NESTING ECOLOGY OF THE RED-BACKED SHRIKE (*Lanius collurio*) IN NORTHEASTERN HUNGARY

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ABSTRACT

Horvath R., Farkas R., Yosef R. 2000. *Nesting ecology of the Red-backed Shrike (Lanius collurio) in northeastern Hungary.* Ring 22, 1: 127-132.

We studied Red-backed Shrike nesting ecology in the vicinity of Josvafo, northeastern Hungary, during 1991-1996. The first of the completed nests were found in mid-May, and nesting peaked in mid-June. With replacement nestings attempted only if the initial nesting attempt failed. Average length of the nesting season was nine weeks. Almost one-fifth of all nests were built in Wild Plum (*Prunus spinosa*) trees, but Dogwood (*Cornus sanguinea*), willows (*Salix* spp.), Elder (*Sambucus nigra*) and Wild Rose (*Rosa canina*) were also used frequently. Average clutch size was 4.3 (N = 186). At least one egg hatched in 84% of clutches. Major factors that affected nest survival were predation (37.8%) and inclement weather (35.1%), which accounted for majority of the nests lost. A mean of 14.6 days was required for incubation and the average fledging period was 14.6 days as well. Average probability of survival using Mayfield's (1961, 1975) method was 35.3% (range 15.1 – 55.8%).

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Key words: *Lanius collurio,* Red-backed Shrike, nesting ecology, Hungary

INTRODUCTION

The Red-backed Shrike breeds across most of Europe and occupies a wide variety of half-open habitats (Hagemeijer and Blair 1997). Although the species is widespread, giving the mistaken impression of being an „abundant" species, in reality it has been in decline for decades across most of its distribution (*e.g.* Poltz 1975; Lefranc 1980, 1997; Kowalski 1987) and yet data on reproduction are minimal (RY. *Bibliography of the shrikes of the world*, in prep.). This is especially true for the population in Hungary where as for now only two studies have been published on their

reproductive biology (Gyorfi 1968, Horvath *et al.* 1998). To our further understanding of the reproductive requirements and capabilities of the Red-backed Shrike in northeastern Hungary and to improve the chances for the conservation of the species in central Europe, we conducted bi-weekly surveys during the breeding season (May – late July) during 1991-1996.

STUDY AREA AND METHODS

Our study was conducted at the Aggtelek National Park, in an area of 107 ha. It is located in a riverine habitat, surrounded by forests, between the villages Szinpetri and Josvafo. We conducted transect counts in each of the breeding seasons during 1991-1996. Transects were conducted during 60-70 observation days per year from late May to late August. During the first two years, we also conducted systematic searches to find all possible nests. This practice was subsequently abandoned because we suspected that it negatively influenced the reproductive success of the population. During the next four years, we only approached a nest if activity of adults disclosed its location in order to verify the activity stage of the breeding pair. Nestlings were considered fledged once they left the nest tree. We attempted to count all fledglings present in a territory during transect counts. In territories where no nest was found, we established breeding success on the basis of fledglings and attempted to determine their age according to plumage. No birds were ringed to facilitate individual recognition.

We calculated nesting success (percent pairs that fledged at least one young), hatching success (percent eggs laid that hatched) and fledging success (percent young hatched that fledged). Probability of survival from beginning of incubation to fledging was calculated using the Mayfield (1961, 1975) exposure-day method. Survival probability per nesting attempt and per egg or nestling during the hatching, nestling and fledging stages were also determined. We calculated the daily survival rates of nests using the average of 17 days for the egg laying and incubation period and 15 days for the nestling stage (based on Table 1). We also recorded nest tree species and inter-nest distance of the nearest neighbouring territory.

RESULTS AND DISCUSSION

During the study period, we found 173 nesting pairs of Red-backed Shrikes (Table 1). These pairs made 194 nesting attempts. Replacement nestings occurred only on 22 (11.3%) occasions, and only after the initial nesting attempt failed. The absence of second attempts and the low number of replacement attempts reflects the small window of time in which this species can breed at this latitude.

The earliest nest construction began on 4 May and the number of nests found increased up to 29 May (Fig. 1). The number of active nests peaked between 8 and 23 June and then slowly declined until the last of the fledglings left the nest in late July. A smaller peak is obvious in late July and this was caused mostly by the activity of

those pairs that had failed in their first breeding attempt and were in their second attempt. This overall pattern is similar to that reported for the species in other regions of its distribution (*e.g.* Czech Republic – Miksik 1993, Poland – Diehl 1998). Most early clutches were completed by the first week of June. Average length of the nesting season was nine weeks.

Table 1
Reproductive success and breeding parameters of the Red-backed Shrike in northeastern Hungary, 1991-1996

	1991	1992	1993	1994	1995	1996	Total
Breeding pairs	32	24	24	24	21	48	
Incubation period	14.4	14.2	14.8	14.7	15	14.5	**14.6**
(*SD, N*)	(1.1, 27)	(0.5,19)	(0.6, 19)	(1.0, 19)	(0.7, 21)	(2.6, 50)	
Nestling period	15.0	14.5	14.9	15.0	14.1	13.8	**14.6**
(*SD, N*)	(0.7, 25)	(0.8, 16)	(1.1, 17)	(0.9, 18)	(1.2, 21)	(2.4, 44)	
Average clutch size	4.4	4.2	3.6	3.7	5.0	4.7	**4.3**
(*N*)	(37)	(27)	(26)	(24)	(21)	(51)	**(186)**
1st attempt N =	32	24	24	19	21	48	
No. eggs laid	142	97	87	89	105	237	
No. eggs hatched	81	65	52	73	77	157	
No. nestlings fledged	78	57	48	66	65	125	
2nd attempt N =	5	3	2	0	0	3	
No. eggs Laid	21	15	7			13	
No. eggs hatched	14	15	6			7	
No. nestlings fledged	11	9	6			6	
Daily mortality rate							
Nest - incubation	0.024	0.017	0.018	0.004	0.089	0.007	**0.027**
Nest - nestlings	0.000	0.004	0.000	0.004	0.040	0.003	**0.009**
Per egg	0.033	0.023	0.025	0.011	0.015	0.018	**0.021**
Per nestling	0.005	0.013	0.050	0.007	0.013	0.016	**0.017**
Daily nest survival							
Nest - incubation	0.705	0.784	0.764	0.943	1.000	0.903	**0.850**
Nest - nestlings	1.000	0.944	1.000	0.942	1.000	0.959	**0.974**
Per egg	0.617	0.719	0.688	0.850	0.797	0.769	**0.740**
Per nestling	0.985	0.827	0.466	0.900	0.832	0.801	**0.802**
P_{egg}	0.435	0.564	0.526	0.802	1.000	0.866	**0.699**
$P_{hatching}$	0.582	0.714	0.617	0.820	0.730	0.683	**0.691**
$P_{nestling}$	0.985	0.781	0.466	0.848	0.663	0.616	**0.727**
Production (%)	24.9	31.4	15.1	55.8	48.4	36.4	**35.3**
Date 1st egg laid	?	?	?	19 May	20 May	4 May	

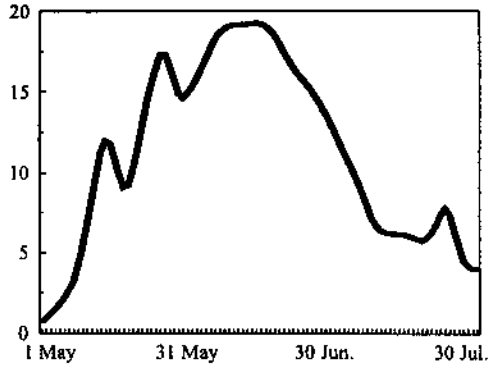

Fig. 1. The average number of Red-backed Shrike nests active per day for the years 1991-1996 in northeastern Hungary

Clutch size ranged from 2 to 6 eggs and the mean was 4.3 (N = 186; Table 1). This is slightly lower than the average in other regions of the species distribution: 5.7 in Romania – Korodi Gal 1969; 4.9 in the Czech Republic – Miksik 1993; 4.9 in Poland – Matyjasiak 1993, Diehl 1998; 4.8 in north-eastern France – Lefranc 1979. A mean of 14.6 days (SD = 0.3, N = 6) was required for incubation. The average probability of the daily nest survival was 0.85 and that of an egg surviving to hatch was 0.70. Our data also concur with the overall geographical trend, wherein birds from eastern Europe lay larger clutches in comparison to birds from western Europe (Lefranc 1997). A similar trend, but from north to south, has been shown for the Loggerhead Shrike (*L. ludovicianus*) in North America (Yosef 1996).

At least one egg hatched in 84% of clutches. This is slightly lower than in Poland (Matyjasiak 1993), where hatchability of eggs was 91% (range 89-93). The average fledging period was 14.6 days (SD = 0.5, N = 6). The average probability of an egg hatching was 0.691 and the average probability of a nestling fledging from the day it had hatched from the egg was 0.73.

The average probability of survival of a nest from the first day, on which an egg was laid in it, until at least one young fledged from it was 35.3% (range 15.1-55.8%). We are unable to compare this data with other European studies of this species because most have not used the Mayfield method to calculate the probability of survival of their populations. The only other study is that of Matyjasiak (1995) for a population in Poland. Our result is similar to that found for the Loggerhead Shrike of North America that has a similar body size. Tyler (1992) in a five-year study in Oklahoma found the probability of survival to be 46%.

Major factors that affected nest survival were predation (37.8%) and inclement weather (35.1%), which accounted for majority of the nests lost. Ten (27.1%) of the nests were found abandoned with their contents intact and no obvious explanation for the desertion. Predators observed at nests were: European Jay (*Garrulus glandarius*), Aesculapian Snake (*Elaphe longissima*), Beech Marten (*Martes foina*) and

dormice (*Glis* spp.). In nearby Czechoslovakia, Miksik (1993) found that nest losses were greater at higher altitudes.

The distance between active nests of neighbouring territories was measured only in the first four years of our study: 1991-1994. The average distance of 119 distances measured was 235.4 m (*SD* = 152.9). The differences between the seasons were not considerable. The averages per season were: 235 m (*SD* = 293.8, *n* = 43) in 1991, 251 m (141.7, 41) in 1992, 329 m (88.4, 29) in 1993, and 257 m (612.4, 9) in 1994. We did not find evidence for clustering of nests as described by Herremans (1993) for Wood Warblers (*Phylloscopus sibilatrix*) and as has been observed for other European populations of the Red-backed Shrike (D. van Nieuwenhuyse, L. Fornasari – pers. comm.).

The largest numbers of completed nests found (*N* = 170) were built in Wild Plum trees – 37 (21.8%). Other tree or bushes frequently used for nest placement were: Dogwood – 30 (17.7%), willows – 27 (15.9%), Elder and Wild Rose – 18 (10.6%) each, hawthorns (*Crataegus* spp.) – 12 (7.1%) and Spindle Tree (*Euonymus europaeus*) – 10 (5.9%). Also used at a low frequency (1-4 nests) were: Hazelbush (*Corylus avellana*), Wild Pear (*Pyrus pyraster*), oaks (*Quercus* spp.), Maple (*Acer tataricum*), Vetch (*Vicia cracca*), Hops (*Humulus lupulus*), Hornbeam (*Carpinus betulus*), Duke of Argyll's Teap (*Lycium barbarum*), St. Lucie's Cherry (*Cerasus mahaleb*) and Privet (*Ligustrum vulgare*).

In conclusion, although we have not correlated the effects of weather on the breeding season capability and reproductive success of our study population (*cf.* Horvath *et al.* 1998), we present a method that should be adopted by all researchers in the future. A consistency of methods will allow us to make comparisons between diverse habitats and regions in the species distribution. This is extremely important if we wish to understand the patterns of reproduction in the Red-backed Shrike and to correctly apply conservation principles to reverse the global decline of the species in particular as well as all the other shrike species in general.

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