

## AGE AND PLUMAGE COLOR IN FEMALE TREE SWALLOWS

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Dwight (1900) says of the Tree Swallow (*Tachycineta bicolor*): "The female has corresponding plumages and moults [to those of the male], but is usually duller with less iridescence and browner wings and tail until adult [=second] winter plumage is assumed which is usually indistinguishable from that of the male." The same sequence of plumages is indicated by Low (1933): "The dull, brown birds and those with a faint tinge of green appear to be one-year old females. The male obtains its brilliant plumage the first year, but the female apparently does not acquire it until the second year. The female may be slightly duller, but frequently she is indistinguishable from the male except when both are held together in the hand."

Although the relationship between age and plumage color appears from the above quotations to have been worked out more than 50 years ago, some doubt remains about the accuracy of ageing females as yearlings or older by these methods, as was done by DeSteven (1978). For example, Kuerzi (1941) reported 5 one-year-old females (banded as nestlings) in the green-tinged brown plumage, but one brown female also returned the following year in the green-tinged brown plumage indicating that fully iridescent upper parts are not always acquired by the second breeding season. On the other hand Chapman's (1955) description of 1 of 5 one-year-old females as "dull blue" indicates that a predominantly blue iridescent plumage may be acquired by the first breeding season.

These uncertainties are partially reflected in the 1980 revision to the key to age and sex of Tree Swallows in the North American bird banding manual (BBM) (Canadian Wildlife Service and U.S. Fish and Wildlife Service 1977) in which breeding adults with brown upper parts are classified as yearling females (SY-F in banding terminology—see Methods) but no provision is made for ageing predominantly blue-plumaged females as older than yearling (ASY).

Can female Tree Swallows be aged accurately by plumage color? Here I present evidence that most breeding females can be classified as yearlings or as older than yearlings with better than 95% accuracy, but a small percentage must be assigned to unknown age. A key for ageing and sexing adult Tree Swallows in the breeding season is also provided.

### METHODS

Nest boxes for Tree Swallows have been maintained by Long Point Bird Observatory at Long Point, Ontario (42°33'N, 80°04'W) since before 1970 and at 2 nearby mainland sites since 1975 and 1977. Nearly all young were banded each year. Adults were captured in the nest boxes, usually during the nestling stage, and were sexed by presence of

a brood patch (females) or cloacal protuberance (males). Data are presented here on plumage color of 171 adults banded as nestlings in 1970–1981 which were recaptured as breeding females in 1971–1982 and generated 288 plumage-age records. Data were collected by the author, other researchers, and several experienced and inexperienced assistants.

Color of the surface of the body plumage of the upper parts of females was classified as Brown, Intermediate, or Blue (capitalized plumage descriptions below represent these categories). In the early years of the study females with *predominantly* brown or greenish-tinged brown upper parts were called Brown, those with *completely* or *almost completely* blue or blue-green iridescent upper parts were classified as Blue, and others which did not fit these categories were fully described. The latter birds were later assigned to the appropriate categories, which by 1978 were defined as: Brown = up to 50% of the surface of body plumage of the upper parts consists of iridescent blue or blue-green feathers (i.e., 50% or more is made up of brown or greenish-tinged brown feathers); Intermediate = more than 50% and up to 90% blue or blue-green iridescent feathers; and Blue = more than 90% blue or blue-green iridescent feathers.

Age designations follow bird-banding terminology: SY = second calendar year of the bird's life, TY = third calendar year, AHY = after hatch year (i.e., SY or older), ASY = after second year (i.e., older than SY), ATY = after third year. Note that an SY bird is 1 year old and is in its first breeding season, a TY bird is 2 years old, and that AHY, ASY, and ATY birds are at least 1, 2, and 3 years old, respectively. M = Male, F = Female, U = Unknown (age or sex). "Adults" are birds of breeding age (SY or older).

#### RESULTS

Variation in plumage color with age in female Tree Swallows is shown in Table 1. Of 288 age-color records 67 (23.3%) were Brown, 18 (6.2%) were Intermediate, and 203 (70.5%) were Blue. Although this distribution depends partly on the age structure in our colonies, which may not be representative of the overall population, it is clear that Intermediates are rare.

Among Brown females 64 of 67 records (95.5%) were SY birds and the remaining 3 were TY. The 18 Intermediates were made up of 9 SY, 8 TY, and 1 fourth year bird. Only 3 of 203 Blues (1.5%) were SY, and the remainder were ASY with ages ranging from 2 to 7 years. Of 113 ATY birds (3 to 7 years old), 112 were Blue and 1 (a fourth year bird) was Intermediate.

These results suggest that Brown and Blue females can be aged SY and ASY with better than 95% confidence. Intermediates are usually either 1 or 2 years old and in banding terminology must be assigned to the AHY category.

Plumages of known-age individuals caught in successive years (Table 2) show that one-year-old (SY) Browns and Intermediates usually change

TABLE 1. Breeding season plumage color of female Tree Swallows banded as nestlings.<sup>1</sup>

Color of upper parts <sup>2</sup>	Number of birds of age (years)			
	1	2	3	4-7
Brown	64	3		
Intermediate	9	8	1	
Blue	3	88	57	55 <sup>3</sup>

<sup>1</sup> Total individuals = 171.

<sup>2</sup> See text for definitions.

<sup>3</sup> 55 plumage-age records representing 39 individuals: 4 years = 31, 5 years = 18, 6 years = 5, 7 years = 1.

to Blue by the following breeding season. Two-year-old Browns and Intermediates are nearly always Blue at 3 years, but 1 Intermediate did not change between 2 and 3 years. Although I have not analyzed all of our data on females banded as breeding adults, it is worth noting that we have a record of 1 individual which was banded as an Intermediate (about 80% blue upperparts), in 1976 and was still in Intermediate plumage in 1982 when it was at least 7 years old. This emphasizes that AHY is the appropriate age designation for Intermediates.

#### DISCUSSION

The data presented here show that about 94% of breeding female Tree Swallows can be aged SY or ASY with better than 95% accuracy by the color of the upper parts alone. This conclusion is supported by detailed plumage color data on known-age females in Colorado (Cohen 1980 and pers. comm.).

Separation of females into the categories Brown, Intermediate, and Blue, for ageing purposes, is somewhat arbitrary as there appears to be a more or less continuous series of plumages from dull brown to bright iridescent blue-green, although some plumages are rarer than others. The following additional comments on plumages may aid assignment of females to the correct plumage category.

Brown females often have faint green iridescent tips to the brown feathers and many have scattered feathers or patches of feathers which are bright iridescent blue-green, commonly on the crown, upper back, wing coverts, or upper tail coverts. Intermediates have at least 50% and up to 90% of the surface of the upper parts of the body plumage consisting of the bright iridescent blue-green feathers. Typical Intermediates have patches of brown feathers (lacking the bright blue-green iridescence) on the forehead, nape, and rump. Many Blue females are easily categorized as they are in bright blue-green plumage which is indistinguishable from that of males; but some have a few feathers lacking blue-green iridescence, usually on the forehead and sometimes on the nape or elsewhere. If there is doubt about the percentage of blue-green iridescent feathers, it is safest to call females Intermediate, as this leads to age AHY (see key below).

TABLE 2. Plumage changes between breeding seasons in known-age female Tree Swallows.

Plumage color at age			No. of birds
1 year	2 years	3 years	
Brown	Intermediate	—	1
Brown	Blue	—	24
Intermediate	Intermediate	—	1
Intermediate	Blue	—	2
Blue	Blue	—	3
—	Brown	Blue	1
—	Intermediate	Intermediate	1
—	Intermediate	Blue	3
—	Blue	Blue	33

The BBM (1980 revision of Tree Swallow age-sex key) uses 2 additional characters to age and sex Tree Swallows: (1) degree of skull pneumatization (birds with small “windows” are designated SY in the breeding season), and (2) color of forehead and feathers at base of nostrils (birds with brown feathers in these areas are called female, others unknown sex).

We have not used skull pneumatization for ageing breeding Tree Swallows at Long Point, but presumably this character would improve age discrimination of males, Intermediate females, and those Blue females which are actually SY. The BBM key does not indicate what percentage discrimination of SYs may be expected from the skull pneumatization criterion, but in the Bank Swallow (*Riparia riparia*) Freer and Belanger (1981) found that 17% of 18 SY birds retained small “windows” in their first breeding season. They advocate use of paired windows at least 2 mm in diameter as the criterion for ageing birds as SY, as single or paired “pinholes” were sometimes retained by older birds. A similarly cautious approach for ageing adult Tree Swallows by this method will be adopted here in view of the lack of data on the rate of skull pneumatization in this species. Although it is not usually necessary to use plumage color to sex breeding Tree Swallows, our experience agrees with the BBM in that birds with brown feathers on the forehead and at the base of the nostrils are females.

Based on the results presented here and the 2 additional characters in the BBM, the following key has been constructed for ageing and sexing adult Tree Swallows in the hand during the breeding season (May–July).

First check for presence of brood patch (F) or cloacal protuberance (M). If present, these should be consistent with sex designations derived from the key.

- 1a. Brown upper parts (0–50% of surface of upper parts of body plumage iridescent blue-green, remainder of upper parts dull brown or brown lightly tinged with green iridescence) . . . . .SY-F

- 1b. Intermediate upper parts (>50–90% of surface of upper parts of body plumage iridescent blue-green; remainder of upper parts brown or brown lightly tinged with green. Brown areas most often on forehead, nape and rump) . . . . . F (see 4)
- 1c. Blue upper parts (>90–100% surface of upper parts of body plumage blue-green; remainder of upper parts brown or brown lightly tinged with green. Brown areas most often on forehead and nape) . . . . . see 2
- 2a. Forehead *and* feathers at base of nostrils brown . . . . . F (see 4)
- 2b. Forehead *and* feathers at base of nostrils blue, green, or black . . . . . see 3
- 3a. Brood patch present . . . . . F (see 4)
- 3b. Cloacal protuberance present . . . . . M (see 4)
- 3c. Not as 3a or 3b . . . . . Sex U (see 4)
- 4a. Small paired unpneumatized “windows” ( $\geq 2$  mm diameter) at rear sides of skull . . . . . SY
- 4b. Skull pneumatization more advanced than 4a or not determined . . . . . see 5
- 5a. Blue female (from 2a or 3a) . . . . . ASY-F
- 5b. Not as 5a (from 1b, 3b or 3c) . . . . . AHY

Because Tree Swallows in juvenal plumage are dull sooty-brown above (Dwight 1900), care must be taken late in the breeding season to distinguish SY-F from HY birds. With experience the sooty-brown upper parts (lacking iridescence) and dusky-white under parts of HY birds are easily recognizable in comparison with the worn and faded plumage of Brown SY females. By late July at Long Point, however, even some HY birds have quite worn and faded plumage.

The key given above has certain implications for ageing and sexing Tree Swallows during and after the postjuvenal and postnuptial molts. Both molts take place before fall migration and are complete; moreover the birds acquire plumages which are essentially identical to those of the following breeding season except that the new tertials are broadly tipped with white (Dwight 1900). Thus after the molts, birds in fresh plumage can be aged and sexed as follows: Brown birds are HY-F; Intermediates are either HY-F or SY-F and must be aged by skull pneumatization; Blue birds with brown foreheads and brown feathers at the base of nostrils are AHY-F, but those which retain small “windows” in the skull can be called SY-F; other Blue birds are either U-M or AHY-F so must be called U-U unknown, except that age can be designated HY, SY, or AHY by skull pneumatization and HY birds are males.

During the molt in late summer and early fall, birds changing from sooty-brown (juvenal) plumage to new Brown plumage and new Blue plumage are HY-F and HY-M, respectively. Birds changing from Brown to Blue are SY-F. A bird changing from old Blue to new Blue plumage is either AHY-M or ASY-F and must be called AHY-U unless “windows” in the skull indicate that it is SY-M or traces of brown plumage on the forehead and above the nostrils allow it to be sexed F (but it should be aged AHY—see below). Intermediate plumages are unlikely to be adequately distinguishable from Blue plumages during molt, but 10–15% of all females are likely to be Intermediate in either the old or new plumage. Birds entering Intermediate plumage from sooty-brown and Brown plumage are HY-F and SY-F, respectively. As Intermediates in

molt may be misidentified as Blue and are likely to be identified as female by presence of brown plumage on the forehead, I would expect them to make up more than 15% of this group of females. Therefore females which appear to be changing from old Blue to new Blue plumage should be aged AHY unless the presence of small "windows" in the skull indicates that they are SY. These age-sex designations based on plumages during molt should not be attempted unless one or both plumages can be clearly distinguished. Ageing by skull pneumatization will usually help in determining sex by narrowing the possibilities, but is often difficult if the head feathers are in molt.

#### SUMMARY

Based on 288 plumage-age records from 171 breeding female Tree Swallows, most females can be classified by plumage color as SY or ASY with better than 95% accuracy, but about 6% have to be called AHY. A key is provided for ageing and sexing adult Tree Swallows in the breeding season and criteria for ageing and sexing Tree Swallows during and after the postjuvinal and postnuptial molts are discussed.

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