Avocetta 35: 43-49 (2011)

Breeding habitat and nesting site of the red-backed shrike *Lanius collurio* in farmland of the Marche region, Italy

FEDERICO MORELLI[1], MASSIMO PANDOLFI[2]

[1] Dipartimento di Scienze dell'Uomo, dell'Ambiente e della Natura, Università degli Studi di Urbino "Carlo Bo" Campus Scientifico Sogesta, 61029 Urbino (Italy) (federico.morelli@uniurb.it)
[2] Istituto di Scienze Morfologiche, Laboratorio di Zoologia e Conservazione, Università degli Studi di Urbino "Carlo Bo" Via Oddi 21, 61029 Urbino (Italy)

Abstract – In this work we studied some characteristics of nesting sites of red-backed shrike *Lanius collurio* in some areas of the Marche Region (Central Italy). These areas are characterized by a temperate climate and by mainly agricultural cover. We analyzed the breeding site macrohabitat and the nest microhabitat. Results showed a prevalence of shrubs, most commonly *Prunus spinosa* and *Rosa canina*, as nest support. The nest is generally located at mid height (1.39 m) and in the midpoint of the shrub. Nesting sites were located mainly in the edge zone of the vegetation patches and nearby the roads. In over 65 % of cases the nests were built less than 5 meters far from roads. Results highlight the importance of some vegetation species and the presence of certain environmental structures (presence of shrubs, tree rows and other marginal habitats of farmland areas) for the preservation of this species, whose conservation status in Italy and Europe is currently unfavourable.

INTRODUCTION

Populations of red-backed shrike *Lanius collurio* are currently decreasing in number and size throughout the world (Yosef 1994). The European population, considered in the last decades to be in moderate decline, is estimated between 6.300.000 and 13.000.000 pairs, but in the last years it appears rather stable and shows a constant short term trend (PECBMS 2008). The Italian breeding population has been estimated between 50.000 and 120.000 pairs (Birdlife International 2004). However, this species still remains the commonest of the European Laniidae, distributed from the Iberian Peninsula to southern Scandinavia and eastwards to the Ukraine, with Sicily (where it is scarce), Greece and Turkey forming its southern limit. In Italy it is present in all regions as a regular migrant and breeding species during summer (Foschi and Gellini 1987, Meschini and Frugis 1993, Dinetti 1997). As elsewhere, in the Marche Region once widespread this species has become far less abundant over the last twenty years (Pandolfi and Frugis 1987, Pandolfi and Giacchini 1995).

For nesting the red-backed shrike prefers transition zones between woods and grassland, tree-rows and thick hedgerows often bordering roads, open country with shrub or tree cover (Cramp and Perrins 1993, Lefranc 1993) and open parks and gardens on the outskirts of towns. Its typical feeding habitat is farmland, often abandoned, with scattered trees or shrubs providing natural perches for hunting (Glutz von Blotzheim 1962, Lefranc 1993, Tucker *et al*. 1994, Farkas *et al*. 1997, Kuzniak and Tryjanowski 2000, Tryjanowski *et al*. 2000).

In this study we analysed red-backed shrike nesting habitat characteristics at four different locations in farmland in the River Foglia catchment area in central Italy. We made a detailed assessment of nest-site features. The selected parameters describe the natural habitats and vegetation type selected for nesting, the nest site microhabitat and the level of human presence in the area (proximity to roads, buildings and villages). These information could help to explain the local distribution of the breeding population of the red-backed shrike (Morelli *et al*. 2007). Moreover, identifying the main factors affecting nest site selection could be of value in developing effective strategies for the preservation of the red-backed shrike at both local and regional level, including specific measures for improving the agro-environmental schemes currently followed.

METHODS

Study area

Fieldwork was carried out in two 'Special Protection Zones' (ZPS), namely ZPS 4 "Badland and dry grassland - Mid-Foglia Valley" and ZPS 7 "Mombaroccio and Beato Sante", located in the River Foglia catchment area near the northern boundary of the Marche Region. Four macro-areas occupied by nesting pairs were surveyed in detail, covering a total of 780 hectares (Fig. 1).

Data collected

The data were collected during the 2006 and 2007 breeding seasons. After locating nesting pairs by direct observation during arrival, courtship and nest-building (from mid May to the end of June), their territorial distribution was recorded and plotted as points on the map. When nests were found, the area around the nest was defined as "nesting site".

The nest microhabitat was characterized according to the following parameters:

1) plant species where nest was built;
2) plant height (meters);
3) nest height from ground (meters);
4) nest position within the shrub crown, described as one of six possible positions obtained by combining height (defined as lower, middle or upper third along the vertical axis) with distance from the centre (defined as proximal or distal along the horizontal axis) (Tab. 1).

The macrohabitat was characterized by means of the following parameters:

1) area (square meters) of the vegetation type where the nest was built;
2) patch vegetation type, using the botanic classification adopted in the synphytosociological map of Marche Region (Catorci *et al*. 2007);
3) nest location in the habitat (in a shrub / in a tree / on the ground);
4) environment surrounding the nesting sites;
5) distance from road (i.e. distance in meters between the nest and the nearest road);
6) road type (classified as: paved road, unpaved (dirty) road, track);
7) distance from built-up areas (i.e. distance in meters from the nest to the nearest village);
8) distance from isolated houses (i.e. distance in meters from the nest to the nearest house).

Were also recorded the following parameters of red-Backed shrikes: number of neighbouring nests around the nest site (within a 500 m radius) and distance in meters from the nearest nest.

Monitoring frequency

After locating the nest sites, all territories were monitored regularly at least once a week in order to cover all the various stages of the breeding phenology (Blondel 1985, Bibby *et al*. 1997). The number of nest checks was kept to a minimum to avoid disturbing the nesting pairs (Tryjanowski and Kuźniak 1999); in some cases the microhabitat parameters were recorded at the end of the breeding season, after the young had fledged.

Nesting sites and GIS

Many of the macrohabitat parameters were calculated by means of a Geographical Information Systems (GIS) analysis of the nesting site and surrounding environment, using

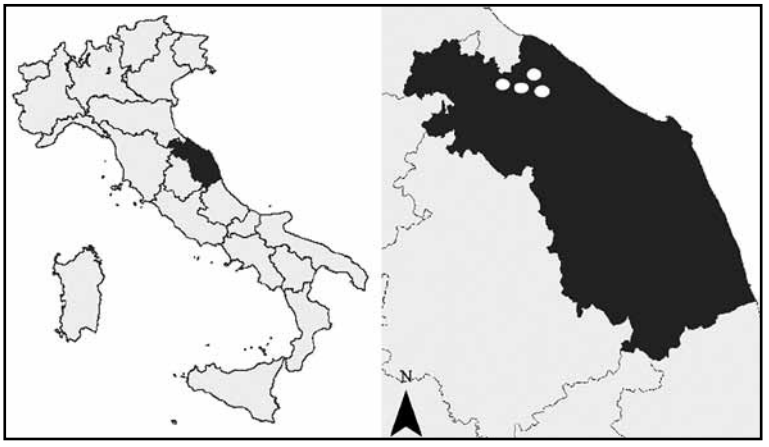

Figure 1. Study area in the Marche region, Central Italy.

Table 1. Nest position within the shrub crown. The vertical axis represents the proportional height in the plants. The horizontal axis represents the position in relation to the shrub trunk.

	Horizontal axis	
Vertical axis	proximal	distal
	A3	B3
	A2	B2
	A1	B1

the vegetation physiognomies map (Catorci *et al*. 2007) and the Marche Region CTR maps (Technical Regional Cartography) with the following thematic layers: buildings, hydrography, altitude and road network. The nests of the species were digitized at 1:500 scale using ESRI™ ArcGIS 9 software, as plots on the map. The nesting site was defined using a buffer of 80 m radius around the nest, corresponding to the territory occupied by shrikes pairs during the breeding season (Cramp and Perrins 1993, Lefranc 1993).

Statistical analyses

The red-backed shrike nest data gathered during the two monitoring years were compared using ANOVA and *Fisher* test. The same tests were run to compare data collected in the various breeding sites. *Chi-square* tests were used to compare the discrete variables. The measures are presented as mean values, with max and minimum values. All tests were carried out using the SPSS v. 13.0 software package.

RESULTS

A total of 50 nests were monitored (Tab. 2): 16 during 2006 and 34 during 2007. As the mean values of the studied parameters were not found to differ significantly from one year to the next or between the various localities (all *F* tests, $P > 0.05$), they were considered as belonging to a single pool of data. Of the 50 nests, 43 were located in ZPS 4 (86.0 %) and 7 in ZPS 7 (14.0 %).

Spatial distribution of the red-backed shrike population

The mean density of red-backed shrike pairs was 0.64 ± 0.10 pairs/10 ha. The mean distance between nests was 316.90 ± 245 m, with a maximum distance of 1100 m and a minimum of 65 m. The elevation of the four nesting areas ranged from a minimum of 70 m (in ZPS 4) to a maximum of 420 m a.s.l. in ZPS 7.

Microhabitat characteristics

The vast majority of nests studied were built in shrubs (96 % of nests; $\chi^2 = 80{,}39$; df = 2; $P < 0.01$); only one nest was built on the ground (2 %) and it was well protected by shrub foliage, while one other nest was located on a tree (2 %). The shrub species most commonly used as a nest support was *Prunus spinosa* (54 % of cases), followed by *Rosa canina* (30 %) and *Crataegus monogyna* (10 (Fig. 2). The height of shrubs chosen for nesting ranged from a maximum of 4 m to a minimum of 1.7 m (mean = 2.79 m; SD = 0.54; N = 49). The nest position within the shrub crown showed a significant preference for mid height (A2 and B2) on the vertical axis ($\chi^2 = 12.13$; df = 2; $P < 0.01$), and for central (proximal) position on the horizontal axis (A1, A2 and A3) in over 65 % of cases (Fig. 3).

No significant variation in nest height was found between the two years of the study (mean = 1.36 m in 2006 and 1.40 m in 2007; F test = 1.64, p: 0.21). The mean nest height was 1.39 m with a max. height of 3 m and a minimum of 0.1 m (excluding one single case of a nest on

Table 2. Red-backed shrike nests and their macrohabitat parameters as recorded during the two study years.

Number of nests	Surrounding environment	Mean surface of vegetation patches where the nests were positioned (m^2)
27	farmland with scattered shrubs	47.9
7	farmland with hedgerows	51.8
5	farmland and uncultivated	30.0
3	shrubs and tree-rows	55.6
2	uncultivated with shrubs	31.1
2	tree-rows	49.2
2	shrubs	37.5
1	farmland and riparian	23.0
1	farmland and vineyards	25.0

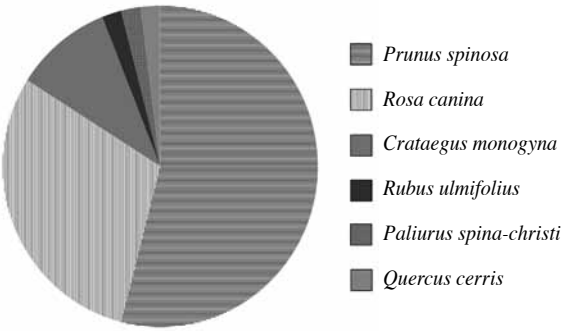

Figure 2. Plant species used as nest support in percentage.

the ground, which was in central position and under thick shrub cover) (Tab. 3).

Macrohabitat characteristics

The main vegetation type of the nesting sites consisted of farmland with shrubs, and to a lesser extent tree-rows or hedgerows. Most nests were built in shrubland. The mean surface of the vegetation patches containing nests was 46.2 m^2 (N: 50), with a maximum of 300 m^2 and a minimum of 6 m^2. The majority of nests (86.1 %) was located along the edges of patches rather than internally (13.9 %), a highly significant difference ($\chi^2 = 21.34$; df = 1; $P < 0.05$; Yate's correction). The vegetation type surrounding the nest sites consisted mainly of farmland and uncultivated land.

Roads were present in all the nesting areas studied.

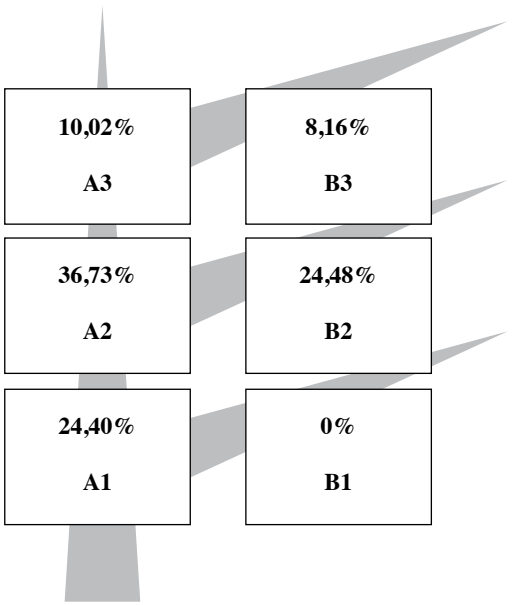

Figure 3. Diagram of nest position within the shrub crown.

Table 3. Shrub and nest height (m).

	Shrub height	Nest height
Mean	2.79	1.39
Maximum	4.5	3.0
Minimum	1.6	0.1
SD	0.76	0.63
N	48	47

Unpaved roads were more common (53.2 %) than paved ones (46.8 %), but no significant differences were found between the two road types ($\chi^2 = 0.17$; df = 1; $P > 0.05$; Yate's correction).

The mean distance from nests to the nearest road was 12.0 m. However, over 75 % of the nests were built less than 12 meters from a road (Fig. 4). Over 65 % of the nests were located less than 1000 meters from the nearest village: the mean distance was 971.3 m. The mean distance between the nests and the nearest house was 229.5 m (Tab. 4).

DISCUSSION

As during the last decades red-backed shrike populations are considered in decline, the species has been the subject of quite detailed research in recent years throughout its European range (Luise 1991, Lefranc 1993, Lugger 1993, Farkas *et al*. 1997, Tryjanowski *et al*. 2000, Latus *et al*. 2004). Studies focusing on the species habitat preferences are of particular interest, given that it frequents developed areas subject to rapid change such as farmland (Donald *et al*. 2006) and transitional or ecotonal zones.

The type of nesting habitat typically chosen by the red-backed shrike in central Italy consists principally of farmland with patches of shrubs, tree-rows or occasional isolated trees, in areas of low hills or lowlands. For nesting purposes, the species shows a significant predilection for mainly tall shrub species (Lefranc 1993, Farkas *et al*. 1997, Tryjanowski *et al*. 2000). The shrubs most commonly used in our study area were Blackthorn *Prunus spinosa* and Dogrose *Rosa canina* (83 % of cases), confirming the findings of previous studies (Farkas *et al*. 1997, Guerrieri and Castaldi 2006). In our study area we have almost no cases of nesting on trees, but the choice of nest trees are strongly dependent from availability of some species of trees (Goławski 2007).

Comparing the results of our study with those obtained in another region (Latium) in central Italy with temperate climate (Guerrieri and Castaldi 2006), we found that the mean density of breeding pairs was conspicuously low-

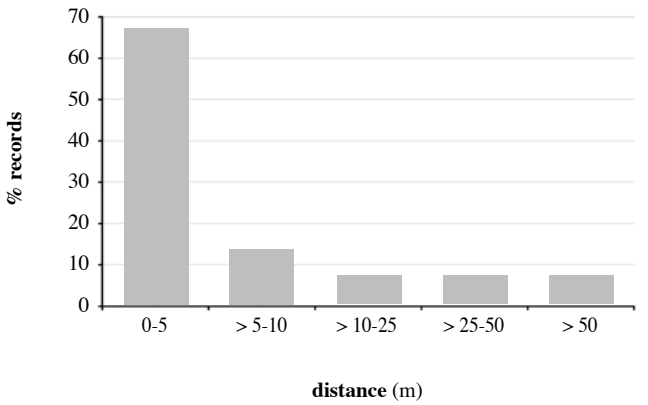

Figure 4. Distance from the nest to the nearest road.

er – 0.64 versus 1.66 pairs/10 hectares – in our region (Marche). This figure is even lower when compared with results from Engadin (southeast Switzerland), where a density of 5.4 pairs/10 ha was found (Pasinelli *et al*. 2007). The mean height of shrubs used for nesting was similar in the Marche (2.79 ± 0.54 m) and in Latium (2.31 ± 0.82 m). Also the mean nest heights recorded by the two studies (1.39 ± 0.63 m vs. 1.35 ± 0.57 m) were practically identical.

Likewise, in both studies the nest position within the most commonly used shrub was A2 and B2 on the vertical axis, with 59% of cases overall in our study versus 57.5% in Guerrieri and Castaldi (2006). In addition, over 64% of the checked nests were positioned at the centre of the shrub crown, where they are most protected by the dense foliage. The predominant vegetation types in the areas around the nest site were: farmland (62%), shrublands (26%), uncultivated or abandoned fields (11%), and a reduced extent hedges (1%).

The breeding habitats in the areas that we studied were fragmented by roads (paved, unpaved and tracks). This observation highlights the shrike's strong tendency to use roadside shrubs as nesting sites or perches (Cramp and Perrins 1993, Lefranc 1993), a tendency fostered by the long-standing local tradition of planting hedges and verges along country roads; these generally consist of *Crataegus sp., Prunus spinosa, Paliurus spina-christi, Ligustrum vulgare* (Witt 1987, Pandolfi 2000).

Over 65% of nests were located less than 5 m from road edges. In many of these cases there were other shrubs available as potential nest sites within the nesting area, but located further away from roads. Although we did not specifically investigate this aspect, our results suggest that the species actively prefers closeness to a road when selects its nest microhabitat. A parameter not taken into account in our study was the disturbance caused by road traffic (n° of cars per hour, etc.), but many of the roads surveyed near nest sites were used regularly. This fact would seem to confirm that road does not influence red-backed shrike nest site selection negatively, a feature already noted among other *Laniidae* which nest in Europe (Bechet *et al*. 1998).

The presence of roads within the nesting habitat shows that territorial fragmentation due to the road network (but not highway) may be a positive factor for the distribution of this species: besides providing suitable nest sites (i.e the aforementioned roadside shrubs) (Morelli 2011), it offers an additional benefit to a species which feeds mainly on insects and micromammals (Lefranc 1993), that is the opportunity to exploit the exposed road surface as a rich hunting territory. This hypothesis has been confirmed by previous studies (Bechet *et al*. 1998). The shrubs along roads

Table 4. Distance between nests and building structures (m).

	Distance from road	**Distance from village**	**Distance from house**
MEAN	12.03	971.32	229.50
MAX	150	3000	500
MIN	0.5	150.0	10.0
N	47	47	47

can offer suitable nest sites but also represent "ecological traps" for birds because of traffic which is dangerous for them (Mumme *et al*. 2000). Nonetheless some animals seem unaffected by the presence of roads (Trombulak and Frissell 2000) and in the studied area the risk of mortality from collision with vehicles seem to be very low.

Our study is the first detailed research on red-backed shrike nest habitat use in the Marche and could contribute to creating a broader knowledge base on the habitats used by this species in this region. The opportunity offered by tools such as GIS (Salem 2003) to characterise and define the habitat types most commonly chosen by the species would prove to be extremely useful for identifying the principal risk factors and hence the correct strategies on which to base practical guidelines for the conservation of this species. Producing regional maps for *Lanius collurio* would be important, given that this information is essential for the *Farmland Bird Index* survey, currently in development in the European Union and useful to assess the conservation status of the agricultural environment by monitoring the presence of a series of indicator species (Gregory *et al*. 2005).

Our results show the importance of certain vegetation types for nest site selection by red-backed shrike. The presence of hedgerows with trees, vegetated road verges or tree-rows (much used in the past to divide up the various agricultural mosaics) has a significant effect on the distribution of this species. All these factors contribute to the quality of the red-backed shrike nesting habitat (Lefranc 1993, Pasinelli *et al*. 2007, Morelli 2012) and for this reason require more active management. For example, local authorities could introduce schemes to register the presence and use of certain shrubs such as *Crataegus sp*. and *Prunus spinosa* in roadside verges, as agricultural mosaic boundaries and to promote their conservation. In fact, the decision to preserve and restore local vegetation can be well motivated by the fact that it constitutes the only real, tangible link with the natural history of the area concerned (Pandolfi 2000). Another measure could be to recreate border, ecotonal or abandoned fields between different types of environment (e.g. woodland and farmland) to provide a favourable habitat for insects, small mammals and other animals. Measures of this type should be thought as an integral part of the Marche Region's agricultural and rural development policies.

These conservation guidelines should also help a reassessment of other issues (e.g. the territorial fragmentation due to roads carrying light traffic) which in some cases may be viewed not as factors not negative but rather potentially increasing the nesting habitat options available to shrikes and other species. In order to understand the ecological units which compose the agricultural environment (Biondi *et al*. 2007) and reconstruct the complex web of habitat interrelations, a cohesive set of such environmental management measures should be developed, and then monitored constantly for testing their contribution to local biodiversity.

Acknowledgements – We thank Nicola Baccetti, Adriano De Faveri, Emilio Baldaccini, Riccardo Santolini, Mauro Furlani and Maria Balsamo for their useful comments; Yanina Benedetti, Paolo Magalotti, Alessandro Fosca and Catia Berzigotti for helping in the field. We also thank Angus Dawson for the critical revision of the English version of the manuscript and the anonymous referees for the improvements of the text.

REFERENCES

Bechet A, Isenmann P, Gaudin R 1998. Nest predation, temporal and spatial breeding strategy in the woodchat shrike *Lanius senator* in Mediterranean France. Acta Oecologica 19: 81-87.

Bibby CJ, Burgess ND, Hill DA 1997. Bird census techniques. Academic Press, London.

Biondi E, Casavecchia S, Catorci A, Foglia M, Galassi S, Morelli F, Pandolfi M, Paradisi L, Pesaresi S, Pinzi S, Ventrone F, Vitanzi A, Angelini E, Bianchelli M, Zabaglia C 2007. Il progetto di "Rete Ecologica della regione Marche" (REM): per il monitoraggio e la gestione dei siti Natura 2000 e l'organizzazione in rete dei siti di maggiore conservazione. 43° Congresso della Società Italiana di Scienza della Vegetazione: "L'applicazione della Direttiva Habitat in Italia e in Europa", Ancona, Giugno 2007.

BirdLife International 2004. Birds in Europe: population estimates, trends and conservation status. BirdLife Conservation Series N.º 12, BirdLife International, Cambridge.

Blondel J 1985. Bird distribution and abundance. Some technical and theoretical comments. In: Taylor K, Fuller RJ and Lack PC (eds). Bird census and atlas studies. British Trust for Ornithology, Tring, pp. 3-14.

Catorci A, Biondi E, Casavecchia S, Pesaresi S, Vitanzi A, Foglia A, Galassi S, Pinzi M, Angelini E, Bianchelli M, Ventrone F, Cesaretti S, Gatti R 2007. La carta della vegetazione e degli elementi di paesaggio vegetale delle Marche (scala 1:50.000) per la progettazione e la gestione della rete ecologica regionale. Fitosociologia 44 (suppl. 1): 115-118.

Cramp S, Perrins CM (eds) 1993. The birds of the Western Palearctic, Vol. 7. Oxford University Press, Oxford.

Dinetti M 1997. Averla piccola, *Lanius collurio*. In: Tellini Florenzano G, Arcamone E, Baccetti N, Meschini E, Sposimo P (eds). Atlante degli uccelli nidificanti in Toscana (1982-1992). Quaderni del Museo di Storia Naturale di Livorno, Monografie 1, Livorno, pp. 414.

Donald PF, Sanderson FJ, Burfield IJ, van Bommel FPJ 2006. Further evidence of continent-wide impacts of agricultural intensification on European farmland birds, 1990-2000. Agriculture, Ecosystems and Environment 116: 189-196.

Farkas R, Horvath R, Pasztor L 1997. Nesting success of red-backed shrike, *Lanius collurio* in a cultivated area. Ornis Hungarica 7: 27-37.

Foschi UF, Gellini S 1987. Atlante degli uccelli nidificanti in Provincia di Forlì. Maggioli, Rimini.

Glutz von Blotzheim U 1962. Die Brutvögel der Schweiz. Schweizerische Vogelwarte Sempach, Aarau.

Goławski A 2007. Size and location of the red-backed shrike *Lanius collurio* nests in the agricultural landscape of eastern Poland. Notatki Ornitologiczne 48: 273-277.

Gregory RD, van Strien A, Vorisek P, Gmelig Meyling AW, Noble D, Foppen R, Gibbons DW 2005. Developing indicators for European birds. Philosophical Transactions of the Royal Society B 360: 269-288.

Guerrieri G, Castaldi A 2006. Caratteristiche del sito di nidificazione, densità e biologia riproduttiva dell'Averla piccola, *Lanius collurio*, in Italia centrale. Avocetta 29: 5-11.

Kuzniak S, Tryjanowski P 2000. Distribution and breeding habitat of the red-backed shrike *Lanius collurio* in an intensively used farmland. Ring 22: 89–93.

Latus C, Schultz A, Kujawa K 2004. Occurrence of the red-backed shrike, *Lanius collurio* depends on natural factors and mode of land use in the Quillow catchment, Germany. Biological Letters 41: 87-93.

Lefranc N 1993. Les pies-grièches d'Europa, d'Afrique du nord et du Moyen-Orient. Delachaux et Niestlé, Lausanne.

Lugger U 1993. The effect of habitat quality on breeding performance in the red-backed shrike *Lanius collurio*. Behavioural Processes 28: 235.

Luise E 1991. Biologia riproduttiva e aspetti etologici dell'averla piccola (*Lanius collurio*) in Valmenera (Cansiglio, Prealpi Venete). Tesi di Laurea. Università degli Studi di Padova.

Meschini E, Frugis S 1993. Atlante degli Uccelli nidificanti in Italia. Supplemento alle Ricerche di Biologia della Selvaggina 20: 1-218.

Morelli F. 2011. Importance of road proximity for the nest site selection of the red-backed shrike *Lanius collurio* in an agricultural environment in Central Italy. Journal of Mediterranean Ecology 11:21-29.

Morelli F. 2012. Plasticity of habitat selection by red-backed shrikes *Lanius collurio* breeding in different landscapes. The Wilson Journal of Ornithology 124:52-57.

Morelli F, Pandolfi M, Pesaresi S, Biondi E 2007. Uso di dati di monitoraggio e variabili degli habitat per la costruzione di modelli di distribuzione delle specie di uccelli nella regione Marche, Italia. Fitosociologia 44 (suppl. 1): 127-132.

Mumme RL, Schoech SJ, Woolfenden GE, Fitzpatrick JW 2000. Life and death in the fast lane: demographic consequences of road mortality in the Florida scrub-jay. Conservation Biology 14: 501-512.

Pandolfi M 2000. Considerazioni generali sulle tecniche di intervento nella progettazione di ripristino dell'ambiente a scopi naturalistici. In: Urbinati C., Ubaldi D., Gubellini L., Poggiani L., Pandolfi M. (eds). Alberi e arbusti per il nostro verde. Quaderni dell'Ambiente n. 5, Assessorato Beni e Attività Ambientali, Provincia di Pesaro e Urbino, Pesaro.

Pandolfi M, Frugis S 1987. Checklist degli uccelli delle Marche. Rivista italiana di Ornitologia 57: 221-237.

Pandolfi M, Giacchini P 1995. Avifauna nella provincia di Pesaro. Centro Stampa Amministrazione Provinciale di Pesaro e Urbino, Assessorato Ambiente Provincia di Pesaro e Urbino, Pesaro.

Pasinelli G, Müller M, Schaub M, Jenni L 2007. Possible causes and consequences of philopatry and breeding dispersal in red-backed shrikes *Lanius collurio*. Behavioral Ecology and Sociobiology. 61:1061-1074.

PECBMS 2008. Trends of common farmland birds in Europe. http://www.birdlife.cz/index.php?ID=1320).

Salem BB 2003. Application of GIS to biodiversity monitoring. Journal of Arid Environments 54: 91-114.

Trombulak SC, Frissell CA 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14: 18-30.

Tryjanowski P, Kuzniak S 1999. Effect of research activity on the success of red-backed shrike, *Lanius collurio* nests. Ornis Fennica 76: 41-43.

Tryjanowski P, Kuzniak S, Diehl B 2000. Does breeding performance of red-backed shrike, *Lanius collurio*, depend on nest site selection? Ornis Fennica 77: 137-141.

Tucker G, Heath M, Tomialojc' L, Grimmett RFA 1994. Birds in Europe, the conservation status. Birdlife Conservation series N° 3, Cambridge.

Witt R 1987. Cespugli e arbusti selvatici. Franco Muzzio Editore, Padova.

Yosef R 1994. Conservation commentary: Evaluation of the global decline in the true shrike, family *Lanidae*. Auk 111: 228-233.

Associate Editor: ***D. Campobello***