

Continued timber harvesting in itself may not be a concern to the nesting birds, particularly when the operations take place during the winter months. Disruption may occur, however, when resource access roads are eventually opened for recreational use. Boat traffic, deposition of lead shot and accidental harassment of birds are potential concerns. The forest management practice of applying herbicides to harvested areas may affect the amount or suitability of forage available for the growing cygnets.

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## Nashville X Tennessee Warbler Hybrids

by  
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### Introduction

A wood warbler specimen identified as a hybrid between the Nashville Warbler (*Vermivora ruficapilla*) and the Tennessee Warbler (*V. peregrina*) has been mentioned by Bledsoe (1988, cited by Morse 1989), Williams (1996), and Dick and James (1996), in each instance based on information I supplied. The detailed analysis of this specimen has not been published, however.

Dr. Ross James of the Royal Ontario Museum called my attention to a second specimen tentatively identified as a similar hybrid, and was kind enough to send it to me for analysis. It seems appropriate to discuss both specimens in a single paper, and the Ontario provenience of the second specimen makes this journal an appropriate publication outlet.

## Materials and Methods

The first specimen, Carnegie Museum of Natural History (CM) no. 152341, a male in first basic plumage, was netted during routine bird-banding activity at the museum's Powdermill Nature Reserve near Rector, Westmoreland County, Pennsylvania (the site of the extinct village of Crisp, which is still shown on some road maps) on 26 August 1979. It was recognized as unusual and probably a hybrid Nashville X Tennessee by bander Robert C. Leberman, who summoned me to Powdermill to examine it. We collected the bird under state and federal permits, and I prepared the specimen at the Reserve. I noted testes slightly smaller than 1 x 1 mm, and a cranium completely clear (i.e., not pneumatized). It weighed 8.7 g and had little fat.

The new specimen is Royal Ontario Museum (ROM) 159630, a female, also in first basic plumage. It was netted, also during bird-banding operations, at Porphyry Island, near Thunder Cape Bird Observatory in Sleeping Giant (formerly Sibley) Provincial Park, Thunder Bay District, by David Shepherd, then Manager of the Observatory, on 25 August 1994. The specimen and its data were transmitted to the ROM by David Brewer, who suggested the Nashville X Tennessee parentage. The label indicates that the bird weighed 8.1 g with light fat, and had an unpneumatized cranium ("SNCO" = "skull not completely ossified").

I made comparisons of both specimens with series of Nashville and Tennessee warblers at CM, initially using only specimens on the labels of which the preparator had indicated graphically or in words the extent of cranial pneumatization, if any. Al-

though this series sufficed for colour comparisons, it was desirable to have additional specimens to enlarge the sample for analysis of measurements. I therefore selected specimens prepared by W. E. Clyde Todd and George M. Sutton and marked "im." on the label; both of these collectors were known to me to have utilized incomplete cranial pneumatization as an ageing character for young birds.

Before combining the measurements of the two samples (those with and those without cranial data on labels), I analyzed them separately. The differences between the means of the two samples I considered to be trivial, and influenced by the small size of the individual samples. Thus the mean wing length for 6 male Nashville Warblers with cranial data was 59.2 mm, and for 3 without such data 58.2 mm. For the combined series of 9 the mean was 58.8. For the Tennessee Warbler samples the match was even closer; for 8 males with cranial data the mean was 65.1 mm, and for 6 without cranial data it was 65.0 mm; for the combined series of 14 the mean was also 65.0.

The colours of these warblers are subtle, so I used vernacular colour names rather than those of one of the available colour guides. As there is sexual dichromatism in both species, comparisons with each other and with the hybrids were made sex-for-sex.

Measurements were taken to the nearest 0.5 mm of the flattened wing, the tail, and the bill from the anterior point of the nostril to the tip of the upper mandible. As measuring progressed, patterns became evident such that a few specimens could be considered as almost certainly missexed; measurement discrepancies were concordant with

colour characters. Such specimens were not included, however, in the size analyses. Tennessee Warblers are distinctly longer-winged than Nashvilles, but tail and bill measurements are virtually identical.

## Results

Graves (1990, 1993) has advocated a procedure of determining a pool of possible parent species for putative hybrids, followed by a process of character-based elimination. Fortunately, this determination for the Pennsylvania and Ontario hybrids is simplicity itself. The straight, sharply pointed bills of the hybrids are found among North American wood warblers only in the genera *Vermivora* and *Parula*; neither of the hybrids displays any trace of the distinctive colour and pattern of Northern Parula (*P. americana*). The only species of *Vermivora* breeding in eastern North America are the sympatric Nashville, Tennessee, and Orange-crowned Warblers (*V. ruficapilla*, *peregrina*, and *celata*), and the Blue-winged/Golden-winged Warbler complex (*V. pinus* and *chrysoptera*), to which the presumably extinct Bachman's Warbler (*V. bachmani*) appears to have been related. Again, the hybrids show no indication of the distinctive colour and pattern characters of this latter group. The Tennessee, Orange-crowned and Nashville Warblers (plus the southwestern relatives of the latter) form a closely related group of species for which a new generic name will have to be found, as the genus *Vermivora* (type species *V. pinus*) as presently constituted appears to be polyphyletic (N. Klein, pers. comm.). According to the protein electrophoretic studies of Barrowclough

and Corbin (1978), within the north-eastern trio under discussion, the Tennessee Warbler is slightly differentiated from the Nashville/Orange-crowned pair. The latter two, it will be noted, are characterized by an orange- or reddish-brown crown patch in males, although this is also an uncommon variant in adult male Tennessee Warblers (Dick and James 1996). Only 1 of 25 reliably sexed males of *V. c. celata* in basic plumage (both first and definitive) in the CM collection lacks at least a trace of a crown patch, and it is present in 9 of 25 females as well. Neither hybrid shows any trace of a crown patch, strongly suggestive that one of the parents was a species lacking the patch (i.e., Tennessee Warbler in first basic plumage), more persuasive for the male hybrid.

Several points argue against the Orange-crowned Warbler as one of the parents. The underparts of both sexes of *V. c. celata* in basic plumage are characterized by blurry olive-green streaks on a greenish yellow background. Neither hybrid shows any sign of ventral streaking. Orange-crowned Warblers lack any white area in the lower abdomen; such an area is present in both the Tennessee and Nashville Warblers (smaller in the latter). Both hybrids have white in that area, more in the female than in the male.

In Nashville Warblers in first basic plumage, there is an area of a richer concentration of yellow, almost orange, in the mid-breast; it is more obvious in females only because of the brightness of the surrounding area in males. There is a slight suggestion of this in some female Tennessee Warblers, but it is of a much greener yellow and is wholly

lacking in males. There is no trace of such a concentration of pigment in Orange-crowned Warblers. It is present, although subdued, in both hybrids.

For reasons outlined above, I believe that the Orange-crowned Warbler can be discounted as a possible parent of either of the two hybrids.

Comparisons between the two putative parent species and the two hybrid specimens follow. All references to the Nashville and Tennessee Warblers refer to birds in first basic plumage.

### Underparts

Male Tennessees are duller (less yellow) below than females, the reverse of the situation in Nashvilles, in which the general yellow of males averages somewhat more intense than in females. In male Nashvilles, the yellow extends to the chin, whereas in females, the chin and upper throat are more buffy. The flanks are slightly brownish in females, and there is always some white on the lower abdomen. In males, the yellow extends to the flanks and there is a much smaller whitish area in the lower abdomen adjacent to the bright yellow undertail coverts. Tennessees have a much larger area of white posterior to the breast, variable in extent but greater in males. In extreme male specimens (such as CM 150579, Pittsburgh, PA, 9 September 1975), the upper breast is barely stained with greenish yellow, with the rest of the underparts (except flanks) being white. The breast and flanks of females are bright greenish yellow, duller and grayer in males.

In the male hybrid, the distribution of pigment on the underparts is similar to that of male Nashville Warblers, in that white is confined to a small area of the posteriormost abdomen; the colour,

however, is more like that of the pigmented area of the male Tennessee, i.e., a more greenish yellow than that of the Nashville. As mentioned earlier, there is an area of pigment concentration on the breast that approaches the orange-yellow colour of this area in Nashvilles. The throat is paler and appears grayer than the posterior underparts, reminiscent of female Nashvilles. The short throat feathers are actually tipped with pale yellow, but the overall grayer appearance of the throat is caused by the dark gray feather bases showing through. The undertail coverts of male Tennessees are nearly pure white, lightly washed with greenish yellow; those of male Nashvilles are rich yellow. Those of the male hybrid are fully pigmented, but with a greenish yellow similar to the breast colour of bright male Tennessees.

The female hybrid has about the same amount of white on the underparts as female Tennessees, but it is faintly washed with greenish yellow. The pigment of the breast is neither as greenish as in Tennessees nor as rich yellow as in Nashvilles; it is more like the Tennessee, but duller. The chin, throat, and upper breast are continuous in colour, as in the Tennessee, rather than differentiated as in female Nashvilles. As mentioned earlier, it has the typical Nashville brighter spot in the middle of the breast. Its flanks are midway between the greenish of the female Tennessee and the browner colour of the female Nashville. The undertail coverts are like those of the Tennessee, white with a wash of greenish yellow.

### Upperparts

The upperparts of male and female Tennessee Warblers, extending to the crown, are virtually identical in colour, an essentially uniform green, with occasional individuals slightly grayer. The rump is barely perceptibly brighter green in most individuals of both sexes. The upperparts of Nashville Warblers are not uniform. The midback is green (never brown as portrayed in Plate 2 of Curson *et al.* 1994), but darker and duller than in Tennessees, and slightly brighter in males than in females. This contrasts with the crown and nape, which are grayish brown, averaging grayer in males (which, in addition, have a reddish-brown crown patch). The rump is distinctly brighter green than the midback; this colour resembles the back colour of Tennessee Warblers and is brighter and more contrasting in males than in females.

In the male hybrid, the midback is nearer the colour of the Tennessee than the Nashville, but the crown is just perceptibly darker than the midback. The contrast between midback and rump is slightly greater than in Tennessees, but less than in Nashvilles. In the female, the crown and midback are essentially the same as in the male, but the rump is slightly paler, making the contrast with the midback more abrupt.

### Face

In Tennessee Warblers, there is a distinct pale greenish yellow superciliary line (whiter in males), bordered below by blackish lores and a short dark postocular line. The sides of the face are of about the same greenish colour as the breast. There is no eyering. In the Nashville, the conspicuous buffy-white eyering is a well-known field mark for

this species, contrasting with the gray of the sides of the face (brownier in females). The lores are pale, only slightly darker than the eyering, and there is no dark postocular line. In some specimens there are a few pale feathers, mostly concealed, at the upper posterior corner of the eyering.

In the male hybrid, the sides of the face are nearest the Nashville in colour, but slightly greener. The eyering is exactly like that of the Nashville, but in addition there is a caudad extension of about 5 mm from the upper edge of the eyering, just where the Tennessee has the posterior portion of its superciliary line. The lores are not differentiated from the general face colour, resembling the Nashville in this. The face of the female hybrid is similar, but the caudad extension at the top of the eyering is shorter (about 4 mm).

### Wings

In both sexes of the Tennessee Warbler, the greater secondary coverts are tipped with greenish yellow or whitish, forming a usually inconspicuous wingbar; it is fairly obvious in some and virtually absent in others. In a very few the median coverts are also tipped, such that there are two quite distinct wingbars (cf. CM 150579, Pittsburgh, PA, 9 September 1975, and CM 166706, Youngstown, OH, 25 September 1982, both male TV tower kills). A similar range of variation is found in Nashville Warblers, except that the spots on the greater coverts, if present, are white and spots are rarely if ever found on the median coverts. In the male hybrid, there are minute yellowish tips on the greater coverts that would quickly disappear with wear. The yellowish tips are more conspicuous in the female.

**Measurements in millimetres****Nashville Warbler:**

Males (9)

wing 57.5 - 60.5 (58.8) sd 0.968

tail 40.5 - 46.5 (43.2) sd 2.151

(n=8) bill 7.5 - 10.0 (8.6) sd 0.678

Females (13)

53.5 - 59.5 (56.9) sd 1.635

37.0 - 44.5 (41.0) sd 1.952

7.5 - 8.5 (8.1) sd 0.300

**Tennessee Warbler:**

Males (14)

wing 62.5 - 67.0 (65.0) sd 0.865

tail 42.0 - 45.0 (43.3) sd 0.935

(n=13) bill 8.0 - 9.5 (8.6) sd 0.463

Females (22)

59.0 - 64.5 (61.6) sd 1.449

39.5 - 43.5 (41.4) sd 1.158

7.5 - 9.5 (8.6) sd 0.549

**Hybrids:**

Male: wing 61.0, tail 43.0, bill 8.0

Female: wing 59.0, tail 39.0, bill 8.5

The marginal wing coverts, underwing coverts, and axillars are nearly pure white in most Tennessee Warblers (washed with greenish yellow in some). In the Nashville Warbler, these feathers are bright yellow. In both hybrid birds, these feathers are pale yellow, whiter in the female.

The wing of the male hybrid is intermediate - shorter than the shortest Tennessee, longer than the longest Nashville. The mean tail length for males of the two paternal species differs by only 0.1 mm, and the tail of the hybrid is thus 0.3 mm shorter than the mean for Tennessees and 0.2 shorter than the mean for Nashvilles. The means for male bill length are identical for the two species; the male hybrid is 0.6 mm shorter than this mean of 8.6; equal to the smallest Tennessee and 0.5 mm longer than the smallest Nashville.

The wing of the female is also essentially intermediate; equal in size to the shortest Tennessee (59) and within 0.5 mm of the longest Nashville (59.5).

Its tail is 0.5 mm shorter than any Tennessee measured, and 2 mm longer than the shortest Nashville, but still 2 mm less than the mean for Nashvilles. Its bill is near the mean for Tennessees and the same size as the largest Nashville.

**Discussion**

In a series of papers on avian hybrids, Graves (1996 and papers cited therein) has performed rather elaborate statistical treatments of measurement data ("bivariate plots of factor scores from a principal components analysis"). These are undoubtedly useful when the parentage is controversial (as in Graves 1988), but in other instances, they simply confirm what was already obvious from plumage characters as well as raw measurement data. I believe the case for the parentage postulated for the two specimens reported herein is strong enough not to warrant devoting the time and space for the additional analytical procedures.

These specimens apparently constitute the first intrageneric hybrids within *Vermivora* as that genus is presently constituted, other than those between the Blue-winged and Golden-winged Warblers. There are no other hybrids known in which the Tennessee Warbler is one of the parents; the Nashville Warbler is one of the putative parents in the first known "*Vermivora*" X *Dendroica* hybrid (Parkes, in prep.).

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