Wilson Bull., 96(3), 1984, pp. 499–504

Molt in vagrant Black Scoters wintering in peninsular Florida.—The Black Scoter (*Melanitta nigra*) is a vagrant south along peninsular Florida, although it occurs regularly south to Jacksonville and St. Augustine on the Atlantic Coast (Bellrose, Ducks, Geese and Swans of North America, Wildlife Management Institute and Illinois Natural History Survey, Stackpole Books, Harrisburgh, Pennsylvania, 1976; Bancroft and Hoffman, in press, Fla. Field Nat.). An unusual influx of Black Scoters occurred during the winter of 1981–82, with birds recorded as far south as Fort Lauderdale on the Atlantic Coast and Naples on the Gulf Coast (Bancroft and Hoffman, in press). The bird collection of the University of South Florida (USF) received 15 Black Scoters (mostly immatures) during the course of the winter and spring.

Most of these birds were involved in molt of their head and body feathers, and their rectrices. Because the order of rectrix replacement seems not to be described adequately for any duck, we provide a description of the replacement of Juvenal with First Basic rectrices in these scoters. The pattern we found was complicated but fairly standardized, suggesting that the "irregular" replacement reported for other ducks (e.g., Weller, Wilson Bull. 69:5–38, 1957; Oring, Auk 85:335–380, 1968) deserves closer examination. We also describe the pattern of body molt for these individuals.

Methods.—All specimens examined were birds found sick on Florida beaches from November 1981 through May 1982. Fourteen specimens, all from Pinellas County beaches, were obtained from the Suncoast Seabird Sanctuary, a rehabilitation facility in Indian Shores, Pinellas Co. One specimen from Vero Beach, Indian River Co. on the Atlantic Coast, was delivered to USF by H. W. Kale II of the Florida Audubon Society. Where necessary, we refer to specimens by field catalog numbers of the preparators.

We follow Palmer (pp. 65–102 *in* Avian Biology, Vol. 2, Farner and King, eds., Academic Press, New York, New York, 1972) for terminology of molts and plumages. Palmer follows the Humphrey-Parkes (Auk 76:1–31, 1959) system of classifying molts and plumages, but presents a more detailed account of molt sequences in waterfowl. Names of feather tracts follow Lucas and Stettenheim (Avian Anatomy: Integument, Pt. 1, Agric. Handbook 362, Washington, D.C., 1972, Fig. 58, Figs. 88–94). Molt was recorded for six feather tracts from the head (frontal, coronal, loral, postauricular, malar, and submalar), two from the neck (dorsal cervical and ventral cervical), and eight from the body (pectorosternal, femoral, abdominal, humeral, interscapular, dorsal, pelvic, caudal). For active tracts we estimated the proportion of Juvenal feathers replaced. Wing tracts in scoters retain Juvenal feathers throughout the first winter (Palmer, Handbook of North American Birds, Vol. 3, Yale Univ. Press, New Haven, Connecticut, 1976), so are not considered further here.

Rectrix molt was easier to quantify than body molt. Except for the two November specimens, the Juvenal rectrices were extremely worn and easily distinguished from Basic rectrices. Black Scoters have 16 rectrices (Cramp et al., Handbook of Birds of Europe, the Middle East, and North Africa; the Birds of the Western Palearctic, Vol. 1, Ostrich to Ducks, Oxford Univ. Press, Oxford, England, 1977); we designated the rectrices on the left side L1 (central) through L8 (outer), and those on the right side, R1 through R8. We refer to pairs of rectrices, consisting of the equivalent feathers from the two sides, by their numbers. Because of extremely rapid rates of abrasive wear of the new Basic rectrices, the relative ages of these feathers could be determined after all had been replaced. We classified the Basic rectrices of the six birds in April and May with completed molt as worn (5) or fresh (6) to indicate relative ages of the feathers.

Ideally, body molt is recorded from live birds, fresh carcasses, flat skins (Humphrey and Clark, Condor 63:365–385, 1961), or during preparation of study skins (Dwight, Auk 31:

TABLE 1

RECTRIX MOLT OF BLACK SCOTERS OBTAINED IN FLORIDA BETWEEN NOVEMBER 1981 AND JUNE 1982

			Rectrices															
			Left								Right							
Bird	Sex	Date	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
Specimens retaining at least some Juvenal rectrices																		
GEW 5445	M	9 Nov.	1[a]	1	1	1	1	1	1	1	1	1	1	1	1	1	2[b]	1
GTB 143	F	12 Nov.	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
WH 198	F	20 Feb.	2	2	2	1	1	1	1	3[c]	3	1	1	1	1	2	1	2
EBJ 15	M	6 Mar.	4[d]	3	3	1	1	1	2	4	4	3	1	3	1	3	2	4
WH 195	M	24 Mar.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
WH 197	F	31 Mar.	4	4	4	1	1	1	4	4	4	4	1	1	1	1	4	4
GTB 123	M	1–7 Apr.	4	2	2	4	1	3	4	4	4	4	3	3	2	4	4	4
Specimens with Basic rectrices only																		
GTB 124	F	6–10 Apr.	5[e]	5	5	5	6[f]	6	5	5	5	5	6	6	5	5	5	5
GTB 127	F	14 Apr.	5	5	5	6	5	6	5	5	5	5	6	6	6	5	5	5
GTB 125	F	6–15 Apr.	5	6	6	6	6	6	6	5	5	6	6	6	6	6	5	2
GTB 126	F	16–17 Apr.	5	5	6	6	6	6	5	5	5	5	6	6	6	6	5	5
WH 196	F	21 Apr.	5	5	6	6	5	6	5	5	5	5	6	6	5	6	5	5
WH 194	F	1 May	5	5	5	6	6	3	5	5	5	5	6	6	5	6	6	5

[a] 1 = Juvenal rectrix.
[b] 2 = rectrix missing.
[c] 3 = Basic rectrix partially grown.
[d] 4 = Basic rectrix fully grown.
[e] 5 = Basic rectrix worn.
[f] 6 = Basic rectrix fresh.

293–308, 1914). On dried study skins active papillae and partially grown feathers often are hidden under the fully grown feathers or under the wings and legs. Molt was recorded during preparation for six of the scoter study skins. We examined these specimens for sheathed and partially grown feathers, and for the characteristic blackish appearance of active feather papillae. Also, in most tracts replacement feathers could be distinguished from Juvenal feathers by differences in color and degree of wear. The capital and cervical tracts of juvenile females provided the greatest difficulties.

Of the other nine birds received, eight were prepared as study skins and one as a skeleton, before the significance of the molt patterns became evident. Before recording molt from the eight study skins, we restudied the six specimens on which molt had been previously recorded to determine how well molt could be detected and to cross-calibrate our determination of molt intensity. The primary external indications of molt were presence of sheaths on feathers, abnormally short feathers (incompletely grown), loose sheathed feathers in tracts, and loose detritus of feather sheaths among feathers. The last two indicators tended to be lost during examination.

We were able to detect molt reliably on the study skins for all head and neck tracts, and for body tracts except dorsal, pelvic, crural, and ventral portion of the caudal (under tail coverts). These tracts generally were hidden beneath the wings or feet. Molt was then recorded

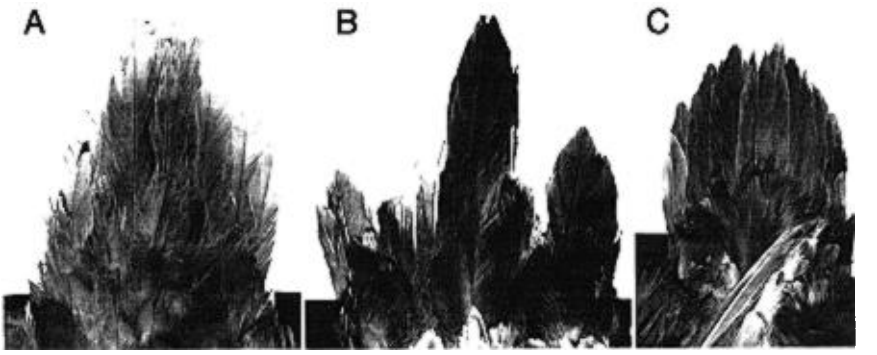

FIG. 1. Tails of Black Scoter specimens, dorsal view. A. GTB 143 from 12 November. All rectrices are Juvenal. B. WH 197 from 31 March. Seven Juvenal rectrices remain as bare shafts. The other nine are replaced by fully grown first-basic rectrices. C. GTB 125 from 6–15 April. All rectrices are Basic. The innermost and outermost are moderately worn and appear paler.

for the 14 remaining tracts on seven of the eight study skins (the eighth was an adult male which was not in molt). Molt data were not recorded on the immature male prepared as a skeleton.

Patterns of rectrix molt.—The Juvenal rectrices have notched tips (Palmer 1976:310) and have a narrower rachis (M. Weller, pers. comm.), whereas subsequent feathers taper to pointed tips. However, on our specimens the Juvenal rectrices generally were abraded so severely that notches were not evident.

The sequence of rectrix replacement was complicated and variable (Table 1). The innermost pair and outermost two or three pairs were replaced first and more or less simultaneously. On some specimens, pair 2 was replaced at about the same time. The remaining pairs 2 or 3 through 5 or 6, were dropped after the innermost and outermost pairs were completely grown. The order among pairs 3–5 was highly variable, but often pair 3 was replaced last.

On both November specimens the rectrices present were Juvenal and moderately worn (Fig. 1A). These specimens still show the notched tips typical of Juvenal rectrices. Four specimens from February–April were in intermediate stages of rectrix molt. One (WH 197; Fig. 1B) had seven Juvenal and nine fully grown Basic rectrices, and apparently was not in active tail molt at the time of death. Note that the Juvenal rectrices are extremely worn, and only stubs of the shaft remain. Note also the pointed tips of the Basic rectrices.

The females from April and May apparently had completed tail replacement, although one (WH 194) was growing rectrix L3. Another (GTB 125) lacked R8, but we suspect accidental loss of this Basic feather. The least worn (hence youngest) rectrices were in pairs 3–5, and pairs 1 and 8 were always worn (Fig. 1C). The patterns of wear on these birds suggest (as does WH 197) a two-stage replacement of the tail. Pairs 1 and 8 are replaced early and nearly synchronously, usually along with pairs 2 and 7 and sometimes feathers from pairs 4 and 6. The remaining rectrices are replaced rather quickly but apparently after a hiatus in molt.

Patterns of head and body molt.—Like Palmer (1976:309–311), we were unable to separate satisfactorily the First Basic and First Alternate feather generations on the head and body,

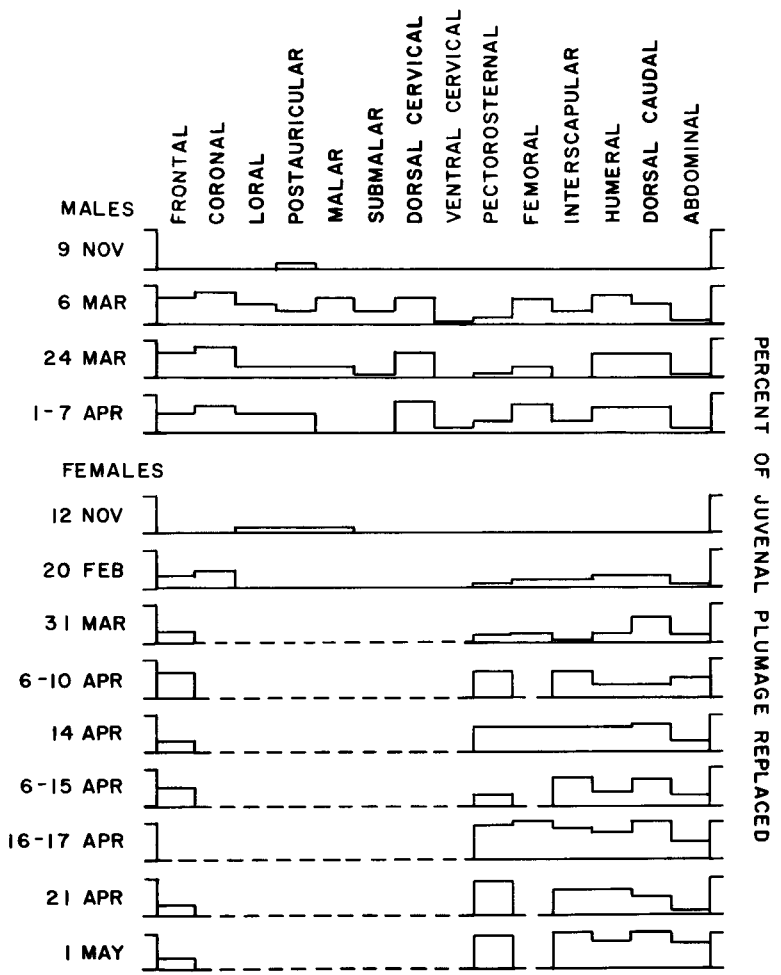

FIG. 2. The extent of plumage replacement for 14 head and body tracts. The bars indicate percentage (0–100) of Juvenal plumage in each tract replaced by Basic and Alternate feathers. Dotted lines indicate tracts that could not be scored on particular specimens.

in part because we lack specimens from December and January. Palmer also reported that Black Scoters have a First Basic plumage of "all feathering except wing" attained usually in fall, and a First Alternate plumage including all feathering "except wing and tail" acquired in late autumn. The timing of molt in Florida specimens was later, perhaps abnormal. Even so, a description of the patterns of feather replacement seems useful in further understanding the sequence of feather replacement in scoters and in understanding factors that influence the timing of molt.

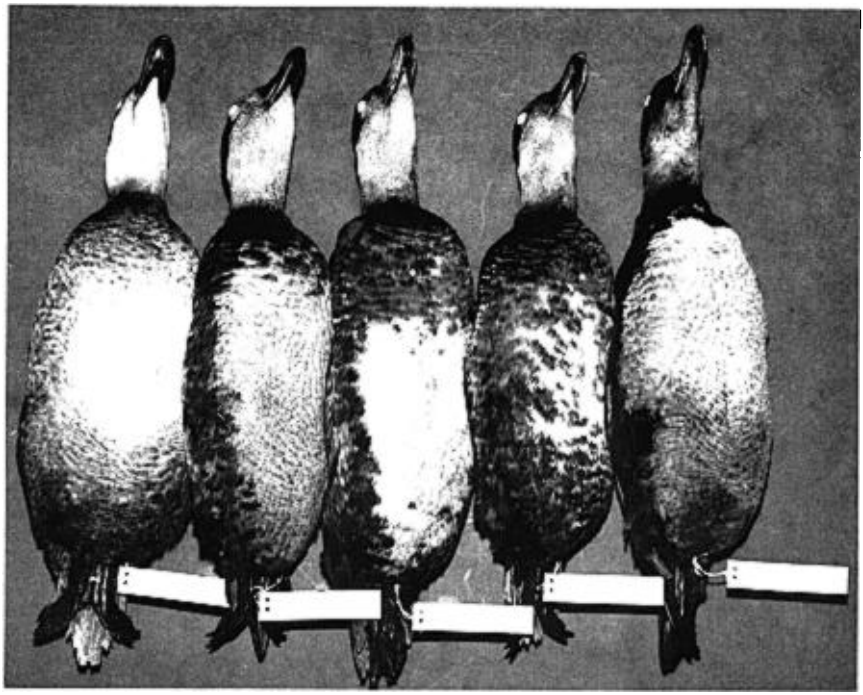

FIG. 3. The course of feather replacement in the ventral tracts in female Black Scoters. The right most bird is a male (EBJ 15, 6 March) for comparison. Females, from left: GTB 143, 12 Nov.; WH 197, 31 March; GTB 124, 6–10 April; WH 194, 1 May.

Fig. 2 illustrates the percentage of each tract containing new feathers (Basic or Alternate) rather than Juvenal feathers. Because of color differences, replaced feathers were quite apparent on males for all tracts considered. On females, fully grown replacement feathers could not be distinguished from Juvenal feathers on most of the head and neck tracts. The differences in color of the Juvenal feathers in the pectorosternal tract result from differential wear and fading.

Molt began in the post-auricular and loral tracts (November specimens) and then spread over the head and on to the body. Dorsally, the humeral and femoral tracts were activated well before the interscapular tract, at least in males. Within the pectorosternal tract the pattern of feather replacement was quite consistent (Fig. 3). Molt appears at the anteromedial margins of the tract, then spreads back along the lateral margins. Feather replacement moves in a wave posteriorly and medially. The abdominal tract lags behind most other body tracts.

In Fig. 2, the relationship between date and stage of molt is much weaker than expected. The three males from March and April died at essentially the same stage of molt. Among females, little progress is evident in molt of the frontal, humeral, or dorsal-caudal tracts between 20 February and 1 May. The individual from 21 April (WH 196) in particular shows little progress beyond the stage shown in February.

We suspect that these birds, attempting to winter south of their normal range, were

physiologically stressed and so delayed molt (Bancroft and Hoffman, in press). When they did begin molt the additional stress probably contributed to their death.

Discussion.—The pattern of rectrix molt we describe in Black Scoters is fairly complicated, and enough variability is present even in our limited sample, that the pattern could have been dismissed as "irregular" (e.g., Weller 1957, Oring 1968). Our data suggest the order of rectrix replacement in ducks in general deserves closer examination.

The timing of the first Prebasic and First Prealternate molts in the Black Scoter is the subject of some controversy. Palmer (1976) indicates that Black Scoters attain their First Basic and First Alternate plumage in autumn, but Cramp et al. (1977) report that immatures in Europe are molting from September through May with a very incomplete post-juvenal (=First Prebasic) molt in fall followed by a protracted prenuptial (=First Prealternate) molt. Apparently our understanding of scoter molt has advanced little during the seven decades since Dwight (1914) first discussed the subject! Dwight stressed the great individual variation in timing of molt in his specimens but because they apparently were collected in various locations over a number of years, the meaning of this variation is unclear.

Our specimens seem to fit better the molt patterns described by Dwight (1914) and Cramp et al. (1977) than those described by Palmer (1976), but our sample may be biased. Clarification of this issue will likely require adequate series of healthy Black Scoters collected within the normal winter range.

Acknowledgments.—L. A. Hanners, E. B. Jones, K. J. McGowan, S. R. Patton, and G. E. Woolfenden read and improved an early version of the manuscript. A. M. Bancroft, E. B. Jones, and G. E. Woolfenden prepared some of the study skins. K. C. Parkes and M. W. Weller made numerous constructive comments on a later version of this paper. We thank all the above people.—WAYNE HOFFMAN AND G. THOMAS BANCROFT, *Dept. Biology, Univ. South Florida, Tampa, Florida 33620.* *Accepted 14 Feb. 1984.*

GEORGE MIKSCH SUTTON AWARD FOR ORNITHOLOGICAL ART

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