

## SKULL OSSIFICATION IN THE WHITE-THROATED SPARROW

By Wilde R. Mellencamp

At what rate does a White-throated Sparrow's skull become ossified? What pattern does the ossification process follow? And when is it completed?

In an effort to answer these questions I examined skulls of the local white-throat flock during the winter of 1968-69. The greater volume of birds was examined at thirty to forty day intervals; for a few, more frequent examinations were made. The study flock was sufficiently attracted to the feeding station that it was possible to make at least three examinations of 12 individuals before their skulls were completely ossified.

In studying the skulls I used a 7-power loupe attached to my reading glasses, and for light source a 100-watt shaded bulb on a drop cord at about head-height. I found that the "bubbles" of ossified bone were most visible when light struck the scalp at a low angle, much as grass shows more depth in the light of the setting sun. If a bird's skin seemed thick or opaque I could often improve visibility by focusing on the scalp and then bringing the head slightly closer, thus bringing the underlying bone into focus. I used only water to part the feathers (and on cold days dried the heads before releasing).

Some sort of standard was needed for judging degrees of ossification. I set up the following rough guide-lines for percentages, based on imaginary equilateral triangle which could be formed on a bird's skull by drawing lines from eye to eye and to a posterior median point. I considered this the 75% triangle - 75% ossified if the unossified area lay within, and about filled, this triangle (see Fig. 1). If ossification had invaded but not completely crossed a line drawn from ear to ear and through the apex (rear) of the triangle it was considered 50%. If only a tiny triangle of ossified material showed at mid-base of the skull, 5%. Intermediate values were judged in relation to these guides; the lower percentages were admittedly difficult to value accurately.

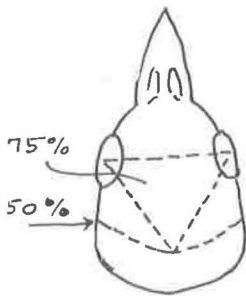


Fig 1.

The first influx of white-throats was examined between Sept. 28 and Nov. 9. This group, of 25, showed either 100% ossification or 10% and under, with the sole exception of a 30% skull on Nov. 2.

At the next large-scale examination, Dec. 22, 23 & 24, another 35 white-throats were added to the banded flock. In these, the range of incomplete ossification was from 5% to 95%, with the majority past the 50% mark. Skulls of recaptures from the October-November examinations had ossified to 35%, 40%, 50% and, in one case, to 95%.

A few birds were added to the study flock on January 4: of five white-throats, one was impossible to skull, two were 75% ossified, one 95% and one 100%. Only three subjects were re-trapped: one had progressed from 9% to 15% and the other two remained the same, at 75% and at 95%.

In the next period of trapping and re-examination, Jan. 19-26, three flock members were added, one 95% ossified and two 100%. Fifteen birds were re-trapped; all showed at least 85% ossification and nine were now at 100%.

By Feb. 8, birds checked on Dec. 22-23 at 35% (2), at 60% (1), and at 75% (2) had become fully ossified and one had progressed from 0% to 95%, one 25% to 99%, and one 40% to 99 - plus % (it took thorough examination to find the unossified areas for this one.)

Four previously examined birds had reached 100% by Feb. 15, two of which were 75% on Dec. 22, one 85% on Feb. 8, and one 5% on Dec. 22. Still incompletely ossified at that examination was one bird, which checked out at 98%.

A comparison of immature birds with varying degrees of ossification for major examination dates is shown in the following table:

Degree of Ossification	Sept. 28/Nov. 9	Dec. 22/23/24	Jan. 19-26
0- 9%	4	4	
10-19%	8		
20-29%		1	
30-39%	1	5	
40-49%		2	
50-59%		2	
60-69%		1	
70-79%		8	
80-89%		4	4
90-99%		6	6
100%			9

In early November all immature skulls fell into the 40%-or-less classification; by January 19 they all fell into the 80%-to100% range; but in the December period the range was from 0 to 100%, a rather remarkable spread. It would seem that if all white-throat skulls matured at the same rate the curve of percent of ossification shown in November would represent the variation between early and late hatches and that this curve would progress into the higher percentages in an orderly fashion. Instead, in December there is a nearly straight-line distribution. Does this mean that the spread in hatch-dates of white-throats from various north-of-Pennsylvania nest sites is wide enough to account for this spread in ossification progress, or is the ossification spread to be accounted for as one more example of variability within a species? The limited scope of the present wild-bird experiment is not great enough to answer this question.

Some conclusions can be drawn as to the accuracy with which white-throats can be aged on the basis of ossification. Through early November there is an extreme distinction between immatures and adults. In the middle of December the numbers of white-throats in the "95% ossified" category is enough to cast doubt on the accuracy of assigning a classification of After Hatch Year to a bird apparently 100% ossified.

An examination of January and February records shows that it is obligatory to designate some captures in these months as second-year birds.

The same records point up the value of examining skulls for small residual areas of un-ossification in the early weeks of the new year. For white-throats these small residual areas tend to be egg-shaped and to lie to either side of the mid-line of the skull in about the center of the 75% triangle. (See Fig. 2a.)

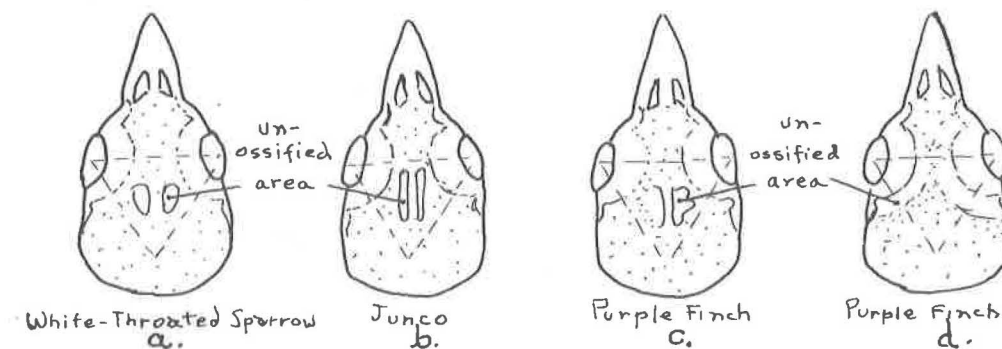


Fig 2.

A variation in the concluding pattern of ossification was observed in two other species (Fig. 2b, c and d). Several Juncos examined showed long, narrow unossified strips in about the same location as the residual areas of white-throats. Purple Finches showed two variations in location and shape of unossified areas. The first lay in the same general position as that of White-throated Sparrows, but its shape was irregular, being well-defined only on the edge nearest the median line, and lobed or blurry on the outer edge. The alternate position was along the border of the eye-socket and in a fairly even and well-defined strip. As of this writing, Purple Finches are being examined which show ossifications as low as 15-40%. Perhaps this species' age can be determined accurately for a longer period than generally recognized.

223 Matsonford Road, Radnor, Pa. 19087

