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A NEW AGE- AND SEX-SPECIFIC MOLT SCHEME FOR THE RED-WINGED BLACKBIRD

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This report concerns the timing and pattern of prealternate molt in different age and sex cohorts of Red-winged Blackbirds (*Agelaius phoeniceus*). Plumages and pterylosis have been described in this species (Dwight 1900, Ridgway 1902, Bent 1942), particularly with reference to the prebasic molt (Selander and Giller 1960, Payne 1969, Meanley and Bond 1970), but our study is the first to examine the prealternate molt.

The presently accepted molting scheme for Red-winged Blackbirds is as follows: (1) Natal down is replaced by the juvenal plumage before fledging. (2) Birds enter the first prebasic molt 45 to 65 days after leaving the nest, and complete the molt 60 to 70 days later (Payne 1969). (3) The first basic plumage is purportedly retained through the following spring (Meanley and Bond 1970) and is replaced in the second prebasic molt, when the bird is approximately 14 months old. (4) This pattern is repeated at about 26 months of age in the third prebasic molt and subsequently every year thereafter.

Differences between the winter and spring aspects of the basic plumage, which are most apparent in subadult males, are believed to be caused by the wear of the tips of contour feathers (Meanley and Bond 1970).

We present evidence which indicates that this scenario is incomplete for members of the nominate race of Red-winged Blackbirds in southwestern Quebec.

METHODS

We collected Red-winged Blackbirds with mist-nets set within the largest known blackbird roost in Quebec (45°15′N, 73°59′W) in spring, 1980 and 1981. Individuals were killed, bagged and frozen for later analyses. Birds were aged and sexed using plumage characteristics (Meanley and Bond 1970). Following the terminology of the U.S. Fish and Wildlife Service Banding Office, we refer to individuals entering their first potential breeding season as second year (SY) birds, while all others are classified as after second year (ASY).

The 1980 sample was divided into early and late roosting periods on the basis of whether the roost was actively growing or declining (Greenwood and Weatherhead 1982) in order to ascertain the relative intensity of the prealternate molt from spring arrival through dispersal to the breeding territories. An additional sample of ASY males was collected on 7 April 1981.

Females were collected on territories during nest building, but before egg-laying in the second week of May 1979 and 1980, from *Typha* spp. marshes located within 5 km of the roost.

We estimated the percentages of developing feathers in each of the interscapular, mid-dorsal and pelvic regions of the dorsal tract, the sternal and abdominal regions of the ventral tract, the under tail coverts, the marginal coverts (epaulets), the crural tract, and the combined area of the malar and coronal regions of the capital tract, by using a fine jet of compressed air to separate the feathers and thereby permit visual inspection of their bases. A combined contour molt index (CCMI) was calculated by summing those percentages. The potential range of CCMI scores was 0–900.

The primaries, secondaries, and rectrices were examined for regenerating feathers.

RESULTS

Of the 174 birds examined, none were molting remiges, while only two were growing rectrices (both SY males). The intensity of the molt in eight of the contour feather regions was generally low and highly variable. Within regions, estimates of the percentages of developing feathers ranged from 0 to 70%. We found no molt in the marginal coverts (epaulets) of any bird examined.

With the exception of the ASY males, the molt intensity, as judged by the mean CCMI, declined through the roosting period (Table 1). Fourteen of the 16 ASY males collected in 1981 showed no body, remigial or rectricial molt, while the remaining two had only a few developing feathers in the malar region of the capital tract. The mean CCMI for this group was 0.94, the lowest of any of the cohorts examined in this study.

No molt was recorded from the 10 SY and 12 ASY females that were collected on their territories.

DISCUSSION

A partial prealternate molt within some of the contour feather tracts was present, occasionally extensively, in all of the age and sex cohorts of Red-winged Blackbirds examined in this study with the exception of the ASY males. While the molt cycle of this species is presently perceived as moving from one basic plumage to the next, mediated by a single, annual (prebasic) molt, we believe that the age- and sex-specific scheme presented in Table 2 is more appropriate.

Examination of hundreds of specimens of the nominate race, and some of the other northern races such as *arctolegus* and *fortis* by K. Parkes (pers. comm.), revealed no trace of a prealternate molt in adult males. However, immature males and females of unspecified age and geographical origin displayed such a molt, occasionally quite extensively.

Similarly, Miskimen (1980) noted that SY females captured in Ohio were molting body feathers, middle and

TABLE 1. Prealternate molt intensity[a] in early and late spring 1980.

	Age and sex			
	SY males	SY females	ASY males	ASY females
Number examined	52 (22)[b]	14 (5)	8 (7)	16 (9)
% actively molting	79 (64)	86 (80)	12 (14)	69 (77)
Mean CCMI	27.4 (17.5)	86.3 (45.0)	1.25 (3.75)	27.5 (11.1)
Maximum CCMI	130 (90)	120 (65)	10 (25)	100 (85)
Minimum CCMI	0 (0)	65 (0)	0 (0)	0 (0)

[a] Intensity is measured by a combined contour molt index (CCMI); see text for details.
[b] Early and late (in parentheses) samples.

TABLE 2. Molt schedules of the Red-winged Blackbird.

	Plumage name	Derived through
Females	Natal down	
	Juvenal plumage	Prejuvenal molt
	1st Basic plumage	1st Prebasic molt
	1st Alternate plumage	1st Prealternate molt
	2nd Basic plumage	2nd Prebasic molt
	2nd Alternate plumage	2nd Prealternate molt
	3rd Basic plumage	3rd Prebasic molt
	etc.	
Males	Natal down	
	Juvenal plumage	Prejuvenal molt
	1st Basic plumage	1st Prebasic molt
	1st Alternate plumage	1st Prealternate molt
	2nd Basic plumage	2nd Prebasic molt
	3rd Basic plumage	3rd Prebasic molt
	etc.	

lower secondary coverts from March through May, while ASY females molted just the middle and lower secondary coverts in May and June.

Age- and sex-specific molt patterns have been noted in two other icterid species, the Bronzed Cowbird (*Molothrus aeneus,* Friedmann 1929) and the Boat-tailed Grackle (*Quiscalus major,* Lowery 1938, Selander 1958), suggesting that this situation may not be restricted to the Red-winged Blackbird. However the molt in these species was largely restricted to the capital and cervical regions of the specimens that were examined.

Selander (1972) noted that energetic constraints may preclude two annual molts under certain ecological conditions, and that alternative schedules often occur in such situations. We suggest that the age- and sex-specific molting scheme of the Red-winged Blackbird might be interpreted as another compromise adaptation between the demands of intense sexual selection pressures and the environmental capacity to support seasonal plumage replacement.

The early spring arrival of ASY male Red-winged Blackbirds to roosts (Greenwood and Weatherhead 1982) and breeding territories (Allen 1914, Nero 1956, Orians 1961, Case and Hewitt 1967) has been well documented and related to intense selective pressures to acquire female-worthy territories. The particularly high energetic demands of territorial behavior before the arrival of the females is reflected in the disproportionately high weight loss of these males as compared to a contemporaneous sample of non-territorial males collected in a roost (Greenwood, Weatherhead and Titman, unpubl. data). We speculate that the additional energetic or specific nutritive demands of a partial prealternate molt, especially in the northern races of the Red-winged Blackbird that return to spring territories typified by unpredictable and potentially harsh environmental conditions, may be so prohibitive as to outweigh the advantages of replacing worn contour feathers. The temporal separation of the molt and breeding effort of the females might be taken as another indicator of the energetic incompatibility of the two activities. Also, the black plumage characteristics of the ASY male indicate a high melanin content, which makes the feathers denser and more resistant to wear (Lucas and Stettenheim 1972). Thus, these males may have less need to replace worn contour feathers than would females or SY males.

While speculative, we suggest that this hypothesis tenders a reasonable functional basis for the age- and sex-specific molting scheme of the Red-winged Blackbird.

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LITERATURE CITED

ALLEN, A. A. 1914. The Red-winged Blackbird: a study in the ecology of a cat-tail marsh. Proc. Linn. Soc. N.Y. 24–25:43–128.

BENT, A. C. 1942. Life histories of North American blackbirds, orioles and tanagers. Smithsonian Inst. U.S. Natl. Mus. Bull. 179.

CASE, N. A., AND H. HEWITT. 1967. Nesting and productivity of the Red-winged Blackbird in relation to habitat. Living Bird 2:7–20.

DWIGHT, J. 1900. The sequences of plumages and molts of the passerine birds of New York. Ann. N.Y. Acad. Sci. 13:73–360.

FRIEDMANN, H. 1929. The cowbirds: a study in the biology of social parasitism. Charles C Thomas Co., Springfield, IL.

GREENWOOD, H., AND P. J. WEATHERHEAD. 1982. Spring roosting dynamics of the Red-winged Blackbird: biological and management implications. Can. J. Zool. 60:750–753.

LOWERY, G. H. 1938. A new grackle of the *Cassidix mexicanus* group., Occas. Papers Mus. Zool. Louisiana State Univ. 1:1–11.

LUCAS, A. M., AND P. R. STETTENHEIM. 1972. Avian anatomy/Integument. Agric. Handbook no. 362, U.S. Dept. Agric., Washington, DC.

MEANLEY, B., AND G. M. BOND. 1970. Molts and plumages of the Red-winged Blackbird with particular reference to fall migration. Bird Banding 41:22–27.

MISKIMEN, M. 1980. Red-winged Blackbirds: age related epaulet color changes in females. Ohio J. Sci. 80:232–235.

NERO, R. W. 1956. A behavior study of the Red-winged Blackbird. I. Mating and nesting activities. Wilson Bull. 68:4–37.

ORIANS, G. H. 1961. The ecology of blackbird (*Agelaius*) social systems. Ecol. Monogr. 31:285–312.

PAYNE, R. B. 1969. Breeding seasons and reproductive biology of Tri-colored and Red-winged blackbirds. Univ. California Press, Berkeley, CA.

RIDGWAY, R. 1902. The birds of North and Middle America. Bull. U.S. Mus. Nat. Hist. 50, vol. 2.

SELANDER, R. K. 1958. Age determination and molt in the Boat-tailed Grackle. Condor 60:355–376.

SELANDER, R. K. 1972. Sexual selection and dimorphism in birds, p. 180–230. *In* B. Campbell [ed.], Sexual selection and the descent of man. Aldine Publ. Co., Chicago.

SELANDER, R. K., AND D. R. GILLER. 1960. First year plumages of the Brown-headed Cowbird and the Red-winged Blackbird. Condor 62:202–214.

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