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POPULATION FLUCTUATION IN A YELLOW-HEADED BLACKBIRD MARSH

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The breeding ecology of the Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*) has been well studied by Willson and Orians (1963) and Willson (1966) and the information presented in this study essentially agrees with their findings. In our study the number of nests, active and inactive, found in 1973 was tenfold greater than that found in 1972 and in 1974 it was fifty percent greater than in 1973. We would like to propose explanations for these different rates of increase in nest building in three consecutive years in the same habitat.

STUDY AREA AND METHODS

The area studied is a marsh 300 m north of the Eagle Lake Field Station on the east shore of Eagle Lake, Lassen County, California. The area immediately surrounding the marsh is flat with sandy, alkali soil. Basin Sage Brush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus nauseosus*) and Downy Brome (*Bromus tectorum*) are the most abundant plants surrounding the marsh for at least 100 m in all directions. Bullrush (*Scirpus* sp.) and rushes (*Juncus* sp.) are the dominant emergent vegetation. The marsh has been in existence for only eight years. It was created by a rising water table (R. Ediger pers. comm.) and has been increasing in size each year.

Observations on the Yellow-headed Blackbird began in May, but most of the field work was done during the periods of 18 June to 24 July 1972 (Walk 1972), 20 June to 20 July 1973 and 20 June to 22 July

1974. The behavior of the birds was observed almost daily during these periods.

We marked each nest in the study area with a numbered tag and visited them every two days subsequently. We banded the nestlings immediately after hatching or as soon afterward as possible. Body weights of the nestlings and lengths of their longest primary were taken at each visit.

We made line transects at 25 m intervals to measure the abundance and density of the emergent vegetation.

TERRITORIES AND NESTS

Male birds begin to arrive in late April and early May, and almost immediately begin to establish territories. The males are polygynous, having 2-5 females, the number being related to the size, location and vegetational features of the territory (Willson 1966). The total adult population was estimated at 25 birds in 1972, 85 in 1973 and 83 in 1974.

The females built their nests in rushes where there were 108-180 reeds per m^2. Eight to 70 reed stalks were incorporated into each nest. Nests supported by *Juncus* required at least five times as many individual plants as those supported by the larger, stronger *Scirpus*. Table 2 lists additional information on nest structure.

We did not measure territory size in 1972, but they ranged in area from 40.4 to 101 m^2 in 1973 and 50 to 150 m^2 in 1974. These are small territories for this species (Willson 1966, Fautin 1940) but are comparable to those found on Willson's study at Ramer Lake in 1963. She explains that the dense population and smaller territories might be possible because the major food was found elsewhere. This was apparently true in this study since the males were regularly seen flying to Eagle Lake's shoreline to feed, a distance of 200 m to 1 km or more.

Table 1. Yellow-headed Blackbird nesting data, Eagle Lake Field Station, California.

	1972	1973	1974
Number of active nests	8	29	19
Number of inactive nests	0	67	110
Total nests found	8	96	129
Average clutch size	3.0	3.0	2.7
Number of young fledging	Unknown	47	32
Mortality	Unknown	38%	37%
Average number of young fledged per nest	Unknown	1.6	1.7

Table 2. Yellow-headed Blackbird nest structure, Eagle Lake Field Station, California.

	1973	1974
Average nest height	21 cm	17 cm
Average nest diameter (outside)	15 cm	14 cm
Average nest depth	5 cm	5 cm
Average height above water (to bottom of nest)	38 cm	30 cm
Average distance between nests	5.1 m	8.3 m

CLUTCH SIZE

Table 1 gives nesting data for the years 1972-1974. Only 8 nests, all active, were found in 1972. In 1973 and 1974 many more nests were found, but most were inactive. Only 29 were active in 1973 and 19 in 1974 although respective totals of 96 and 129 completed nests were located; the remainder were not used. The average clutch size was approximately 3 for all years. This appears to be somewhat small compared to other studies (Roberts 1909, Fautin 1940, Willson 1966). In 1972 all young of the small population of 8 nests were fledged by July but most nests were quite active at this same time in 1973 and 1974.

GROWTH RATES AND MORTALITY

The young weighed 5-8 g at birth and averaged a weight increase of 5 grams/day. Willson (1966) found that males gain weight at a somewhat faster rate (7.1 g/day) than females (4.6 g/day). We found that the rate of elongation of the 10th primary was slower than the rate of weight gain; the nestlings added an average of 5 mm in primary length per day.

The incubation period ranged from 12-13 days and the period spent in the nest by young was 10-12 days. Table 1 shows nest success and mortality data. Known mortalities were due to drowning, abandonment and starvation, strangulation in reeds, and failure to hatch. Other eggs and young disappeared due to unknown reasons, possibly predation by Raccoons (*Procyon lotor*) (Walk 1972). The weather was very mild during the entire study in 1972 and 1973 but there were 3 days of heavy rains in 1974 which apparently caused several nests to topple.

DISCUSSION

What caused the dramatic increase in nests and adult birds from 1972 to 1973? The only factor that was considerably different between the

two years was the water depth of the marsh. The average depth of the marsh in 1973 was 0.78 m, while in 1972 it was over 1 m. This decrease in depth and increase in amount of emergent vegetation due to successional processes resulted in a much more widespread and denser growth of the emergent vegetation, both *Scirpus* and *Juncus*. This growth provided many more nest sites than were available in 1972. The populations of the other birds (Killdeer, *Charadrius vociferus*; American Avocet, *Recurvirostra americana*; Spotted Sandpiper, *Actitis macularia*; Wilson's Phalarope, *Steganopus tricolor*; Black Tern, *Chlidonias niger*; and Blue-winged Teal, *Anas discors*) which nested in or on the edges of the marsh were similar for the two years, so interspecific competition for nest sites as an explanation seems unlikely. Interspecific competition for food also seems improbable due to different feeding habits.

In 1974 the marsh was about 5.3 hectares in size, versus about 4 hectares in 1972 and 1973. This increase was undoubtedly due to the rise in the water table and increased rainfall (P. Maslin pers. comm.). In addition a "late" spring in 1974 (pers. obs.) retarded plant growth.

The increased average water depth (1.1 m) and delayed vegetation growth made it necessary for the birds to utilize thinner, shorter stalks of *Scirpus* and *Juncus* than would usually be present. Most of the nests were built in *Juncus* which grew in shallower water than *Scirpus*, much of which was too short to support nests at the beginning of the nesting period. The weaker *Juncus* collapsed in many instances (37% of all nests found). So although the marsh was larger, the increased water depth in part delayed plant growth, making fewer suitable nest sites available. Even though there were more nests built in 1974 than 1973, only 19 were active in 1974 versus 29 in 1973.

Many of these additional nests could have been due to nesting attempts which failed or frustration nests (nests built but unused). The nesting area was visited several times before the onset of the study and no eggs or incubation behavior was noted so it appears that most of these nests were frustration nests.

The similarity of population sizes of adult birds in 1973 (85) and 1974 (83) indicates that the marsh habitat may have temporarily reached its capacity to support a breeding blackbird population. Perhaps with more favorable weather and consequently faster plant growth and more nesting sites, more adults could have nested in the marsh in 1974. The larger territory size in 1974 indicates poorer quality territories than in 1973.

CONCLUSIONS

It appears that the enormous increase in size of the blackbird colony from 1972 to 1973 was likely due to the increasing plant colonization

of the marsh by natural succession, thereby providing additional nesting sites. Other possibilities are: 1) more birds discovering the suitable habitat; and/or 2) previous nesters and their young returning to the marsh. From 1973 to 1974 a smaller increase was noted, possibly due to the following: 1) the potential of the marsh in terms of number of nesting sites was being fulfilled, 2) high water and cooler weather delayed plant maturation, thereby producing fewer nest sites, and 3) many nests were built but not used.

The number of blackbirds nesting in any colony is greatly influenced, if not controlled by, the availability of potential nest sites. The number of nest sites is influenced by water depth, weather and habitat size. Cool weather and high water at the onset of breeding season delays plant maturation, allowing fewer sites. Warmer weather and shallower water provide more sites at the appropriate time.

Since the study has only been made for three consecutive years and the weather has been somewhat different each year, no definite patterns have emerged. There is another large colony of Yellow-headed Blackbirds on the opposite side of Eagle Lake (Crase and DeHaven 1972). It is possible that population sizes in these two colonies is interdependent, i.e., the density of the population in one marsh may be dependent on the suitability of the other for nesting. Additionally, the number of adults arriving in either may be influenced by the degree of previous breeding success in the other. A simultaneous study of both marsh habitats over several years would prove interesting.

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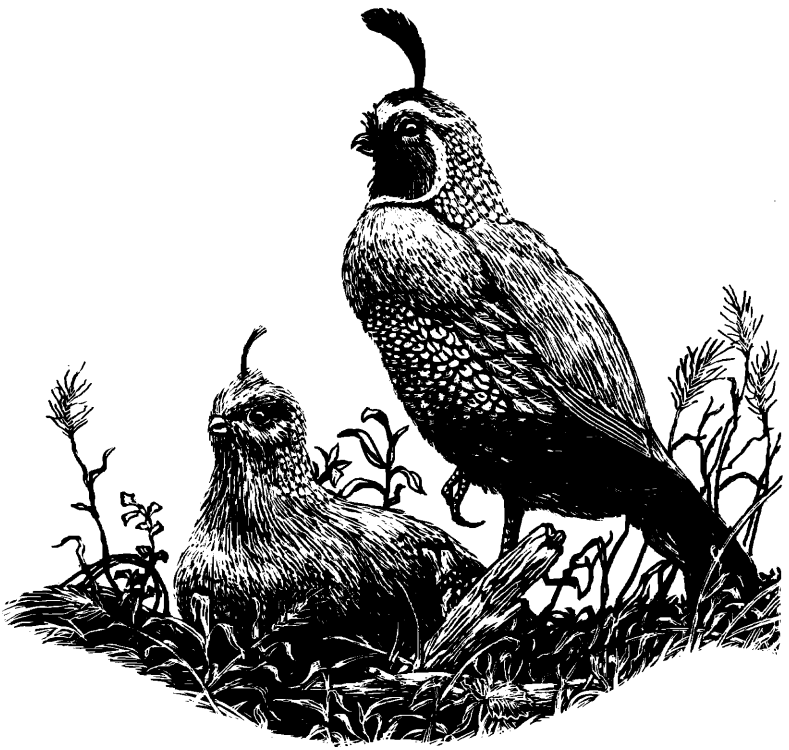

Sketch by Franz Cilensek