

take keen delight in shooting the birds from boats and usually leave the dead or wounded where they fall. This correspondent wrote that he killed 182 Eagles in 1919 and 327 in 1921, for the bounty—fifty cents each. Although he is convinced that he is really doing humanity a favor by killing as many Eagles as possible, I believe that the sum total of the annual damage done to Alaskans and their interests by Eagles would not cover the annual total of bounties collected for killing these birds.

I do not feel that I have collected a sufficient amount of data on Alaska Eagles to definitely determine their economic status, therefore I hope that some competent, energetic zoologist will spend several months in Alaska studying the economic phases of the Eagle problem and then recommend proper legislation. Since I found Eagles common only along the coasts, I can see no reason for placing a bounty on them throughout the entire territory. Granting that damage by Eagles is actually as great as isolated observers have noted, and as general as the bounty law would suggest, it occurs to me that a strip of country fifty miles wide along the coasts would be sufficient territory in which to apply a bounty law.

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## A BREWSTER'S WARBLER AND HIS BROOD.\*

BY T. DONALD CARTER AND R. H. HOWLAND.

### *Plate XXIV*

WHILE acting as enumerators during the bird census of the Wyanokie Plateau, in northern New Jersey, on June 4, 1922, the writers discovered a male Brewster's Warbler (*Vermivora leucobronchialis*) mated with a female Golden-winged Warbler (*Vermivora chrysoptera*) and their brood of five young. Wyanokie is situated west of Midvale in north-central Passaic County. The census area of about 3000 acres consists principally of moun-

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\* Note on heredity of Brewster's Warbler by John T. Nichols.

tainous woodland with lower lying fields and stream fed swamp lands. The census has been taken annually for the Biological Survey since 1916, numerous observers taking part. Both the Blue-winged Warbler (*Vermivora pinus*) and Golden-winged Warbler breed rather commonly in the valleys and lower lying sections where conditions are to their liking. Brewster's Warbler would therefore be reasonably looked for, but until this year had been noted but once since the census-taking was begun.

The first part of the territory canvassed by the writers on June 4 embraced rather high woodland, gradually sloping downward as we followed a stream which finally separated the woodland from a swamp area. As we neared a small clearing in the woods which was within about 100 yards of the brook and swamp, the call-note of a bird directed our attention to a certain tree. Each of us supposedly sighting the same individual and sure of its identification, the words that ensued were unexpected. One insisted that the bird had a yellow breast and was a male Nashville Warbler (*Vermivora ruficapilla*), while the other was equally as emphatic in stating that the breast was white and that the bird was a male Brewster's. Our altercation was short-lived, however, for we found that there were two birds in the same tree and but a few feet apart. The circumstance, which has been reviewed by us with amusement, is mentioned in view of the fact that the Nashville is quite uncommon in this region during the nesting season. But one other individual was reported during the census.

We both turned our attention to the Brewster's which was holding a small green caterpillar. This circumstantial evidence of a family near at hand led us to retire a few feet. We were quiet but a few moments when he flew from the tree to a small butternut in about the center of the open space, and then worked his way down until he had almost reached the ground. After hesitating a moment he dropped into a tangle of briars, short undergrowth and long grass at the foot of the butternut, and was lost to view. He reappeared almost at once and worked his way upward, taking about the same route by which he descended. The absence of the caterpillar was noticed with satisfaction and we hastened to the spot where he had disappeared into the undergrowth. After some careful search we discovered the nest with a

female Golden-winged Warbler brooding. She remained on the nest, her yellow crown being the only conspicuous mark for either bird or nest, until our hands were about a foot from her. She then suddenly slipped off, disclosing five nestlings probably a day old and certainly not more than two days old. The nest, which was subsequently noted carefully and is now in the collection of the American Museum of Natural History, was almost invisible in the concealing tall grass, briars and tangle of vines, and while on the ground directly at the foot of an elm sprout, it was not attached to it. It was composed of bark and leaves, chiefly oak leaves, and a few small twigs. The stems of the leaves did not all point upward. The leaves were bound with coarse strips of bark, the center of the nest being composed of finer strips of bark and tendrils. The cup lining was of horse-hair and a few strips of dried grass. It would seem that the birds must have traveled a considerable distance for the horse-hair. Outside depth of the nest was 4.5 "; width 4 ". Inside depth, 3.5 "; width, 2.5 ".

After watching the birds awhile, we again resumed the journey. Later in the day, after the census was completed, we returned to the nest with some of the other observers. The birds obligingly allowed close observation but the female flushed from the nest much more quickly than in the morning and was much shier than the male Brewster's.

On the afternoon of June 10, six days after our introduction to this interesting pair and their offspring, Dr. G. Clyde Fisher accompanied us on a return visit to Wyanokie. Armed with cameras, bird bands and a portable bird-trap we, with considerable apprehension as well as anticipation, approached the nest location. During the journey up we had mentioned some of the possibilities of mishap to our brood, and our thought of the dangers which might make our journey without result now seemed almost a prediction, for as we approached the nest a chorus of alarm notes reached our ears. It was evident that our birds were in trouble and we quickened our steps. We first descried a pair of Ovenbirds (*Seiurus aurocapillus*) giving their distress chip. Then our Brewster's appeared and also his mate. A Black-and-White Warbler (*Mniotilta varia*) was also showing concern. Peering into the bushes we quickly perceived the cause of all the commotion, for there, not

more than three feet from the nest lay a four and a half foot mountain blacksnake (*Elaphe obsoletus*). Going immediately to the nest one of us discovered it to be empty. Reassurance to a degree came from another of us who almost at once found a minute olive-green fledgling on the ground about 20 feet from the nest. The little fellow was put into the trap for safe keeping while an attempt was made to take a photograph of the snake. This proved impossible and we tried to capture it, hoping that we might recover whatever of the youngsters it had secured. But the underbrush and carpet of leaves were very thick and the snake eluded us after a strenuous chase.

The fledgling was then banded (No. 48864, A. B. B. A. series), and its plumage noted as follows: Head and crown, uniformly olive-green; back, olive-green; rump, lighter olive-green; tinged with yellow; tail, olive-green, like head and back, the feathers just breaking through sheaths; under tail-coverts, yellow; throat uniformly olive-green; breast, becoming darker olive-green; sides and flanks, whitish with tinge of yellow; belly, like sides; wings, bluish-gray, outer webs slightly margined with olive-green; two distinct and widely separated bright yellow bars.

After replacing it in the trap, which was then set, the Brewster's Warbler entered almost at once but the trap was set too firmly and failed to spring.

A word about the trap might be of interest here, for it is very compact, easy to carry and of great assistance in catching birds for banding. It can be folded from the size 10" × 7.5" × 7.25" when set, to 10" × 7.5" × 3", when folded. The sides fold under the base while the ends fold over the top. It is divided into two compartments. The top of each compartment is provided with a trap-door that is held open by a forked stick. An elastic band or spring is attached to this door, so that when the bird enters and touches the stick, the door falls.

While getting a lighter crutch for the trigger of the trap another fledgling was located hiding under a small bush. Out it scurried with a frightened chip, and was soon made captive and banded (No. 48865). A marked difference in plumage between this and the first one was noted at once. While the upper parts, wings and tail were the same as 48864, the throat and breast were much

lighter olive-green (almost grayish). The breast was somewhat darker than the throat, but was slightly tinged with yellow. Sides and flanks were the same as in 48864 but the belly was yellow.

After this fledgling was placed beside the other, the trap was again set, and the Brewster's in his concern for the welfare of the two youngsters entered the trap almost immediately and was caught and band number 48866 placed on his left leg. The young were banded on the right leg. We suppose that this was the first Brewster's Warbler to be banded but Dr. Stone has called our attention to the fact that Dr. Winsor M. Tyler banded one in 1913. (Mem. Mus. Comp. Zool., XL No. 6, p. 315). "In the field" the bird had the appearance of having a slightly gray throat, but this proved to be either an optical illusion or due to shadow, for the entire underparts were pure white and the bird was otherwise typical.

After being photographed the Brewster's escaped from our hands as we were attempting to transfer him from one to the other, but he was back in a few minutes with a small green caterpillar, hovering about us as we took more photographs of the two fledglings, and entered the trap again without the slightest hesitation almost immediately after they were again placed in it. He was again photographed. It might be stated that he displayed considerable fighting spirit while in the hand, picking at our fingers liberally but did not squeal. Liberated from the hand for the second time, he flew off but a short distance and was back again almost at once and entered the trap on two more occasions during the afternoon. We admired his utter disregard of consequences in his concern for the welfare of the young, and his desire to administer to their wants was evidenced constantly by the green worms which he kept collecting and carrying. The female while flying down within a few feet of us, and often approaching the trap, was much more wary and at no time was she in much danger of being our prisoner. During our stay the two parents kept up an almost constant chip scolding, which was most continuous when we had the young birds in our hands. The male was not heard to sing. The Black-and-White Warbler paid us three or four visits and a male Golden-winged Warbler also was seen near by, at one time displaying before our female.

The young birds were finally placed in nearby shubbery and the parents were immediately engaged in efforts to lead them away, the male taking the more active part as usual. With green caterpillar in bill, on three or more occasions he inserted his bill into the gaping mouth of a youngster and at once withdrew it, still holding the worm. He would then hop to a near branch and coax the young one to follow. His wishes were finally gratified.

While packing our paraphernalia, we heard the faint chirping of a young bird and upon investigation found it to be another of the brood that had been hiding not ten feet from where we were carrying on operations. The little fellow had kept quiet and under cover for a good two hours. We had not seen the parents make any approach in its direction, but their concern was at once manifested when we took it in hand. It was given band number 48867. The plumage proved to be exactly like that of 48865. The other two youngsters had become accustomed to us, even to the point of one taking a meal worm which was held temptingly before it on the end of a stick, and this fledgling was very lively by contrast.

On the afternoon of June 18, R. H. H. approached the vicinity of the location from a different direction. Arriving at a break in the woods similar to the open patch where the nest was located and about 400 yards south of it, a familiar chip-scold greeted him, and there was the Brewster's with the invariable green caterpillar in his bill. The movements of the Brewster's were followed for nearly an hour, during which time he kept scolding and often approached within a few feet, kept collecting caterpillars and once disappeared into the near underbrush and apparently fed a young bird which was faintly heard but could not be seen. Again an Ovenbird and a Black-and-White Warbler occasionally came near to add a scold or two, but the female Golden-winged Warbler was not in sight. A youngster was finally located, within 15 feet of the observer and almost facing him, perched about five feet from the ground close to the trunk of a small sapling, which was in the midst of a clump of small growth. The Brewster's became more excited and flew very close to the observer, but the young bird kept motionless until a move was made to get a better look at its tail, and then it turned quickly and flew downward into dense

underbrush. While the band on the leg of the Brewster's was easily discerned, the fledgling crouched too low to permit of a band being seen. The plumage of the young bird had undergone considerable change in eight days time. The head and back were dull greenish-gray; wings were bluish-gray, the two bright yellow bars being closer together than on June 10, throat and breast were pale yellowish-green; the belly was seemingly yellow, while the sides were yellowish-white with perhaps a tinge of green.

A prolonged thunder storm, which had been brewing for some time, and which the Brewster's had been preparing for by preening (scolding meanwhile), made further search for young impossible, the Brewster's being lost to sight as soon as the downpour came. Without being able to hear the guiding chip it was impossible to locate him when he disappeared.

On July 8, we carefully searched in the vicinity of the nest location. An inadequate view of a Brewster's was obtained, it being impossible to see a band or tell positively whether the bird was adult or immature. If the adult however, it was apparently in partial molt for the breast was a dirty "moth-eaten" white. There was seemingly some yellow on the underparts. One of the young was discovered, band on right leg being visible, and while undoubtedly a Golden-winged Warbler, a complete description of the state of the plumage could not be obtained in the brief interval that the bird remained in view.

Mr. John T. Nichols furnishes us with the following note on the ancestry of Brewster's Warbler:—

The hypothesis that Brewster's and Lawrence's Warblers are hybrids between the Golden-winged and Blue-winged Warblers ('Auk' Jan., 1908, p. 86) is now generally accepted. Two divergent plumages in the same cross could be obtained by alternative or 'Mendelian' inheritance in the following manner. Considering only the characters of throat patch and color of underparts; if plain throat and white underparts are 'dominant,' all the first generation of a cross between a Blue-wing and a Golden-wing will have plain throat and white underparts, that is, will be Brewster's. They will, however, carry the throat patch and yellow underparts of their respective parents as 'recessive' characters, to give a definite small proportion of Lawrence's Warblers in ensuing generations.

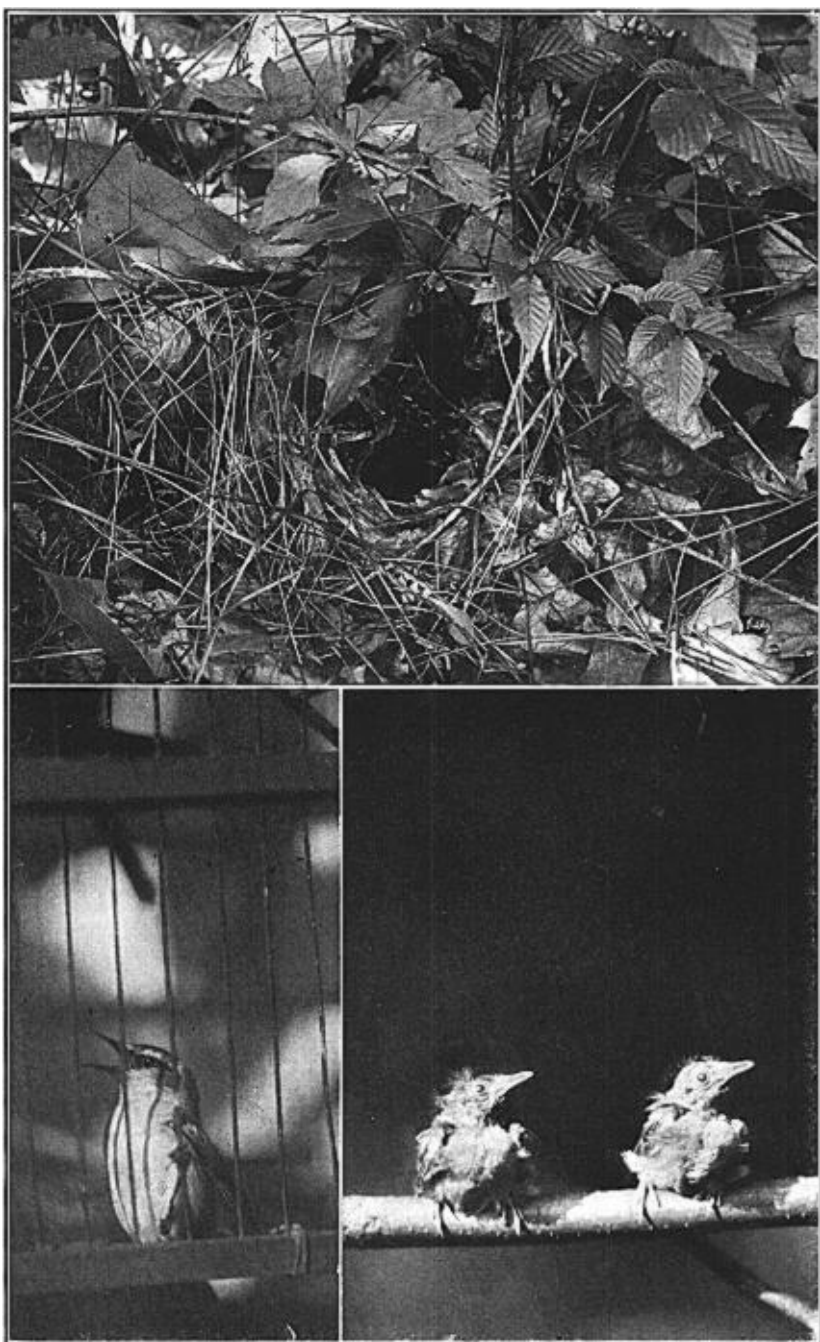
In a case like the present, if we suppose that the female Golden-winged Warbler was a pure Golden-wing, and the male Brewster's Warbler a first generation cross (the most likely condition), it is possible to prophesy the character and proportions of their offspring. All would inherit white underparts from the female masking any yellow underparts they might get from the male (for in this particular case the *white* inheritance dominates over the *yellow*). Therefore all would in fact have white underparts, and Golden-winged and Brewster's Warblers be the only plumage possibilities. Half would inherit a throat patch from the male (possessed by a first generation Brewster's as a recessive character) and be Golden-wings in plumage. Half would inherit a plain throat from the male (which would mask the throat patch from the female) and be Brewster's in plumage. The young would thus be of two types, half Golden-wings and half Brewster's. Although their underparts would in every case be white, half would inherit the recessive yellow of the underparts from the male and be capable of passing it on to the next generation. That is to say, half of the Brewster's Warblers of this brood would differ from first generation Brewster's in the inability to pass on yellow underparts to succeeding generations, and half of the Golden-wings would differ from pure Golden-wings in the ability to pass on yellow underparts.

Space is lacking to go into the complications in case the parents of this brood were mixed birds, not a pure Golden-wing and a first generation Brewster's as supposed. It will suffice to say that by further banding and observation it may be possible to prove in this locality an exceedingly interesting hypothesis in heredity, or learn matters of interest concerning the crossing of these two species.

The plumages of the young so far as observed here prior to July 8 were nestling plumages, and definite determination of these birds is dependent on their future recovery.

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1. Nest of Brewster's Warbler. (Photo by G. Clyde Fisher.)

2. Male Brewster's Warbler. (Photo by T. D. Carter.)

3. Offspring of Male Brewster's and Female Golden-wing. (Photo by G. C. F.)