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Effects of Little Owl Predation on Northern Shrike Postfledging Success

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Knowledge of reproductive success is frequently useful in understanding population trends and evolutionary consequences of individual traits. In birds, reproductive success is normally measured as number of young fledged. In most avian species, it is relatively easy to collect data on clutch size and hatching success. Fledging success is harder to assess, although not as difficult as finding the number of offspring that attain sexual maturity. Dispersal of young is extremely difficult to quantify and, in most reproductive studies, not evaluated. Thus, a positive correlation between fledging success and survivorship to first breeding remains an untested assumption in most studies. I present data showing that, although Northern Shrikes (*Lanius excubitor*) in southern Israel had high fledging success, they also had high postfledging mortality because of predation by Little Owls (*Athene noctua*), so that fledging success was not a good measure of reproductive success. I also present evidence that the owls depressed the reproductive success of the shrikes by reducing their hunting success, and eating their fledglings.

The Little Owl is the most common and widely distributed owl in Israel. It is the most diurnal of owls and breeds in burrows in the ground from March through May, with double brooding occurring occasionally (Paz 1987). This owl has a monogamous mating system, with a pair bond often persisting all year and for up to four years. First breeding is usually at one year of age, but not all birds breed every year (Cramp 1985).

The Northern Shrike is also territorial year around. In Israel it is found on the Golan heights, along the Syrian rift valley, and in the Judean and Negev deserts (Paz 1986, Yosef 1989). This species usually is monogamous, although polygyny has been observed (Yosef and Pinshow 1988a).

I observed interactions among eight pairs of Northern Shrikes and three pairs of Little Owls over a three-year period (1987-1989). This was part of a larger study of the breeding ecology of shrikes, for which I monitored 15 pairs. The study was done on Sede Zin in the Negev desert highlands, Israel (34°47′N, 30°52′E, 475 m above sea level), an area of loessial plain on which two settlements are found—Kibbutz Sede Boqer to the north and Midreshet Sede Boqer to the south (Fig. 1). The southern limits of Sede Zin are bordered by cliffs of the Nahal Zin ravine. The predominant perennial plants are the shrubs *Hammada scoparia, Zygophyllum dumosum, Reaumuria hirtella, Anabasis syriacus* and *Artemesia herba-alba*. The major woody species are *Tamarix nilotica, Atriplex halimus, Retama raetam* and *Thymelaea hirsuta*. A large variety of herbs and geophytes are found in the region (Danin et al. 1975).

Data pertaining to shrike reproduction and behavior were collected between 1987 and 1989 (Yosef 1989, Yosef and Pinshow 1989). All adult shrikes were trapped with bal-chatri noose traps (Burger and Mueller 1959, Clark 1968). Each was color banded for individual identification and released. All nestlings were banded on the seventh day after hatching. As in many studies, I considered a nest to have fledged if the young survived until the age of banding and if the nest was empty but undamaged when I checked one week later. I also tried to see the young in their natal territories, prior to dispersal, to ascertain their fledging. Time-budget studies (following techniques described by Altmann 1974) allowed evaluation of effects of the presence of an owl on shrike behavior and foraging tactics. I recorded 17 half-hour time budgets when shrikes and owls foraged within 30 m of each other, during which times shrikes were presumed to be aware of the presence of owls. For comparison, I also tabulated 17 half-hour time budgets of shrikes when owls were not present.

All shrike territories were based on observations of bird activity and on observations of shrike reactions to taped songs of males and to a taxidermic mount. Little Owls were not banded and their territories were not measured. However, approximate territorial boundaries were known by general observation of the birds' movements.

I observed behaviors and noted habitat requirements common to Little Owls and Northern Shrikes. Both species utilized open areas and perched on and hunted from the same perches. Neither species hunted on the wing but, rather, pounced on prey from a perch. Territories were similar in size, and Little Owl territories overlapped two or three shrike territories. Fifteen shrike territories averaged 58.3 ± SD of 7.2 ha. Little Owl territories range from 30 to 50 ha (Paz 1987). In addition, although shrikes were the earliest nesting passerine in the region, Little Owls bred in the same months (Paz 1987). Shrikes were cautious when around owls, and gave alarm calls when owls flew close to the shrike's nest. Shrikes did not attack or mob Little Owls suggesting that, although adult

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shrikes recognized the owls as potential predators, they remained wary.

During 17 half-hour periods in the absence of owls, shrikes made on average 36.2 ± 5.1 attempts to capture prey, and hunting success was 80.9 ± 10.4%. On the other hand, in the presence of owls, shrikes made 15.3 ± 2.9 attempts and hunting success was 43.7 ± 11.6%. Significant differences occurred in the total number of attempts ($t = -15.19$, 14 df, $P = 0.0001$) and hunting success ($t = -14.35$, 14 df, $P = 0.0001$) between shrikes in the presence and absence of owls. Not only did shrikes hunt less when owls were present, but also their hunting success was impaired.

Little Owls appeared to remain strictly within the boundaries of their territories. From September 1987 until June 1988 I observed: owl A visit shrike territories 1, 2 and 5; owl B territories 3, 7 and 8; and owl C territories 11, 15, and occasionally 10.

The first evidence of owl predation on young shrikes was found on 13 June 1988. Following discovery that shrikes can transfer young from the nest to an alternate site (Yosef and Pinshow 1988b), I initiated a search to find what I surmised to be the transferred brood of shrike pair 1. During the search I discovered owl nest A, which was located under an outcrop on a rocky hillside about 50 m from the shrike nest. Among prey remains and owl regurgitation pellets at the entrance to the burrow, I found banded legs of birds. The band numbers confirmed that the owls had killed 10 of the 12 (83%) young shrikes that pair 1 had fledged in two nesting attempts. I also found bands of all five young from territory 2. Thus, it was evident that, although fledging success of pairs 1 and 2 was 71% (17 young fledged from 24 eggs, four clutches), no more than two young shrikes (8% of eggs) could have survived the postfledging period.

Following this discovery, I located two other owl nests within the study area. At owl nest B, the remains of seven fledgling shrikes were found and, at nest C, the remains of 16. The overall fledging success of shrike pairs 3 and 7 was 77% (17 young from 22 eggs), but no more than 45% (10 young from 22 eggs) could have survived the postfledging period. Also, in pairs 11 and 15, fledging success was 89% (24 young from 27 eggs), but was diminished to no more than 30% (8 young from 27 eggs) postfledging survival.

Only the five young from pair 2 appear to have been taken directly from the nest by owls. I observed all other young after they fledged from their nests foraging in their natal territories prior to their disappearance. At the time, I attributed their disappearance, from day 5 to 15 after fledging, to natural dispersal. No adult shrike remains were found at the owl burrows, which suggests that fledglings foraging independently in their natal territories were highly vulnerable. The disparity between fledging success and postfledging survival became quite evident when the data for all shrike pairs were pooled. Overall fledging success of the six shrike pairs near owl nests was 79% (58 young from 73 eggs), but no more than 27% (20 young from 73 eggs) could have survived past the postfledging period to be recruited into the breeding population. The fledging success observed for all 15 pairs studied was 81%, but no more than 60% could have survived the postfledging stage.

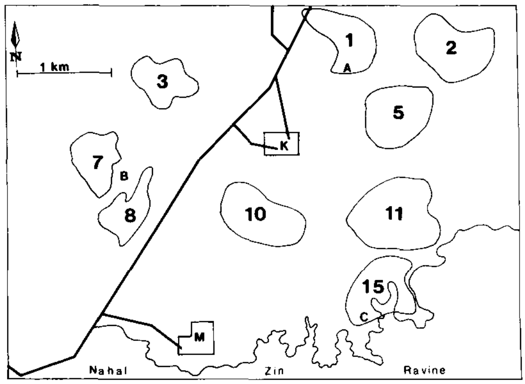

Fig. 1. Northern Shrike territories (denoted by numbers) and Little Owl nest sites (denoted by letters) on Sede Zin in the Negev Desert highlands, Israel. K is Kibbutz Sede Boqer, and M is Midreshet Sede Boqer. Contour line represents cliffs of Nahal Zin ravine, and thick line the Beer Sheva-Mitzpe Ramon highway that passes through study area.

The implications of the results presented are that Little Owl presence had an adverse impact on shrike hunting success and on the amount of time spent hunting. The results also demonstrate the extreme vulnerability of recent fledglings as they first roam their natal territories. Other researchers should be aware of the possibility of similar impacts even in very different habitats or faunal assemblages.

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Literature Cited

Altmann, J. 1974. Observational study of behaviour: Sampling methods. Behaviour 49:227–267.

Burger, D. B., and H. C. Mueller. 1959. The bal-chatri: A trap for birds for prey. Bird-Banding 30: 18–26.

Clark, W. S. 1968. Modification of the bal-chatri trap for shrikes. EBBA News 30:147–149.

Cramp, S. (Chief Ed.). 1985. Handbook of the birds of Europe, the Middle East and North Africa. The birds of the western Palearctic. Vol. IV, Terns to woodpeckers. Oxford Univ. Press, Oxford.

DANIN, A., G. ORSHAN, AND M. ZOHARY. 1975. The vegetation of the northern Negev and the Judean Desert of Israel. Israel J. Bot. 24:118-172.

PAZ, U. 1986. Encyclopedia of the plants and animals of Israel, vol. 6. Ministry of Defense Publication, Tel-Aviv, Israel.

PAZ, U. 1987. The birds of Israel. Ministry of Defense Publication, Tel-Aviv, Israel.

YOSEF, R. 1989. The breeding biology of the Great-grey Shrike and the ecological implications of its impaling prey. M.Sc. thesis, Ben-Gurion Univ. of the Negev, Beer-Sheva, Israel.

YOSEF, R., AND B. PINSHOW. 1988a. Polygyny in the Northern Shrike (*Lanius excubitor*) in Israel. Auk 105:581-582.

YOSEF, R., AND B. PINSHOW. 1988b. Nestling transfer in the Northern Shrike (*Lanius excubitor*). Auk 105: 580-581.

YOSEF, R., AND B. PINSHOW. 1989. Cache size influences female mate choice and reproductive success in the Northern Shrike. Auk 106:418-421.

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Call Matching and Positive Assortative Mating in Red Crossbills

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Within some regions of North America, the morphological variability in Red Crossbills (*Loxia curvirostra*) is much greater than in most other songbird populations, leading some authors to consider the possibility that crossbill morphotypes are reproductively isolated from one another (Monson and Phillips 1981, Payne 1987, Groth 1988, 1993). I investigated this problem by measuring the morphology of mated crossbills in a single region, the southern Appalachian Mountains, in which individuals of divergent morphologies had opportunities to interbreed. I hypothesized earlier (Groth 1988) that crossbills in this region belonged to two distinctive groups, or species, based on vocalizations and morphology. Random mating in morphology would not support the hypothesis of reproductive barriers between the two groups. Instead, mixed matings between morphotypes might suggest alternative hypotheses, such as genetic polymorphism for bill and body size (e.g. Smith 1987), or that crossbills in the Appalachians were simply unusually variable for songbird populations, as in some Darwin's finches (Grant 1986).

Where their vocalizations have been studied, breeding pairs of other cardueline finches show precise flight-call matching between mates (Mundinger 1970, 1979, Marler and Mundinger 1975, Samson 1978), which may be a mechanism facilitating individual recognition in vocalizations. I used call matching as a means of deciding whether pairs I observed were mated. Out of a larger sample of 157 adult and juvenile crossbills captured and recorded in Montgomery County, Virginia (Groth 1988), 48 individuals (all adults) were members of pairs showing the call-matching phenomenon (Fig. 1). Crossbill pairs were closely associated in the field, and once one member was in the mist net the other usually followed within a few minutes. Nests of most pairs were not found, but I did not make extensive efforts to search for them. Crossbills were uncommon in the Appalachian region during the study, and 14 call-matching pairs were captured on days for which no other crossbills were seen, reinforcing the idea that these birds were each other's mates. Seven pairs were associated with other adult crossbills in flocks of up to four individuals, but were considered "mated" because of the precise call matching they exhibited. Two pairs (G and U, Fig. 1) were each captured with begging juveniles, and another (pair V, Fig. 1) was found nesting. Also captured, but not used in the analysis, were three male-female pairs that were traveling alone but did not show call matching.

Six bill characters, wing length, and tarsus length (all to nearest 0.1 mm), as well as body mass (to nearest 0.1 gm), were measured for each individual. As a means of summarizing "size" (Rising and Somers 1989), principal components were calculated using SAS PROC PRINCOMP (SAS Institute 1985) from the correlation matrix of nine variables for the 48 birds in the analysis. This program equilibrated the variances of characters. All variables loaded approximately equally on the first component (PC1), which accounted for 73% of the total variance and can be interpreted as a function of overall bill and body size. Larger birds received higher scores along PC1. After

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