

## OBSERVATIONS ON THE HEAD MARKINGS OF THE GOLDEN-CROWNED SPARROW

WITH ONE ILLUSTRATION

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In the work of banding Golden-crowned Sparrows (*Zonotrichia coronata*) at my Woodacre banding station in Marin County, California (see *Condor*, xxxi, 1929, p. 194), sufficient data have been accumulated in the last four September-to-April "seasons" to warrant the publication of the observations set forth in the present paper. In the beginning of this work the matter of determining the age of a Golden-crowned Sparrow at the date of banding proved to be puzzling. As "repeats" and "returns" came into the traps confidence in my power of discrimination in regard to differences in sex and age rapidly diminished on account of the variations in the head markings of supposedly immature birds. Available literature describing this sparrow gives the impression that the various authorities concerned with the description of the head markings of immature birds either "side-stepped" the issue or were content with a very meager portrayal of conditions. Ridgway (*Birds of North and Middle America*, Bull. No. 50, U. S. Nat. Mus., i, 1901, p. 334) gives about the best short description so far found, as follows: "*Immature (young of the first winter?)*.—Similar to adult female, but without any lateral black stripe on pileum or well-defined median stripe, the whole forehead and anterior of crown yellowish olive, more or less flecked with dusky (sometimes with more or less indication of a black lateral stripe), the posterior portion of the pileum light grayish olive-brown, streaked with dusky." This description would be improved by adding, what some other authorities mention, that in place of the lateral black stripe on the pileum of adult birds there often is a very distinct, though narrow, brown stripe on the pileum of immature birds, particularly of males. However, there is too much variation in the head markings of fall and winter birds, except in cases where the bird is in what I shall call "full" (that is, similar to nuptial) plumage, to permit of writing out any really satisfactory description that would cover the ground. The prominent head markings in the nuptial plumage are, of course, the broad, bright yellow median stripe over forehead and crown, merging into light gray posteriorly, and the broad lateral black stripe bordering the yellow.

At the end of the first season, I had kept the traps going as long as any Golden-crowned Sparrows were appearing, in order to take note of the spring molt of the head feathers that this species undergoes; and practically every individual taken in late March and early April had either acquired nuptial head feathering or showed distinct signs of soon doing so. The few that were not actually in the molt had ample time to make the change before reaching their nesting ground in the far north. In the second autumn of this work, when birds banded in the previous season began to appear in the traps, I found that some of these "returns" showed head markings closely approaching those of the nuptial plumage, while the head markings of other "returns" were not distinguishable from those of individuals that I was recording in my note book as immatures.

The fact was interesting that the majority of these return birds, banded the previous fall, none of which could be less than a year old and all of which had acquired the nuptial head dress at least once, had again assumed what I had been calling immature markings. That seemed to confirm my idea that this sparrow did not attain a state of full plumage until the third summer of its life, that is, until the third post-juvinal molt. In the second season's work, to meet this development, I assumed that

individuals with *very distinct but still brown* lateral crown-stripe, and those showing some blackish effect anteriorly in this brown stripe, were birds of the previous year, and that those with indefinite brown lateral crown-stripe, or none at all, and with much dusky flecking over the crown and nape, were the real birds of the current year and I so tried to record them.

Unfortunately there turned out to be so much intergradation among the head markings of immature birds that nothing very satisfactory resulted from my efforts to work out reliable criteria for recognizing the successive stages of development, and finally it came down to recording the birds, on banding, as immatures or adults according to whether black or brown predominated in the lateral crown-stripes. What seemed certain, however, was that where there was little or no indication of a lateral crown-stripe and yet much dark longitudinal flecking over most of the head the bird was in its first post-juvenile plumage, and very probably a female, to judge by museum specimens. Birds in this class were recorded, on banding, as "Im"; where the lateral crown-stripe was definitely present, but neither heavy nor absolutely black, the under-scoring was omitted; where this stripe was heavy, but only brown, the bird was recorded as a yearling.

When "returns" commenced to come into the traps in the third fall of banding, it became evident that my symbols, except the "Im" and the "Ad" (adult) were of little value, for here were birds that had been banded *two years previously* appearing with practically the same head marks as had some of the birds that I was calling immatures or yearlings. This made it evident that comparison of live birds, even when banded, would not entirely clear up matters, particularly as there was no reliable way of recognizing their sex, in case that should prove a factor in age determination. Museum specimens of the Golden-crowned Sparrow that are labeled "immature" are only of value for comparison when they have been made up by careful preparators who would notice in the course of preparation the incomplete ossification of skull that is shown by young birds up to, *but not later than*, the end of their first fall.

Among at least the smaller species of passerine birds the stage of immaturity is supposed to be concluded within the first year of their existence, but the returns of Golden-crowned Sparrows proved that the word "immature" must be applied to this species for a longer period and that many museum specimens that were taken in winter and are labeled "immature" are of doubtful value for age comparisons. They might have been in their second or even third winter. In consequence of this it became evident that nothing but examples of banded birds, with sex ascertained by dissection, would give the answer to this problem. In this matter certain casualties, at first deplored, helped to supply such specimens, and finally enough were assembled to show definite results. In this affair, cats, hawks and wires contributed largely.

To make sure that the appearance of similarity in head markings of individuals of different ages, up to two years old at least, was not a personal error in judgment, I arranged an exhibit of eight specimens on a tray, backs up and labels concealed from view. Five of these were of unbanded birds, undoubtedly birds of the year, of which the skulls were not yet completely ossified, taken and prepared by myself in October, 1931. The other three were banded females as follows: band no. A 176689, banded December 29, 1929, put up as a specimen December 27, 1930; A 120544, banded February 23, 1929, made into specimen January 11, 1931; A 110511, banded October 27, 1928, specimen January 11, 1931. This exhibit was submitted to two well known ornithologists and to several other naturalists with a fair knowledge of our local birds and the request was made that they should select by sight the older

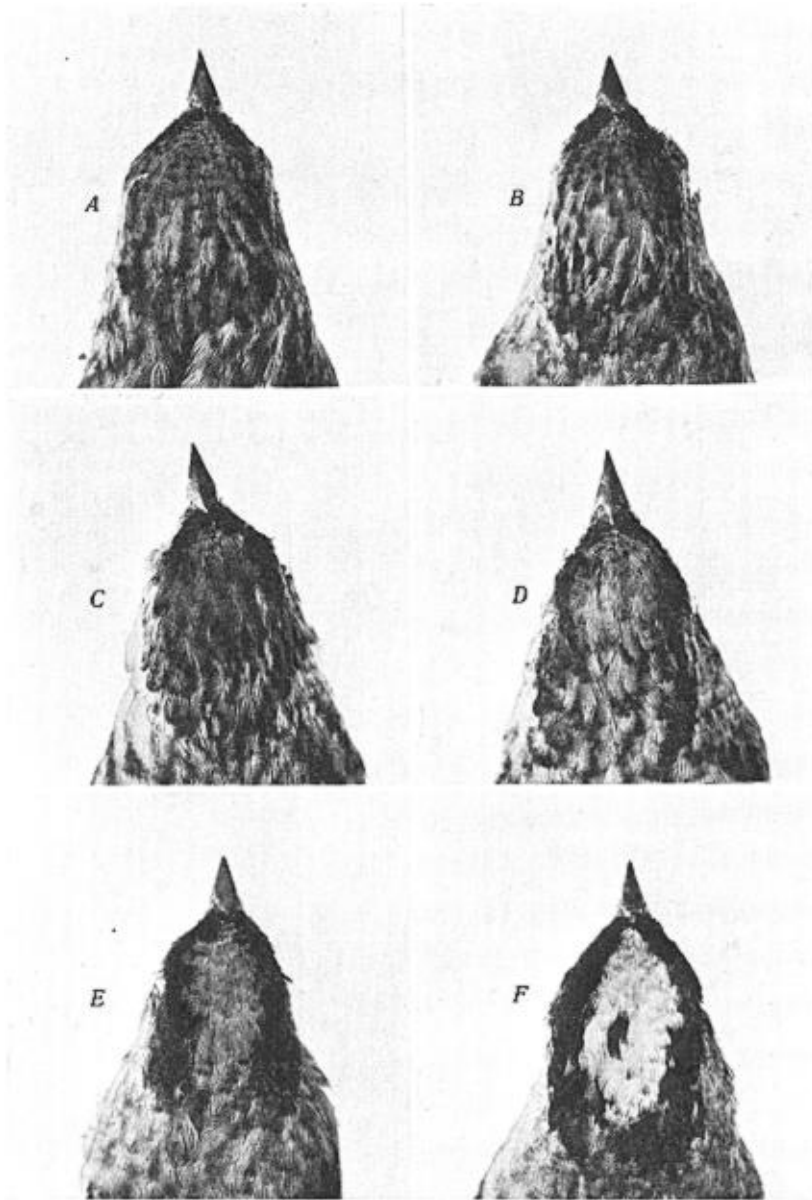


Fig. 9. HEAD MARKINGS OF GOLDEN-CROWNED SPARROWS. (A) FEMALE, BANDED A110511, OCTOBER 27, 1928, SPECIMEN JANUARY 10, 1931. (B) MALE, FIELD NO. 4021, IMMATURE IN FIRST AUTUMN PLUMAGE, SPECIMEN OCTOBER 24, 1931. (C) MALE, BANDED A120542, FEBRUARY 23, 1929, SPECIMEN JANUARY 4, 1931. (D) FEMALE, BANDED A120686, SEPTEMBER 9, 1929, SPECIMEN OCTOBER 12, 1931. (E) FEMALE, C. A. S. NO. 23753, SPECIMEN NOVEMBER 15, 1920. (F) MALE, BANDED A120776, OCTOBER 5, 1929, SPECIMEN NOVEMBER 9, 1931.

birds. One ornithologist selected two birds, side by side, as adults, but one turned out to be a male bird of the year put up by myself October 10, 1931, and the other was a female, banded in the previous fall and hence at least a yearling. The other ornithologist was confident that he could recognize the differences in age and selected one as surely being adult—but it was another bird of the year. Finally they all gave up trying to distinguish yearlings from elders. There are other banded specimens in the Academy collection that show the same similarity of markings at different ages, and my records are replete with notes proving my contention that age determination of live Golden-crowns that are not at least approaching the fully adult stage is largely a matter of guesswork.

Although the coloring of the head of the Golden-crowned Sparrow is not well adapted to photographic reproduction, the endeavor is here made to illustrate by that method the similarity of marking just mentioned. It happens, however, that differences in the "make-up" among the specimens shown made it impossible to place the heads exactly in the same position as regards the angle of reflection of light in relation to the lens of the camera, and also that some of the heads have a little more red in the brown of the feathers, which makes them appear somewhat darker in the photograph (fig. 9) than they do in reality and somewhat less similar to the others. For the illustration I am greatly indebted to Dr. G. Dallas Hanna, Paleontologist of the California Academy of Sciences, who is an expert in the photographing of difficult subjects.

Of the specimens here shown the first is a female, at least in its third year, that was not recognized by the expert ornithologists as being older than the male (B), only a few months old, that was arranged next to it in the test mentioned in this paper. Neither was the male (C) recognized as being at least two years of age, in fact nearer three. This last has more red in the brown of its head feathers and hence looks darker in the photograph, though it is in reality very similar to (A) and (B). (D) is a female, banded two years previous to being made into a specimen, which has the head in an intermediate stage between the above three and the two following that are in fully adult feathering. Of these last, (E) and (F), both November specimens, the first is an unbanded female of unknown age and the last a male banded two years previously. Both of these show head markings very similar to those of the nuptial plumage, but the crown of the female is neither quite as brightly colored as that of the male, nor are its lateral crown-stripes as wide or as deeply black.

Now, in the fourth season of banding this sparrow, sufficient data have been accumulated to warrant setting forth certain conclusions concerning the species, such as the following:

That in the spring each individual goes through a molt of the head feathers and assumes the nuptial markings consisting of a wide yellow median crown stripe, that posteriorly merges into light gray (rarely entirely replaced by gray), and a wide deep black stripe adjoining the yellow on either side. In this paper the black stripe is spoken of as the *lateral crown-stripe*.

That the male bird has generally, but not always, brighter and more strongly defined median and lateral crown-stripes than has the female, at all seasons.

That the majority of the *banded* birds that return to the traps in the fall, that is to say, birds banded in previous seasons, have the head markings of the same character as those of the nuptial plumage, but usually less pronounced, and in this paper these are called *adult head markings*.

That a large proportion of the *unbanded* birds that appear in the fall are without a well defined median crown-stripe but with the forehead more or less yellow

that merges into brown on the crown and nape, also with more or less distinct lateral crown-stripes that vary in color from light brown to blackish brown, the crown and sides of the head having an appearance of narrow flecking or streaking caused by darkening of the tip and distal median part of each feather. Individual birds vary greatly in this particular. Some have this streaking quite dark and heavy while others have but little of it, and some have a black feather or two showing anywhere in the lateral crown-stripes, even in cases where the latter are not well defined.

That some of these immature birds continuously develop black feathers in the lateral crown-stripes through the fall and winter and gradually assume adult head markings, only to shed them in the spring molt for the brighter feathers of the nuptial state.

That some of the individuals in the post-juvenal plumage can be recognized as birds of the year by the faintness of the head markings, and that these are most apt to be females, as proved by museum specimens; but that many of them, particularly among the males, have sufficiently strong head markings as not to be distinguishable from some of the birds that are of a year or two greater age, as proved by the returns of banded birds, especially of banded females.

At the present time I am recording as *positively birds of the year* only those with the faintest markings, having commenced this system in the fall of 1930. Of the birds so recorded in that season those that returned to the traps in 1931 still had only a slightly less definite appearance of immaturity than they had at the time of banding. Many birds were recorded in 1930 as only *probably* immature, and of those so recorded that returned to the traps in 1931 many appeared with strong, bright, fully adult head markings while a larger number of this class were either with duller, but fully adult, markings or showed evident sign of approaching that state.

It seems reasonable, from the facts stated in this paper, to conclude that the Golden-crowned Sparrow does not attain fully adult head markings until its third post-juvenal molt. From return birds in 1932, I hope to be able to show this even more conclusively, with the assistance of the recent care taken in age recording of the birds of the year.

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