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NESTING HABITAT OF BACHMAN'S WARBLER—A REVIEW

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Bachman's Warbler (*Vermivora bachmanii*) is on the verge of extinction; no populations are known. Recent systematic searches in widely separated parts of its range failed to locate nesting birds (Stevenson 1972, pers. comm., Hamel et al. 1976). The 2 most recently published sightings were apparently of transient birds as each was seen only once (Imhof 1973, American Ornithologists' Union 1975). Most observations of the bird were made in the late 1800's and early 1900's when little attention was given to habitat. Often habitat descriptions were ambiguous and thus, misleading when considered alone. By comparing the varied descriptions collectively, a clearer conception of the warbler's habitat evolves. Much of the information on the nesting habitat of Bachman's Warbler is unpublished and generally not known to exist. We reviewed published and unpublished descriptions of habitat in order to better identify the most likely breeding areas.

REPORTS OF NESTS

We know of 40 nests of Bachman's Warbler that have been found. Some mention of habitat was made in the account of 32. Eleven of these descriptions were published. The remaining 21 habitat descriptions were found in the field notes of A. T. Wayne which are on file at the Charleston Natural History Museum. We examined Wayne's notes from 1901, when he rediscovered the bird in South Carolina (Wayne 1901), to 1928 when he apparently stopped taking notes. We believe the set of field notes is complete (A. E. Sanders pers. comm.); but, Wayne did not record 3 of the nests in his notes. Observations on the same nest were often made on different days; however, Wayne apparently collected all Bachman's Warbler nests he found and recorded the names of persons to whom he sent them. This information along with radically different habitat descriptions allowed accurate determination of the number of nests located. Wayne found at least 35 nests in I'On Swamp, near Charleston, South Carolina, between 1906 and 1919.

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Bachman's Warbler (*Vermivora bachmanii*), male above and female below.
Watercolor and acrylic painting by Sidney A. Gauthreaux, Jr.



S.A. Gauthreaux 1977

Widmann (1897, 1899) reported 2 nests from Missouri. One nest was reported from Kentucky (Embody 1907) and 2 from Alabama (Holt 1920, Stevenson 1938). A nest from Georgia originally reported as that of Bachman's Warbler (Arnow 1908) was later attributed to Swainson's Warbler (*Limnothlypis swainsonii*) by Wayne (1912). Burleigh (1958) credited the Georgia nest to Bachman's Warbler but we accepted Wayne's judgment. With the exception of records of Barnes (1954), Dawn (1958), and Chamberlain (1958), we disregarded sightings of the bird when a nest was not found. In these cases a male was observed throughout much of the nesting season and was apparently on territory even though presence of a nest or female was not confirmed.

RESULTS AND DISCUSSION

The swamp habitat.—All Bachman's Warbler nests were found in low, wet forested areas. The 35 nests Wayne found in South Carolina were in the headwater swamp and adjacent wet flats of I'On Swamp. The other 5 nests were in bottomland forests along coastal plain rivers. Twelve of the descriptions of nest sites mentioned water, but as water levels fluctuate rapidly in both headwater swamps and bottomlands, the lack of water at other nest sites is of unknown significance. Also, it is possible that Wayne failed to record in his brief notes the proximity of water to some nests.

Descriptions of the overstory vegetation near Bachman's Warbler nests were poor. Wayne (1907) said of the area where his first 6 nests were found, "The trees are chiefly of a deciduous character, such as the cypress, black gum, sweet gum, tupelo, hickory, dogwood, and red oak. In the higher parts of the swamp short-leaf pines [probably *P. taeda*], water oaks, live oaks, and magnolias abound." At least some of the other nests Wayne found were in different parts of I'On Swamp up to 2.4 km from the site of the first nests. However, no further reference was made to the overstory trees. Widmann (1897) described the forests of the St. Francis River basin but failed to associate the site of his nest discovery with any particular forest community. Embody (1907) found, "The tulip tree, sweet and black gums, sycamore, elm and various oaks occur in abundance." He, too, was talking of the bottomland not the actual nest site. Holt (1920) said, "The burn (where the nest was located) was surrounded by the virgin swamp growth of *Pinus taeda*, *Magnolia virginiana*, *Pieris nitida*, *Ilex coriacea*, *Persea* and other hydrophytic vegetation." Stevenson (1938) mentioned that elm (*Ulmus alata*) and cherry (*Prunus serotina*) were near the nest.

I'On Swamp, the headwater swamp where Wayne found 35 nests, is a complex of forest communities. Non-alluvial headwater swamps occur in the interstream areas of the lower coastal plain where poorly developed drainage patterns and depressions impound rainwater and seepage. Wet flats are the better drained areas bordering the swamps (Stubbs 1966). The deep water

areas in the headwater swamps are forested with swamp tupelo (*Nyssa sylvatica* var. *biflora*) and bald cypress (*Taxodium distichum*) with almost no understory. Shallower areas support pond cypress (*T. ascendens*) and swamp tupelo with an impoverished understory, again offering little potential for nesting habitat. The next drier zone is forested by the sweet bay (*Magnolia virginiana*)—swamp tupelo—red maple (*Acer rubrum*) association that often has a moderate to dense understory. Slightly drier sites, the wet flats, support sweet gum (*Liquidambar styraciflua*), willow oak (*Quercus phellos*), numerous other hardwoods and scattered loblolly pine (*P. taeda*). Drier sites support other hardwood associations that grade into loblolly pine sites. The driest areas are forested in longleaf pine (*P. palustris*). All of these conditions occur in I'On Swamp. Stands of the sweet bay—swamp tupelo—red maple association and the wet flats seem the most probable areas where Wayne found nests.

Current flood plains, also called first bottoms, are dissected by former stream channels that create sloughs, which are generally the last part of the bottom to dry. Sloughs are forested by bald cypress and water tupelo (*N. aquatica*) stands that, because of the inhibiting effect of long standing water, have poorly developed shrub layers and thus, are probably poor habitat for the warbler. The remainder of the first bottoms and the slightly higher former flood plains or terraces are forested by some 70 species of trees (Putnam et al. 1960) including those listed by Widmann (1897), Embury (1907), Holt (1920), Stevenson (1938), and Barnes (1954). The drier portions of the first bottoms and wetter areas of the terraces seem to best fit the descriptions given by those workers.

It appears that Bachman's Warbler used the portions of the river bottoms and headwater swamps that were inundated for relatively short periods compared to the lowest and wettest areas. The territory in a longleaf—loblolly pine stand (Dawn 1958, Chamberlain 1958) was the most radical deviation from the use of such areas; however, nesting was not determined. In view of all nests being found in swamps and bottomlands, there is little reason to believe that pine stands were of much importance to the bird as nesting habitat.

Seral condition of the overstory.—Only twice was reference made to virgin or primeval condition of the forest (Wayne 1907, Holt 1920). Because the area was surrounded by virgin forest, it is important that the site of the nest Holt (1920) found had undergone disturbance: "The nest was . . . in a small burned-over area covered with a thin, new growth of blackberry briars." Wayne spoke of the primeval swamp in which he worked as having an understory that was "chiefly cane, aquatic bushes, and swamp palmetto,

while patches of blackberry brambles and thorny vines are met with at almost every step.” The patches of blackberry (*Rubus* spp.) are evidence that disturbance had occurred in the overstory: these are relatively shade intolerant plants that appear to grow best in full sunlight. In hardwood stands, cane (*Arundinaria tecta*) develops into thick patches following disturbance to the overstory (Hughes 1957). In the case of virgin forests, the disturbance to the overstory would have been due to natural mortality of the trees.

The description by Widmann (1897) of the area in which he found a nest also indicated disturbance: “. . . two acres of blackberry brambles . . . medley of half-decayed and lately felled tree tops . . . steaming under a broiling sun. . . .” Stevenson (1938) found a nest “. . . in a thicket between two branches of an unused logging road . . .” indicating an opening in the overstory.

There is no evidence that the swamp where Wayne (1907) found his nests was virgin forest. A study by D. B. Urbston and D. R. Mudge (pers. comm.) of former land use patterns in I'On Swamp indicated only 6% of the swamp hardwood forest was over 30 years old in 1900–1920. The swamp had been cultivated extensively for rice, the practice of which declined rapidly after 1865. Outlines of the former fields show clearly on aerial photographs and dikes are prominent landscape features.

There is evidence that Wayne found some of the nests in abandoned rice fields. The year prior to his initial nest discovery in 1906, Wayne wrote to Brewster (1905), “I have at last found a breeding ground of Bachman's Warbler. The locality . . . is very swampy and was originally a rice field, but is now covered with a dense forest of deciduous trees with innumerable patches of low bushes and blackberry brambles.” Of his discoveries in 1906 Wayne (1907) wrote, “. . . I made a special effort to find the nest and eggs of this rare warbler, and knowing that the birds which I had seen and did not molest in 1905 would return to the same swamp to breed the following spring, I determined to devote my entire time with the hope of finding a nest.” Thus, Wayne's first 6 nests and several later ones were probably in or on the edge of former rice fields that were undergoing natural reforestation. His statement of primeval swamp most likely referred to the tough working conditions and not to the seral stage of the forest. Although a thinned or sparse overstory is implied, it is not clear what range in tree densities the warbler used.

Understory conditions.—Several species of understory plants were found repeatedly supporting or concealing nests (Table 1). All identified species, with possible exception of supplejack (*Berchemia scandens*) and American

TABLE 1
 FREQUENCY OF UNDERSTORY PLANTS IN
 DESCRIPTIONS OF NEST SITES OF BACHMAN'S WARBLER

| Species | Wayne | Widmann | Embody | Holt | Stevenson | Total |
|-------------------------------------------------|-------|---------|--------|------|-----------|-------|
| Cane | 14 | | 1 | | 1 | 16 |
| Palmetto (<i>Sabal minor</i>) ¹ | 8 | | | | | 8 |
| Gallberry (<i>Ilex coriacea</i>) ² | 8 | | | | | 8 |
| Unidentified shrub | 6 | | | | | 6 |
| Unidentified vine | 3 | | | | | 3 |
| Greenbrier (<i>Smilax</i> spp.) | 7 | | | | | 7 |
| Blackberry | 3 | 2 | 1 | 1 | 1 | 8 |
| Grape (<i>Vitis</i> spp.) | 2 | | | | 1 | 3 |
| American holly | 1 | | | | | 1 |
| Supplejack | 1 | | | | | 1 |
| Fetterbush (<i>Lyonia lucida</i>) | 1 | | | | | 1 |
| Number of nests | 27 | 2 | 1 | 1 | 1 | 32 |

¹ May include *S. palmetto*.

² May include *I. glabra*.

holly (*Ilex opaca*), form dense thickets when the overstory is open. As discussed in the previous section, the overstory appeared to be open, and a relatively dense understory was implied. Additional evidence of the density of the understory was given by Wayne who used the terms "dense swamp," "dense thicket" and the like 11 times and mentioned that 4 nests were in a "tangle" of cane and vines. Embody (1907) also referred to a tangle of cane. Holt (1920) found a nest beside a path that had been cut through a blackberry patch. Thus, the idea of a dense understory is reinforced. The mean height of 29 nests was about .6 m and the range .3 to 1.2 m suggests that the understory was dense from near ground level to 1 m or higher. Dense understories are ephemeral, perhaps explaining the disappearance of the bird from known nesting sites in the time when it was still relatively abundant. To us, the range in density of the understory that the warbler used for nesting is one of the largest gaps in knowledge of its habitat.

Another poorly defined factor is the size of the thicket chosen for placement of the nest. Widmann (1897) spoke of a 0.8 ha patch of blackberry but area is difficult to estimate without practice. We have found experienced observers tend to overestimate distance and area in stands with a dense understory. Therefore, we feel Widmann could have overestimated the size of the opening in which he found the nest. The thicket in which Stevenson (1938) found a nest was less than .02 ha. Other records do not shed light on this question.

SUMMARY

Between 1897 and 1919, 40 nests of Bachman's Warbler were found in the Southern Coastal Plain. Thirty-five were in headwater swamps and adjacent wet flats in South Carolina and 5 were in bottomlands along rivers in Missouri, Kentucky and Alabama. From descriptions of nesting habitat at 32 of the sites, it appears the bird used the portions of the bottomlands and headwater swamps that were inundated for relatively short periods compared to the lowest and wettest areas. The sweet bay—swamp tupelo—red maple association of the headwater swamps, the sweetgum—willow oak association of the wet flats and the bottomland hardwoods of the first bottoms and terraces form the complex of plant communities most probably used as nesting habitat. The overstory of areas chosen for nesting appeared to have been subjected to disturbance, either natural or man caused, that stimulated development of a relatively dense understory of shrubs, palmetto, and cane. Many of the nests found in South Carolina could have been in or on the edge of abandoned rice fields that were undergoing secondary succession.

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LITERATURE CITED

- AMERICAN ORNITHOLOGISTS' UNION. 1975. Report of the Committee on Conservation. Auk 92 (4, Suppl.):1B-16B.
- ARNOW, I. F. 1908. Bachman's Warbler in Camden Co. and breeding in Chatham Co., Georgia. Auk 25:479.
- BARNES, I. R. 1954. A new look at Bachman's Warbler. Atl. Nat. 9:18-30.
- BREWSTER, W. 1905. Notes on the breeding of Bachman's Warbler, *Helminthophila bachmanii* (Aud.) near Charleston, South Carolina, with a description of the first plumage of the species. Auk 22:392-394.
- BURLEIGH, T. D. 1958. Georgia birds. Univ. Okla. Press, Norman.
- CHAMBERLAIN, E. B. 1958. Bachman's Warbler in South Carolina. Chat 22:73-74, 77.
- DAWN, W. 1958. An anomalous Bachman's Warbler. Atl. Nat. 13:229-232.
- EMBODY, G. C. 1907. Bachman's Warbler breeding in Logan County, Kentucky. Auk 24:41-42.
- HAMEL, P. B., R. G. HOOPER AND L. M. WRIGHT. 1976. Where is the Reverend Bachman's Warbler? S. C. Wildl. 23:9-13.
- HOLT, E. G. 1920. Bachman's Warbler breeding in Alabama. Auk 37:103-104.
- HUGHES, R. H. 1957. Response of cane to burning in the North Carolina Coastal Plain. N. C. Agr. Exp. Stn. Bull. 402.
- IMHOF, T. A. 1973. Spring migration: Central Southern Region. Am. Birds 27:782-785.

- PUTNAM, J. A., G. A. FURNIVAL AND J. S. MCKNIGHT. 1960. Management and inventory of southern hardwoods. USDA For. Serv. Agric. Handb. 181.
- STEVENSON, H. M. 1938. Bachman's Warbler in Alabama. *Wilson Bull.* 50:36-41.
- . 1972. The recent history of Bachman's Warbler. *Wilson Bull.* 84:344-347.
- STUBBS, J. 1966. Hardwood type-site relationships on the Coastal Plain. *In Proc. Symposium on hardwoods of the Piedmont and Coastal Plain.* Ga. For. Res. Council., Macon.
- WAYNE, A. T. 1901. Bachman's Warbler (*Helminthophila bachmanii*) rediscovered near Charleston, South Carolina. *Auk* 18:274-275.
- . 1907. The nest and eggs of Bachman's Warbler, *Helminthophila bachmanii* (Aud.), taken near Charleston, South Carolina. *Auk* 24:43-48.
- . 1912. Bachman's Warbler in Camden Co. and breeding in Chatham Co., Georgia. *Auk* 29:105.
- WIDMANN, O. 1897. The summer home of Bachman's Warbler no longer unknown. *Auk* 14:305-310.
- . 1899. Bachman's Warbler in summer. *Osprey* 3:13.

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