three males were heard singing at once, and two nests were found. In almost every clearing of suitable size at least two pairs of birds were found, the nests being sometimes located rather close together. The females, when once flushed off the nest, are very shy about returning while the observer is about, but one can easily tell whether a flushed female has a nest in the immediate neighborhood by the utterance of a sharp "chip," which is nervously given, the bird flitting constantly about from twig to twig, a habit which makes them difficult to collect in the heavy undergrowth.

On the second day of our sojourn, June 19, we visited one of the typical nesting places of this warbler, a boggy, cleared swale, with scattering, small second growth, and soon flushed a female from a nest containing six fresh, or practically fresh, eggs. This nest, typical of the majority of those found in both construction and situation, was placed in the side of a small tussock, bedded in moss and completely overhung by the dead grass of the previous year's growth. The nest was composed entirely of fine, nearly white, dead grass stems. From the front rim protruded outward and downward, a wisp of dead grass tips, lying over the lower grasses in the tussock, and shingled over by the overhanging grass, establishing a continuity of the side of the tussock, thus cunningly adding to the perfect concealment. A tiny tree and one or two bush shoots grew from the tussock, close to the nest, and this feature was typical of the greater number of the nests found. Though larger, the nest was similar, both as to general appearance and situation,

to nests of the Nashville Warbler, found by Philipp and Wilcox the previous year, and to a nest of that species found by Bowdish in Ontario.

On June 20 another nest with six eggs was found, also situated in a moss bank, overhung with grass, in the edge of the woods and partially under the tips of a fallen dead branch. A nest with five fresh eggs, found on the same date, was snuggled down in the middle of a flat bed of moss, with little grass in the vicinity, and could be seen without the removal of any cover. This was the most striking departure from the type of nesting already described.

On June 22, a rainy day, the female was caught on the nest with six eggs, found June 20, by clapping a hat over the nest. On June 23 three nests were found, each containing five eggs, built in the typical situations before described. On June 24 another typically situated nest containing five eggs was found. Another was located on the same date which had been dragged from its original site, presumably by some mammal, bits of egg shell giving evidence of destruction of eggs. This was the most bulky and substantially built of all the nests found.

Another nest with five fresh eggs was found on June 26, and a nest in its original, typical situation, containing bits of egg shell, bespoke another tragedy. The last nest, found June 27, situated in the side of a grass tussock, in the edge of woods, just off a boggy clearing, contained *seven* eggs, in which incubation appeared to be half or more complete. These eggs had not hatched on July 1, the day before we left, and the last opportunity we had to examine the nest.

Four nests measured as follows, in inches:

1. Depth, outside, 2; inside, $1\frac{1}{2}$; diameter, outside, $3\frac{1}{2}$; inside, 2.
2. Depth, outside, $2\frac{1}{4}$; inside, $1\frac{1}{4}$; diameter, outside, 4; inside, $1\frac{1}{2}$.
3. Depth, outside, $3\frac{1}{4}$; inside, $1\frac{1}{8}$; diameter, outside, $3\frac{1}{2}$; inside, 2.
4. Depth, outside, 3; inside, $1\frac{1}{2}$; diameter, outside, 3; inside, $1\frac{1}{8}$.

None of these presented the "quite flat" appearance described by J. Parker Norris, Jr., in the nest taken by Allan Brooks in British Columbia. On the contrary, they were well cupped and, though far from bulky, were fairly substantially built.

The eggs vary from 5 to 7 in number, usually 5, and are dead white in ground color, well sprinkled with fine specks and small blotches of reddish brown, and less numerous and conspicuous lilac markings, more thickly about the large end, where, in perhaps a third of the specimens, they tend to form a wreath. Three sets measure as follows, in hundredths of an inch:

No. 1. $.66 \times .50$; $.62 \times .47$; $.64 \times .47$; $.62 \times .47$; $.62 \times .47$;
 $.62 \times .47$.

No. 2. $.66 \times .52$; $.65 \times .51$; $.67 \times .52$; $.64 \times .51$; $.70 \times .50$.

No. 3. $.64 \times .49$; $.63 \times .49$; $.65 \times .47$; $.62 \times .45$; $.63 \times .47$.

The males sing most persistently, and at all times of day, and as they sing from some perch, usually lofty, within a few rods of the nest, they give a good clue to its general location.

The song, though quite characteristic, is rather difficult to describe. In fact, the authors finding this beyond their powers, appealed to Mr. Louis Agassiz Fuertes, who kindly furnished the following notes:

"I would not recognize it among other 'Vermivoraë' by its 'chip,' but I usually spot its *song*, which to my ear is represented as 'Xee', Xee', Xee' see', see', see' see'-e-e-e-e-" or K'see'-K'see', xee', xee', see' see' see'-e-e-e-e.' It is done in a thin or wiry quality of tone, high, like a Nashville's, and is the only Warbler song I know that is a consistent accelerando from end to end, all on the same pitch. Though wiry, it is frequently quite loud, and may be heard for some distance. It may — and probably does — have more elaborated songs for the period of early summer, which I have never heard."

As a basis for estimating the frequency of song repetition, counts were kept on three singing birds for a period of five minutes each, with a result of 32, 36 and 22 songs, respectively, within the period. In one instance, a bird was observed to sing while on the wing, repeating the song twice in the course of a short flight.

In addition to the birds of the ten nests observed, at least a dozen males were heard singing in other localities within a radius of four or five miles. The Tennessee Warbler would appear to be one of the most numerous warblers of this part of New Brunswick, while the two nesting records of the Nashville Warbler in 1914 and one nest with four eggs, found on dry upland, June 29 of the

present year, would, according to our experience, seem little more than casual.

The stomachs of four birds taken were preserved and sent to Mr. H. W. Henshaw, Chief of the Biological Survey, United States Department of Agriculture, who kindly furnished the following copies of analyses of contents:

No. 1, male, June 21, contents; eight small caterpillars (as in No. 3), 35%; Dipterous fragments, 23%; a small spider, 2%; scale-like fragments (perhaps of some catkin), 40%.

No. 2, female, June 22; empty.

No. 3, female, June 23, contents: a camponotid ant, 16%; at least 78 small caterpillars (*Tortricidæ*), 75%; a snail (*Vitrea hammoides*) 4%; unidentified vegetable fragments, 5%.

No. 4, male, June 28, contents: 3 Lampyrids near *Podabrus*, 8%; a small Coleopterous (?) larva, 3%; about 15 small caterpillars (as in No. 3), 25%; a Neuropterous insect (apparently a caddis fly), 50%; 2 small spiders, 14%; trace of unidentified vegetable matter.

In connection with the subject of food, a note published in the 'Bulletin of the Nuttall Ornithological Club,' Vol. V, 1880, page 48, by J. A. Allen, cites destruction of grapes by these birds in Kansas in September of the previous year, the birds puncturing the skin and eating the pulp or succulent parts.

On the other hand, W. F. McAtee, describing his experience with injury to grapes by these birds, in 'The Auk,' Vol. XXI, 1904, page 489, found that while puncturing many grapes, the Warblers did not eat the pulp, but seemed to quench their thirst with the juice. Examination of stomach contents showed insects of species most injurious to grapevines, and as the Warblers are present in the grape growing areas as transients only, it is argued that such harm as is wrought by the grape puncturing habit is probably far more than offset by the insects eaten. The suggestion is also made that by supplying abundance of water, the injurious habit might be eliminated.

Little information seems available as to the migration of the Tennessee Warbler in New Brunswick. The Biological Survey has but two records of arrival, both for Petit Codiac, by John Brittain; May 19, 1886, and May 26, 1888.

In conclusion, it may be of interest to cite the more pertinent

published data respecting the breeding of the Tennessee Warbler, which we have been able to locate.

In 'The Warblers of North America,' Chapman cites C. J. Maynard 'Birds of Coos Co., N. H. and Oxford Co., Me.,' (Proceedings Boston Society Natural History, 1871, page 7) who "found it to be very common in wooded localities about Umbagog." The citation does not state that nests were found and we have not been able to consult the source cited.

H. D. Minot, 'Land and Game Birds of New England,' 1876, states that "the nest and eggs are essentially like those of the Nashville Warbler, though the eggs vary and exhibit certain peculiar forms, and though the nest is 'often placed in the woods.'"

In the 'Bulletin of the Nuttall Ornithological Club,' Vol. VI, 1881, page 7, C. Hart Merriam, in 'Birds of the Adirondac Region,' states of the Tennessee Warbler: "Breeds. Not rare in suitable localities. Generally prefers hard-wood areas." In a list of the birds of Point De Monts, Quebec, the same author in the same publication, Vol. VII, 1882, page 234, says: "A tolerably common summer resident."

J. H. Langille, 'Our Birds in Their Haunts,' 1884, says "It breeds far to the north, its nest having been found in Michipicoton, on Lake Superior."

Ernest Thompson Seton, 'The Birds of Western Manitoba,' (Auk, Vol. III, 1886, pages 325-326) gives the Tennessee Warbler as a "Rare summer resident."

Walter Faxon found a singing male in Berkshire Co., Mass., July 15, 1888; (Auk, Vol. VI, 1889, page 102). He quotes William Brewster as always having found it in conifer regions and C. H. Merriam and J. A. Allen as having found it frequenting hard wood.

John Brittain and Philip Cox, Jr., in notes on summer birds of the Restigouche Valley, New Brunswick (Auk, Vol. VI, 1889, page 118) give the Tennessee Warbler as "Very rare."

In 'Bulletin No. 18, United States Department of Agriculture — Bureau of Biological Survey,' Wells W. Cooke records two sets of eggs taken by one of the parties of the Biological Survey in the summer of 1901 at Fort Smith, Mackenzie. "These eggs are among the first absolutely authentic specimens known to science." This note however gives no description of the nesting habits.

J. Parker Norris, Jr., describes (Auk, Vol. XIX, 1902, page 88) a nest and four eggs in his collection, taken by Allan Brooks at Cariboo, British Columbia, June 15, 1901. On the same date Brooks found another nest with newly hatched young and several more nests with young the following week. From this it would appear that the breeding season there was a week or two earlier than we found it in New Brunswick. We infer from Brooks' data that he found the birds nesting on dry ground, but otherwise the situation of the nests, arched over by dry grass, seems to have been the same as in the case of the New Brunswick nests. Norris' description of these eggs agrees largely with those we observed, but his nest differs both as to the flat appearance previously mentioned and in having a greater variety of material, leaves not occurring in the nests we found, while moss was seldom used by the New Brunswick birds. A photograph of the nest in the Norris collection appears in 'The Oölogist,' (Vol. XXII, 1905, page 134).

Macoun's Catalogue of Canadian Birds, as to breeding, only quotes the description of the Norris nest, above mentioned, and an alleged nest reported by W. Raine as having been taken near Edmonton, Alberta, in 1899, situated two feet up in a willow bush. O. W. Knight in his 'Birds of Maine' reports a nest found by C. D. Farrer, near South Lewiston, Maine, June 4, 1895, containing five eggs, advanced in incubation, and other nests with young, found near Bangor, Maine.

The August, 1915, issue of 'The Oölogist' reports a nest and four eggs in the collection of Gerard Alan Abbott, taken by E. Arnold, at Gaff Topsail, Newfoundland, June 25, 1913.