THE POSTJUVENAL MOLT OF THE MALE BROWN-HEADED COWBIRD (Molothrus ater)

BY JAMES BAIRD

The differentiation of sex and age groups is of vital interest to banders, life history workers, and others who have to deal with living birds. Some species of birds are characteristically plumaged whether male or female, adult or immature, or any combination of the above. However, the majority have one or more stages in their plumage development which cause difficulty in identifying with certainty the age and sex of an individual. In the Brown-headed Cowbird, *Molothrus ater*, this difficulty is evident in several stages of the plumage development: 1) the *natal down* presents obvious difficulties; 2) the *juvenal plumage*, in which both sexes are colored alike, and where the only distinction is that of size; and 3) upon completion of the postjuvenal molt *(1st winter plumage)*, where there is sexual dimorphism, but where the adults and immatures are nearly alike in color. It is this last-mentioned problem that is under discussion, for I believe that there are differences which allow the immature male and the adult male to be separated.

The well-known propensity of a few immature male cowbirds to retain a number of juvenal feathers, including even rectrices and remiges, in the 1st winter plumage has been commented upon by a number of authors (Dwight, 1900; Forbush, 1927; Friedmann, 1929). These birds were generally dismissed as anomalies or as individuals that were not in the best of health. My own interest in the subject arose from just such individuals, and the matter was investigated in my search for a further refinement of data on cowbird weights. Over 1,200 cowbirds, more than half of which were males, were weighed and banded at the Norman Bird Sanctuary, Middletown, Newport County, Rhode Island. These were all examined closely and notes were made on the plumage. The majority were captured during the winter and spring of 1957 and in the winter of 1958. Random sampling, by collecting, of a migrating flock composed largely of molting immature birds on September 22, 1957, resulted in the accumulation of additional data on seven males that were in active molt. An important standard of reference for known adults was provided by the returning of males banded in previous years.

A brief review of some of the cowbird molts and plumages is in order: Male and female cowbirds are identically olive-brown in the juvenal plumage. In the early fall, males and females alike undergo a postjuvenal molt into the 1st winter plumage, thus allowing the first separation of the sexes by plumage. Dwight *(ibid.)* says of the male in this plumage: "Unlike the previous plumage, chiefly black instead of brown, young birds becoming practically indistinguishable from adults." He states further that the "Adult Winter Plumage (is) acquired by a complete postnuptial molt in September. Adults are not distinguishable, as a rule, from young birds in first winter dress."

Friedmann *(ibid.)* quotes Dwight in full and further elaborates on certain aspects of the plumage coloration. He also contributes a discussion of the order of molt in the immature male. However, he

agreed with Dwight that immature male cowbirds *(M. ater)* could not be distinguished from adults, although in the section dealing with the Shiny Cowbird *(M. bonariensis)* he commented on the fact that 9 out of 10 immature males retained enough of the juvenal plumage to be identified as such in the field.

Bent (1958) again relies on Dwight's description of the plumages and molts, but he errs (p. 442) when he refers to the "postnuptial molt . . . producing a first winter plumage which is indistinguishable from that of the adult" (postnuptial obviously should read postjuvenal).

Forbush *(ibid.)* apparently suspected that the postjuvenal molt was not complete, for this is his description: "first winter plumage acquired by a complete (?) postjuvenal molt; this plumage practically as adult . . .; a few male birds still retain brown feathers. . . ."

Unfortunately, I was unable to examine birds that were in the early stages of molt, and therefore cannot comment on or contribute further to this aspect as discussed by Friedmann *(ibid.)*. My information concerns some of the features of the middle and late stages of the molt, particularly with respect to molt progress within each feather tract.

As noted by Friedman *(ibid.)*, in the course of the postjuvenal molt of the male cowbird the molt proceeds in a set pattern which varies little between individuals. However, as the molt period closes, the peripheral areas of the various feather tracts (the areas that are molted last) may not complete the molt, and this varies considerably among individuals. Thus, the back feathers are molted from the center outward (posteriorly and laterally), and in those individuals in which the molting has stopped before the back molt is completed, the brown feathers of the juvenal plumage are to be found along the outer edges of the back. But it should be noted that the retention of juvenal feathers follows an orderly progression, with one area succeeding another. Retention of juvenal feathers on the back invariably means that juvenal feathers will also be found in the scapulars and underwing coverts. The degree of molt completion varies considerably and may possibly be related to the time of hatching; birds hatched in the early summer may more nearly complete their molt than birds hatched during the late summer.

In the early stages of this study, I felt that the main difficulty lay in determining whether birds which had no trace of the brown juvenal feathers were immatures which had actually completed their molt, or were adults. This still remains a question to be considered, but I now believe that the ageing of male cowbirds can be done with a high degree of accuracy, since apparently the postjuvenal molt of the male is not complete but is arrested at one or another stage of completion. There may be exceptions, but consideration of the proportion of adults to immatures banded indicate that there are few. In 1957 of 585 males banded, 189 (32.3%) were adults, while 396 (67.7%) were immatures. In 1958 (to date) of 166 males banded, 30 (19%) were adults, while 136 (81%) were immatures.

It seems quite likely that the postjuvenal molt of the female cowbird may also be arrested at one or another stage of completion, and the ageing of a few individuals may be accomplished by virtue of the retention of a large number of the juvenal feathers. However, in

dealing with birds which have nearly completed their molt, the similarity in the color of the juvenal and the 1st winter plumage renders detection of vestiges of the juvenal plumage exceedingly difficult.

ORDER OF MOLT COMPLETION AND DIRECTION OF MOLT WITHIN EACH FEATHER TRACT

Head—Friedmann *(ibid.)* stated that "The head feathers are molted in an irregular fashion. . . ." This is not borne out by examination of birds in the middle and late stages of molt. It appears that there is a definite order of molt. The following regions of the head are listed in the order of molt completion (although in several of these regions, the molt is sometimes not completed), with the direction of molt within each region also given:

Nape—completes molt before other areas of the head, Molt centrifugal.
Throat—starts posteriorly, proceeds anteriorly and laterally.
Lores—centripetal molt.
Crown—posterior and lateral progression.
Forehead—anterior progression.
Chin—anterior and lateral progression.
Malar area—anterior progression.
Auriculars—general.
Orbital area—general. Incomplete molt in 9% of the immature males examined.

The head color of the immature in fresh fall plumage is strongly tinged with purple. During the course of the fall and winter this purple tinge disappears, leaving the head brown. Dwight *(ibid.)* states that the "First Nuptial Plumage [is] acquired by wear, which shows very little and chiefly in the paler brown of the head." This statement is correct to the extent that there is no prenuptial molt, but the paler brown of the head is not brought about by wear, as is the color change in the breast of the Robin (i.e., the wearing away of the feather tip which is a different color from that underlying the tip). Examination of the individual feathers of the head reveals that there are no purple edgings to the feathers, each feather being essentially unicolored and purple tinged, with some individuals even having strong buffy edging of the feathers. Friedmann *(ibid.)* alluded to the true situation when he said that apparently the purple color gradually faded out leaving the brown more noticeable. Additionally, it appears that the postnuptial molt of the adult results in less purple in the head than in the postjuvenal molt of the immature. Spring adults known to be more than a year old have a paler, more golden brown head, especially the nape, than the immature male.

Body—Friedmann *(ibid.)* assigned an order of molt to the feather tracts of the body. While it is probable that molt starts in one area before another, examination of birds in the middle and late stages of molt reveals no area other than the breast significantly advanced over another.

Scapulars—posterior progression. The last two feathers are frequently not molted (92% of the immature males examined).
Back—posterior and lateral progression. The outermost feathers not molted in 23% of the immature males examined.

Belly—posterior and unilateral (ventral) progression. Mid-line of the belly infrequently not molted (23%).
Sides—posterior and unilateral (dorsal) progression.
Breast—posterior progression. Molt completed early.
Flanks—posterior progression.
Rump—posterior and lateral progression.

Crural area—molt proceeds downward.

Wing—Molt begins in the wing with the upper wing coverts, which complete their molt well in advance of the remiges. Some birds retain the innermost juvenal upper wing coverts. The primaries are molted from the innermost outward (1, 2, 3, . . . 9), and each primary covert is molted with its primary. Infrequently the 8th and the 9th primaries are not molted. Friedmann *(ibid.)* reported that the secondaries were molted from the outermost inward. Exception must be taken to this statement in that all specimens examined had the 6th secondary fully grown, while nos. 3, 4 and 5 were still juvenal. It would appear that secondary no. 1 is molted first, the 6th next, and the molt then proceeds inward in the following order: 2, 3, 4 and 5. The secondary coverts are replaced irrespective of the order of molt of the secondaries. The tertials are molted early, probably with the 1st and/or 6th secondary. The feathers of the alula are molted simultaneously, and during the later stages of the wing molt, frequently with the 8th and 9th primaries. The underwing coverts[1] are subject to a great deal of variation in completeness of molt. All or most of the underwing coverts were of the juvenal plumage in 71% of the immature males examined. All had the outermost row of the inverted undercoverts juvenal, although some had a scattering of feathers of the 1st winter plumage. Recognition of these juvenal feathers is always essential in determining the age of an immature which has almost completed the postjuvenal molt—the feathers of the juvenal plumage are light brown with a dull sheen, while the feathers of the 1st winter plumage and subsequent adult plumages are a silvery gray with a strong black edging to each feather. The direction of molt of the underwing coverts is from the innermost outward, with the *pteryla patagialis corridorii* and the innermost inverted undercoverts being molted first, then the lesser undercoverts, and lastly portions of the outermost inverted undercoverts.

Tail—Friedmann *(ibid.)* suggests that the molt of the upper tail coverts occurs at the same time as, and as part of the rump molt. That this is not so can be seen by referring to the direction taken by the rump molt, in which new feather growth starts anteriorly and centrally, spreading laterally and posteriorly, thus placing in juxtaposition ensheathed feathers of the lower rump and the fully grown new feathers of the upper tail coverts. The upper tail coverts start the molt anteriorly, spreading posteriorly and laterally. The last two feathers to be replaced are the central pair lying above the central rectrices. The same exception is taken to Friedmann's statement concerning the undertail coverts being related in their molt to that of the belly. The molt of the undertail coverts proceeds posteriorly and laterally, as in the upper tail coverts, and the last feathers to be molted are the central pair underlying the central rectrices.

[1]Terminology for description of underwing as in Blake (1956).

I could find no evidence that the rectrices are molted in the order suggested by Blake *(ibid.)*—5, 6, 4, 3, 2, 1. But possibly molt inception is obscured by the time the feathers are half grown. On the basis of the specimens which I examined, I would have said that the molt proceeds in the order: 6, 5, 4, 3, 2 and 1.

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BRIEF CONCLUSIONS FOR THE BANDER

1. At any season, a male Brown-headed Cowbird which shows no olive-brown feathers mixed with the black (on close examination) can be termed an adult with reasonable safety.
2. Male Brown-headed Cowbirds which do show olive-brown feathers mixed with the black are definitely immature (for a period of roughly one year, from postjuvenal molt to first postnuptial molt).

SUMMARY

1. Evidence is presented that the postjuvenal molt of the male Brown-headed Cowbird is not complete.
2. The areas of the body which most frequently retain vestiges of the juvenal plumage are those parts of the various feather tracts that are molted last. In decreasing order of frequency they are:
   Outermost row of the inverted undercoverts of the underwing.
   The last two feathers of the scapulars (humeral tract).
   One-quarter to all of the underwing coverts.
   The outer edges of the back (spinal tract).
   The mid-line of the belly (inner edges of the ventral tracts).
   The orbital area of the head.
   Other areas: primaries, secondaries, flanks, etc.
3. There is a progression in the degree of molt completion that follows the order given above.

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Norman Bird Sanctuary, Third Beach Road, Middletown, Rhode Island.