REPRODUCTIVE BIOLOGY OF LOGGERHEAD SHRIKES IN SOUTHWESTERN OKLAHOMA[1]

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ABSTRACT.—I studied a migratory population of Loggerhead Shrikes (*Lanius ludovicianus*) in southwestern Oklahoma during 1985–1989. Shrikes began to pair from late February to early March. Mid-April represented the peak of nesting activity, and the earliest nest completed was on 13 March. Second nests were constructed between late May to late June. The breeding season typically spanned about 11 weeks. Mean nest height was 3 m. Trees favored as nest sites were Osage orange, hackberry, Chinese elm, and eastern red cedar. Clutch size averaged 5.8 eggs, incubation period 16.9 days, and nestling period 16.8 days. In 84% of all clutches, at least one egg hatched. Mayfield's (1961, 1975) exposure-day method was used to calculate a survival probability of 46%.

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Many studies have discussed the decline of Loggerhead Shrike (*Lanius ludovicianus*) populations in the United States (Erdman 1970, Arbib 1971, Graber et al. 1973, Anderson and Duzan 1978, Kridelbaugh 1981, 1982, Phillips 1986, Robbins et al. 1986, Tate 1986). However Oklahoma continues to maintain comparatively healthy numbers (Robbins et al. 1986, Droege and Sauer 1990). This study was undertaken to gather baseline reproductive data on a migratory population of Loggerhead Shrikes in the Southern Great Plains.

STUDY AREA AND METHODS

Average elevation of the mostly level study area was 350 m and it lay within a 24-km radius of Lawton, Comanche County, southwestern Oklahoma. Mixed-grass prairies interspersed with cultivated fields, mesquite pastures, stockponds, and streamside woodlands characterized the countryside. Cattle ranching predominated, with wheat, hay, and cotton the principal cash crops. Average annual precipitation was 80 cm and mean January and July temperatures were.

Beginning in February, visits were made every second or third day to known former breeding sites until nest construction commenced. Thereafter, nests were checked every 3–6 days until hatching or fledging neared, when these intervals were decreased. No birds were banded to facilitate individual recognition.

Probability of survival from beginning incubation to fledging (n = 109 nests) was calculated using Mayfield's (1961, 1975) exposure-day method. Survival probability during the hatching and nestling periods were also determined.

RESULTS

A total of 133 nesting pairs of shrikes was found during the study period. Construction of nests was initiated from the last week of February to mid-March and peak nesting was during the first week in April. Most early clutches were complete by the first week of May.

Second clutches were laid between the fourth week in May and the third week in June. Some were laid after a successful nesting. The mean date for the final egg of the last clutch was 8 June. The average percent of success for nests in which at least one egg hatched was 84%, but only 60% of 133 nests fledged at least one young. Average clutch size was 5.8 (3–7, n = 101). The mean nestling period for 28 nests was 16.8 days.

Of 122 pairs, only 24 (19%) attempted second broods, which were begun from mid-April to mid-June. A maximum 3 of 18 eggs in second nests fledged young. In 1986, a pair of shrikes incubated eggs in 3 successive nests. Only 3 nesting territories were used all four years for second nests.

Shrubby, densely crowned trees were used for 128 nests in the following percentages: Osage orange (*Maclura pomifera*-31); hackberry (*Celtis reticulata*-13); Chinese elm (*Ulmus pumila*-11); and eastern red cedar (*Juniperus virginiana*-9). Nineteen other species were also used. Average height of nests was 2.97 ± 0.16 m (n = 128).

[1] Editors' note: These data were previously published in a slightly different format (Tyler 1992), but this paper is included here for completeness of the Proceedings.

Several parameters of breeding success were calculated using the Mayfield (1961, 1975) exposure-day method. The formula is:

$$\text{Probability of survival} = \frac{(1-r)^d}{s} = s^d$$

where r = mortality rate, d =number of days exposed, and s = survival rate.

During 1663 days of exposure during incubation, 19 (of 109) nests failed (suspected predation, 10 nests; desertion, 6; high winds, 3). This gives (19/1663) a daily mortality rate (r) of 0.0114 or 1.1% per nest-day. The daily rate of nest survival (s) was therefore 1−0.0114, or 98.9%. Calculated for the 17 days required for incubation (109 nests surviving at the rate of 98.9% per nest/day for 17 days), 93.9, or 94% of the original 109 nests would survive. This means that 102 nests would still be viable after the 17 days required for incubation.

Two days are usually required for hatching. The day the first egg hatched was considered the final day of incubation for that nest. Of 619 eggs present at hatching time, only 468 hatched. Therefore, the probability of survival during hatching was 468/619, or 76%.

During the nestling phase, normally taking 16.8 (17) days, 27 of 90 nests failed during 1308 days of exposure. The daily mortality rate was then 27/1308, or 2.1%, and the daily survival rate was 97.9%. After 17 days at this rate, only 64% of nests survived.

The probability of survival from egg to fledgling can now be determined by multiplying all three of the foregoing percentages. Thus, 94 × 76 × 64 = 46%.

Discussion

Compared to the average nest height of 2.97 m in Oklahoma, averages in other states were 3.20 m in Missouri (Kridelbaugh 1983), 3.00 m in Alabama (Siegel 1980), and 2.00 m in Colorado (Porter et al. 1975). As in Oklahoma, the species chosen most often for nesting was Osage orange in Illinois (Graber et al. 1973) and Kansas (Johnston 1964). But in Missouri, Alabama, Virginia (Luukkonen 1987), and South Carolina (Gawlik & Bildstein 1990), eastern red cedar was used most frequently.

Arrival on the breeding grounds in Oklahoma and Missouri took place about mid-February. The earliest completed nest was found on 13 March in Oklahoma, a week or so earlier than in Missouri. In both Alabama and Oklahoma, peak nesting occurred in early April, but during late April in Missouri and Illinois and not until late May in Colorado. In Oklahoma most hatching occurred in early May and hatching success was 81%, which is similar to that in Colorado (79.5%) and Missouri (85%). In Oklahoma, young fledged most frequently in mid- to late-May and fledging success was 60%, which is similar to that for Missouri, 59.4%, but success in Colorado (55.9%) and Alabama (50%) was somewhat lower. Lowest success rates were during those springs having most inclement weather.

Mean clutch size in various studies were as follows: Oklahoma and Minnesota (Temple and Brooks 1986), 5.8; Illinois and Missouri, 5.7; Kansas, 5.3; and Virginia, 5.1. In the higher latitudes of Colorado, clutches averaged considerably larger, however, at 6.4.

Shrikes in Oklahoma incubated an average of 16.9 days, which coincides with Lohrer's (1974) average in Florida and Kirdelbaugh's (1983) in Missouri. In California (Miller 1931) and Colorado, this period averaged only 16 days. However Lohrer and Kridelbaugh used the last egg to determine incubation period.

The nestling period lasted 16.8 days on average in Oklahoma, 17 in Colorado and Florida, 17.6 in Alabama, but the mean was 19 days in Missouri and 20 in California.

Double-broodedness ranged from 7.7 to 32% per year during the present study, and averaged 19.1%. Variability from year to year seemed to be correlated with greater hatching success and possibly with length of growing season. Fifty-eight percent of second nests succeeded, compared to the overall survival rate of 46%. In Missouri, 22% of shrikes built second nests.

In Oklahoma, the overall survival rate was 46%, compared to 43.2%, 62.2%, 69.1%, and 72% in Alabama, Colorado, Missouri, and Illinois, respectively.

With nesting habitat abundant, we must look elsewhere for an explanation of the shrike's poor success rate in Oklahoma. Pesticides and herbicides in the food chain no doubt play a part, as does local habitat alteration which affects breeding site suitability and food abundance directly or indirectly. Examples would include conversion of pasturelands to cultivation or reseeding with exotic grasses, clearing fields of isolated trees, and elimination of hedgerows. Its present low rate of reproduction in the Southern Great Plains does not bode well for the future of *Lanius ludovicianus*.

Shrikes (Laniidae) of the World: Biology and Conservation

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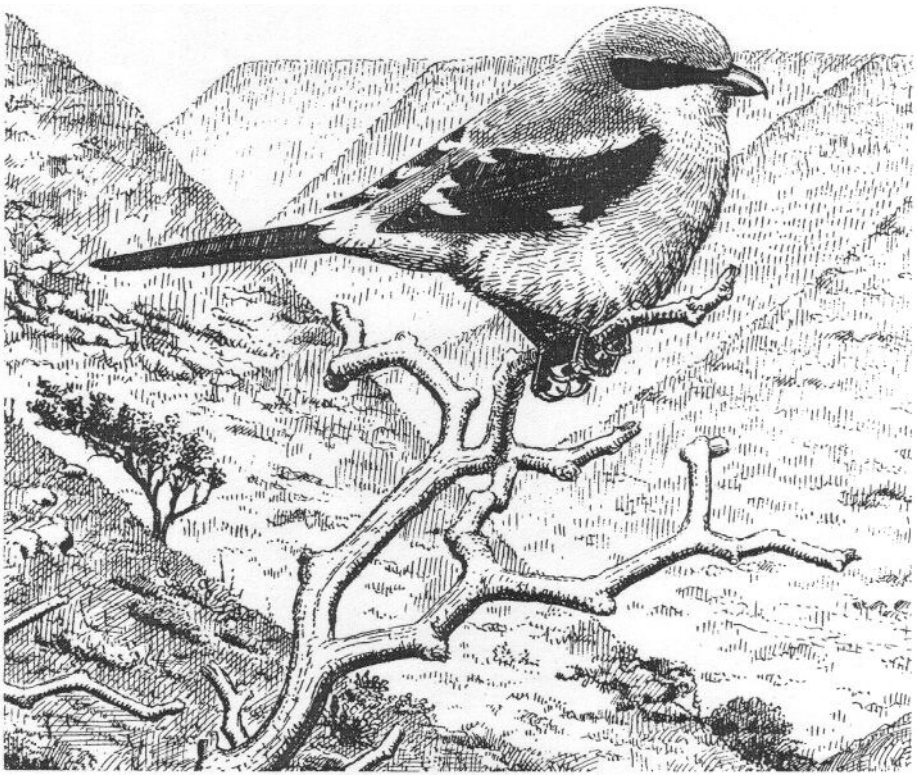

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