

The field identification of Bachman's Warbler (*Vermivora bachmanii* Audubon)

*A critical examination of available specimens
and illustrations of the most sought-after wood warbler*

Paul B. Hamel and Sidney A. Gauthreaux, Jr.

EXTENSIVE SYSTEMATIC searches for breeding populations of Bachman's Warbler in recent years have failed to locate any individuals (Hamel *et al.* 1976; Hamel and Hooper 1979a, 1979b; Hamel 1979). The possibility exists, nevertheless, that the species is still extant (*e.g.*, Ripley and Moreno 1981) and that breeding populations might yet be found. Bachman's Warbler is at the top of the "most wanted" list for birders and its rare status has drawn considerable attention from environmentalists (Tucker 1980). That same rarity also means that few observers searching for the bird have field experience with its identification. Consequently, observers must depend upon published paintings and field guides for reference to field marks and plumage variations.

A recent survey of more than 400 Bachman's Warbler specimens has revealed significant new information on plumage variability among individuals of the species. The survey also has pointed out discrepancies between the plumages of the species and published paintings and descriptions of them. The purposes of the present contribution are

- (1) to provide illustrations and discussion of plumage variation among age and sex classes of Bachman's Warbler; and
- (2) to identify and evaluate certain available paintings and field guide descriptions.

METHODS

SPECIMENS IN THE collections of the following institutions were examined: U. S. National Museum, American Museum of Natural History, Museum of Comparative Zoology at Harvard, Univ. of Michigan Museum of

Zoology, Field Museum of Natural History, Academy of Natural Sciences of Philadelphia, Royal Ontario Museum, Carnegie Museum of Natural History, California Academy of Natural Sciences, Museum of Vertebrate Zoology, Charleston, S. C., Museum, Univ. of Georgia, Tall Timbers Wildlife Research Station. Each specimen was photographed with Kodak Hi-speed Ektachrome tungsten film under standard lighting and background conditions. Where possible age of summer and autumn specimens was determined by palpating the skull to determine extent of ossification (*cf.* Johnston 1967; J. Farland, *pers. comm.*). Upon completion of the survey 19 specimens representing the range of plumage variability were borrowed from several collections. These formed the subjects from which the accompanying watercolor illustrations (Figs. 1 and 2) were prepared by Gauthreaux. Specimens used are noted in Table 1. Paintings and field guide descriptions for analysis were selected from among those listed by Hamel (*in press*).

RESULTS

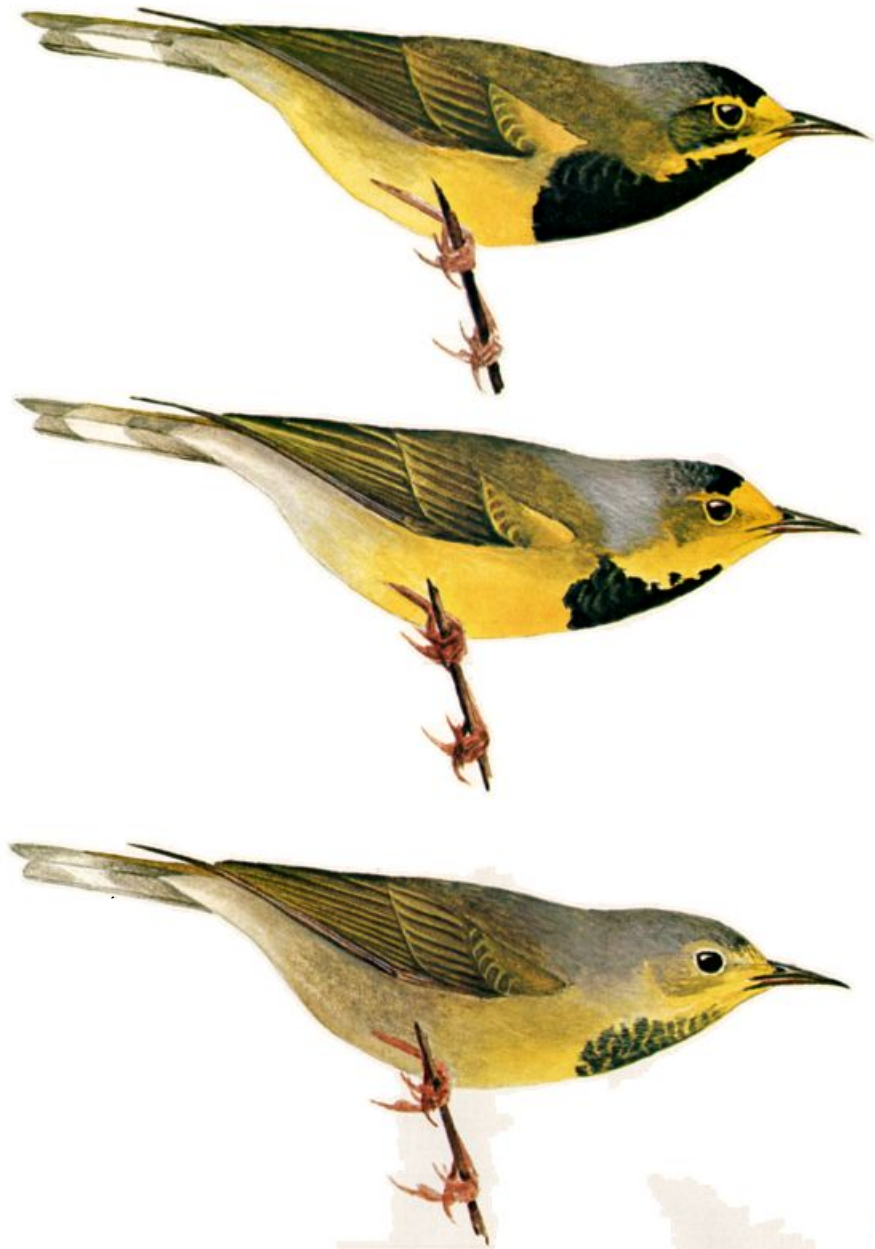
Field Marks

IT IS OUR PURPOSE here to describe briefly the important field marks of the birds, rather than to present detailed plumage descriptions. The illustrations (Figs. 1 and 2) indicate several plumages for each sex; thorough and accurate descriptions are provided by Chapman (1917) and Dingle (1953). We present the field marks of male and female Bachman's Warbler in Table 2, in which we simultaneously compare descriptions of the birds from six popular field guides.

Male plumage is no more difficult to identify in this than in any other sexu-

ally dimorphic Parulid, and field guide descriptions are uniformly satisfactory in describing it. There are discrepancies, however, especially with respect to the bend of wing color and to the presence of white in the tail. Two guides present erroneous information on the extent and distribution of white in the tail (Robbins *et al.* 1966, and Short 1981). The patches of white in the rectrices of Bachman's Warblers are like those in the tails of Northern Parulas (*Parula americana*, *cf.* Blake 1980). None of the guides notes the yellow bend of the wing in males, which, if present, is a distinctive feature of the species. This character, as discussed below, becomes more distinct with age in male Bachman's Warblers.

Female plumage is not as distinctive as male plumage at any age. However, certain recent reports are of single female Bachman's Warblers unaccompanied by males (Shuler *et al.* 1978, R.J. Newman, *pers. comm.*, Ripley and Moreno 1980). The major features of the plumage of female Bachman's Warblers include a pale eye ring (not always yellow as several guides indicate), a yellowish forehead, gray crown and nape, an olive back, a gray or dusky throat, and a whitish crissum. The variability of these characters with age and within age class is extreme. Possible confusion with other species is great, particularly with young or winter individuals of Nashville (*Vermivora ruficapilla*), Orange-crowned (*V. celata*), and Tennessee (*V. peregrina*) warblers (*cf.* Chapman 1917). The birds are easily separable in leisurely comparison of museum skins, under conditions that are unapproachable in all but the rarest circumstances in the field. In view of the rarity of this species, its variability, and the variability of the plumages of immature indi-



Figures 1 and 2. Plumage series of male and female Bachman's Warblers. No juvenal plumage is shown.



Table 1. Specimens used as subjects for illustrations of Bachman's Warblers in Figures 1 and 2.

| | <i>Male Series</i> ^a | <i>Female Series</i> ^a |
|---------|--|---|
| TOP: | MCZ 244371, MCZ 246511, | MCZ 244377, MCZ 230531, MCZ 244376 |
| MIDDLE: | CM 100570, MCZ 230540, MCZ 246511 | CM 100571, Phila 41450 USNM 152827 |
| BOTTOM: | Phila 41453, MCZ 246520, MCZ 246509, CM 12655, Phila 41448 | MCZ 246535, Phila 41461 MCZ 246534, MCZ 230539 |

^aSource of specimens: CM—Carnegie Museum of Natural History, MCZ—Museum of Comparative Zoology, Phila—Academy of Natural Sciences of Philadelphia, USNM—United States National Museum.

viduals of similar *Vermivora* species, we believe that conclusive identification of a female Bachman's Warbler under field conditions requires extreme caution.

THE PAINTINGS

WE HAVE SELECTED 28 illustrations for comparison, to indicate the wide array of published illustrations of the birds, and to provide a review of a reasonably complete sample of those illustrations (Table 3). We have referred the illustrations to the plumages in our own illustrations (Figs. 1 and 2) for convenience. Most of the illustrations, as most of the extant specimens, are referable to the middle illustrations of the respective sex. We make no attempt to critique the shapes of the birds as illustrated (neither of us has seen the birds in life), but painted shapes vary

from life-like to bluebird-shaped to the contorted poses of a pair of museum mounts. Few of the illustrators themselves had much (or any) experience with the birds in life. The shape of wild Bachman's Warblers is probably like that of other *Vermivora*, such as Orange-crowned or Blue-winged (*V. pinus*) warblers. The most commonly omitted field marks in the paintings of males are the white tail spots and yellow bend of wing. Frequently, the slightly decurved culmen is not painted.

Illustrations of females cannot be treated so quickly, for many are not accurate. Twenty-three illustrations of females are referenced in Table 3; nine of them depict a plumage more nearly like that of a first-year male in the fall than like that of a typical female. Commonly females are shown as precisely the same as males except without the black on the throat. Such is not the case;

observers expecting female Bachman's Warblers to have distinctly marked plumage with bright yellow throats are looking for some other species.

Plumage Variation

IN EACH OF OUR illustrations (Figs. 1 and 2) the birds are shown in decreasing age sequence with young (hatching year) individuals in first basic plumage at the bottom. Among males the extent of black on the crown and throat, the extent of yellow on the forehead, bend of wing, and lower breast and belly; and the amount of white in the tail vary with age. In each of these characters birds taken in the spring (alternate plumage) have greater amounts than birds in first basic plumage taken in the fall, with some overlap. Furthermore, birds with fully ossified skulls taken in the fall (e.g., MCZ 246511) have greater amounts than birds with unossified skulls taken in the fall. Thus these characters indicate a developmental sequence of plumages of the birds in which older birds have more black on crown and throat; more yellow on the forehead, belly, and bend of wing, and more white in the tail than do younger birds. Too few known-age specimens are available to examine the extent to which this developmental process goes; the top bird in the illustration is an example of the extreme plumage noted in

Table 2. Comparison of field marks of Bachman's Warblers as described in six field guides.

| <i>Male Field Marks</i> | | | | | | | | | |
|----------------------------|------------------------|-------------|-----------------------|--------------------|---------------|---------------|---------------|-----------------|-----------------|
| <i>Field Guide</i> | Black Crown and Throat | Gray Nape | Yellow Under-sides | Yellow Fore-head | Yellow Wrist | Bright Rump | White in Tail | Olive Back | Whitish Crissum |
| Pough 1946 | x | | | | | | | | |
| Peterson 1947 | x | | x | x | for ♀ | | | x | |
| Robbins <i>et al.</i> 1966 | x | | x | x | | | | | x |
| Bull and Farrand 1977 | x | | x | x | | | | x | |
| Peterson 1980 | x | | x | | | | | | |
| Short 1981 | x | x | x | x | for ♀ | | x | x | |
| <i>Female Field Marks</i> | | | | | | | | | |
| <i>Field Guide</i> | Gray Crown and Nape | Gray Throat | Yellowish Under-sides | Yellowish Forehead | Pale Eye-ring | White in Tail | Olive Back | Whitish Crissum | |
| Pough 1946 | x | | | | x | | | | x |
| Peterson 1947 | x | | x | | x | | | x | |
| Robbins <i>et al.</i> 1966 | x | | | | x | | | | x |
| Bull and Farrand 1977 | x | | | | | | | x | |
| Peterson 1980 | x | | | | x | | | | |
| Short 1981 | x (& cheek) | x | x | | x (yellow) | | | x | |

Table 3. Comparison of selected published illustrations of Bachman's Warblers with those in Figures 1 and 2.

| Citation | Artist | Plumage type ^a | | | | | |
|----------------------------|-----------------------|---------------------------|-----------|--------|----------------|----------|---------|
| | | Male, Fig. 1 | | | Female, Fig. 2 | | |
| | | Top | Middle | Bottom | Top | Middle | Bottom |
| Audubon 1841 | J. J. Audubon | | ♂0 | (♀0) | | | |
| Baird <i>et al.</i> 1874 | ? | | ♂0, + | | | | |
| Brasher 1962 | R. Brasher | | ♂+ | (♀0) | ♀+ | | |
| Buchheister 1974 | J. H. Dick | ♂+ ----- | ♂+ | (♀-) | | | |
| Bull and Farrand 1977 | ? | | ♂0 | | | | |
| Chapman 1917 | L. A. Fuertes | | ♂+ | (♀0) | | | juv. ♀0 |
| Chapman 1939 | L. A. Fuertes | | ♂+ | (♀0) | | | juv. ♀0 |
| Dawn 1958 | photo W. Dawn | | ♂+ | | | | |
| Dawn 1962 | photo W. Dawn | | ♂+ | | | | |
| Forbush and May 1939 | R. T. Peterson | ♂- | | | | ♀- ----- | ♀- |
| Gauthreaux 1976 | S. A. Gauthreaux, Jr. | | ♂+ | | | ♀0 ----- | ♀0 |
| Gauthreaux 1977 | S. A. Gauthreaux, Jr. | | ♂+ | | | | ♀+ |
| Griscom and Sprunt 1979 | J. H. Dick | ♂0 | (♀- ----- | ♀- ?) | | | |
| Howell 1932 | F. L. Jacques | ♂0 | | | ♀0, + | ♀0, + | |
| Imhof 1976 | R. Parks | | ♂0 | | | | |
| Lowery 1974 | R. E. Tucker | | ♂0 | (♀0) | | | |
| Peterson 1947 | R. T. Peterson | | ♂+ | | | ♀0 | |
| Peterson 1963 | R. T. Peterson | | ♂+ | | | ♀0 | |
| Peterson 1980 | R. T. Peterson | ♂+ | | | | ♀+ | |
| Potter <i>et al.</i> 1980 | photo J. H. Dick | | ♂+ | | | | |
| Pough 1946 | D. Eckelberry | | ♂0 | | | ♀0 | |
| Robbins 1975 | J. J. Audubon | | ♂0 | (♀0) | | | |
| Robbins <i>et al.</i> 1966 | A. Singer | ♂0 ----- | ♂0 | | | ♀+ | |
| Short 1981 | J. C. Yrizarry | | ♂0 | (♀-) | ----- | ♀- | |
| Sprunt 1958 | photo J. H. Dick | | ♂+ | | | | |
| Stevenson 1982 | W. Hughes | ♂0 | ♂+ | | | ♀0 | |
| Studer 1888 | T. Jasper | | | ♂0, - | | | |
| Zimmerman 1977 | W. Zimmerman | ♂0 ----- | ♂0 | | | ♀0 | |

^aScoring:

Plumage the illustrator intended to depict:

♀ female; ♂: male; juv.: juvenal.

Our judgment of accuracy of illustration:

+ good; 0: adequate; -: misleading.

Parentheses indicate illustrations that are more like representatives of the opposite than of the intended sex.

the museum survey. The large majority of birds taken in the breeding season agree with the plumage depicted in the center illustration. Published photographs such as those of Walter Dawn (1958, 1962) and John Henry Dick (in Sprunt 1958; in Potter *et al.* 1980) are of a bird in that plumage.

Among females a similar developmental sequence of plumages apparently exists in which the birds become yellower below with age. Older individuals are also yellower about the face and sometimes bend of wing, and often have some white in the tail, compared to first-year females. The eye ring may or may not be yellow in females. As illustrated (Fig. 2) it is more often cream, ivory, or even white. The throat patch in females is in most cases not a distinctly bordered area as it is in males, but rather a dusky gray band that blends into the olive of the side of the neck and the off-white axilla. In occasional females some black feathers occur on the crown or breast or both. Typically these feathers are not as extensively black as are those

of the males, having black central areas bordered proximally and distally by dusky gray. We believe these male-like traits are possibly the result of age-related reduction in ovarian activity, as discussed by Sturkie (1965) and Welty (1962). We raise the speculation because the plumage of these birds, an extreme example of which is the top illustration, is not qualitatively the same as that of first-year males. A number of skins of first-year birds, taken in the fall in Florida by Atkins, have a plumage like that of the bottom male in our illustration yet are labelled "female." In our opinion these birds, whose gonads were doubtless very small when they were collected, were missexed. The female in the central illustration indicates the plumage most commonly recorded in the museum survey.

SUMMARY

A MUSEUM SURVEY of more than 400 specimens of Bachman's Warbler has revealed new information on plum-

age variation and field marks of this Endangered Species. Plumage data from the survey are compared with existing field guide descriptions and published paintings of the birds. Many paintings and field-guide descriptions fail to indicate that males have white tail spots and yellow on the bend of the wing. Frequently, females have been depicted as more distinctly marked than is typically the case. Field identification of a female Bachman's Warbler unaccompanied by a male of the species is a very difficult task. We present illustrations indicating age and sex differences in Bachman's Warbler plumages.

ACKNOWLEDGMENTS

We acknowledge the assistance of the following institutions and curators who facilitated access to and loaned material to us during this study: R.C. Banks, J.S. Weske, G.J. Watson at the U. S. National Museum; J. Bull and J. Farrand at the American Museum of Natural History; R.A. Paynter, Jr. at

the Museum of Comparative Zoology at Harvard. R. Storer at the Univ. of Michigan Museum of Zoology; M.L. Traylor at the Field Museum of Natural History; F.B. Gill at the Academy of Natural Sciences of Philadelphia; J.C. Barlow at the Royal Ontario Museum; K.C. Parkes at the Carnegie Museum of Natural History; L.C. Binford at the California Academy of Natural Sciences; N.K. Johnson at the Museum of Vertebrate Zoology; A.C. Sanders at the Charleston, S.C., Museum; C.W. Helms at the Univ. of Georgia; and R.L. Crawford at the Tall Timbers Wildlife Research Station. Paul Kerlinger made constructive comments on an earlier draft of the manuscript.

LITERATURE CITED

AUDUBON, J.J. 1841. Birds of America. vol. 2. 205pp. J.J. Audubon, N.Y. ● BAIRD, S.F., T.M. BREWER, AND R. RIDGWAY. 1874. History of North American birds. vol. 1 Land birds. 596 pp. Little, Brown, and Co., Boston. ● BLAKE, C.H. 1980. Warbler tail spots. *N.A. Bird Bander* 5(3):98-99. ● BRASHER, R. 1962. Birds and trees of North America. vol. 4. 62 pp. Rowman and Littlefield, N.Y. ● BUCHHEISTER, C.W. 1974. Gift of awareness. *S.C. Wildlife* 21(4):34-39. ● BULL, J.L., and J. FARRAND, JR. 1977. The Audubon Society field guide to North American birds, eastern region. 775 pp. Alfred A. Knopf, Inc., N.Y. ● CHAPMAN, F.M. 1917. The warblers of North America. 307 pp. Appleton, N.Y. ● ——. 1939. Handbook of birds of eastern North America. 2nd rev. ed. 581 pp. D. Appleton Century Co., N.Y. ● DAWN, W.D. 1958. An anomalous Bachman's Warbler.

Atlantic Nat 13(4) 229-232 ● ——. 1962. Rare warbler of southern swamps is more often heard than seen. *Natural Hist.* 71:41-43. ● DINGLE, E. VON S. 1953. *Vermivora bachmanii* (Audubon). Bachman's Warbler. In Life histories of North American wood warblers. Part I. p. 67-74 A.C. Bent, ed. U. S. N. M. Bull. 203. ● FORBUSH, E.H., and J.B. MAY. 1939. Natural history of the birds of eastern and central North America. 554 pp. Houghton Mifflin, Boston. ● GAUTHREAU, S.A., JR. 1976. [Painting of Bachman's Warblers]. *S.C. Wildlife* 23(2):inside back cover. ● ——. 1977. [Painting of Bachman's Warblers]. *Wilson Bull.* 89(3):frontispiece. ● GRISCOM, L., and A. SPRUNT, JR., eds. 1979. The warblers of America. Rev. and updated by E.M. Reilly, Jr. 302 pp. Doubleday & Co., Garden City, N.Y. ● HAMEL, P.B. 1979. Bachman's Warbler: The decline (and fall?) of an endangered species. ABSTRACT. *Amer. Zool.* 19:1003. ● ——. In press. Bachman's Warbler: Bibliography of a species in peril. *USDA Forest Serv., SE Forest Expt. Stn., Gen. Tech. Rep., SE-20.* ● —, and R.G. HOOPER. 1979a. The status of Bachman's Warbler, a progress report. *Proc. Rare and Endangered Wildl. Symp., Athens, Ga.*:112-121. ● —, and —. 1979b. Bachman's Warbler—the most critically endangered. *Proc. S.C. Endangered Species Symp.* 1976:164-168. ● —, —, and L.M. WRIGHT. 1976. Where is the Reverend Bachman's Warbler? *S.C. Wildlife* 23(2):9-13. ● HOWELL, A.H. 1932. Florida bird life. 579 pp. Fla. Dept. Game and Freshwater Fish, Tallahassee. ● IMHOF, T.A. 1976. Alabama birds, 2nd ed. 445 pp. Ala. Univ. Press, University, Ala. ● JOHNSTON, D.W. 1967. The identification of autumnal Indigo Buntings. *Bird-Banding* 38:211-214. ● LOWERY, G.H., JR. 1974. Louisiana birds, 3rd ed. 651 pp. La. State Univ. Press, Baton Rouge, La. ● PETERSON, R.T. 1947. A field guide to the birds, 2nd. rev. ed. 290 pp. Houghton Mifflin, Boston. ● ——. 1963. A

field guide to the birds of Texas and adjacent states 304 pp. Houghton Mifflin, Boston ● ——. 1980. A field guide to the birds, 4th ed 384 pp. Houghton Mifflin, Boston. ● POTTER, E.F., J.F. PARNELL, and R.P. TEULINGS. 1980. Birds of the Carolinas 408 pp. Univ. N.C. Press, Chapel Hill, N.C. ● POUGH, R.H. 1946. Audubon bird guide eastern land birds. 312 pp. Doubleday, Garden City, N.Y. ● RIPLEY, S.D., and A. MORENO. 1980. A recent sighting of Bachman's Warbler in Cuba. *Birding* 12:211-212. ● ROBBINS, C.S., B. BRUUN, H. S. ZIM, and A. SINGER. 1966. Birds of North America. 340 pp. Golden Press, N.Y. ● ROBBINS, P. 1975. "A wonderfully hospitable place." *S.C. Wildlife* 22(2):9-15. ● SHORT, L.L. 1981. Birds. In Harper & Row's complete field guide to North American wildlife. p. 1-220. H.H. Collins, ed. Harper & Row, Publ., N.Y. ● SHULER, J., P. NUGENT, J. TROCHET, and J. VAN OS. 1978. Bachman's Warbler observations continue in I'On Swamp. *Chat* 42(2):23-24. ● SPRUNT, A., JR. 1958. The rare Bachman's Warbler again. *Audubon* 60:214. ● STEVENSON, H.M. 1982. Bachman's Warbler . . . rarest North American bird? *Florida Wildlife* 35(6):36-39. ● STUDER, J.H., ed. 1888. The birds of North America. 192 pp. Nat. Science Assn. of America. N.Y. ● STURKIE, P.D. 1965. Avian Physiology, 2nd. ed. 766 pp. Comstock Publ., Ithaca, N.Y. ● TUCKER, J.A., ed. 1979. Bachman's Warbler: ABA's most wanted bird. *Birding* 11:268. ● WELTY, J.C. 1962. The life of birds. 546 pp. W.B. Saunders, Philadelphia. ● ZIMMERMAN, W. 1977. [Painting of Bachman's Warblers] *Chat* 41(2):front cover.

—Department of Zoology,
Clemson University,
Clemson, South Carolina 29631.