

A HYBRID BETWEEN ZONOTRICHIA CORONATA AND ZONOTRICHIA LEUCOPHRYS

WITH TWO ILLUSTRATIONS

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The head markings of Golden-crowned (*Zonotrichia coronata*) and White-crowned (*Zonotrichia leucophrys*) sparrows are so strikingly different in nuptial plumage that question seldom arises about the identity of these species in mixed spring flocks in California. It was with decided interest, but not without doubts, that I responded to an invitation of Mr. Charles G. Thompson to verify the characters of a crowned sparrow feeding about his yard that he said showed features of both species. When I called at his home at 587 Arlington Avenue, Berkeley, the bird was in sight and the mixed characters were in evidence, just as Thompson had described them. The sparrow had the four black crown stripes of *leucophrys* sharply defined, but also it had the full-sized gold patch of *coronata*. It appeared large, and several times it drove the smaller White-crowned Sparrows from the grain scattered on the ground, once tangling in a brief, vigorous fight in which it was the victor.

Although Mr. Thompson was much interested in watching the bird about his place, he assented to its capture alive for purposes of close study. The bird had been first seen about April 1, 1939. By April 19, after several days of trapping, we were able to secure it. It was photographed in color and in black and white and then placed in a large cage with the intent of holding it over the summer period so that the winter plumage could be studied. Unfortunately the bird died on May 24 while I was out of town. The skin and skeleton were salvaged and now are no. 77233, Mus. Vert. Zool.; the bird was a male with fully developed gonads.

Because the head stripes of the hybrid correspond in the supra-orbital and loreal areas to those of *Z. l. gambelii*, detailed comparison of the hybrid has been made with that race of White-crowned Sparrow. Also, of all races of *Z. leucophrys*, *gambelii* is most likely to meet *coronata* in the breeding season.

The black crown stripes of the hybrid are narrow as in *gambelii*, and they are terminated posteriorly by a gray stripe that extends back from the superciliary region. Lateral black stripes, normal for *gambelii*, run posteriorly on to the nape below and behind the lateral gray stripe. Anteriorly the dorsal black stripe does not meet the eye and does not invade the loreal region as in the nuptial plumage of *coronata*. In all respects, then, the distribution of the black is that of *gambelii* with no influence of *coronata* manifest. In many fall-taken specimens of *coronata* the black is incompletely developed and the superciliary region is grayish (see Mailliard, Condor, vol. 34, 1932, pp. 66-70). However, the black or brown when present in such birds is limited to a narrow, tapered penciling on the crown, quite unlike the form of the stripe in breeding *gambelii* and in the hybrid. Even in fresh nuptial plumage, *coronata* may show traces of a gray superciliary line, but this consists merely of ephemeral white tipplings on the black feathers of this region. In the hybrid the feathers of the superciliary stripe are white to their downy bases. Thus, the pattern of the hybrid's crown is not explicable as a feature of immature or retarded plumage of *coronata*.

In the coloration of the head, apart from the black stripes, the hybrid is predominantly *coronata*. In the central area of the crown, the gold extends backward to normal degree and it is not in the least diluted by mixture of gray or white. The gold is brighter than in many *coronata* of early spring, but no brighter than in certain breeding individuals. The posterior light areas of the crown and nape are gray, not white as in *gam-*

belii. Only in the superciliary stripe is the gray lighter, suggesting *gambelii* influence, but even here the tone is much closer to that of the lower lores and occiput of *coronata* than to the pure white of *gambelii*.

Above the eye of the hybrid, in the superciliary stripe, is a small patch of gold. This mark, which is not found in the nuptial plumage of either parental species, evidently results from the elimination of black from the superciliary area, thereby permitting the appearance of gold which otherwise is suppressed or obscured. The stripe pattern of *gambelii* has made possible the appearance of the gold of *coronata* in an unusual region. The gold spot is not situated anterior to the eye as is the yellow of the White-throated Sparrow (*Zonotrichia albicollis*). This fact, the curvature of the lateral black stripes on to the nape and the presence of gold in the median area seem to preclude *albicollis* as a possible parent of the hybrid.



Fig. 13. Hybrid between *Zonotrichia coronata* and *Zonotrichia leucophrys*. The gold areas show as dark gray. Photograph by Elmer C. Aldrich.

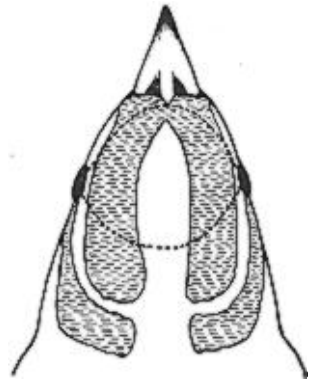


Fig. 14. Diagram of hybrid, showing pattern of black and circular area in which yellow pigment is present.

The gold of *coronata* results from a yellow carotenoid pigment in the rami throughout most of the pennaceous part of each feather together with small deposits of melanin in the tips of the barbules. The melanin seems to alter the color effect, producing gold instead of pure yellow. That the yellow pigment is a carotenoid is shown by its susceptibility to extraction in fat solvents, especially CS_2 .

Immature Golden-crowns display a nearly circular area of clouded or mottled gold on the top of the head. This touches the orbits laterally and extends from the base of the culmen back through the crown area. In various stages intermediate between this and the full nuptial pattern (Mailliard, *loc. cit.*), black or brown restricts the yellow, but even in full nuptial plumage it may leave minute yellowish tips on black feathers near the eye. Such traces frequently can be found if careful search be made. A semi-albino of *coronata* (no. 51864, Mus. Vert. Zool.) has the black of the crown suppressed except for a few pure black feathers posteriorly. The circular yellow patch is thus fully exposed, and more plainly visible than in immatures.

It became apparent that the complete circular area of yellow pigment might always be present in *coronata*, but variously obscured by black. To test this hypothesis, pure black feathers of the nuptial plumage of *coronata* were removed from the supposed circle of yellow. These were treated with hydrogen peroxide (H_2O_2) to bleach the melanin. As the melanin disappeared from the rami, clear yellow pigment was revealed identical

in appearance and position with that of gold feathers. The treated feathers varied macroscopically from bronze to gold, depending upon the amount of residual melanin in the barbules. Where melanin was bleached from certain basal rami, that in yellow feathers are pigmentless, the result was pure white. We may conclude that the black feathers had in them, completely obscured, a full complement of yellow carotenoid distributed in normal fashion. For assistance in the study of the pigments I am indebted to Mr. Frederick H. Test.

The color of the dorsal surface of the hybrid, back of the nape, is typical of *coronata*. Below on the throat and in the center of the belly, the hybrid is whiter than any *coronata*, evidently reflecting the *gambelii* influence, but the chest and sides are darker than in *gambelii*. As a result, the ventral coloration is less uniform beneath than in either species. The chest band tends to be mottled white and dark gray.

The bills of spring-taken *coronata* are dark brown dorsally whereas those of *gambelii* are pinkish except at the tip. The hybrid's bill is most like *gambelii*, although the pink is perhaps duller than usual and the black tip especially large.

Measurements of fifty males of each of the parental species are here tabulated for comparison with the hybrid. The wing and tail of the hybrid fall far below the range of variation for *coronata*, even below the average of *gambelii*. The dimensions of bill and feet, however, are typical of *coronata* and in some instances fall on or above the maximum for *gambelii*. It is remarkable that the measurements are not more generally intermediate between the means for the two species. However, there is doubtless much heterozygosity among factors controlling dimensions in both species and the chance combination of variables of the two species would permit an assortment of characters such as that found in the hybrid.

MEASUREMENTS OF MALE ZONOTRICHIAS IN MILLIMETERS

| Hybrid | 50 <i>Z. coronata</i> | | 50 <i>Z. l. gambelii</i> | | |
|------------------|--------------------------------|---------------------|--------------------------------|---------------------|------------|
| | Average and standard deviation | Range | Average and standard deviation | Range | |
| Wing length | 75.5 | 81.33 σ 1.39 | 78.5-85.0 | 78.49 σ 2.09 | 73.0-82.5 |
| Tail length | 72.5 | 79.05 σ 2.06 | 74.5-83.0 | 73.16 σ 2.21 | 69.5-78.5 |
| Bill length | 8.5 | 8.41 σ 0.28 | 7.7- 9.0 | 7.81 σ 0.30 | 7.2- 8.5 |
| Bill depth | 7.0 | 7.01 σ 0.24 | 6.4- 7.6 | 6.42 σ 0.23 | 6.0- 7.1 |
| Tarsus | 23.6 | 24.18 σ 0.65 | 22.7-25.4 | 22.30 σ 0.69 | 20.9- 23.6 |
| Middle toe | 14.1 | 14.18 σ 0.44 | 13.3-15.4 | 13.11 σ 0.46 | 11.8-14.2 |
| Hind toe | 9.6 | 9.67 σ 0.38 | 8.8-10.8 | 8.56 σ 0.36 | 7.8- 9.1 |
| Claw of hind toe | 6.9 | 6.71 σ 0.40 | 6.0- 7.6 | 6.41 σ 0.40 | 4.9- 7.6 |

Linsdale and Sumner (Univ. Calif. Publ. Zool., vol. 40, 1934, p. 312) give weights of twenty-five Golden-crowned Sparrows of mixed sex taken in early April as 27.5 to 38.5 grams (average 32.8). Somewhat comparable figures for nineteen *gambelii* are 21.1 to 29.6 grams (average 25.4). The hybrid weighed 33.6 grams five days after its capture, at which time it was in good condition.

While the hybrid was in captivity much interest attended the character of its notes. After a few days of adjustment to its cage, it began singing with full power. The pattern, quality and pitch were typical of the Golden-crown. One can no more than speculate on the reason for this. There is in my mind doubt that the song is completely hereditary in all its elements. Was this hybrid raised in a community dominated by Golden-crowns, with perhaps its own male parent of that species?

Little can be concluded from this hybrid concerning the inheritance of characters of *coronata* and *leucophrys*, particularly since it is not certain, even though probable, that the bird is of the first hybrid generation. Nevertheless, we may be sure that sepa-

rate factors exist for head pattern and color. It seems likely that pattern and presence or absence of yellow are controlled by few factors and also that gold is dominant over absence of gold, that a pattern of two stripes (on one side) is dominant over single stripe, and that *coronata* back coloration is dominant. As already suggested, the measurements of the hybrid may result from chance combination of numerous factors for dimensions present in the parental species.

Throughout much of northern coastal Alaska and northern and central British Columbia, *coronata* and *gambelii* breed in the same geographic areas. *Coronata* nests in the Hudsonian Zone in timberline scrub. Brooks and Swarth (Pac. Coast Avif. No. 17, 1925, p. 92) state that *gambelii* in the northern part of British Columbia "is confined to the lowlands (Canadian zone); in the southern part of the province it breeds from Transition to Hudsonian (timber line)." It is in the latter situation, possibly where meadows and willow thickets reach timberline, that the breeding habitats of the two species may occasionally be contiguous. Possibly because of the rarity of such situations, or perhaps even more because of lack of compatibility as regards breeding when the two are thrown together, hybridization has not occurred to such an extent that it has been detected before. I find in the literature and in available specimens no evidence of interbreeding of these two strikingly different species other than that embodied in the specimen here reported.

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