Habitat use by the endangered Lesser Grey Shrike *Lanius minor* in Central Romania

Cosmin Ioan Moga[1*], Tibor Hartel[1], Kinga Öllerer[2] & Árpád Szapanyos[1]

[1] **Mihai Eminescu Trust, Cojocarilor 10, 545400 Sighisoara, Romania**
[2] **Institute of Biology – Romanian Academy, Spl. Independentei 296, 060031 Bucharest, Romania**
* Corresponding author: cosminioanmoga@gmail.com

ABSTRACT. In this paper we present data relating to nest density and habitat use by the Lesser Grey Shrike *Lanius minor* in the Târnava Mare Valley, Romania, using both nesting tree parameters (microhabitat), and habitat parameters measured in a 100m radius around each nest. The density of nests was 0.96 per km². Average distance between nests was 768.4m. Most of the nests (94.1%) were found in poplars, in the region of the middle third of their trunk, especially at the terminal parts of the branches. The birds preferred open habitats, with extended arable field cover. Moreover, the tree and shrub cover were small in areas used for nesting. As poplars are the preferred nesting habitats of this bird, and are scarcely represented in this area, the protection of these trees is critical for conservation of the Lesser Grey Shrike.

KEY WORDS: *Lanius minor*, nest site selection, habitat preference, Romania

INTRODUCTION

Lanius minor (Gmelin, 1788) is a long distance migrant passerine bird, which overwinters in South Africa, its nesting area extending from south-west Europe to Central Asia (Cramp & Perrins, 1993). This bird is in decline in the majority of the European countries, both the population abundances and the range of the species being affected (Lefranc & Worfolk, 1997; Sanderson et al., 2006). Romania is a stronghold of this species in Europe, nowadays having 364,000-857,000 pairs (Burfield & van Bommel, 2004). The species is protected according to the Birds Directive – Annex I, being one of the species for which Natura 2000 sites are designated in the European Union, and for which compensation measures are offered for land owners in the Member States. In Romania there is a lack of information regarding the density of this species/area unit and its ecology.

In this study we determined the following: (1) nest density per unit surface area (1km^2); (2) microhabitat used for nest building (the tree species and tree parameters); (3) habitat characteristics of the areas selected as territories, in comparison with unoccupied (control) sites, in a 100m radius (3.14ha) around each nest, underlining the proportion of habitat elements in the areas where territories were established.

MATERIALS AND METHODS

Study area

The Târnava Mare Valley is located in southern Transylvania, Romania (central coordinates: 46°14'N, 24°48'E). From a landscape perspective, the area is characterized by a hilly relief with elevations roughly between 400 and 700m. Arable fields cover less than 32% of total land cover, and are situated only at the base of gentle hill slopes and in the floodplain of larger valleys. The slopes of the hills are covered with meadows, pastures and various succession stages of forestation. The floodplain is situated at 320-450m altitude, and has a width of 600-1000m (most often 800m). In the floodplain the main land use is represented by arable fields, this having around 70% cover. Several abandoned plots covered by weeds and hedgerows and scattered shrubs and trees are situated in and across these arable fields. Moreover, the narrow adjacent water courses of the Târnava Mare River are bordered by small riparian forest corridors. Compact alluvial galleries stretch along the Târnava Mare River. These galleries are formed by White Willow *Salix alba* and White Poplar *Populus alba*, and are up to 50m in width.

Our study was conducted in the major river bed, represented by the former floodplain. Here the White Willow (Doniță et al., 2005), is the most common tree, with up to 70% cover. The rest of the trees are represented by White Poplar (around 28%) and other species such are Ash (*Fraxinus angustifolia*) and very rarely Black Alder (*Alnus glutinosa*), these covering around 2%. We considered only White Willow and White Poplar in our analysis because these were the most common trees. In the rest of the major river bed, the characteristic riparian vegetation is represented by old trees (almost exclusively by *Salix alba* and *Populus alba*), shrubs, patchily distributed reed *Phragmites australis* and different sedge *Carex* spp. species.

Data collection and analysis

The study was conducted between May 5 and June 28, 2008. We used line transects with unlimited width (Bibby et al., 2000), the maximum length of a transect being 1km, depending on accessibility in the field. The total length of transects was 22km and the average width of the studied floodplain section was 800m, meaning a study area of 17.6km². The observations were done between 9am and 12am always on clear days without strong wind.

Observations were done simultaneously by two people, walking side by side close enough to allow permanent visual contact between them while still covering the entire width of the major river bed. After the identification of *L. minor* individuals, their nests were detected by observing the birds heading towards their nests. Distances between nests were measured with a handheld GPS device.

The trees where the nests were constructed by the birds were considered by us as being microhabitats. In each microhabitat we recorded the following parameters: (i) the tree species in which the nest was found, (ii) the diameter at breast height of the tree (d.b.h.), (iii) the section of the tree in which the nest was built (lower, middle or upper 1/3), and (iv) the exact place where it was built (near the trunk or on a lateral branch). Since only one nest was observed in a willow, the d.b.h. values were compared only in the case of the poplars. In the comparison we considered 16 randomly selected poplars in which no nests were built.

We characterized the surroundings of trees with *L. minor* nests using seven parameters (see below). We consider these variables habitat variables. We chose 100m radius (i.e. 3.14ha) around each microhabitat because this is close to the documented territory size of the studied bird: 3.3ha (Min=1.9, Max=11.2ha) (Krištín, 1995), and 6.21ha (Min=2.9ha, Max=14.6) (Wirtitsch et al., 2001). The following habitat variables (in % cover) were estimated, after the methodology described by Cristea et al. (2004): (i) tree cover, meaning the canopy projection cover of all trees in the study plot, and similarly (ii) willow cover (out of total tree cover); (iii) poplar cover (out of total tree cover) and (iv) the total shrub cover. The total open habitat area covered only by herbaceous vegetation and arable field (v) was further split into two categories based on visual estimations: (vi) the herbaceous vegetation cover (grassland and abandoned agricultural plots invaded by weeds out of total open habitat cover) and (vii) agricultural field cover (out of total open habitat cover). Most of the agricultural fields were represented by maize cultures (very rarely and only in small plots we found potato plantations and straw cereals), the plantation distance being 70cm between rows and 35cm in rows, therefore in the study period around 45% of the field was bare ground. In order to determine the position of the nests, and the centre of the bird territories, we considered the distance (measured with GPS) from the tree where the nest was located to the Târnava Mare River, separating two situations: (1) the nest was built in a tree from the main alluvial forest gallery, or (2) in the floodplain, in isolated tree groups or vegetation strips along the tributaries, some of which are dried-out during summer.

On the transects where we did not find the species, we described the same variables in 17 observation points in a 100m radius, selected randomly, in order to include all habitat types from the Târnava Mare floodplain, from the river edge to the first terrace. The minimum distance between the randomly selected study points and the observation points was 500m.

For the comparison of the habitat variables between the observation points in which nests were present (bird territories), with those where no nests were found (control sites) we used the ANOVA parametric *t* test, and the non-parametric Mann-Whitney U test. Data normality was tested with the Levene test.

RESULTS

We recorded 17 *L. minor* nests meaning 0.96 nests per km². The average distance between nests was 768.4m (Median=575, Min=50, Max=2800, SD=692.5). All nests were built separately and had a dispersed distribution in the landscape.

Out of these 17 nests, 16 (94.1%) were found in poplars, and only one nest (5.9%) was built in a willow. The d.b.h. of these poplars (Mean=102.8, Min=35, Max=152.9, SD=36.1), is larger than the d.b.h. of the 16 poplars we used as control sites (Mean=34.1, Min=23.9, Max=66.9, SD=10.6), the difference being statistically significant (Mann-Whitney U test, Z=4.70, P<0.0003). Out of the 16 nests, 12 (75%) were built in the middle 1/3 of the tree trunks, and four (25%) were built in the upper 1/3. The nest built in a willow was located in the upper 1/3 of the tree, the d.b.h. was 100.31cm, and the distance to the river was 150m. 15 nests (88.2%) were built in lateral branches, towards their top, and two nests (11.8%) were built between the main trunk and one of its lateral branches (the case of one nest built in poplar and the only nest built in willow).

The descriptive analysis of the habitat variables recorded in the observation points located in bird territories (nest was present) and in the control sites, and the comparison of the variables between these two categories are presented in Table 1. The average distance between the trees where nests were built and the river is 213.2m (Median=80.00, Min=10, Max=1000, SD=318.7, n=17). Out of the 17 trees where nests were built, six (35.3%) were located in the main alluvial forest gallery of the Târnava Mare, and 11 (64.7%) were located in the floodplain, in isolated tree groups or vegetation strips with few trees.

The average values for the proportion (%) of different habitat elements from the bird territories are presented in Table 1. The largest proportion is represented by open habitats (87.88%), and within these the arable fields (57.6%). The average shrub cover is 9.4% over the entire area, while tree cover is 6.5%. Among trees, poplars are more preferred.

TABLE 1

Descriptive analysis and comparison of habitat variables related to the presence and absence of *L. minor.*

	***L. minor* presence**				***L. minor* absence**				
	Average cover (%)	**Min.**	**Max.**	**SD**	**Average**	**Min.**	**Max.**	**SD**	***P***
Total tree cover	6.52	3.00	10.00	2.06	20.88	5.00	40.00	13.37	0.001[2]
Total willows	2.76	0.00	5.00	1.82	16.88	3.00	35.00	11.87	**<0.0004[2]**
Total poplars	3.64	1.00	6.00	1.45	4.11	0.00	10.00	2.42	0.49[1]
Shrub cover	9.41	2.00	20.00	4.54	23.52	10.00	40.00	10.11	**0.0001[2]**
Open habitat	87.88	75.00	96.00	4.97	61.58	35.00	90.00	18.60	**<0.0004[2]**
Herbaceous vegetation	31.11	5.00	54.00	14.90	17.05	5.00	55.00	12.38	**0.005[1]**
Arable land	56.76	30.00	85.00	16.29	44.52	25.00	85.00	18.32	**0.04[1]**

Note: 1 – *t* test, 2 – Mann-Witney U test.

DISCUSSION

The recorded nest density was 0.96 per km², this being a small to average density compared to figures given in the consulted literature data. KRIŠTÍN (1995) recorded 66 nesting pairs in 50km² (1.32 pairs per km²) in a study conducted in Slovakia, whereas LOVÁSZI et al. (2000), in Hungary recorded 0.05 nesting pairs per km², the largest density being 0.6 nesting pairs per km². In a Slovakian study, KRIŠTÍN et al. (2000), recorded a density of 4.20 pairs/km² in 1996, and 3.85 pairs/km² in 1997, values that are larger than those from KRIŠTÍN (1995) and LOVÁSZI et al. (2000). We found that the nests were isolated, a situation that is different from other studies (CRAMP & PERRINS, 1993; KRIŠTÍN et al.; 2000; WIRTITSCH et al.; 2001). A potential reason may lie in the scattered distribution of the poplars in the landscape, these trees representing key habitat for nesting for the Lesser Grey Shrike in our area.

Although the floodplain of Târnava Mare is rich in willows – trees, potentially suitable as nesting habitats – all nests except one were found in poplars. Possibly, the structure of these trees offers better conditions for nesting than does that of willows. Moreover, we found that the unoccupied poplars from the control plots were significantly smaller (d.b.h.) than those occupied by birds (see results). These results suggest that even within a particular microhabitat type (i.e. poplar trees in this case) larger ones are more preferred. The predominant use of poplars for nest building was noted also by HORVÁTH (1959) and LOVÁSZI et al. (2000). In the study conducted by LOVÁSZI et al. (2000), beside poplars, four other species were also used in nest building, but to a lesser degree. The situation is similar to our findings that nest site selection is not related to the numerical abundance of the tree species in the area. KRIŠTÍN (1995) noted that 97% of the observed nests were built in fruit trees. Similarly, WIRTITSCH et al. (2001), in a study from central Slovakia, observed a large proportion of nests built in fruit trees. The authors did not record a clear preference for one kind of fruit tree; some of the species (i.e. apple) were used according to their availability while others not. The above-mentioned studies suggest that *L. minor* may show a wide preference for microhabitats. In our case, this bird selected almost exclusively large poplars. This may be due to low competition for microhabitats because of, e.g. the low density of individuals. At low density, the competition for nesting sites may be low, and the actual offer (i.e. large poplars) may allow the occupancy of the best nesting sites. This may explain the almost exclusive use of large poplars, even is these are relatively underrepresented compared to willows. At higher population densities the competition for the best nesting places may result in the use of a wider spectrum of microhabitats (i.e. in terms tree species).

In our study, most of the nests (75%) were built in the middle 1/3 of the trees. Although we found no literature data with which we could compare these findings, we mention that in the study of LOVÁSZI et al. (2000), in one of the sites the nests were built especially high, while in the other site they were built at different heights, without a clear tendency. The authors considered that the height at which nests are built is probably influenced in certain situations by anthropic pressure. The average distance between the Târnava Mare River and the trees from the minor river bed where the nests were built is 213.2m, the maximum distance being 1000m. This suggests that nests are preferentially built in trees forming small groups in the narrow alluvial corridors of the floodplain, and not in the main alluvial forest gallery of the Târnava Mare, where tree canopies are more close to each other. The preference of this species for loose tree cover was observed also by KRIŠTÍN (1995). The majority of the nests from our study were built on lateral branches, towards their top, a situation reported also by KRIŠTÍN (1995). A reason might be the avoidance of predators.

We found that Lesser Grey Shrike territories are established preferably in open habitats with large areas of arable fields and herbaceous vegetation, with small shrub and tree cover. Of the small number of trees found in the territories, poplars were the more numerous. In a similar way, LOVÁSZI et al. (2000) found that birds prefer open, steppe habitats, where trees have a loose distribution and the herbaceous vegetation is low. In the study of KRIŠTÍN (1995) all nests were found in extensive orchards surrounded by pastures and arable plots. We remark again the importance of loose tree cover, open habitat with herbaceous vegetation and of arable fields in nesting territory selection. In the same study, nests were often found nearby houses, in the surrounding gardens. In the study of WIRTITSCH et al. (2001), meadows represented the most preferred habitat in the territories of the Lesser Grey Shrikes (in the period of chick feeding, especially the mowed meadows), but also a considerable area of bare ground. In our study, the largest area is covered by open habitats, and within these, by arable fields. Similar results were reported by WIRTITSCH et al. (2001), where the largest proportion was represented by meadows, followed by arable fields. The same authors showed that bare ground, lacking vegetation, present in large amounts in agricultural fields, was the most used habitat element for feeding by *L. minor*, during nest building and incubation, while during the period of chick feeding food was gathered especially from mowed meadows. WIRTITSCH et al. (2001) explain these preferences for bare ground and low vegetation by the better accessibility to large insects, on which the Lesser Grey Shrike feeds preferentially (KRIŠTÍN, 1995). The same explanation might be valid also in our case, in the preference for agricultural fields, with bare ground. In the study of (KRIŠTÍN, 1995), of the open habitat categories, meadows were represented in the largest amount, while agricultural fields were present in a lesser amount, a situation that is different in our study.

CONCLUSION AND IMPLICATION FOR CONSERVATION

In the central section of the Târnava Mare Valley, *L. minor* prefers open habitats with small shrub and tree cover, with high amounts of arable fields located in the major river bed of the Târnava Mare. Although there are larger numbers of willows (*S. alba*) available for nest building, the Lesser Grey Shrike nests preferentially in large poplars, located at a distance from the main alluvial forest gallery. Our study shows that old poplars are the preferred nesting microhabitats for *L. minor.* Therefore, the maintenance of old, isolated poplars in the floodplain of the Târnava Mare, and of the small tree-groups where these poplars are found, is an essential condition for the conservation of this species, endangered at the European level. The cutting of old trees (both willows and poplars) by locals is a frequent practice in this area (Moga, unpublished data). For this reason, local communities and authorities responsible for environmental protection need to be better informed regarding the importance of old trees (especially White Poplars) and the insurance of their natural regeneration.

ACKNOWLEDGEMENTS

We thank the Mihai Eminescu Trust for the financial support of this study.

REFERENCES

BIBBY CJ, BURGESS ND, HILL DA & MUSTOE S (2000). Bird census techniques. Second Edition. Academic Press, London: 302pp.

BURFIELD I & VAN BOMMEL F (eds) (2004). Birds in Europe: population estimates, trends and conservation status. BirdLife International, Cambridge: 374pp.

CRAMP S & PERRINS CM (1993). The birds of the Western Palearctic, Vol. 7. Oxford University Press: 577pp.

CRISTEA V, GAFTA D & PEDROTTI F (2004). Fitosociologie. Editura Presa Universitara Clujeana, Cluj-Napoca: 143.

DONIȚĂ N, POPESCU A, PAUCĂ-COMĂNESCU M, MIHĂILESCU S & BIRIȘ I-A (2005). Habitatele din România. Editura Tehnică Silvică, Bucureşti: 496pp.

HORVÁTH L (1959). The life history of the Lesser Grey Shrike in Hungary. Acta Zoologica Hungarica, 4:319-322.

KRIŠTÍN A (1995). Why the Lesser Grey Shrike (*Lanius minor*) survives in Slovakia: food and habitat preference, breeding biology. Folia Zoologica, 44(4):325-334.

KRIŠTÍN A, HOI H, VALERA F & HOI C (2000). Breeding biology and breeding success of the Lesser Grey Shrike *Lanius minor* in a stable and dense population. Ibis, 142:305-311.

LEFRANC N & WORFOLK T (1997). Shrikes. A guide to the shrikes of the world. Pica Press, Sussex: 192.

LOVÁSZI P, BÁRTOL I & MOSKÁT C (2000). Nest-site selection and breeding success of the Lesser Grey Shrike (*Lanius minor*) in Hungary. The Ring, 22 (1):157-164.

SANDERSON FJ, DONALD PF, PAIN DJ, BURFIELD IJ & VAN BOMMEL FPJ (2006). Long term declines in Afro-Palearctic migrant birds. Biological Conservation, 131:93-105.

WIRTITSCH M, HOI H, VALERA F & KRIŠTÍN A (2001). Habitat composition and use in the lesser grey shrike *Lanius minor.* Folia Zoologica, 50(2):137-150.

Received: March 22, 2009
Accepted: March 5, 2010
Branch editor: Blust Ronny