

MOLTS AND PLUMAGES OF THE RED-WINGED BLACKBIRD WITH PARTICULAR REFERENCE TO FALL MIGRATION

By BROOKE MEANLEY and GORMAN M. BOND

Tordoff and Mengel (1956) have summarized a number of findings on the relationship of molt to migration in passerine birds and have concluded that there is strong evidence to support the contention of various authors that molt does influence at least the time of migration. The present study was undertaken to determine whether a correlation could be found between the onset or fall migration and the completion of molt in Red-winged Blackbirds (*Agelaius phoeniceus*). As a prerequisite to such a determination, we found it necessary to record the sequence, duration, and completion of molt of each feather tract leading to the Basic or "fall and winter" plumage. The results of this study are recorded in the following pages. For the sake of completeness we also are showing the succession of molts and plumages acquired by both sexes of Red-winged Blackbirds from juvenal plumage to the Definitive Basic or "second winter" plumage.

METHODS

This study is based on an examination of over 500 specimens collected from the Patuxent River marshes in Maryland, the Delaware River marshes, ricefields near Eudora, Arkansas, and cornfields in Berrien County, Michigan. These collections were made during the late summer and early fall from 1958 through 1968. Most of these specimens were frozen immediately upon collecting and later thawed out for examination. We did not segregate age or sex groups in the following study, as the sequence of molt appears to be the same for both first and second winter birds, and both sexes. Information on the appearance of plumages at other times of the year was obtained from specimens in the collection of the U. S. National Museum.

SUCCESSION OF MOLTS AND PLUMAGES

Juvenal Plumage (Male)—Plumage is similar in color and pattern to that of adult female except for yellow wash of underparts and side of head. Shoulder patch or epaulets (lesser coverts) mottled brown and yellow or brown and buff. (Female)—Similar to male. *First Prebasic Molt* (also called "post-juvenal molt")—Described elsewhere in this paper. Begins usually from 45 to 60 days after the young bird has left nest. This is a complete molt except for the retention (by some individuals) of a few underwing coverts (see below).

First Basic Plumage—Fall and Winter Aspect (also called "first winter plumage" and "immature plumage"). (Male)—Black, with

feathers of upper parts edged with brown or buff, and those of underparts edged with buff or white. Bird has speckled appearance. Shoulder patch usually orange with black mottling, especially in the yellow band (median coverts) bordering the orange. Some immature males have reddish shoulder patch like adult, but have black flecks in yellow band. Also, some have blackish shoulder patch. (Female)—Dusky above with buffy and rusty feather edgings; underparts streaked with black and white, but more buffy on breast and sometimes on flanks, than in breeding plumage; median and secondary greater coverts prominently edged with buffy. Usually lacks pink of chin and throat (which may be buffy, yellow, or light salmon) and crimson of shoulder patch (which may be rusty, orange, or grayish), as in second winter plumage.

First Basic Plumage—Spring and Summer Aspect (also called “first nuptial plumage” and “subadult plumage”) (Male—usually non-breeding)—Plumage dull black, acquired by wear. Shoulder patch may be more conspicuous than in first winter plumage due to wearing away of black subterminal bars which usually remain as small black dots. (Female—usually breeding)—Similar to first winter plumage, but darker above due to wearing away of buffy and rusty edges of feathers; breast less buffy.

Second and Subsequent Prebasic Molts (also called “post-nuptial molt”) Occurs approximately one year after First Prebasic Molt. Described elsewhere in this paper. This is a complete molt except for sometime retention of a few underwing coverts.

Second and Subsequent Definitive Basic Plumage—Fall and Winter Aspect (also called “adult winter plumage” and “second winter plumage”) (Male)—Does not have the overall speckled appearance of male in First Basic Plumage—Fall and Winter Aspect; underparts almost immaculate, and similar to male in breeding plumage; feathers of head, back, and secondary coverts edged with brown and buff; the bright scarlet-vermillion shoulder patch is acquired together with the rich bordering ochraceous—buff median coverts. (Female)—Similar to female in First Basic Plumage—Fall and Winter Aspect, except that shoulder patch usually is crimson and chin and throat pink.

Second and Subsequent Definitive Basic Plumage—Spring and Summer Aspect (also called “adult nuptial plumage”). (Male and Female)—Acquired by wear. Similar to First Basic Plumage—Spring and Summer Aspect, except for more intense coloring of shoulder patch in both sexes, and chin and throat of female.

The pterlography of the Red-winged Blackbird may be divided into eight feather tracts:

alar	(wing)
ventral	(undersurface; chin to vent)
dorsal	(upper surface; neck to tail)
humeral	(shoulder)

femoral	(thigh)
crural	(leg)
caudal	(tail; upper and lower coverts)
capital	(head)

SEQUENCE OF MOLTS

(leading to first and second winter and subsequent plumages)

ALAR TRACT—The *primary* feathers are one of the earliest series to molt. Our earliest record is of a juvenile male molting primaries on 9 July. In a series of 60 juvenile males collected on 24 July, 10 had begun to molt; and 12 of 17 Red-winged Blackbirds (including both sexes and 3 age groups) were molting by 29 July. The molt of the primary feathers proceeds regularly from the innermost primary (primary I) to the outermost primary (primary IX).

By 1 October, most birds have acquired the outer 3 primaries (primaries VII, VIII, and IX) or they are in some advanced stage of development. At any stage of development, the Red-winged Blackbird has usually 2, but sometimes 3 and rarely 4 non-functional primaries. Average dates for the full development of new primary feathers are 15 August—primary I; 1 September—primaries II-IV; 15 September—primaries V-VI; 1 October—primaries VII-IX.

Molt of the *secondaries* begins with the outermost (secondary I) and proceeds inward to secondary VI. Secondary I (sheath) appears about the time all of the secondary coverts have been replaced, and seldom before the middle of August. Only 1 of 34 birds from the Patuxent River marshes examined on 31 July had started molt of the secondaries. The feathers of this series are not fully renewed until early October.

The *tertials* are sometimes considered to be part of the secondary series. Although they have a molt pattern of their own, their molt begins about the same time as that of the secondaries.

The middle tertial is dropped first, followed by the innermost tertial. Both of these feathers often are well developed before the outermost breaks from the sheath.

The *greater primary coverts* are molted along with their respective primary feathers. Unlike the greater primary coverts, the *greater secondary coverts* molt ahead of the secondaries. These feathers are molted rapidly, several being in the same stage of development at the same time. The progression of molt in this series is from the outermost inward, as in the secondaries. Four of 24 juveniles, examined on 31 July, had new secondary coverts in quill. Most birds have completed molt of the secondary coverts by 15 August, at about the time secondary I is in sheath.

Molt of the *lesser coverts* begins early and is frequently the first series to be dropped. By 31 July, 24 of 34 juvenile males taken at the Patuxent River marshes were molting lesser coverts. The inception of molt in the juvenile male is particularly conspicuous since it involves replacement of the feathers in the lesser coverts and

results in the reddish or orange shoulder patch. The new shoulder patch contrasts sharply with the yellowish brown "female appearing" juvenal plumage in this area of the wing. Molt of this series is usually completed by 1 September.

The *median coverts* are the last coverts on the wing to be molted. This process begins about the time primary VI is in quill. The feathers are molted simultaneously.

The *alula* series is completing growth at about the same time as the last three primaries. The *marginal coverts* on the upper or outer surface of the forearm, lying beneath the alula, are molted at about the time primary VI is being replaced.

The first underwing series to be molted is the *marginal coverts* on the underside of the forearm. Molt of this series begins at about the time primary IV is dropped, and is followed by the *under middle primary* and *under middle secondary coverts*. The progression of molt of the under middle secondary coverts is inward, while that of the under middle primary coverts appear to be irregular or nearly simultaneous. The under middle coverts are molted before primaries VIII and IX. The *under greater primary coverts* and *under greater secondary coverts* are molted last. The progression of molt in this last series is the same as that in the primaries and secondaries, i.e., outward and inward, respectively. Molt is completed about the same time as that of the primaries and secondaries.

As pointed out by Selander (1958:357), first-year birds frequently retain some juvenal underwing coverts and tertials through the post-juvenal molt. Of 70 immature male Red-winged Blackbirds examined during the last week in October, 70 percent had retained some juvenal under greater primary coverts. In most cases in which partial replacement of the coverts occurs, the proximal ones are retained.

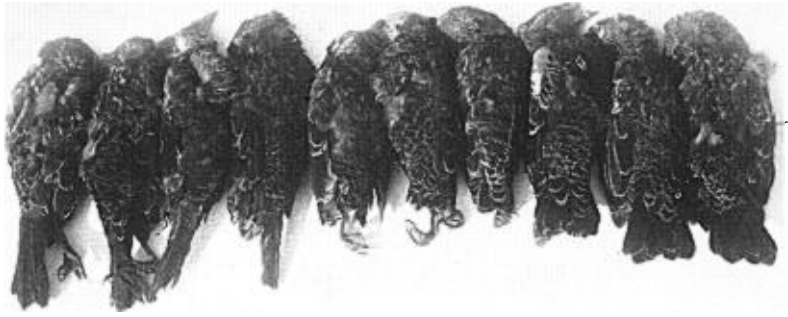
The complete replacement of the feathers of the alar tract requires about 8 weeks. An exceptionally late molting young was examined on 27 October that had secondaries V and VI about one-third unsheathed.

VENTRAL TRACT—The first signs of molt in the ventral tract appear in some birds during the last few days of July, when the feathers of the anterior portion of the lateral branches begin to drop. From here, the molt progresses posteriorly along the branches and anteriorly toward the throat and chin regions. The last feathers of the ventral tract to be replaced are those towards the center of the abdomen.

DORSAL TRACT—Molt of the dorsal tract begins about the first week of August. Molt begins at the rump, proceeds to the upper back and then to the cervical region.

HUMERAL TRACT—The earliest evidence of molt in this tract occurs during the last few days of July. The molt proceeds from the anterior region, posteriorly. Several birds taken 3 September still had the posterior area of this tract in quill.

Figure 1. (from left to right) Progress of molt in tails of immature male Red-winged Blackbirds collected 16 September 1964, in Anne Arundel County, Maryland.



FEMORAL TRACT—The molt in this region begins later than the humeral tract. The progression, however, is similar in both tracts.

CRURAL TRACT—Molt of the crural tract seldom begins before 15 August. The progression is generally from the proximal end of the tibia to the tarso-metatarsal region.

CAUDAL TRACT—The caudal tract comprises the tail feathers (rectrices) and the upper and lower tail coverts. The tail coverts begin molting before the rectrices and at about the time primary V is in quill. Usually the upper tail coverts begin molting first. The rectrices begin molting when primary VI is in quill. A few birds have dropped some old tail feathers by the end of the third week in August.

Ten specimens examined on 16 September (Figure 1) had tail feathers (rectrices) in the following conditions: 1 had not molted any tail feathers; 1 had 4 old feathers; 2 had 2 old feathers each; and 6 had all new tail feathers breaking sheath (2 with feathers three-fourths out of sheath and 4 with feathers one-fourth out of sheath—virtually bob-tailed).

The center tail feathers are the last rectrices to be renewed. Two of eight birds examined on 1 October had completed growth of new tail feathers; the other six had completed growth of all tail feathers except the two center ones.

CAPITAL TRACT—Molt in the head region involves replacement of feathers of the crown and sides of the head. This is one of the last tracts to begin feather replacement, but molt of most of the capital tract is complete before that of the secondaries, underwing series, and tail. The inception of molt in this region coincides with the beginning of development of primary V or VI. Some individuals have begun molt of the capital tract by the middle of August.

Molt begins in the crown region; and the last areas of the capital tract to complete the molt are the eye stripe and the cheeks (malar region).

CONCLUSIONS

In the Patuxent River marshes of Maryland, the peak population of Red-winged Blackbirds (about 2,000,000) coincides with the period of maximum food availability during late August and early September. Banding studies indicate that this population is mostly of local origin (Meanley 1964). Our studies show that during this same time Red-winged Blackbirds are undergoing their most critical period of feather replacement. When observed in flight, they have a ragged or "moth eaten" appearance and usually a slower and more labored flight. They are less mobile than usual since they have several remiges or rectrices missing or not completely renewed. The molting of most Red-winged Blackbirds is nearly complete by 1 October. At this time a few birds still have some pin feathers in the head region, and the central tail feathers and the inner secondaries are only partly unsheathed. Virtually all Red-winged Blackbirds have completed their molts by the middle of October.

During the same period and in the same areas, a total of 10,000 Red-winged Blackbirds were banded. Birds banded in summer were recovered in the same area during the period of molt; but south of the area after the molting period.

We were also able to determine from the banding operation that birds did not begin their departure from the marsh for the wintering grounds until the two outermost primaries and the two innermost or central tail feathers were two-thirds or more grown. By the end of October, when all but a few of the birds had completed their molt, the Red-winged Blackbird population in the Patuxent River marshes is down to about 100,000 birds.

Based on this evidence, we believe that there is a decided correlation between molt, particularly the replacement of the remiges and rectrices, and fall migration in the Red-winged Blackbird.

LITERATURE CITED

- MEANLEY, B. 1964. Origin, structure, molt, and dispersal of a late summer red-winged blackbird population. *Bird-Banding* **35**: 32-38.
- SELANDER, R. K. 1958. Age determination and molt in the boat-tailed grackle. *Condor* **60**: 355-376.
- TORDOFF, H. B. and R. M. MENGEL. 1956. Studies of birds killed in nocturnal migration. *Univ. of Kansas, Museum of Nat. Hist.* **10**: 1-44.

U. S. Department of the Interior, Patuxent Wildlife Research Center, Laurel, Maryland 20810 and Smithsonian Institution, Washington, D. C. 20560

Received March. 1969.