Nesting Ecology of The Red-Winged Blackbird in North Central Minnesota

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ABSTRACT—Reproductive success of a Red-winged Blackbird population nesting in marsh-like habitat in north central Minnesota was estimated. Territorial defense by males began in late April, and nest initiation occurred from mid-May through about mid-July. Nest-starts appeared to be divided into two categories: initial attempts which occurred in late May with a high degree of synchrony, and renesting attempts which occurred from about June 4-July 8. The nesting season lasted only about two months. A minimum of 20 percent of marked females renested on the study area, and others may have renested elsewhere. Three of the six females that renested switched male territories, moving as far as 230 m. An average of 2.6 young were fledged per male territory. A shortage of water adversely affected nesting habitat and probably lowered reproductive success.

Red-winged Blackbirds (*Agelaius phoeniceus)* have a significant economic impact upon the growing industry of wild rice *(Zizania aquatica)* cultivation (about 5,000 ha) in northern Minnesota (Moulton 1979). Red-wings nest in the emergent vegetation that borders the peripheral drainage ditches of the wild rice paddies. Wild rice is subject to blackbird damage from the time it begins to ripen until harvest, a period of about one month (August).

The objectives of this study were to determine the size, distribution, and reproductive success of a breeding population of Red-winged Blackbirds on typical wild rice paddies.

The study was conducted from late April to early August of 1977 on seven commercial wild rice paddies (total area 53.2ha) located 185 km north of Minneapolis in Aitkin, Minnesota. The paddies had been constructed in 1973 on peat soil of a former marsh. Dominant plant species bordering the drainage ditches were broad-leaf cattail (*Typha latifolia)* and narrow-leaf cattail (*T. angustifolia)*, sedges *(Carex spp.)*, bulrushes *(Scirpus spp.)*. various grasses (Gramineae), and some water plantain (*Alisma* spp.) and arrow-head (*Sagittaria* spp.). Blackbird nesting on the paddies was largely restricted to the linear habitat along the 9,566 m of ditches associated with these paddies.

Nest and territory sites were mapped on an enlarged aerial photograph of the paddies. Nest searching begain in early May and continued through July; active nests (one or more eggs or nestlings) were checked daily. Some nests not aged directly during laying were aged by backdating assuming that: 1) one egg was laid per day, 2) the incubation period was 12 days, and 3) the fledging period was ten days.

Prior to nesting, some birds were captured in mist nets and in a large, walk-in decoy trap baited with oats and live blackbirds. Territorial males were captured in wire traps that used a live, adult male as a decoy (Bray et al. 1975). Nesting females (with nestlings) were captured by placing small pieces of mist net around their nests. Each bird was marked with a band on one leg and a numbered, plasticized-nylon streamer secured around the tarsus with an aluminum grommet (Arnold and Coon 1971. DeHaven 1975), on the other leg. Birds were classed as either second-year (SY) or after-second-year (ASY) on the basis of plumage. Females were aged by color of marginal wing coverts (Payne 1969:57).

Nesting chronology

A total of 182 nests was located and marked. Aging was possible for 96 of 154 active nests. The date the first egg was laid and the fledging date for each aged nest is given in Figure 1. The first egg was laid on May 17 and the last young fledged on July 16, a nesting season of only 61 days. The median dates forest starts and fledging were May 24 and June 18, respectively. Nesting attempts seemed to consist of a period of fairly synchronous initial attempts from May 17-June 3, and renesting attempts from June 6-July 8 (Figure 1). Heavy rainfall on the last three days of May might have delayed nest initiation. The rain broke a severe drought which had caused a water shortage on the paddies. Because water was limited, all seven paddies were not flooded simultaneously. Nesting habitat was affected by the sequence of flooding (pumping) of the paddies. The paddy flooded earliest (April) supported 16 active nests on 1,163 m of ditch with a median nesting date of May 20. The paddy supported 1 nest/72 m of ditch and fledged 1 young/53 m of ditch. The paddy flooded last (June) supported only five active nests or 1,378 m of ditch with a median nesting date of June 24. That paddy supported only 1 nest/278 m of ditch and fledged 1 young/455 m of ditch. For all seven paddies, 9,566 m of ditch supported 132 active nests (1 nest/ 72 m and 1 young fledged/70 m) with a median nesting date of May 24.

Reproductive success

Of 182 nests built on the study area, 48 (26 percent) fledged young. Thirty-one nests (17 percent) were abandoned. 17 without eggs, five with eggs, and nine with nestlings. Eight of the nine nests abandoned with nestlings resulted from trapping females on their nests. Ninety-nine nests (54.4 percent) were depredated, 11 without eggs, 67 with eggs, and 21 with nestlings. Four nests (2.2 percent), one with eggs and three with nestlings, were flooded by rising water due to pumping.

Table 1 summarized causes of mortality for 154 active nests, 96 of which were aged. The distinction between aged and unaged nests is necessary because estimates of egg and nestling mortality for aged nests do not include nests lost before they could be aged (Mayfield 1961, Caccamise 1976). Therefore. mortality estimates for aged nests could underestimate actual mortality, but no serious bias was apparent. About 80 percent of the total egg mortality, and more than 50 percent of all nestling mortality, was due to predation.

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Table 1. Causes of egg and nestling mortality for 154 active Red-winged Blackbird nests (96 of known age).

	Eggs				Nestlings			
	Aged Nests		All Nests		Aged Nests		All Nests	
	No.	%	No.	%	No.	%	No.	%
Unhatched	13	10.8	15	6.3	-	-	-	-
Abandoned	4	3.3	16	6.7	28[a]	26.2	28	21.7
Predation	95	79.2	194	81.2	50	46.7	68	52.7
Nest failure	3	2.5	3	1.3	0	0	0	0
Dead in nest	-	-	-	-	4	3.7	4	3.1
Flooded	0	0	2	0.8	8	7.5	11	8.5
Disappearance	5	4.2	9	3.8	17	15.9	18	13.9
Total	120		239		107		129	

[a]Twenty-six nestlings abandoned after the females were captured on their nests.

In this habitat, nests with nestlings appeared somewhat less susceptible to predation than were nests with eggs. Nests that survived to hatching probably were those that were most difficult for predators to reach because of rising water levels. The primary predator was the raccoon (*Procyon lotor)*, but other potential predators included mink (*Mustela vison)*, skunks (*Mephitis mephitis)*, river otter *(Lutra canadensis)*, grackles *(Quiscalus quiscula)* and garter snakes *(Thamnophis s. sirtalis)*.

Data on clutch size and reproductive success of 134 nests with completed clutches are shown in Table 2. The average clutch size was 3.7 eggs, the mode was four eggs. A total of 137 young was fledged from 48 of 154 (31.2 percent) active nests. The fledging rate observed on 45 defined male territories (25 marked and 20 unmarked males) was about 2.06 young/male territory.

Territoriality of marked males

Most males did not begin territorial defense until late April. Of five ASY males captured in the walk-in decoy trap and tagged in early May, two later established territories on the area. Territorial males did not become aggressive enough to be captured on-territory in small decoy traps until May 12. Between May 12 and 26, 30 ASY males were captured on-territory and tagged. Seven males may have abandoned their territories as a result of capturing and were not seen again. Territorial males did not respond to decoy trapping after May 26. Apparently, aggressiveness toward other males had waned by that time.

Two males in SY plumage successfully defended territories that attracted nesting females. One of the territories fledged three young.

Nesting by marked females

Prior to the start of nesting in mid-May, 11 females (five ASY and six SY) were captured in mist nets and marked. Four of them remained on the study area and three (two ASY and one SY) nested, but no nest was located for the other SY female. Between June 2 and 21, 33 nesting females (26 ASY and seven SY), with nestlings, were captured on their nests and marked. Six (four ASY and two SY) of the 33 females (18 percent) abandoned their nestlings immediately after capture and were not seen again. Of the 36 marked females that nested, eight (22 percent) were classed as SY birds. The 36 marked females accounted for 42 nests (41 active) on the study area. One SY female built a second nest after the loss of its first nest, but never laid a second clutch.

Marked females fledged 1.5 young/SY female and 2.04 young/ASY female. The difference in production between SY (N=6) and ASY (N=24) females may not be real since the sample size for SY females was so small.

Trapping records gave no indication that SY females nested later than ASY females.

Renesting observations

Of 30 marked females that could have been observed renesting, six (20 percent)renested on the study area. Eighteen marked females successfully fledged young from nests started on or before June 3. Only one marked female established a second nest on the study area. The second-nest was successful and was the only observed case of double-brooding. Three of six females that renested switched male territories, and one moved 230 m from the first nest. Renesting data represent minimum estimates since females that left the study area may have renested elsewhere.

For aged nests (Figure 1), a significant ($t = 3.44$, 89 df, P is less than 0.001) decrease in average clutch size occurred after June 4; 3.91 ($N = 64$) and 3.48 ($N = 27$) before and after June 4, respectively. In that regard, there were four instances of renesting where clutch sizes were known for both initial and subsequent nests (Figure 1). In all cases, the females involved were ASY and laid original clutches of four eggs. However, only one female laid four eggs in its second clutch; the other three females each laid only three eggs in their second clutches.

Implications of renesting strategy

True reproductive success in a given habitat is best measured in terms of number of young fledged per territory or per nesting female per nesting season (Dolbeer 1976). Reproductive success seems to vary between geographic locations, habitat types and season within the same habitat depending upon environmental conditions. For example, drought conditions decrease red-wing reproductive success in some marsh habitats (Brenner 1966, Davis and Peek 1972). Water shortage may have lowered the reproductive tale of the red-wing population examined during this study.

Reliable quantitative estimates of renesting rates, including the extent of movement by renesting females, although very difficult to obtain, are important reproductive parameters for population-dynamics models. Dolbeer (1976), studying marked birds, found that the total number of females nesting/territory/season was maximized by a temporal spacing of nesting attempts (successive polygyny) by females

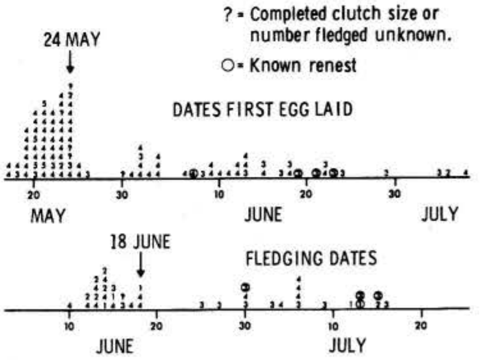

Figure 1. Nesting and fledging chronology (1977) for 96 aged, Red-winged Blackbird nests. Each number represents the completed clutch size or young fledged. Arrows indicate median dates.

that were moving between territories. Blakley (1976), studying unmarked birds, also observed a temporal spacing of nest attempts and suggested that SY females delay nesting until the latter part of the nesting season. Beaver (1975), studying unmarked birds, suggested that the decline in observed clutch size may indicate that late nesting birds were SY females. The present study provides evidence that renesting birds, regardless of age, tend to lay fewer eggs in renesting attempts, and supports Dolbeer's (1976) findings.

The phenomenon of territory switching by individually marked, renesting, red-wing females observed by Dolbeer (1976) and Fankhauser (1964) also was observed during this study. This study and that of Dolbeer (1976) suggest that this kind of movement may be common. If so, then many studies may have underestimated the reproductive rate of the red-wing populations examined.

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Table 2. Reproductive characteristics and success of 134 Red-winged Blackbird nests with completed clutches.

	Completed Clutch Size					
	1	2	3	4	5	Total
No. Nests	3	6	26	93	6	134
No. Eggs	3	12	78	372	30	495
No. Hatched	1	3	48	203	17	272
% Hatched	33	25	61.5	54.6	56.7	54.9
Hatch/Nest	0.33	0.5	1.85	2.18	2.83	2.03
No. Fledged	0	0	26	111	0	137
% Fledged	0	0	60.5	57.5	0	53.3
Fledged/Nest	0	0	1.08	1.23	0	1.06

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