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THE JUVENAL PLUMAGE AND POSTJUVENAL MOLT OF THE CHIPPING SPARROW[1]

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IN my paper on the juvenal plumage and postjuvenal molt in certain species of Michigan sparrows[3] I call attention to the fact that the postjuvenal molt of the Eastern Chipping Sparrow, *Spizella p. passerina* (Bechstein), begins in early summer or in midsummer rather than in "the middle of August"[4] in young of the first brood.

During the late summer of 1936 I was able, through the courtesy and interest of the Museum of Zoology of the University of Michigan, to rear a young Chipping Sparrow of known age at the Edwin S. George Wild Life Reserve, to observe it carefully from day to day, to record certain changes in plumage, and thus to determine at precisely what age the postjuvenal molt *may* begin in this species.[5]

My captive Chipping Sparrow was hatched at about noon

[1] Contribution from the Edwin S. George Reserve.

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[3] George Miksch Sutton, "The Juvenal Plumage and Postjuvenal Molt in Several Species of Michigan Sparrows," *Cranbrook Inst. Sci. Bull.*, No. 3, 1935: 29.

[4] Jonathan Dwight, Jr., "The Sequence of Plumages and Moults of the Passerine Birds of New York," *Annals N. Y. Acad. Sci.*, 13, 1900: 198.

on July 22. I took it[6] from its nest on July 30, when it was almost exactly eight days old. It was one of a brood of three. When I took it the other two nestlings fluttered off through the grass, refusing to remain in the nest.

At 7 P.M., July 30, my captive weighed almost exactly 10 grams. It had eaten small grasshoppers all that afternoon.

Feeding it at regular intervals during the ensuing several days I found to my surprise that it weighed almost exactly 10 grams at 7 P.M. on July 31, exactly 10 grams at 7 P.M. on August 1, and exactly 10 grams at 7 P.M. on August 2. Thus, during a seventy-nine hour period of its early life it did not gain so much as a tenth of a gram in weight, though it ate grasshoppers almost constantly during the daylight hours.[7] At noon on August 3, I found to my relief that it weighed 10.1 grams. From August 3 to 16 its weight steadily, though slowly, increased. On August 5 (5 P.M.) it weighed 11.2 grams. On August 11 (9 A.M.) it weighed 11.8 grams. On August 16 (noon) it weighed 13 grams. From August 16 to September 16 it never (to the best of my knowledge) became heavier than 13 grams. I did not weigh it every day, however, during this period.[8]

When I took my captive from the nest its tail was barely visible. Measuring from the very base of the middle rectrices to the tip of the longest blood-quill, I found the tail of the eight-day-old bird to be 1.5 mm. long. Measuring again on August 5 (bird fourteen days old), I found the tail to have grown to a length of 20.5 mm. On August 10 (bird nine-

[5] I use the word "may" here advisedly, for there probably is some individual variation in the postjuvenal molt; furthermore, the molt in captive individuals may to some extent be abnormal.

[6] To the best of my knowledge there is no way of determining the sex of juvenal Chipping Sparrows without examination of the gonads. My captive was liberated when about eleven weeks old, its sex undetermined.

[7] It is natural to wonder whether the bird was receiving proper nourishment from the food I gave it during this period. It ate heartily and almost incessantly, that much I can say; but I am not sure that grasshoppers were as nourishing as other insect food might have been.

[8] I have weighed many adult Eastern Chipping Sparrows from time to time, finding males to weigh from 10.7 to 13.6 grams; females from 10.7 to 13.1 grams.

teen days old) the tail measured 35 mm. On August 17 (bird twenty-six days old) the rectrices were almost free of their sheaths. August 19 (bird twenty-eight days old) the tail measured 61 mm. The rectrices were now full grown, being entirely free of sheaths at the base. According to these data the tail feathers grow at a rate of about 3 mm. per day. The remiges attained full development slightly less rapidly. When my captive's rectrices became fully developed (at twenty-eight days of age) the remiges were still partly sheathed. These sheaths remained in evidence until August 22 (bird thirty-one days old).

A notable feature of the eight-day-old Chipping Sparrow is the streaking of the breast and sides. So pronounced is this marking that at first glance every feather of the underparts appears to bear some sort of dark mark at its tip. Virtually no feathers of the eight-day-old bird are fully unsheathed; and many of them (especially those of the lores, chin, and throat) are still wholly sheathed. Feather growth is rapid, of course. By the time the bird is ten days old some feathers of the crown, nape, and middle of the back have attained full size. On August 7 (bird sixteen days old) I examined my captive carefully, finding most of the feathers of the crown, nape, and back to be fully developed. The feathers of the chin and upper throat were still sheathed at the base.

On August 16 (bird twenty-five days old) I noted new, wholly sheathed feathers coming in along the edge of the dorsal feather-tract and here and there in the scapular region; a complete row of very small, wholly sheathed, unmarked, white feathers appearing along either side of the ventral apterium; and a patch of wholly sheathed lesser wing coverts (each about 4 mm. long) which apparently had developed *as a tract,* all destined to lose their sheaths simultaneously. I noted this same sudden, *en-masse* appearance of lesser wing coverts in the young Eastern Grasshopper Sparrow, *Ammodramus savannarum australis* Maynard, upon which I recently reported.[9]

[9] George Miksch Sutton, "The Postjuvenal Molt of the Grasshopper Sparrow," *Occ. Papers Mus. Zool., Univ. Mich.,* 336, 1936: 4.

On August 17 (bird twenty-six days old) the new feathers appearing in a row along either side of the ventral apterium were observed to be still wholly sheathed; and a few scattered, wholly sheathed feathers were noted here and there in the crown. On August 18 (bird twenty-seven days old) the new crown feathers just mentioned were unsheathed at the tip, the red-brown color of their margins furnishing a sharp contrast to the dull brown margining of the feathers among which they had developed. These new red-brown feathers may represent a post-nestling phase of the juvenal plumage, but we cannot regard their appearance as evidence of molt for they do not *replace* feathers that have dropped out any more than do the rows of entirely new feathers which appear along the edges of the ventral apterium at about the same time in the bird's life.

On August 27 (bird thirty-six days old) I discovered a single row of new feathers in each side of the chest. These feathers were *replacing* streaked feathers that had dropped out, some of which I found here and there in the cage. By this time the new, white, unmarked belly feathers first noted August 16 were almost free of their sheaths, and *an additional row* of small, white, unmarked feathers had appeared on each side of the ventral apterium.

By August 31 (bird forty days old) the streaked feathers of the underparts were dropping out rapidly; very few spotted or streaked feathers remained on the chin and throat; plumulaceous juvenal feathers were disappearing from the middle of the back; and patches of new pinfeathers were evident in the edges of the chest, the back, and the sides.

On September 5 (bird forty-five days old) the juvenal middle coverts began to drop from the right wing. On the following day practically all the middle and greater coverts dropped from both wings. I saw the bird actually scratch and pluck some of these out. On September 7 (bird forty-seven days old) a middle tertial of the right wing disappeared. On the following day a middle tertial disappeared from the left wing.

On September 10 (bird fifty days old) the middle coverts

of the first winter plumage began to unsheath. The new greater coverts, which were long and wholly sheathed, presented the appearance of a row of very thick, somewhat stubby hairs. By September 12 (bird fifty-two days old) the streaked feathers of the underparts were practically gone. By September 15 and 16 more tertials dropped out, all streaked feathers disappeared from the underparts, many dull feathers molted from the crown and nape (not the red-brown ones, however), and the new greater coverts began to lose their sheaths.

From September 16 on I was not able to observe the bird closely from day to day. Bearing United States Biological Survey Band No. L55362, it gained its freedom in early October.

Summary

The young Chipping Sparrow at the time it leaves the nest has no red-brown feathers whatsoever in its crown. These red-brown feathers appear when the bird is about four weeks old. They do not drop out in the earlier stages of the postjuvenal molt, and may, indeed, be part of the first winter plumage.

The postjuvenal molt begins when the bird is about thirty days old. The postjuvenal molt thus must begin in late June and early July in young of normal first broods, rather than in "the middle of August."

The plumage worn by the eight-day-old Chipping Sparrow is not, strictly speaking, a complete plumage of any sort. Not until the bird is about three weeks old does it don its first set of lesser wing coverts. As the total skin area of the growing bird increases new rows or sets of feathers appear, particularly in the region of the lower breast and belly.

The juvenal middle and greater coverts drop out almost simultaneously when the bird is about six weeks old. Molting of the body plumage takes place much more gradually, but the streaked feathers of the underparts are all gone by the time the bird is forty-five days old.

The postjuvenal molt does not involve the remiges and rectrices, but it does involve the tertials, the dropping out of which is subsequent to that of the middle and greater coverts.