Condor, 80:102–103

WING MOLT IN FEMALE RUDDY DUCKS

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While studying the reproductive biology and behavior of Ruddy Ducks (*Oxyura jamaicensis*) at Farmington Bay Waterfowl Management Area (W.M.A.), Farmington, Utah, I collected 19 female Ruddy Ducks during April–May 1973, one of which was in a flightless or "flapper" condition when collected. This bird was later identified by cloacal and internal examination as a yearling (immature) hen. Flightless Ruddy Ducks are normally encountered at Farmington Bay W.M.A. only during the fall prebasic molt in August and September. During a previous study of Ruddy Duck behavior at Farmington Bay W.M.A. (Joyner 1969), I observed two other flightless Ruddy Ducks (November 1967 and February 1968). Unfortunately, neither bird was collected.

Humphrey and Clark (1964) and Siegfried (1973) suggested that Ruddy Ducks of both sexes probably undergo two molts annually, the fall prebasic molt and a mid-winter prealternate molt. Although both molts are considered to be complete by Palmer (1976:501), both Humphrey and Clark (1964:180) and Palmer (1976:505) have noted the paucity of sightings and collections which verify the occurrence of flightless (complete molt) Ruddy Ducks on their wintering grounds. Therefore, the extent of the molt remains unclear.

The molting female that I collected on 26 April 1973 was judged to be in poor physical condition from its protruding cervical vertebrae and sternal keel, and by its low body weight (394.5 g, female no. 1, Table 1) compared to the weights of 18 other hens collected during the same period. This hen weighed 14% less than the next lightest hen (456.5 g), 37% lighter than the heaviest hen (629.4 g), and 27% lighter than the mean weight of the other 18 hens ($\bar{x} = 539.9$ g). Heavier hens were generally found to be in a more advanced reproductive state as determined by ovarian and oviduct development than were known-aged yearling hens; therefore, it was not surprising to find that the flightless hen showed slight ovarian and oviductal development. The female appeared to be undergoing an intensive prealternate (?) molt. The primary and secondary feathers were sheathed and averaged 15–30 mm in length and the tail consisted of five highly worn and faded rectrices plus four new rectrices averaging 30–35 mm in length. The extent

TABLE 1. Weights and bursal indices of 19 female Ruddy Ducks collected during April–May 1973.

No.	Weight (g)	Bursal[a] index	Max. oviduct width (mm)	Length largest ovum (mm)	Occluding[b] membrane	Date collected
1[c]	394.5	109.1	1.8	3.0	present	26/4/73
2	456.5	0.0	8.6			13/4/73
3[c]	464.5	131.7	2.5	3.5	present	17/4/73
4	467.0	0.0	12.4	5.3		3/5/73
5	476.8	0.0	10.2	4.6		26/4/73
6	500.0	0.0	9.5	3.5		17/4/73
7	514.9	0.0	10.9	4.8		17/4/73
8[c]	517.0	0.0	6.8	4.7		28/4/73
9[c]	521.6	87.2	4.3	3.7	present	26/4/73
10	524.2	0.0	11.4	5.6		14/4/73
11	537.6	0.0	10.1	5.3		14/4/73
12	539.5	0.0	11.7	6.8		18/4/73
13	544.6	0.0	11.4	5.7		17/4/73
14	580.0	0.0	10.2	4.9		26/4/73
15	583.5	0.0	16.7	7.1		17/4/73
16	610.0	0.0	15.4	7.7		14/4/73
17	625.0	0.0	11.7	6.9		26/4/73
18	625.2	0.0	14.4	8.3		17/4/73
19	629.4	0.0	16.8	12.0		26/4/73

[a] From Anderson et al. (1969).
[b] Membrane absent unless otherwise indicated.
[c] Yearling hen.

of the molt was not evaluated other than to identify the presence of basic I and alternate plumage.

A post-mortem examination was not conducted on the molting bird, so I can only speculate as to the cause and identity of the apparently abnormal molt. Two alternatives seem plausible. (1) The hen was undergoing a delayed prealternate molt; the delay resulting from physiological stress due to (a) overwintering in a harsh environment, (b) heavy parasite infestation, or (c) disease. All three factors may influence the timing of the molt in waterfowl (Billard and Humphrey 1972). (2) The molt was a premature prebasic II molt induced by physiological stress resulting from a, b, or c above. As the hen retained much of the basic I plumage, I suggest that the abnormal molt was a delayed prealternate molt, thus conforming to the complete mid-winter molt hypothesis. The bird's poor physical condition and, subsequently, the delay in its presumed prealternate molt could have been induced by one or several of the factors listed by Billard and Humphrey (1972). Ruddy Ducks overwintering at Farmington Bay W.M.A. (winter densities normally low, 0–50 birds) face a relatively harsh winter climate and a scarcity of food due to the lack of open water (Joyner 1969). This alone could have caused the observed low body weight of the hen and, in turn, may have delayed the prealternate molt. Ruddy Duck drakes overwintering at Farmington Bay W.M.A. in 1967–68 retained the basic plumage through mid-March. Spring migrants arriving at Farmington Bay W.M.A. in mid-March were found to be in the nuptial or alternate plumage (Joyner 1969:33).

Four of the Ruddy Duck hens collected retained some basic I plumage (identified as yearling females in Table 1) as described by Palmer (1976: 505–506) and were identifiable as yearlings by plumage alone. Three of the 4 hens retained a bursal remnant and occluding membrane. We considered the remaining 15 hens to be in alternate plumage. They lacked both a bursal remnant and occluding membrane, and could not be aged. Of the 15 hens, 5 showed an incomplete tail molt.

The verification of a complete mid-winter molt in the Ruddy Duck will obviously have to be based on authenticated sightings and/or collection of flightless Ruddy Ducks on their wintering grounds. My earlier sightings (November 1967, February 1968) lend support to the complete mid-winter molt hypothesis, whereas this sighting clouds an already opaque issue.

Financial support was provided through research grants from the Frank M. Chapman Memorial Fund of the American Museum of Natural History, the Society of Sigma Xi, and the Josselyn Van Tyne Memorial Fund of the American Ornithologists' Union. I thank E. Bailey, V. Thomas, and A. L. A. Middleton for critically reviewing the manuscript.

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Condor, 80:103–104

POSSIBLE INFLUENCE OF FOOD ON EGG-LAYING AND CLUTCH SIZE IN THE BLACK-BILLED CUCKOO

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Nolan and Thompson (1975) discussed the apparent proximal influence of food supply on clutch size and timing of breeding in the Yellow-billed (*Coccyzus americanus*) and Black-billed (*C. erythropthalmus*) cuckoos. Observations I made in 1976 on nesting Black-billed Cuckoos on the forested ridge which separates Lake Manitoba and the Delta Marsh, Manitoba, provide additional evidence for such control.

On 5 June 1976 I found two Black-billed Cuckoo nests, both containing five eggs. Nest I was 1.7 m above the ground in the crotch of a bent Manitoba maple (*Acer negundo*). Nest II was 3.2 m up on a horizontal branch of a Manitoba maple. On 8 June, nest I contained three young and two eggs, but by 12 June the fourth young and an unhatched egg were on the ground. Nest II had fallen to the ground by 11 June. Considering the incubation period of 10–11 days in this species (Spencer 1943), these clutches probably were started on 20 May or even earlier. The large clutches and their early initiation coincided with an infestation of the forest tent caterpillar (*Malacosoma disstria* Hbn.) on the ridge. The larvae were first detected in insect sampling of tree foliage on 13 May 1976, were abundant by 17 May, peaked by 6 June, and had pupated by 6 July (see Busby 1978). Hence, they had been available as food and as a possible stimulus to Black-billed Cuckoo nesting since mid-May.

Black-billed Cuckoos consume forest tent cater-