BREEDING BIOLOGY OF YEAR-OLD AND OLDER FEMALE RED-WINGED AND YELLOW-HEADED BLACKBIRDS

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Age of male Red-winged (*Agelaius phoeniceus*) and Yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) is known to influence their breeding behavior (Orians 1961, Willson 1966), but little effort has been devoted to the comparative breeding biology between age classes of females. Both species are polygynous (Verner and Willson 1969) ; how age might affect the females within this system, however, is unknown. The objective of this study was to compare data on selected parameters of breeding between yearling and older adult females of both species.

Field work was conducted from 1972–1974 on Dewey's Pasture and Dan Green Slough, 2 glacial marshes in northwestern Iowa that have been described by Bennett (1938).

METHODS

Red-wings were aged by using the methods presented by Nero (1954, 1961) and Meanley and Bond (1970) ; yearling females have a pink or salmon epaulet and light pink chin and face, while older females show a more crimson epaulet and dark pink chin and face. To verify this aging technique, I initiated a banding program in 1972. Eighteen females were recaptured in years after their banding, 7 of which were yearlings. Both yearlings and older adults showed patterns similar to those described.

No similar aging technique exists for Yellow-heads, but Bent (1958:112) described the first-year female as "much like the adults, but colors are more veiled." By examining 21 returning marked females (11 yearlings and 10 older adults), I was able to establish that yearlings have lighter breasts, throats, and facial regions than older adults.

A major advantage of the aging techniques for both species is that an observer can readily distinguish ages in the field.

Observations on the nesting activities of both species began in late May of each year. Most females were captured, banded, and classed as either year-old or older. The few females not trapped were aged in the field by the methods described. After incubation had begun, nests were checked only every 2 or 3 days to minimize disturbance; the nestlings used for growth rate studies, however, were checked daily.

The date the first egg was laid was used as an indicator of nesting chronology. If not known precisely, this date was estimated, considering 12 days to be an average incubation period for both species (Nero 1961, Willson 1966). Only first nests were used for analysis. Statistical comparisons were made with Student's t-test (Steel and Torrie 1960).

RESULTS

Nesting chronology, clutch size, and egg size.—Yearling Red-wing and Yellow-head females began nesting an average of 15 and 16 days later, respec-

TABLE 1

DATES OF NEST INITIATION (1972–1974)

	N	Mean ± 2 S.E. (days)	Range
RW yearling[1]	67	8 June ± 5.2	25 May–18 June
RW older adult	41	25 May ± 5.7	19 May– 5 June
YH yearling	71	7 June ± 4.9	22 May–15 June
YH older adult	49	23 May ± 5.4	18 May–29 May

[1] RW = Red-winged Blackbird, YH = Yellow-headed Blackbird.

tively, than older adults (Table 1). The yearlings also showed a greater range in nest initiation dates. The differences between nest initiation dates of yearlings and older adults were highly significant for both species ($P < 0.01$).

Means and frequencies of clutch sizes observed are given in Table 2. Yearling females of both species had significantly smaller clutches than older females ($P < 0.01$). The mean values are similar to those of other studies. The average clutch size was 3.1 for 504 Yellow-head nests in Iowa (Ammann 1938); 3.7 for 118 nests in Utah (Fautin 1941); and 3.6 for 371 nests in Washington (Willson 1966). For the Red-wing, average clutch sizes reported were 3.5 for 926 nests in New York (Case and Hewitt 1963); 3.4 for 243 nests in Oklahoma (Goddard and Board 1967); and 4.2 for 13 nests in Missouri (Crawford 1970).

Yearling females of both species laid significantly shorter eggs than older females ($P < 0.01$) (Table 3). Egg width did not differ significantly for either species ($P > 0.05$). The mean values for both length and width are similar to those found in other studies (Bendire 1895, Reed 1965).

TABLE 2

CLUTCH SIZE AND FLEDGING SUCCESS (1972–1974)

	Clutch Size					Mean Fledged Young Per Nest
	2	3	4	5	Mean	
RW yearling	4[1]	37	34		3.40	0.73 (71)[2]
RW older adult		1	40	6	4.11	1.63 (40)
RW all ages	4	38	74	6	3.67	1.05 (111)
YH yearling	8	49	31		3.30	0.87 (83)
YH older adult			51	6	4.11	1.81 (52)
YH all ages	8	49	82	6	3.62	1.30 (135)

[1] Number of clutches.
[2] Sample size in parentheses.

TABLE 3
EGG SIZES (1972–1974)

	N	Mean (mm) Length	Width
RW yearling	165	22.1	17.0
RW older adult	145	26.8	18.2
YH yearling	181	23.2	17.3
YH older adult	157	27.1	18.9

Nestling growth and fledging success.—At hatching, nestlings of yearling females averaged only slightly smaller than those of older adults; weights at 10 days of age, however, were significantly lower for nestlings reared by yearling females ($P < 0.01$) (Table 4). Male nestlings of both species have been reported to grow faster and attain greater weights at fledging than females of the same age (Ammann 1938, Williams 1940, Holcomb and Twiest 1971). I assumed in this study that the sex ratio was constant throughout the nestling period and that differences in sex-specific weights would have no net effect.

Fledging success is given in Table 2. Yearling females of both species fledged significantly fewer young than did older females ($P < 0.01$). The fledging successes reported in this study are similar to those reported elsewhere (Wood 1938, Willson 1966, Goddard and Board 1967).

Pairing status of age classes.—Data on pairing status and its relationship to age were collected on 30 Red-wing and 20 Yellow-head territories during

TABLE 4
GROWTH IN WEIGHT (G) OF NESTLINGS (1972–1974)

Age (days)	Red-wing yearling	Red-wing older adult	Yellow-head yearling	Yellow-head older adult
1	3.6 (65)[1]	4.0 (44)	3.9 (66)	4.1 (49)
2	5.8 (48)	6.1 (37)	6.8 (50)	7.0 (40)
3	8.8 (47)	9.5 (30)	10.4 (49)	10.8 (36)
4	12.7 (39)	13.7 (27)	16.5 (43)	16.8 (35)
5	16.6 (36)	18.9 (23)	22.0 (40)	22.5 (29)
6	21.1 (28)	24.2 (22)	28.7 (33)	29.9 (24)
7	25.9 (19)	27.3 (20)	33.1 (24)	35.8 (19)
8	28.3 (15)	31.6 (16)	37.3 (16)	40.7 (17)
9	30.4 (11)	34.3 (13)	40.5 (13)	45.1 (15)
10	32.1 (10)	37.4 (12)	43.7 (10)	49.3 (11)

[1] Sample size in parentheses.

TABLE 5
MEAN CLUTCH SIZE AND FLEDGING SUCCESS IN RELATION TO PAIRING STATUS (1973–1974)

	Primary Female			Secondary Female		
	N	CS[1]	FS[1]	N	CS	FS
RW yearling	6	4.0	1.2	29	2.9	0.6
RW older adult	24	4.2	1.8	11	4.1	1.3
YH yearling	7	4.0	2.0	17	2.8	0.8
YH older adult	13	4.1	2.0	4	4.0	1.2

[1] CS = clutch size, FS = fledging success.

1973–74. Herein, I use the terminology of Martin (1974); the first female to nest in a male's territory is referred to as the primary female, and all those nesting subsequently are termed secondary females.

Table 5 presents data for females where pairing status was determined. For the Red-wing, most primary females were older adults. Some older adults were secondary females, but in all such instances, the primary female was also an older adult. Only 6 yearlings were primary females, 4 of which mated monogamously, and the other 2 mated polygynously where the secondary females were also yearlings. In no instance was a yearling female the primary mate and an older female secondary within the same territory.

A similar situation existed for the Yellow-head (Table 5). All yearling primary females mated monogamously, and all older adult secondary females were secondary only to other older adults.

Further evidence to suggest that age is an important factor influencing pairing status was gained by examining data from returning females of known age (Table 6). In most instances, females were secondary as yearlings and primary when 2 years old; 2 females, however, were secondary both as yearlings and as 2-year-old birds, and 1 female was primary when a yearling as well as when she was 2 years old.

To determine if differences in breeding biology existed in relation to pairing status, data were compared between yearling and older females of both species (Table 5). Older adult primary females did not show significantly larger clutches than older adult secondary females ($P > 0.05$), but primary yearling females of both species laid significantly larger clutches than did secondary yearling females ($P < 0.01$). Trends similar to these also were found in the clutch sizes of known-age females (Table 6). Yearling females fledged significantly ($P < 0.01$) fewer young than did older adults for all pairing situations, except for primary Yellow-heads (Table 5). Yearling and older adult primary females of both species fledged significantly more young than did secondary

TABLE 6

PAIRING STATUS AND CLUTCH SIZE OF RETURNING KNOWN-AGE FEMALES (1973–1974)[1]

Species	Female No.	Age	
		Yearling	2 years old
Red-wing	DP74	II° (3)	I° (4)
	DP97	II° (3)	I° (4)
	DP189	II° (2)	II° (3)
	DP191	II° (4)	I° (4)
Yellow-head	DP67	II° (3)	I° (5)
	DP96	II° (3)	I° (4)
	DP157	II° (3)	II° (3)
	DP181	I° (4)	I° (5)
	DP192	II° (3)	I° (4)
	DP197	II° (3)	I° (4)

[1] I° = primary female, II° = secondary female, number in parentheses is clutch size.

females ($P < 0.01$). Egg size within age groups was not influenced by pairing status. Sample sizes were inadequate to analyze differences in nesting chronology or fledgling weight between primary and secondary females.

DISCUSSION

Lighter-colored females have been noted several times in breeding populations of both species (Nero 1954, Bent 1958, Strosnider 1960), but little comment has been made regarding breeding success of these females. Data presented in this paper suggest that these females are yearlings and that they contribute less to total population production than older females.

Why yearling females breed later than older adults is unclear, but apparently Red-wing yearling females migrate later in the spring than older females (Allen 1914, Nero 1956a). Also, females of both species actively defend their sub-territories against trespass by other females (Nero 1956b, Willson 1966). Possibly one or both of these factors may act to delay breeding by yearling females.

Goddard and Board (1967) noted that early Red-wing nests had larger clutches, were more successful, and fledged more young than later nests, but no indications were given as to causative factors involved. Holm (1973) stated that late arriving females and some early arriving females may be forced to occupy territories in poorer habitats. No data were collected on territory quality in this study, but it is possible that late arriving females (apparently yearlings) are forced to occupy sub-optimum territories and, thus, produce smaller clutches and fewer young.

In a study of the adaptations for polygynous breeding in Bobolinks (*Dolichonyx oryzivorus*), Martin (1974) found that yearling females laid smaller clutches than older females, and primary females received more assistance in nestling care by the male, laid larger clutches, and fledged more young than did secondary females. He hypothesized that primary females laid larger clutches than secondary females mainly because males feed nestlings of primary females more often than they do of secondary females. Yellow-head males are known to feed young in primary nests more often than in secondary nests (Willson 1966). Data from other studies suggest that Red-wing males do not feed their young (Nero 1956a, Holm 1973), but some exceptions are noted (Bent 1958, Case and Hewitt 1963). Why this difference exists is unknown.

Why older adult females did not show a significant difference in clutch size relative to pairing status is not clear. Possibly older adult females, being more experienced in nestling care, would be able to raise more young without help from a male than would yearling secondary females.

Data presented here show that age has a pronounced effect on the breeding biology of Red-wings and Yellow-heads. Although a few studies of other species (e.g. Leinonen 1973, Koskimies 1957) indicate that age has little or no effect on some parameters of breeding, I believe that most species will show age-related differences worthy of study. Other studies (e.g. Laskey 1943, Snow 1958, Lack 1966, Crawford 1974, 1975a, 1975b) have discussed other ways in which age may influence reproduction in birds. Further studies should be conducted so that a more complete understanding of reproduction in relation to age may be attained.

SUMMARY

The relationships between age and breeding biology of female Red-winged and Yellow-headed blackbirds were studied in northwestern Iowa during 1972–1974. Yearling females of both species began nesting later, laid shorter eggs, and fledged fewer and slightly smaller young than did older females. Primary (first-nesting) females were mostly older adults while yearlings were typically of secondary status. Yearling primary females laid larger clutches than did yearling secondary females, but both yearling and older adult primary females fledged more young than did secondary females of the same age. Possible factors affecting delayed breeding and subsequent reduced production of yearlings are discussed.

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