

Habitat use of the Barn Owl *Tyto alba* and the Little Owl *Athene noctua* in central-eastern Poland

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(Received on 10th January 2006; Accepted on 21st April 2006)

Abstract: Habitat use of the breeding Barn Owl and Little Owl was studied from March to May 2002 in an area of 264 km² of agricultural landscape in central-eastern Poland. The study was conducted by using tape-recording stimulation in 70 villages and 1 town. 12 breeding pairs of Barn Owls (0.45 bp/10 km²) and 9 of Little Owls (0.34 bp/10 km²) were recorded. In both Barn Owl and Little Owl territories, arable fields and grasslands predominated (79.9% and 71.3% of the territories, respectively). Comparison of inferred territories around calling points (paper territories) and randomly chosen areas (random territories) showed that Barn Owl preferred orchards. Proportions of habitat types differed significantly between those owl species.

Key words: *Tyto alba*, *Athene noctua*, territories, extensive farmland

INTRODUCTION

The Barn Owl *Tyto alba* (Scop., 1796) and the Little Owl *Athene noctua* (Scop., 1769) are species characteristic of farmland. Their decline has been noted in many European countries (HAGEMELER & BLAIR 1997, BIRDLIFE INTERNATIONAL 2004). This is caused mainly by changes in their environment, accompanied by intensification of farming practice (mainly the use of pesticides) and disappearance of potential nesting sites (TUCKER & HEATH 1994). Both owl species occur in varied habitats – from open and extensively cultivated farmland with a mosaic of grassland and fields, to highly urbanised areas (suburbs) and rocky mountains (CRAMP 1985, GÉNOT & VAN NIEUWENHUYSE 2002).

Knowledge of the distribution and numbers of the Barn and Little Owl in Poland is very poor, but fragmented data indicate a decreasing trend in numbers of both species (TOMIAŁOJC & STAWARCZYK 2003). Nevertheless, in central-eastern Poland, where extensive agriculture dominates, these owl species show stabilization in the

last 20 years (DOMBROWSKI et al. 2004). The aim of the present paper was to define habitat preferences of the Barn Owl and the Little Owl in the agricultural landscape of central-eastern Poland. Identification of habitat preferences of both owl species can be important for their active conservation, as the structure of landscape can affect their breeding success (BOND et al. 2004).

STUDY AREA AND METHODS

The study was conducted in the eastern part of the Mazovia Province ($52^{\circ}17'N$; $22^{\circ}17'E$ at the centre of the plot, 140-160 m above the sea level: central-eastern Poland), which is characterised by a highly fragmented agricultural landscape (Fig. 1). The study plot covered 264 km² and was located 10 km north of the town of Siedlce, where arable fields predominated (Fig. 2). The study area includes 70 villages and settlements and the town of Mordy (ca 2500 inhabitants).

Between March and May 2002, human settlements (including single buildings) were visited twice and tape-recording stimulation was used. The first control was

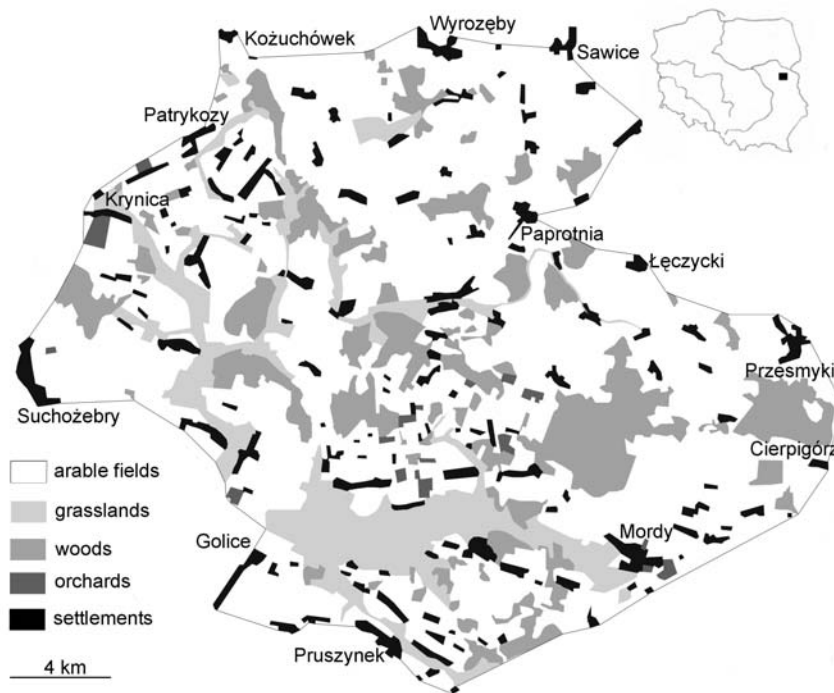


Fig. 1. Map of the study plot

performed between 12th March and 19th April, and the second one between 23rd April and 3rd May. Depending on settlement size, 1-5 points of stimulation were set up (140 in total), where calls of the Little Owl and of the Barn Owl were played in 3-minute sequences. The control of the whole study plot lasted 4 nights. In addition,

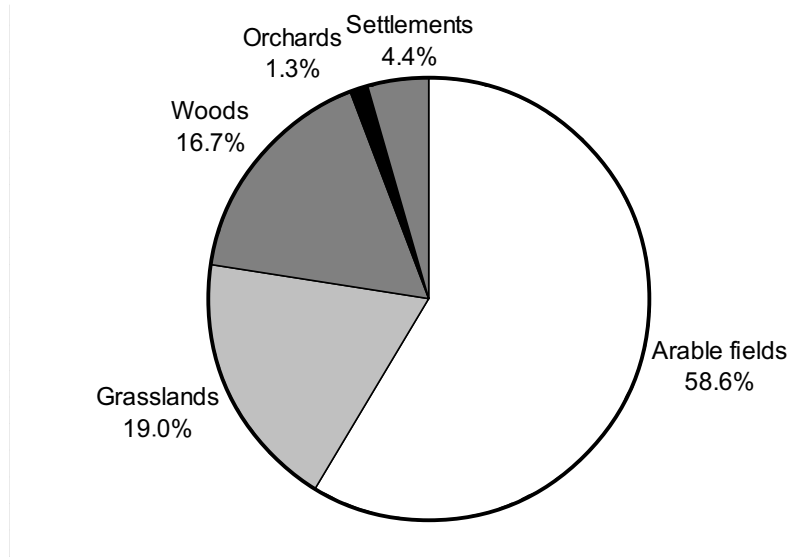


Fig. 2. Habitat structure of the study plot

the third control was done (on 6th/7th May) at the sites where the occurrence of one of the species during the first 2 controls was suspected. Additionally, we visited all 11 churches situated in this area, because Barn Owls often occupied high church towers (GOŁAWSKI et al. 2003).

Habitat preferences of both owl species were studied basing on comparison of proportions of certain habitats within paper territories and random territories. Paper territories were assigned by drawing circles centred upon the sites of records of singing individuals. When during 2 inspections the birds were heard from different places, as a centre of the territory a point in half distance between calls was assumed. There was a single such case in each species, and distances between encounters of birds during both these controls did not exceed 100 m. From among the stimulation points where no owls were encountered, points established as centres of random territories were chosen at random. The number and size of random territories was the same as the number and size of paper territories of each owl species (12 for the Barn Owl and 9 for the Little Owl). It was also assumed that the centre of a random territory should be located at least 5 km from the compared paper territory. The area of each habitat within territories of both types was calculated with a planimeter from a topographical map on a scale of 1:10 000.

Because of a lack of data from Poland about the size of owl territories, data from other countries of Central Europe were used for comparison. Densities of both species on the study plot were relatively low and the radius of these circles corresponds to the maximum territory size of each species. The Barn Owl territories were estimated at 1500 m (706 ha) – (CRAMP 1985, MICHELAT & GIRAUDOUX 1991), while those of Little Owls were estimated at 440 m (60 ha) – (FINCK 1990, GÉNOT & VAN NIEUWENHUYSE 2002). Constant size of the territories was assumed, although it may change during the breeding season (FINCK 1990, ROULIN 2002).

In the statistic analyses for comparisons of the habitat size between paper and random territories, Fisher's linear discriminant (FLD) was used. For comparison of proportions of habitats in paper territories of both species of owls, the G test was used (SOKAL & ROHLF 2001). All statistics were calculated with the program Statistica (STATSOFT 2003).

RESULTS

We recorded 12 breeding pairs of the Barn Owl (0.45 bp/10 km²) and 9 of the Little Owl (0.34 bp/10 km²). Three broods of the Barn Owl were located in churches and the fourth pair regularly visited a church, although they had a nest in another place. One church visited by a Little Owl was also identified.

Paper territories of both owl species included 5 types of habitat (Table 1). The percentage of habitat types differed significantly between the 2 owl species (G-test: $G_4 = 10.4$, $P = 0.034$). In Barn Owl paper territories, arable fields predominated, as

Table 1. Area of habitats (ha) in paper (P) and random territories (R) of the Barn Owl *Tyto alba* and Little Owl *Athene noctua*

Habitat	Barn Owl				Little Owl			
	P		R		P		R	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Arable fields	422.6	22.56	411.9	28.36	32.9	3.61	39.8	4.09
Grasslands	141.7	19.08	146.6	17.97	10.0	1.71	11.9	2.59
Woods	85.9	22.47	113.6	22.16	3.5	1.30	1.2	0.99
Orchards	18.5	6.15	3.2	1.65	3.7	2.42	0.7	0.66
Settlements	37.3	8.44	30.7	4.41	9.9	3.17	6.4	1.95

they reached 59.8% of the area. Together with grasslands, open areas covered 79.9% of the territories. Woods covered 12.2%, orchards 2.6%, and human settlements 5.3%. Differences in habitat structure between paper and random territories were statistically significant (ANOVA, $F_{1,22} = 5.74$, $P = 0.026$). The model explained 20% of the

Table 2. Results of Fisher's linear discriminant analysis of the Barn Owl paper and random territories

Variable	B	SE	t	P
Orchards	0.014	0.006	2.396	0.026
Constant	0.353	0.113	3.123	0.005
$F_{1,22} = 5.74$, $P = 0.026$, $R^2 = 0.20$				

variance in size of particular habitats in both kinds of territories. Only orchards turned out significant in the analysis ($P = 0.026$, Table 2)

In Little Owl paper territories, arable fields reached 54.6% of the area. Settlements and grasslands covered, respectively, 16.6% and 16.7% of the territories. Lower proportions were covered by orchards (6.2%) and woodlands (5.9%). The area of habitat did not differ significantly between paper and random territories (ANOVA, $F_{5,12} = 1.33$, $P = 0.317$).

DISCUSSION

The density of the Little Owl in this study was lower than in other types of landscape in Poland (TOMIAŁOJC & STAWARCZYK 2003). However, most studies in Poland were carried out at least a dozen years ago, when numbers of the Little Owl were much higher. The noted density of the Barn Owl was high in comparison with other regions of Poland (TOMIAŁOJC & STAWARCZYK 2003). A high number of this species could be a result of the protection project conducted in this area (GOLAWSKI 2001). In comparison with western and southern Europe (HAGEMEIJER & BLAIR 1997), breeding densities of both owl species in the study area were lower, probably because in eastern Poland they reach the north-western edges of their breeding ranges.

Both species of owls are in Europe closely associated with open habitats of agricultural landscape (CRAMP 1985). In central-eastern Poland, arable fields and grasslands – their main feeding habitats – also predominated within paper territories of both the Barn Owl and the Little Owl. However, the coverage of these habitats in random territories was not significantly different from that in paper territories. This was due to the predomination of this type of habitats in the whole study area. The presence of various open areas is an important factor that influences the occurrence of both species of owls. In France, Barn Owls were hunting more often in areas covered with bushes than on arable fields. Attractiveness of this type of habitat is connected with greater body weight of prey found there (MICHELAT & GIRAUDOUX 1993). A large proportion of open areas results in an increase in Barn Owl prey diversity (VARUZZA et al. 2001). This is confirmed by observations of Barn Owls hunting on pastures and tilled fields, and – in particular – on stubble fields shortly after harvesting (TOMÉ & VALKAMA 2001). In the Little Owl, the density was distinctly related to the proportion of meadows, but it was negatively correlated with the area of arable land (GÉNOT & VAN NIEUWENHUYSE 2002). In the Czech Republic, this species also preferred meadows and avoided arable fields (ŠÁLEK & BEREC 2001). The increase in the proportion of fields with a concurrent decrease in grassland areas, caused a decrease in density of the Barn Owl in the agricultural landscape of North America (COLVIN 1985) and of the Little Owl in Austria (ILLE & GRINSCHGL 2001).

As a result of the high landscape fragmentation in the study area, the paper territories of both species included woodlands. The negative influence of woodlands on Barn Owl density was stated, e.g., in Flanders, Spain, Czech Republic and Italy (CENTILI 2001, ŠÁLEK & BEREC 2001, VAN NIEUWENHUYSE & BEKAERT 2001, ZUBEROGOITIA & MARTINEZ-CLIMENT 2001). In the Barn Owl in central-eastern Poland, a distinct preference for orchards was found. This preference did not seem

to be caused by the spatial correlation between orchards and settlements (paper territories: $R = -0.13$, $P = 0.693$, $N = 12$; random territories: $R = -0.10$, $P = 0.750$, $N = 12$). We did not find any preferences for orchards in the Little Owl, although this relationship was described by many researchers. In many places of Little Owl occurrence in Europe, orchards covered even as much as 20% of the area (GÉNOT & VAN NIEUWENHUYSE 2002). Orchards provide favourable conditions because of prey abundance (insects) on regularly mowed meadows (ILLE & GRINSCHGL 2001). Moreover, old fruit trees are suitable nesting places. A strong preference for sunflower fields and olive tree areas and avoidance of grassland and marshland were observed in the Little Owl in Spain by FAJARDO et al. (1998). Those authors explain these preferences mainly by a high attractiveness of olive tree areas in comparison with grasslands.

The presence of built-up areas in owl territories is connected with the availability of breeding sites. Both described species of owls often use buildings as nesting places (CRAMP 1985). Barn Owls favour, in particular, farm buildings and churches (KOPIJ 1990, BRUIJN 1994, BAUDVIN & JOUAIRE 2001), although in England a high proportion of nests was observed in hollow trees (BUNN et al. 1992). However, Little Owls use buildings and most often nest in hollows under the roof (GÉNOT & VAN NIEUWENHUYSE 2002). Although the species breeds equally often in tree cavities, a distinct relation to sparsely built-up areas was found (VAN NIEUWENHUYSE & NOLLET 1991, MARTÍNEZ & ZUBEROGOITIA 2004). The higher proportion of human settlements in the Little Owl territories in comparison with the Barn Owl found in our study probably results from smaller territories of the first species.

Acknowledgements: We wish to thank C. MITRUS for critical comments on the first draft.

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