

AGING TRICOLORED BLACKBIRDS BY CRANIAL OSSIFICATION

By RICHARD W. DEHAVEN, FREDERICK T. CRASE,
AND MICHAEL R. MILLER

Cranial ossification has been used to age passerine birds since 1822 (Niethammer, 1968). However, only Nero (1951), Serventy et al. (1967), and Biur and Thapliyal (1972) have described ossification patterns from known-age birds; these birds were wild only in Nero's study of House Sparrows (*Passer domesticus*). While studying the movements of Tricolored Blackbirds (*Agelaius tricolor*) within California's Central Valley, we banded more than 33,000 tricolor nestlings whose ages were known to within two days. Of these, 39 were collected up to three years after banding and provide the cranial ossification data for this paper.

METHODS

We recovered the banded tricolors by trapping from August through October and by shooting at breeding sites from April through June. The birds were frozen until study skins were prepared. During preparation of the skin, the cranium was removed as outlined by Grant (1971), cleaned in a 3% solution of hydrogen peroxide, and dried at room temperature. Ossified areas were identified with a microscope light and outlined in black waterproof ink. When the degree of ossification was questionable, skulls were sectioned and viewed under a binocular microscope. Sketches (Fig. 1) were made directly from the skulls and may show some observer bias in drawing and some distortion near the skull border.

RESULTS AND DISCUSSION

Of the 12 skulls from birds aged 15 to 25 weeks, 11 show a similar pattern of ossification (Fig. 1). Double-layered bone is present in the posterior parietal and exoccipital regions, anterior frontal bones, and along the median suture between the frontals. Ossified areas cover less than one-half of each skull and ossification is fairly symmetrical, except in each of two birds (15 M and 25 M) where one parietal is ossified more than the other. The 12th bird, an 18-week-old male with only two small frontal windows remaining unossified, is a striking exception to the pattern and shows the variation that may occur. There was also some variation between equal-aged individuals. For example, the 15-week male shows more ossification than the 15-week female; the 17-week males, more than the 17-week female.

Of 27 skulls from tricolors aged 46 to 156 weeks, only four, aged 50, 52, 68, and 101 weeks, retained unossified areas (Fig. 1). However, these unossified windows, unlike those of the younger birds, were somewhat opaque and fairly thick, although sectioning showed them to be single-layered. Occasional hardening of this type was

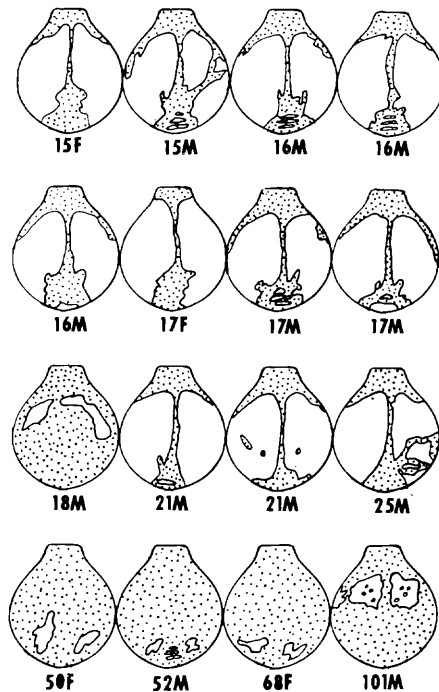


FIGURE 1. Cranial ossification in the Tricolored Blackbird. The frontal border of each skull is toward the top of the figure and ossified areas are dotted. Age (in weeks) and sex are given below each skull. Skulls from the following birds (identified by age and sex) were completely ossified and are not shown: 46F, 47F, 48M, 48M, 50M, 52F, 52F, 55F, 60F, 63M, 97F, 97F, 100F, 100M, 103F, 103F, 104F, 104M, 104M, 122M, 154F, 154M, and 156F.

also reported for the Zebra Finch (*Taeniopygia castanotis*), Indian Weaver Bird (*Ploceus philippinus*), and House Sparrow by Serventy et al. (1967), Biur and Thapliyal (1972), and Nero (1951), respectively. Nero suggested that such peculiarities might be the result of injury or diet. Whatever the cause, Payne's (1965) belief that some tricolors retain unossified skull regions for up to two years appears correct.

Unfortunately we cannot describe ossification in the tricolor from hatching to 15 weeks nor from 25 to 46 weeks because no birds were collected during these periods. However, from the birds we did collect, the pattern of double-layering in the skull appears similar to that in the House Sparrow and Indian Weaver Bird, but different from that in the Zebra Finch, which apparently shows less ossification along the median suture. The rate of cranial ossification in the tricolor also appears similar to that in the House Sparrow, which

completes ossification in about 26 to 32 weeks. Complete ossification occurs earlier in the Zebra Finch (20-23 weeks) and the Indian Weaver Bird (17-20 weeks).

In the tricolor skulls from the 18-week male and 101-week male, windows remain only in the frontals, whereas in the 50-week female, 52-week male, and 68-week female, the unossified windows are in the parietals (Fig. 1). Payne (1965) also reported that the last areas to ossify in the tricolor skull may be either the frontals or parietals.

In nine of the tricolor skulls (including three in the age group over 46 weeks), from one to three small, clear, oval areas remained near the base of the occipital bone above the foramen magnum (Fig. 1; see 16-week-old males for example). Payne (1965) also noted this condition in tricolors, and it was reported for the Zebra Finch, Indian Weaver Bird, and House Sparrow.

Because most tricolors we collected had completely ossified skulls after 46 weeks of age, ossification is likely completed in most individuals between 25 and 46 weeks. Thus, in southern California (south of 35°N latitude), where some tricolors may hatch in early April, most birds with unossified windows that cover 40% or more of the skull may be accurately aged as juveniles at least through September. This aging criterion is probably accurate for most birds at least through October in the Central Valley of California, where young may hatch in late April, and may be accurate through November in southern Oregon, where they may hatch in early June. Birds with windows that cover 25% or less of the skull can probably be separated into age groups after the investigator gains experience in distinguishing the windows of adult birds from the thinner, more transparent windows of juveniles, and in correlating skull ossification with plumage characteristics.

SUMMARY

The pattern and rate of cranial ossification in 39 Tricolored Blackbirds of known age was similar to that reported in the House Sparrow. Most tricolor skulls were less than one-half ossified by the 25th week but completely ossified by the 46th week, although substantial variation occurred. One bird, only 18 weeks old, showed extensive ossification; a few birds over a year old still retained unossified (but thickened) skull windows. Most juvenile tricolors can probably be distinguished by ossification patterns at least through September in southern California, through October in the Central Valley of California, and through November in southern Oregon.

LITERATURE CITED

- BIUR, K., AND J. P. THAPLIYAL. 1972. Cranial pneumatization in the Indian weaver bird, *Ploceus philippinus*. *Condor*, **74**: 198-200.
- GRANT, G. S. 1971. Removal of cranium during preparation of study skins for later ossification studies. *Bird-Banding*, **42**: 47.
- NERO, R. W. 1951. Pattern and rate of cranial 'ossification' in the house sparrow. *Wilson Bull.*, **63**: 84-88.

- NIETHAMMER, G. 1968. Pneumatization of the cranium as a criterion of age. Letter to the editor. *Ibis*, **110**: 106.
- PAYNE, R. B. 1965. The breeding seasons and reproductive physiology of tricolored blackbirds and redwinged blackbirds. Ph.D. dissertation. Univ. Calif., Berkeley. 279p.
- SERVENTY, D. L., C. A. NICHOLLS, AND D. S. FARNER. 1967. Pneumatization of the cranium of the Zebra Finch *Taeniopygia castanotis*. *Ibis*, **109**: 570-578.

U. S. Bureau of Sport Fisheries and Wildlife, Denver Wildlife Research Center, Davis Field Station, Box C, Davis, California 95616 (RWD, FTC); Division of Wildlife and Fishery Biology, Univ. Calif., Davis, California 95616 (MRM).

Received 24 September 1973, accepted 27 November 1973.