SURVIVAL OF YELLOW-HEADED BLACKBIRDS BANDED IN NORTH DAKOTA

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Traditionally, life tables have been used to estimate survival rates of animal populations, but Jolly (1965), Cormack (1968), Seber (1973), and Anderson (1975) have suggested that this method be abandoned in favor of stochastic models. Brownie et al. (1978) showed that stochastic models represent a major advance over life table methods. Eberhardt (1972:167) stated, "There seems to be little advantage in continuing the practice of life-table analysis of banding data." In the present paper, we present the survival rate of Yellow-headed Blackbirds (*Xanthocephalus xanthocephalus*) as estimated by both a stochastic model and a life table method. Royall et al. (1971) presented the distribution of Yellow-head recoveries, but no one has reported on the survival rate of Yellow-heads.

About 91,300 Yellow-heads had been banded in the United States through 31 December 1975. Ann M. and Robert T. Gammell banded 40,324 (44%) of the Yellow-heads at Des Lacs National Wildlife Refuge, Ward County, North Dakota.

METHODS

The analyses discussed in this paper concern 36,398 normal banded birds banded at Des Lacs Refuge from 1964 through 1975, those years when more than 500 Yellow-heads were banded annually. Almost all birds were trapped in modified Australian crow traps (Zajanc and Cummings, 1965).

We had hoped to estimate annual survival rates from band recoveries. However, as of 31 August 1976, only 102 (0.25%) of the Des Lacs birds were reported as dead, or obtained in such a manner (e.g., caught by a cat) that we assumed they were dead. These data were insufficient to allow us to estimate survival rates. Therefore, we estimated annual survival rates from recapture data. After considering several estimation models and the paucity of the recovery data, we analyzed records of banded birds recaptured at Des Lacs in years after the year of banding using the stochastic model H_{01} of Brownie et al. (1978). This model assumes that annual survival and recovery rates are constant over time, but are age specific (i.e., young and adult). Further, because recapture data are used, we assume the same rate of homing for each age and sex class. We also used the method of Brownie et al. for estimating mean life span.

Since this is a period of transition between the use of deterministic life tables and stochastic estimation models, we decided to present also the survival rate of Yellow-heads as determined by a life table method. We calculated the mortality rate by Hickey's (1952:10) composite dynamic life table method. We used only the last recapture of an individual bird and adjusted the recaptures by the number of birds banded to

TABLE 1

Number of Yellow-headed Blackbirds banded from 1964 through 1974, and the number of recaptures and estimates of annual survival rates as determined by a stochastic model.

	Males			Females		
	No. banded	No. recaptures	Survival rate (%)[1]	No. banded	No. recaptures	Survival rate (%)[1]
Immatures	6,148	204	45.3 ± 5.6	7,264	92	41.3 ± 6.6
Adults	17,633[2]	540	58.5 ± 2.0	5,353	145	75.3 ± 3.4

[1] Estimated annual survival rate ± SE.
[2] Adult male is understood to include subadult, adult, and AHY birds.

counteract the biases resulting from unequal annual trapping effort (Henny, 1972). All birds used in this analysis were banded after their first 1 January of life, the date accepted by many as the point when the annual mortality rate has stabilized after the initial low survival period of young birds (Lack, 1946; Farner, 1955).

Because of the relatively small number of recaptures of birds banded as adult males (155) and AHY males (25; either subadults or adults), these recaptures were pooled with the 360 recaptures from Yellow-heads banded as subadult males. Hereafter, this group is referred to as adult males. Female Yellow-heads are reproductively mature the second calendar year of life, so all females, other than immatures, were classified as adults.

RESULTS AND DISCUSSION

From 1965 through 1975, the trapping program at Des Lacs produced 981 recaptures, grouped by age and sex and analyzed with the H_{01} stochastic model (Table 1). These survival estimates suggest a difference by age and sex. Immature Yellow-heads probably do have a lower survival rate than adults, for it is generally accepted that immatures of other birds have a lower survival rate than adults (Lack, 1946; Farner, 1955). A difference in survival rates between sexes cannot be substantiated without more data. Since survival rates may vary by age and sex, it would not be valid to pool all the recaptures to get an overall estimate of survival rate for the species.

The estimated annual survival rate for adult females (75.3%) appears to be unusually high for a passerine. We have no explanation for this. Also, the standard errors of the survival estimates for immature males (5.6%) and females (6.6%) are somewhat large. The large standard errors are probably due to the paucity of data for these sex and age classes. In contrast to other sex and age classes, more adult male Yellow-heads were banded. This resulted in a more precise estimate of annual adult male survival rate (58.5%). The estimated mean life span of adult

males from time of banding was 1.9 years, with a 95% confidence interval of 1.7–2.1 years.

Because only adult males were banded in large numbers, we restricted our analysis by the composite dynamic life table method to this sex and age class. The calculated annual adult male survival rate was 52.2%. The 52.2% survival rate is similar to survival rates of 51.6% for Common Grackles (*Quiscalus quiscula*) and 51.7% for Red-winged Blackbirds (*Agelaius phoeniceus*) that Fankhauser (1971) calculated by life table methods.

The 58.5% annual adult male survival rate estimated for Yellow-heads by the stochastic model is higher than most survival rates calculated for passerines by life table methods (Plattner and Sutter, 1947; Lack and Schifferli, 1948; Farner, 1949, 1952; Hickey, 1952; Fankhauser, 1971). Botkin and Miller (1974) stated that life tables underestimate survival rates. Henny (1972) suggested that survival rates obtained from recaptures and estimated by life tables are minimum estimates, because the last year a bird is retrapped may not be the year that the bird died. Since life tables underestimate survival rates, it is not surprising that the survival rate estimated by the stochastic model was higher than that estimated by the life table.

Considering the low recapture rate of Yellow-heads, we suggest that 2,000–3,000 birds of each age and sex class would have to be banded annually in one area for about six years to obtain reasonably precise estimates of annual survival rates. Such a program should even allow comparisons to be made in annual survival rates between subadult and adult males.

SUMMARY

From 1964 through 1975, 36,398 Yellow-headed Blackbirds were banded at Des Lacs National Wildlife Refuge. A stochastic model was used to analyze 981 recaptures that were obtained from 1965 through 1975. The results suggest that survival rates differ by age and sex. However, there was a paucity of data except for adult males (birds banded as subadult, AHY, or adult males). The estimated annual adult male survival rate was 58.5%, and the estimated mean life span was 1.9 years from time of banding. An annual adult male survival rate of 52.2% was calculated with a composite dynamic life table method.

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