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Short research contribution

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HIGH POPULATION DENSITY OF LITTLE OWL (*ATHENE NOCTUA*) IN HORTOBAGY NATIONAL PARK, HUNGARY, CENTRAL EUROPE

ABSTRACT: Little Owl is a rapidly declining farmland species across Central Europe, however its population status is poorly known in Hungary. The main aim of this study was to determine the distribution and population density of Little Owl in Hortobagy National Park (north-eastern Hungary), which is characterized by a high proportion of grassland habitats. During March and April of 2011–2012, the Little Owl occurrence was surveyed using tape-recorded stimulation in 245 sampling points in an area of 489 km^2. In total, we recorded 245 calling males with relative positive occurrence of 75.5% in an individual sampling point. The average nearest neighbour distance of two calling males was 553.6 meters (min. = 70 m, max. = 3100 m). The average population density of Little Owls was 5.01 calling males/10 km^2, however this could reach up to 85.97 calling males/10 km^2 in 3.06 km^2 locally. Residential buildings and farms were the main expected breeding places in our study area. High density of the Little Owl in the study area is probably influenced by traditional pastoral management, extensive agriculture and high proportion of grasslands. The particualar role could be atributed to presence of short-sward pastures around human settlements, considered to be crucial for the species survival in Central Europe. Further monitoring of the Little Owl is necessary to assess its current population status across various parts of its distribution range.

KEY WORDS: Little Owl, population density, distribution, breeding places, Hortobagy National Park, Hungary

The Little Owl (*Athene noctua*) is a small farmland owl species whose population has rapidly declined during the last 60 years across many European countries (Cramp 1985, van Nieuwenhuyse *et al.* 2008). This negative trend is especially obvious in Central Europe where an up to 50% population decline has been recorded (Šťastný *et al.* 2006, Šálek and Schröpfer 2008, van Nieuwenhuyse *et al.* 2008) and its distribution has been highly fragmented due to several local population extinctions (Żmihorski *et al.* 2006, Šálek and Schröpfer 2008). Although the Little Owl's distribution and population density is known for the majority of Central European countries, *i.e.* Austria (Ille 1996, Ille and Grinschgl 2001), Czech Republic (Šálek and Schröpfer 2008), Germany (review in van Nieuwenhuyse *et al.* 2008), Poland (Żmihorski *et al.* 2006, 2009, Ławicki and Rubacha 2008), and Slovakia (Chrenková *et al.* 2012), there is a substantial lack of any data from Hungary (see Gorman 1995). The main aim of this study is to present unique data on very high density of

Little Owl, a flagship species for conservation of tradidional farmland.

The survey was conducted in a 489 km^2 area in Hortobagy National Park and in the surrounding non-protected agricultural landscape, northeast Hungary (GPS: 47°33'N, 20°54'E, see Fig. 1). The study area is comprised of lowlands (average altitude = 92 m) with a mosaic of semi-natural grasslands (48.4%), arable land (35.9%), inland marches (4.1%), water area (4.5%) and a small proportion of forest areas (3.0%). Human settlements (4.1%) are represented by the villages of low density, small towns (> 6000 inhabitants) and local farms for breeding cattle, horses, sheep and geese. The area is characterized by a continental climate with relatively dry (mean annual precipitation = 550 mm) and mild warm weather (mean annual temperature = 9.5°C).

The population density of the Little Owl was monitored between March and April in 2011–2012 using tape-recorded stimulation of the male territorial voice, which is the most widespread and efficient method used for the recognition of Little Owl's presence (see *e.g.* van Nieuwenhuyse *et al.* 2008). The selected period coincides with peak of annual Little Owl´s vocal acitivity (Exo 1989). Playback experiments were carried out during favorable meteorological conditions (without strong wind and precipitation), from sunset until midnight, sometimes extending into morning hours. We examined all localities where Little Owls were expected to occur ac-

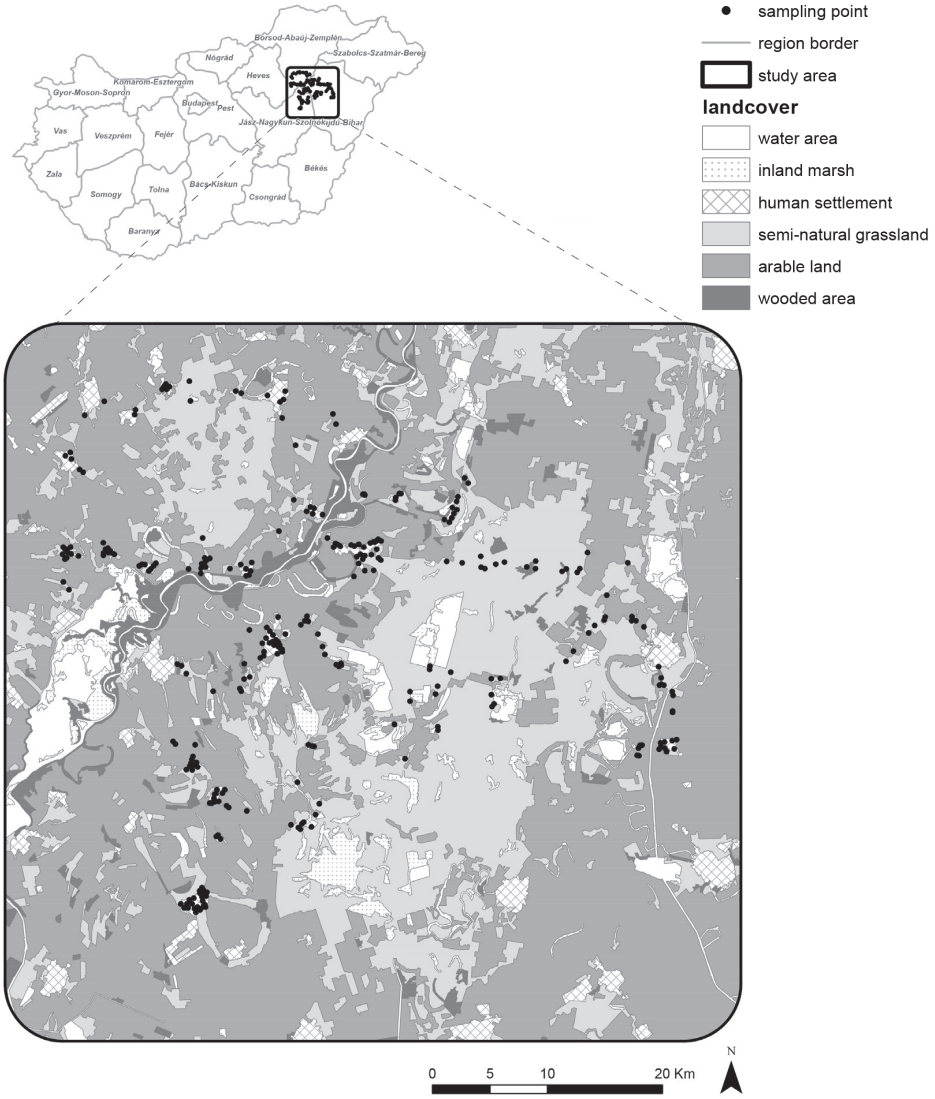

Fig. 1. Map and main land-use composition of the study area, Hortobagy National Park, Hungary.

cording to their habitat preferences, in particular human settlements (villages, towns), farms, agricultural buildings, parks, gardens, orchards, pollared willows and old trees. In each location the territorial voice of the Little Owl was played for two minutes and repeated three times, separated by a silent period of one minute between each repetition (Johnson *et al.* 2007). In addition, tape-recorded stimulation was supplemented with acoustic monitoring using automatic digital recorders (Olympus DS-50, Olympus DM-650) which were installed at several localities where they continuously recorded from dusk until dawn in order to determine the number of calling males. Expected breeding places were determined as places in owl territories where a nest was found or where breeding behavior was repeatedly recorded.

During the 2011–2012 study period, we recorded 245 calling males in 245 sampling points. In 4 sampling points we recorded 4 calling males, in 7 sampling points 3 calling males, and in 34 sampling points 2 calling males (Fig. 2). Relative occurrence of at least one calling male in one sampling point was 75.51 %. Average nearest neighbour distance of two calling males was 553.55 meters (min. = 70 m, max. = 3100 m). Average population density in the whole study area was 5.01 calling males/10 km^2, however in areas with a large proportion of available breeding places (*e.g.*, smaller towns) the population densities reached higher values. For example, in three smaller towns, we recorded 26 calling males/3.06 km^2, 20 calling males/3.01 km^2 and 17 calling males/3.48 km^2. The majority of expected breeding places were recorded in residential buildings (60%, n= 147) and farms (40%, n = 98).

Our results, which represent the first large-area systematic survey in Hungary, indicate high population density and widespread distribution of the Little Owl in Hortobagy National Park and its surrounding area. Average population density recorded (5.01 calling males/10 km^2) indicates one of the highest population densities of this species from an agricultural landscape in Central Europe (van Nieuwenhuyse *et al.* 2008). For example, average population density of Little Owl in 35 study plots across the whole territory of the Czech Republic was 0.1 calling males/10 km^2 (Šálek and Schröpfer 2008) and the preliminary results from a monitoring program in Slovakia show 0.9 calling males/10 km^2 (Chrenková *et al.* 2012). In Poland, average population density of Little Owls in the 1980s was 1.7 territories/10km^2, however during the 1990s the densities dropped to 0.7 territories/10 km^2 (van Nieuwenhuyse *et al.* 2008, but see also Ławicki and Rubacha 2008, Žmihorski *et al.* 2006). Ille and Grinschgl (2001) found densities of 0.3–2 pairs/10km^2 in various types of agricultural landscapes in Austria. Finally, in Germany population density of 1.4–1.7 calling males/10km^2 was recorded across various regions (Keil 2001, Zens 2005). Our results are only comparable with current distribution of the Little Owl in Kleve district, western Germany (population density 3.6–11.3 territories/10 km^2) which is considered a core area for the species in Central Europe (Vossemeyer *et al.* 2007). Similarly, in accordance with some previous studies (Šálek and Schröpfer 2008, Tomé *et al.* 2008, van Nieuwenhuyse *et al.* 2008) we found locally high population densities (*e.g.* 84.97 calling males/10 km^2 on 3.06 km^2).

The high densities of Little Owl in our study area, which are in contrast to other agricultural localities in Central Europe, could be associated with a higher proportion of grassland habitats (48.4%, see Study area).

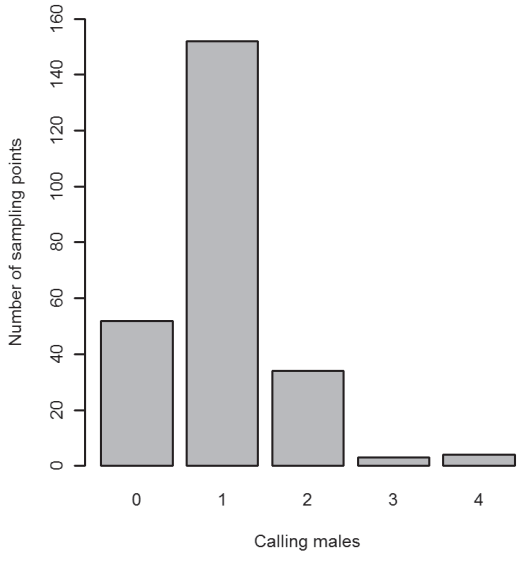

Fig. 2. Histogram showing the number of calling males grouped by their density per surveyed localities.

Short-sward grasslands, especially pastures with high prey availability represent the most important foraging habitat of the Little Owl in Central Europe (Dalbeck *et al.* 1999, Šálek and Berec 2001, Šálek and Schröpfer 2008, Šálek *et al.* 2010, Šálek and Lövy 2012). Šálek and Schröpfer (2008) documented higher occupancy of the Little Owl territories in localities with a larger proportion of grasslands. Similarly, Vossemeyer et al. (2007) recorded twice as many occupied territories in localities with a high percentage of grasslands – 40.6%, as opposed to localities where proportion of this habitat was only 15.7 and 17.0%, respectively (see also Dalbeck *et al.* 1999). Large-scale changes in agricultural landscapes result in habitat loss and fragmentation of the traditional agricultural and pastoral habitats. This proces may lead to food limitation during breeding season, and contribute to population decline (Šálek *et al.* 2010, Thorup *et al.* 2010). The study area is characterized by a mosaic-like open landscape structure, with one of the largest continuous natural grasslands in Europe. These grasslands are comprised of a variety of diverse grassland types including natural grasslands, meadows, and extensively-used short-grass pastures. The short-grass pastures are especially abundant around cattle and sheep farms, which are important breeding places in our study area. Due to the fact that Hortobagy National Park has protected area status and harbours cultural and natural values, traditional farming that is encouraged over intensive agriculture has helped to maintain a high diversity of grassland habitats. In contrast, most of the agricultural areas of Central Europe, where intensification has taken place, has lead to a decrease in the proportion of grassland habitats and resulted in overall decline of numerous species of farmland birds (Donald *et al.* 2001, 2006, Atkinson *et al.* 2005). Our study showed that 83% of farms surveyed were occupied by Little Owls with prevailing occcurence in actively used farms. The preference of the Little Owl for man-made structures such as residential buildings and farms is in accordance with most studies from Central Europe (Żmihorski *et al.* 2006, 2009, Šálek and Schröpfer 2008, Chrenková *et al.* 2012), which documented close association with human settlements. Furthermore, this could be supported with high species occurrence/densities in the residential buildings within small villages and medium-sized towns with high availability of barns, haylofts, stables for domestic animals, and abandoned houses. Although we could not exclude nesting in natural tree cavities such as pollarded willows or old trees, these landscape elements are very sparsely scattered within the study area indicating that suitable nesting sites in man-made structures could be limiting factors for Little Owl distribution in Hortobagy National Park.

In conclusion, our study presents the first data about distribution and population density of the Little Owl in Hungary. Further research including long-term demographic monitoring is necessary to reveal distribution and status of Little Owls in other parts of its range and to estimate its population trends.

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