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Long-term changes in habitat selection of wintering waterbirds: high importance of cold weather refuge sites

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Abstract. Recent studies showed that climate changes shape species distribution and could cause range shifts in the flyway level of the species. Here, we demonstrated changes in species habitat selection as a response to weather severity in twelve most abundant wintering waterbird species with prevailing increase in numbers during three investigated periods (1972–1978, 1987–1993 and 2003–2009). We used wintering waterbird counts from 93 sites throughout the Czech Republic from mid-January term as the coldest period of winter when the effect of thermoregulation on wintering waterbirds distribution is most apparent. We recorded no significant changes in weather severity in three investigated periods in our study area, and hence we considered the effect of preference of cold weather refuge sites, i.e. habitats which can reduce negative effect of cold weather (running waters, urban area and extensive water surface area). We found prevailing effect of weather severity in the first period what may show thermoregulatory effects being expressed by weather severity on species habitat selection in the next period in six of the twelve investigated species (Mute Swan *Cygnus olor*, Common Pochard *Aythya ferina*, Tufted Duck *Aythya fuligula*, Little Grebe *Tachybaptus ruficollis*, Common Moorhen *Gallinula chloropus* and Common Coot *Fulica atra*). In the face of recent climate change and in spite of the increasing importance of wetlands in the Czech Republic for wintering waterbirds, the suitability of these sites for wintering is likely temperature-dependent. Thus, the preference of cold weather refuges reducing the effect of winter harshness becomes important in individual species.

Key words: environmental variables, weather severity, urban habitats, wintering waterbirds, International Waterbird Census

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INTRODUCTION

Noticeable changes in land use and land cover have occurred throughout Europe in recent decades, such as the industrialization accompanied by urbanization and the anthropogenic pressure on arable land, forest and especially wetland ecosystems (EEA 2006, Reif et al. 2008, Feranec et al. 2010). Moreover, significant changes in climatic conditions are also recently mentioned as key factors affecting shifts in wintering waterbird species distribution across Europe (Dalby et al. 2013, Lehikoinen et al. 2013). Nevertheless, given the recent climate changes experienced in Europe, there have been only few studies attempting to assess the impact of the environmental variables on waterbirds at individual wetlands (Kleijn et al. 2014, Musilová et al. 2015). Wetlands are considered as one of the most vulnerable ecosystems (Finlayson & Moser 1991, Keddy 2010) and the landscape elements comprising wetlands may affect the habitat use and movements of those waterbirds that depend on them, furthermore, most waterbirds have special habitat requirements throughout their annual cycle (Riffel et al. 2003, Taft & Haig 2006). Waterbirds are animals that can rapidly respond to habitat change, they therefore, belong to the most evident indicators of the quality and richness of a wetland ecosystem (Delany et al. 1999, Fernández et al. 2005, Amat & Green 2010). During the breeding season, waterbirds generally occur in low densities over extensive areas (Scott & Rose 1996, Kear 2005), whereas over the winter, large numbers of waterbirds are

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Effect of pre-fledging body condition on juvenile survival in Yellow-legged Gulls *Larus michahellis*

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Arizaga J., Herrero A., Aldalur A., Cuadrado J. F., Oro D. 2015. Effect of pre-fledging body condition on juvenile survival in Yellow-legged Gulls *Larus michahellis*. Acta Ornithol. 50: 139–147. DOI 10.3161/00016454AO2015.50.2.002

Abstract. Body condition of nestlings can influence their future survival. Here, we used data obtained from a colour-ringing program of Yellow-legged Gull *Larus michahellis* in two colonies from northern Iberia to quantify the relative importance of pre-fledging body size and mass on post-fledging juvenile survival. Chicks were ringed with colour-rings at their colony in June/July when they were almost ready to fledge, and, thereafter, sighting data of these birds were collected over a period of one year and analysed with Cormack-Jolly-Seber capture-recapture models. The Yellow-legged Gull in the region is resident, so sighting data were mostly collected within an area close to natal colonies, where the field effort was intensive. Monthly survival from August onwards was higher than from ringing date to August (0.59 ± 0.06 SE), reaching model averaged values of 0.91 ± 0.03 and 0.98 ± 0.03 for the two colonies analysed. Moreover, condition of chicks (measured as residual body mass and body size) before fledging had a positive effect on survival from ringing date to August, but not from August onwards, when survival was strongly affected by the colony of origin.

Key words: Cormack-Jolly-Seber models, MARK software, northern Iberia, population dynamics, sighting data, fledglings condition, seabirds, demography

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INTRODUCTION

Survival rate is one of the main parameters determining population dynamics (Newton 1998). Population dynamics of seabirds are sensitive to variation in adult survival rates, consistent with a K-strategy, with annual values normally ranging between 0.75 and > 0.95 (Croxall & Rothery 1991). First year of life, by contrast, is characterized by a high mortality rate (Gaston 2004). Unusually high survival rates during this period (hereafter, juvenile survival), however, can have a severe impact on population dynamics. For instance, high food supply during breeding season allows a high reproductive output in large gulls (Oro et al. 1995; Annett & Pierotti 1999, Rock 2005), and also high post-fledging survival. As a consequence of this, some British gull populations have multiplied their numbers by a factor of more than 10 in a single decade (Rock 2005). Knowing juvenile survival is hence of great importance for proper understanding of population dynamics of long-lived organisms, such as seabirds. Although juvenile and sub-adults survival of seabirds can be assessed using multi-state models (Lebreton et al. 2009), the literature on this particular period of life is still rather scarce.

In seabirds, juvenile survival can be divided into two main periods: nestling survival (from hatching to fledging; in large gulls it covers a period of ca. 35–40 days; Olsen & Larson 2004) and post-fledging survival (once chicks fledge and leave the colony). Furthermore, in some species such as the Yellow-legged Gull *Larus michahellis*, these two stages can be also distinguished during the post-fledging period: the one when juvenile birds only move around the colony and depend on parental care (up to ca. 25 days from fledging date in some large gulls, but see Kralj et al. 2014), and a subsequent one during which juveniles leave the surroundings of the colony and become independent (Cramp & Simmons 1983).

Body condition is one of the main parameters determining survival during the nestling period

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Does core-periphery gradient determine breeding performance in a breeding colony of White Storks *Ciconia ciconia*?

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Bouriach M., Samraoui F., Souilah R., Houma I., Razkallah I., Alfarhan A. H., Samraoui B. 2015. Does core-periphery gradient determine breeding performance in a breeding colony of White Storks *Ciconia ciconia*? Acta Ornithol. 50: 149–156. DOI 10.3161/00016454AO2015.50.2.003

Abstract. The timing of breeding and nest location in colonial birds may have fitness consequences. In particular, it has been demonstrated that peripheral breeders perform less well than core breeders. To determine whether environmental factors such as date of breeding and nest position influence reproductive success, we studied the breeding ecology of a large colony of White Stork *Ciconia ciconia* at Dréan, northeast Algeria, during 2011 and 2012. Mean egg-laying dates varied significantly between years and differed between core and peripheral nests with more precocious laying occurring in the center. Egg-laying in larger nests started earlier than in smaller ones in the core area but neither nest size nor nest position along the core-periphery gradient had any influence on studied breeding parameters i.e. clutch size, hatching success and chick productivity. There was no yearly difference in clutch size which averaged 4.7 ± 0.7 eggs (N = 156 clutches). Mean chick productivity was higher in 2012 (2.85 ± 1.21 chicks) than in 2011 (2.29 ± 2.28 chicks) and was marginally associated with egg-laying date. In contrast, nesting success declined with delayed onset of breeding. Results suggest that a low predation rate, abundant resources and a possible trade-off between fitness components may confound adaptive breeding-habitat selection in White Stork.

Key words: Ciconiiformes, coloniality, nest-site selection, nest size, reproductive success, waterbirds, North Africa

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INTRODUCTION

Breeding performance is known to be influenced by many factors such as food shortage, predation, weather, and age of mates (Furness 1982, Saether 1990, Martin 1995, Rodríguez & Bustamante 2003). One of the main determinants of breeding success in colonial birds is nest position (Coulson 1968, Tenaza 1971, Hoogland & Sherman 1976). However, there are many confounding factors such as the spatial structure of the breeding colony, nest density, parental quality, age and behavior which may interact with nest position and each other; thus making the task of unraveling their influence on reproductive performance a challenge (Anderson & Hodum 1993, Bunin & Boates 1994, Martin et al. 2000, Vergara & Aguirre 2006, Minias 2014).

Coloniality may be viewed in terms of costs and benefits when the grouping of individuals trade advantages like a larger spectrum of potential mates, increased vigilance against predators, dilution in number, and improved information about patchy resources against disadvantages like vulnerability to infectious diseases, cuckoldry, and adverse intraspecific interactions (Wittenberger & Hunt 1985, Brown & Bromberger Brown 1986, Danchin & Wagner 1997, Anderson et al. 2004, Ashbrook et al. 2008). A bird colony may be likened to a "selfish herd" where an individual's fitness is tied up to the number and location of its neighbours (Hamilton 1971). As asymmetries among individuals within a colony exist (Rendón et al. 2001), some birds behave as *primus inter pares*. Thus, access to resources may not be distributed according to the "ideal free distribution" (Fretwell & Lucas 1970).

Consistently, nests located on the periphery have been shown to perform less well than core nests (Furness 1984, Forster & Phillips 2009). However, nest location may be confounded by age/experience (Vergara et al. 2010) or habitat structure (Minias et al. 2013) but, more often than

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Suitability of poplar plantations for a cavity-nesting specialist, the Lesser Spotted Woodpecker *Dendrocopos minor*, in the Mediterranean mosaic landscape

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Camprodon J., Faus J., Salvanyà P., Soler-Zurita J., Romero J. L. 2015. Suitability of poplar plantations for a cavity-nesting specialist, the Lesser Spotted Woodpecker *Dendrocopos minor*, in the Mediterranean mosaic landscape. Acta Ornithol. 50: 157–169. DOI 10.3161/00016454AO2015.50.2.004

Abstract. Monocultures of even-aged trees in short rotation are a forest system of low ecological complexity that has been described as unsuitable for the establishment of stable populations of forest birds. However, key habitat quality cues could make them attractive to forest specialists. This paper assesses the suitability of poplar plantations in the northeast of the Iberian Peninsula for a forest specialist, the Lesser Spotted Woodpecker *Dendrocopos minor*. Poplar stands occupy a small area of an agroforestry mosaic landscape where semi-natural Mediterranean woodland is predominant. Population size, nesting success, home ranges and habitat selection were studied by radio-tracking and monitoring during the breeding season and the winter. Poplar plantations were preferentially selected for breeding and foraging in the spring and the winter. Home ranges in the breeding season and the winter (32.4 and 438.5 ha, respectively) were similar to those observed in semi-natural woodlands that have been studied in Europe. However, population density (0.25 territories/100 ha) was lower than that described in most European semi-natural woodlands. Nesting success was low (0.54), due to strong competition with other cavity nesters, predation of nests by the Greater Spotted Woodpecker, and loss of one of the adults. Fifty per cent of the foraging activity during the breeding season took place in an area of 180 metres around the nest. The amount of standing dead wood in poplar stands was much higher than in the surrounding habitats and source areas. The moderate breeding success and the high rate of adult predation may suggest that poplar plantations act as an ecological trap, in which standing dead wood may be a habitat quality cue that attracts birds to this non-ideal habitat. Poplar plantations become even less suitable when most of the available habitat is felled at the same time. Suitable planning of poplar plantation rotations and recovery of riparian forest is the best way to ensure the survival of Lesser Spotted Woodpecker populations in the long term.

Key words: *Dendrocopos minor*, *Dryobates minor*, poplar plantations, habitat selection, nest-site selection, conservation, forest management, ecological trap, Mediterranean region, *Populus* sp.

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INTRODUCTION

Tree plantations are a highly modified forest system in comparison to semi-natural woodlands, which are mainly composed of native trees and shrubs that have not been established by artificial regeneration (FAO 2005). In general, a plantation is an even-aged crop of just one species of interest for forestry, felled by clear cutting in short rotations. Consequently, old trees or dead wood tend to be absent, and the vertical structure of the vegetation is highly limited. The lack of natural dynamics explains why short rotation plantations are not highly suitable for the establishment of

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Rabbit abundance influences predation on bird nests in Mediterranean olive orchards

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Carpio A. J., Tortosa F. S., Barrio I. C. 2015. Rabbit abundance influences predation on bird nests in Mediterranean olive orchards. Acta Ornithol. 50: 171–179. DOI 10.3161/00016454AO2015.50.2.005

Abstract. In recent decades, the intensification of agricultural practices in olive orchards, including intensive use of agrochemicals, along with the absence of natural herb layer, has led to a decline in songbird communities. Increased nest predation has been suggested as another important factor in the decline of farmland birds. High abundances of alternative prey species, such as European Rabbits *Oryctolagus cuniculus* may attract generalist predators, which may increase predation rates on bird nests, a phenomenon known as hyperpredation. In this work, we evaluate artificial nest predation in intensively farmed olive orchards, using quail eggs (one plaster and two natural eggs in each nest) placed on the ground (97 nests) and on trees (106 nests). 53.7% of nests (109 out of 203) were predated; 51 of these nests had at least one egg with signs of predation and in 58 nests all eggs were predated. Nests placed on the ground (61%) were predated more frequently than those on trees (46%). Rabbit abundance was identified as one of the main factors increasing the probabilities of a nest being predated. Despite lower rates of nest predation in areas with low rabbit abundance, we found a higher diversity of nest predators, such as *Mustela nivalis*, *Mustela putorius*, *Martes foina* or *Erinaceus europaeus* in these areas. This study suggests that conservation efforts aimed at increasing the breeding success of farmland birds should avoid areas with high abundance of rabbits owing to the phenomenon of hyperpredation.

Key words: farmland birds, hyperpredation, nest predation, olive orchards, European Rabbit, *Oryctolagus cuniculus*

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INTRODUCTION

A large proportion of European bird species depend on farmland habitats as breeding or wintering areas (see Tucker & Heath 1994, Skórka et al. 2006). As a consequence of agricultural intensification farmland birds have undergone a significant decline in Europe (Preiss et al. 1997, Tryjanowski et al. 2011), due to habitat loss and fragmentation, and increased predation from invasive and generalist predators (Evans 2004, Reif 2013). Few studies have investigated the impacts of agricultural intensification on ground-nesting passerines owing to the difficulty in locating and monitoring their nests in the field, which precludes estimates of their breeding parameters (Weidinger 2001, 2009, Calero-Riestra et al. 2013). Further, the literature on avian life histories is clearly biased towards forest species or populations clustered at north-temperate latitudes (Moreno 2004), whereas little information is available for Mediterranean areas where there are seasonal differences in the availability of food (Stamou et al. 2004) and predation rates (Yanes & Suarez 1995).

In recent decades, agricultural intensification and landscape simplification have dramatically affected the Mediterranean region. Olive groves are one of the predominant crops in this region and play an important role for many resident and migrant bird species (Rey et al. 2011). The intensification of agricultural practices in olive groves, with the intensive use of agrochemicals and the absence of natural herb layer has led to a decline in songbird communities (Castro-Caro et al. 2014). Intensive management in olive orchards has also produced a simplification of the landscape, with a progressive loss of hedges and remnants of natural vegetation. Predation on adult birds and nests is an important factor in the decline of some farmland birds (Söderström et al. 1998, but see Kujawa

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Effects of hedges and herbaceous cover on passerine communities in Mediterranean olive groves

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Castro-Caro J. C., Barrio I. C., Tortosa F. S. 2015. Effects of hedges and herbaceous cover on passerine communities in Mediterranean olive groves. Acta Ornithol. 50: 180–192. DOI 10.3161/00016454AO2015.50.2.006

Abstract. In recent decades, agricultural intensification and landscape simplification have dramatically affected farmland biodiversity. To reduce this trend, agri-environmental schemes (AES) of the Common Agricultural Policy (CAP) were launched in the European Union in the early 1990s. Since then an effort has been made to asses the effectiveness of these measures, but, in the Mediterranean region, where olive groves are among the predominant crops, the effectiveness of AESs to maintain farmland biodiversity remains poorly evaluated. In conventional olive farming, the only AES now in practice are the implementation of herbaceous, non-crop vegetation within crops (i.e. ground covers) aimed at preventing soil erosion, and the maintenance of hedges. These practices, when applied separately, can increase structural complexity, likely benefitting farmland biodiversity at different spatial scales; however, little is known about the potential synergistic effects when these measures are applied in combination in Mediterranean agroecosystems. This study assessed the combined effects of herbaceous ground cover and hedges on passerine communities of olive groves over a 4-yr period. Hedges, and to a lesser extent ground covers, efficiently increased the abundance and richness of passerine communities of olive groves, particularly that of insectivorous birds, but the effects of both measures were independent of each other. Hedges were particularly relevant to the richness and abundance of passerine communities, especially at distances up to 50 m. Therefore, we suggest that management should promote the creation of a hedge network embedded in the olive grove matrix, for example by promoting or maintaining hedgerows located between properties. This study underscores the important role of increasing structural complexity in Mediterranean perennial agroecosystems through the implementation of ground covers and maintaining hedges, to preserve farmland passerine communities, and encourages the use of these agri-environmental measures as a tool in landscape planning and conservation.

Key words: agroecosystem, agricultural intensification, biodiversity, agri-environment schemes, Passeriformes, conservation

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INTRODUCTION

Agricultural intensification entails the simplification and homogenization of the landscape, which leads to a generalized decline of farmland biodiversity (McLaughlin & Mineau 1995, Benton et al. 2003). Reversal of the negative effects of modern agriculture on the environment is an important concern at the European level (Smith et al. 2010, Tryjanowski et al. 2011) and European policies promote wildlife–friendly approaches (Fischer et al. 2008). Thus, biodiversity conservation on European farmland encompasses a range of different practices aimed at enhancing biodiversity by restricting farming intensity, maintaining low-input farming practices or creating landscape elements, such as hedges, ponds or wildflower strips that increase structural complexity of farmland habitats (Benton et al. 2003, Burel et al. 2013). Many of these measures are subsidised in the framework of agri-environment schemes (AESs) of the European Common Agricultural Policy (CAP) (Kleijn et al. 2011).

Although AESs are considered the main policy instrument currently available in Europe to promote environmentally-friendly farming practices (Donald & Evans 2006), there is still little information regarding the effects of these measures on biodiversity. In the last decade, some studies from various European countries have evaluated the effects of conservation initiatives on farmland biodiversity showing mixed effects (Kleijn et al. 2011, and references therein). Moreover, the adoption of these practices is still relatively feeble in

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Low immigration and high local recruitment in an isolated, coastal population of a declining grassland passerine, the Northern Wheatear *Oenanthe oenanthe*

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Henry P.-Y., Ollivier P. 2015. Low immigration and high local recruitment in an isolated, coastal population of a declining grassland passerine, the Northern Wheatear *Oenanthe oenanthe*. Acta Ornithol. 50: 193–203. DOI 10.3161/00016454AO2015.50.2.007

Abstract. The western European populations of Northern Wheatear *Oenanthe oenanthe* have halved over the past two decades. In this context of increasingly fragmented populations, a key issue is to understand the role of immigration in the maintenance of remnant populations. We characterized the local survival, fecundity, recruitment and immigration rates of a small, geographically isolated, coastal French population during a period of population stability, while the regional population was rapidly decreasing (1991–1999). Annual local adult and juvenile survival rates were estimated with capture-resighting data at, respectively, 0.463 ± 0.052 (n = 157 adults) and 0.215 ± 0.054 (n = 363 nestlings). Only 2.1 immigrants joined the population per year (7.3% of all recruits). This annual immigration rate (0.039) is lower than all 14 available estimates for small to medium-sized birds. The local population growth rate depended equally on all demographic parameters, apart from a minor influence of the immigration rate. Within-site breeding dispersal distances were low, and differed between sexes (78 ± 49 m for males, 259 ± 274 m for females). Juvenile and adult survival rates appeared lower than for populations of wheatears settled in high quality habitats, but this deficiency was compensated by high fecundity and the 2 annual immigrants. The small population size (22–27 pairs), extremely low immigration, and strong dependence on local recruits suggest that this population was demographically isolated on a patch of moderate habitat quality, with no chance of rescue by immigration in case of stochastic event. Indeed, this population went extinct in the 2000's, after a disturbance of unknown origin.

Key words: apparent survival, coastal grassland, demography, dispersal distance, habitat fragmentation, immigration, local extinction, local population dynamics, local recruitment

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INTRODUCTION

How small, geographically isolated populations go extinct or persist has long been a hot topic of research in population dynamics and conservation biology (Bowler & Benton 2005, Brook et al. 2008, Drake & Griffen 2010). As human activities increasingly fragment habitats, the connection between populations decreases (Brook et al. 2008). One of the key issues when investigating how a small, geographically isolated population can maintain a stable number of reproductive adults is to assess the role of immigration versus local recruitment in the local population dynamics (Dale 2001, Bowler & Benton 2005, Ward 2005, Schaub et al. 2006, Pradel & Henry 2007). The population size could remain stable thanks to reduced emigration because of geographic isolation (Weatherhead & Forbes 1994, Dale 2001, Bonte et al. 2012), or sufficient immigration from the rest of the metapopulation (Bowler & Benton 2005, Wilson & Arcese 2008). Although the relative importance of permanent emigration can be assessed by comparing local survival between populations, estimating the contribution of immigration to the local population dynamics is more complicated (Abadi et al. 2010). When studying population dynamics with capture-mark-recapture data, immigrants are not marked. Therefore immigrants cannot be distinguished from locally born recruits that have not been marked at birth. In such a situation, the proportion of recruits that

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High egg size variation in African Blue Tits *Cyanistes caeruleus ultramarinus* on the periphery of species range

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Kouidri M., Adamou A.-E., Bańbura A., Ouakid M. L., Chabi Y., Bańbura J. 2015. High egg size variation in African Blue Tits *Cyanistes caeruleus ultramarinus* on the periphery of species range. Acta Ornithol. 50: 205–212. DOI 10.3161/00016454AO2015.50.2.008

Abstract. Amount and quality of resources may be variable and generally poor in habitats of marginal avian populations living at the edge of species breeding range. We studied variation in egg traits (length, breadth, volume and shape) in three populations of the African Blue Tit *Cyanistes caeruleus ultramarinus* inhabiting degraded habitats in highlands of Algerian Saharan Atlas at mean altitudes 1328–1437 m a.s.l. We found high within-clutch repeatability of all the egg traits studied. As theoretically expected in peripheral parts of the species geographic range, there was considerable variation in egg-size traits among the study populations, with eggs being distinctly smaller and more elongated at a site characterised by most human-modified habitat composed of maquis scrubland with rare *Pistacia* trees. Egg length and shape tended to be affected by the altitude of nest site and by clutch size, but not laying date. We found some effects of egg traits on hatching and fledging success, suggesting that fitness advantage of egg sizes is dependent of egg shape. We conclude that the above patterns of variation in egg size and shape of the African Blue Tit populations have influence of fitness. Our finding of considerable variation in egg traits between separate peripheral populations confirms the theoretical expectation and seems to be a novel result.

Key words: *Cyanistes*, N Africa, Saharan Atlas, high altitude, peripheral populations, egg variation

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INTRODUCTION

Size and shape traits of avian eggs show some consistent patterns of variation. They are usually highly specific for species and even races (Väisänen 1969, Makatsch 1976), in some cases they show geographic gradients (Chylarecki et al. 1997, Encabo et al. 2002), show a high within-clutch repeatability (Bańbura & Zieliński 1990, 1998, Christians 2002), and are heritable (Ojanen et al. 1979). Yet the meaning of egg size trait variation is often unclear (Perrins 1996). From the life-history perspective, it is obvious that consistent within-clutch variation in egg sizes results from consistent allocation of resources in subsequent eggs (Stearns 1992). The size of an individual egg results directly from the amount of resources a female is able to allocate into it, which is determined by both hereditary and environmental factors (Potti 1993, Perrins 1996). The amounts of resources, including food and minerals, may differ very much between habitats (Perrins 1996, Encabo et al. 2001, Bańbura et al. 2010), resulting in habitat-specific allocation tactics (i.e. Mägi & Mänd 2004).

The environmental constraints may be especially harsh, variable and to much extent unpredictable in marginal areas inhabited by peripheral populations, which are, therefore, worth studying in detail (Slagsvold 1981, Jarvinen 1986, Adamou et al. 2014). It is widely accepted that populations occurring at the edge of species geographic ranges are less stable than those in the core part of the range (Slagsvold 1981, Gaston 1996). Because of

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Offspring sex ratio of Japanese Tits *Parus minor* is related to laying date and clutch size only in the first clutches

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Nomi D., Yuta T., Koizumi I. 2015. Offspring sex ratio of Japanese Tits *Parus minor* is related to laying date and clutch size only in the first clutches. Acta Ornithol. 50: 213–220. DOI 10.3161/00016454AO2015.50.2.009

Abstract. Over decades, several hypotheses for sex allocation have been proposed and tested repeatedly. However, many studies have shown inconsistent results among species, populations, and study years. We investigated sex ratio patterns in a population of Japanese Tit *Parus minor*, which is closely related to the Great Tit *Parus major*. In this four-year study, a total of 1500 offspring from 191 nests were sexed. We found that the proportion of male offspring in each brood was negatively related to laying date and clutch size only in the first clutches. This corresponds to our prediction that in sexually dimorphic Japanese Tits, females may control sex ratio by adjusting clutch size or the timing of laying to reduce costs of rearing. However, this relationship did not appear in later clutches, indicating that manipulation of sex ratios occurred only in part of the season. Parental quality was not related to sex ratio in either first or later clutches. Our results suggest that female Japanese Tits may control the sex ratio to balance reproductive effort and self-maintenance rather than to raise the offspring fitness benefits in relation to the quality of parents, and that they use a different sex allocation strategy between first and later clutches.

Key words: clutch size, cost of reproduction, life history, multiple breeding, *Parus major*, *Parus minor*, sex allocation, sexual size dimorphism

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INTRODUCTION

Over decades, sex allocation theory has attracted many researchers. The most classic sex allocation theory is Fisher's hypothesis (1930), where natural selection favours equal investment in sons and daughters. This hypothesis predicts that sex ratio will be biased towards the smaller (less costly) sex when costs of rearing differ between sexes. However, Fisher's hypothesis deals with population level adjustment in sex ratios and does not necessarily explain variation on the individual level.

Current sex allocation studies mainly focus on individual optimization in sex ratio, and predictions are mostly based on the Trivers-Willard hypothesis (1973): when expected fitness returns differ between sons and daughters in certain situations, females may produce more offspring of the sex with the higher reproductive value. According to Trivers-Willard hypothesis sex ratio may be adjusted when: (1) there is variation in female condition, (2) the condition of offspring at the end of the parental investment period is correlated with the condition of the mother, (3) the offspring condition endures into adulthood, (4) and the condition of offspring differentially affects reproductive success between the sexes. In general, males have greater variance in reproductive success than females and therefore, females in better conditions should produce male offspring because better males have higher expected fitness compared to better females (Trivers & Willard 1973). So far, this idea has been applied to many sex ratio studies, and a variety of related hypotheses have been proposed in different situations (Cockburn et al. 2002). In birds, females are the heterogametic sex and may thus have the potential to control primary sex ratios of eggs (Pike & Petrie 2003, Navara 2013). To date, a number of studies have shown evidence of optimal sex allocation in birds, owing to the development of

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House Sparrows *Passer domesticus* and Tree Sparrows *Passer montanus*: fine-scale distribution, population densities, and habitat selection in a Central European city

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Šálek M., Riegert J., Grill S. 2015. House Sparrows *Passer domesticus* and Tree Sparrows *Passer montanus*: fine-scale distribution, population densities, and habitat selection in a Central European city. Acta Ornithol. 50: 221–232. DOI 10.3161/00016454AO2015.50.2.010

Abstract. Populations of House and Tree Sparrows have rapidly declined in various breeding habitats throughout their European distribution range; however, the strongest decline was recorded within urban environments. In our study we investigated fine-scale distribution, population densities and habitat selection of both sparrow species within a 200 × 200 m squares in a medium sized city (České Budějovice, Czech Republic) during the breeding season. The total population density of House and Tree Sparrow was 11.7 and 2.8 individuals/10 ha; however the densities of both sparrow species markedly differed among various urban units. The highest density of House Sparrow was recorded in residential areas (33.3 ind./10 ha) and Tree Sparrows were mostly found in garden colonies (10.3 ind./10 ha). After removing spatial effects, we found that numbers of both sparrows were negatively correlated with area of artificial surfaces (e.g. pavements, streets, railway networks or parking spaces) and positively correlated with area of city green. Built-up area did not affect numbers of House Sparrow, but there was a slight negative relationship with Tree Sparrow numbers. However, maximum numbers per square for both species were found in the areas where city green represented ca 50 % of all habitats. This suggests that mix of built-up areas and city green is more important for sparrow numbers than each habitat per se. Comparison of use/availability for studied habitat reveals that both sparrow species clearly avoided artificial surfaces. House Sparrow showed preference for built-up areas and Tree Sparrow showed similar preference for built-up areas and city green. Different habitat selection can be explained by a combination of different requirements for nest sites together with the nutritional needs of sparrows during the breeding season. The majority of nest sites were located in artificial structures such as roof tiles (80% for House Sparrow and 50% for Tree Sparrow), followed by nests located in crevices and holes on buildings. Both sparrows nested in older buildings: 92% of House Sparrow and 85% of Tree Sparrow nests were situated in buildings older than 30 years, i.e. built before the 1980s.

Key words: House Sparrow, Tree Sparrow, urban environment, city green, built-up area, habitat selection, nest-site selection

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INTRODUCTION

Urbanization represents one of the key forces of land use change and is considered as a major threat to biodiversity worldwide (Vitousek et al. 1997, McKinney 2002, Angold et al. 2006) and bird communities in particular (Devictor et al. 2007, Aronson et al. 2014). The rapid increase in urbanization brought substantial loss, modification and fragmentation of (semi) natural habitats/vegetation which were replaced with various built-up areas and impervious surfaces on local and landscape scale (McKinney 2002). These massive changes have many consequences for bird communities and thus there is urgent need to understand the species/populations response to specific urban conditions. Hence, the study of bird distribution and determination of habitat features affecting its occurrence in an urban environment is crucial for their effective conservation and management efforts.

The population sizes of House Sparrow *Passer domesticus* and Tree Sparrow *Passer montanus* have dramatically declined across their distribution in Northern and Western Europe over the last decades (Summers-Smith 1999, 2003, Gregory et

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Does traffic noise affect the distribution and abundance of wintering birds in a managed woodland?

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Wiącek J., Polak M. 2015. Does traffic noise affect the distribution and abundance of wintering birds in a managed woodland? Acta Ornithol. 50: 233–245. DOI 10.3161/00016454AO2015.50.2.011

Abstract. Anthropogenic noise, a consequence of expanding infrastructure and industry in ecosystems, is a serious and ubiquitous threat, which can significantly modify the behaviour and certain population parameters in animals. Birds are particularly vulnerable in this respect, given that they communicate mostly vocally in dense habitats. In the winter time traffic noise can modify distribution of birds by masking of their alarm and contact calls. Additionally seasonal variation in avian auditory can modified birds responses to traffic noise during winter. The present paper reports the results of an investigation into the influence of a busy road (annual average 6673 motor vehicles per day) and traffic noise on woodland birds in winter. To our knowledge this study is the first to assess the effect of road noise on woodland birds during winter. We counted birds using the point–count method at 36 survey stations located in the forest at various distances from the road. At each such station we assessed selected habitat parameters, the distance from the road and the noise intensity level. We recorded a total of 454 birds belonging to 19 species. The mean noise intensity during the counts was 74.9 ± 2.6 dB at the stations situated 60 m from the road, 49.3 ± 2.5 dB at the stations 310 m from the road and 41.2 ± 2.9 dB at the stations 560 m from the road. The abundance and species richness of wintering birds did not depend on distance from the busy road or traffic noise in December, but in next months (January and February) the number of species and bird abundance were lower near the road. There were also differences in the abundance of a particular ecological bird assemblages distinguished according to food preference or social behaviour in relation to distance from the road. The proportion of granivorous birds decreased from December to February and with increasing noise level. The proportion of birds belonging to flocking species was related primarily to survey month and increased from December to February. This case study indicates that, in contrast to the results obtained during the breeding season and the autumn migration in the same study plot, road and traffic noise has no effect on the number of birds in the vicinity of a road during December. However in the next months, in January and February bird abundance and number of species was lower near the road, similar as during breeding and autumn migration periods.

Key words: road noise, woodland birds, winter, urbanization, traffic

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INTRODUCTION

Roads carrying heavy traffic adversely affect animals in a number of ways. Apart from the fragmentation of landscapes, roads and traffic noise affect the distribution of organisms in space (Mc Collin 1998). Two of the most serious effects of such human disturbances are mortality resulting from collisions with vehicles (Erritzoe et al. 2003, Orłowski 2005) and indirect effects of traffic noise (Orłowski 2008, Slabbekoorn & Ripmeester 2007, Halfwerk et al. 2011, see also the review by Reijnen & Foppen 2006). The expansion of civilisation is introducing into the environment more and more anthropogenic noises, which differ fundamentally from the noises of nature (Wood & Yazerinac 2006). One of the most serious types of this ubiquitous noise is that generated by road traffic. Recent research has shown that such noise may significantly reduce the density of breeding birds in the vicinity of roads (Reijnen & Foppen 1994, 2006, Palomino & Carrascal 2007, Polak et al. 2013). It may also affect the numbers of migrating birds (McClure et al. 2013, Ware et al. 2013, Wiącek et al. 2015). One of the plausible modes of action that has been put forward is that vocal communication between birds is hampered (Brumm & Slabbekoorn 2005). This might lead to reduced breeding success (Kuitunen et al. 2003): it may be harder to find a partner (Habib et al. 2007) and the intensity and frequency of singing may change (Brumm 2004, Salaberria & Gill 2010, Oden 2013).

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Nest surface temperature predicts fledging success of Blue Tits *Cyanistes caeruleus* but not Great Tits *Parus major*

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Deeming D. C., Pike T. W. 2015. Nest surface temperature predicts fledging success of Blue Tits *Cyanistes caeruleus* but not Great Tits *Parus major*. Acta Ornithol. 50: 247–251. DOI 10.3161/00016454AO2015.50.2.012

Abstract. Studies investigating nest function in birds show that individual preferences and environmental temperature can affect the type and amount of materials used in their construction and, thus, how well insulated they are. Levels of insulation of bird nests may be important because this could impact on heat loss by adults and eggs during incubation, and by nestlings during rearing, which may in turn affect individual fitness. Here we used infrared (IR) thermography to measure the surface temperature of nests of Great Tits *Parus major* and Blue Tits *Cyanistes caeruleus in situ* during incubation to test the hypothesis that nest insulation predicts reproductive success. Previous studies of thermodynamics during incubation have focussed on factors, e.g. egg temperature, which do not directly measure the thermal conditions in the nest itself. Rarely applied to studies of avian incubation, IR thermography has yet to be used to quantify the thermal properties of nests with the incubating bird *in situ*. The rate of temperature change (°C/cm) of the nest material, as determined for the first 1.5 cm away from the edge of the bird, was significantly associated with fledging success in Blue Tits, although not Great Tits. This provides the first evidence that the insulatory properties of nests during incubation can correlate with offspring fitness, and so has important implications for the study of nest function in an ecological context. IR thermography provides a methodology that allows future research to investigate the factors that determine nest insulation.

Key words: incubation, IR thermography, nest materials, temperature, breeding success, *Cyanistes caeruleus*, *Parus major*

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Bird nests have long been viewed as receptacles for eggs during incubation and chicks during rearing (Hansell 2000), but renewed interest into how nests function means that factors that affect nest design and construction are now being considered (Rohwer & Law 2010, Heenan & Seymour 2011). In temperate Britain, tit nests in nestboxes, or Common Blackbird *Turdus merula* nests built in the open, and constructed during the cooler, earlier part of the breeding season are larger and better insulated than those constructed later when temperatures are warmer (Britt & Deeming 2011, Mainwaring et al. 2012, 2014, Deeming et al. 2012). Given that neither eggs nor chicks are present at this time, nest construction may better reflect the thermal requirements of the parent bird: a better insulated nest wall (i.e. cup lining and nest wall combined) should reduce heat loss and lower the energetic cost of incubation (Britt & Deeming 2011). Presumably, the birds are relying on the prevailing climate continuing to warm after nest completion, although climate change may be making localised temperature conditions more unpredictable (Mainwaring 2015). Hence, nestlings hatched in a relatively poorly insulated nest constructed during a warm part of the season may be exposed to a higher probability of mortality due to hypothermia should the local climate turn colder. The insulatory properties of the nest may, therefore, be associated with nestling survival and fledging success.

Typically nests are removed from the site of their construction after the breeding season to have their thermal properties examined or compositions examined (Rohwer & Law 2010, Britt & Deeming 2011, Crossman et al. 2011, Mainwaring et al. 2012, 2014). However, in cavity-nesting species, like Blue Tits *Cyanistes caeruleus* and Great Tits *Parus major*, the nest materials are compressed by the growing chicks and the structure may have

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Parentage analyses reveal hidden breeding strategies of European Rollers *Coracias garrulus*

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Abstract. The European Roller *Coracias garrulus* is a secondary hole-nesting bird that has largely been considered genetically monogamous, although molecular techniques to confirm this assumption had never been used. Here we test this hypothesis by using 5 years of data from a nest-box population in the south of Spain and 6 microsatellite markers recently tested in the species. Overall, 49 broods containing 176 nestlings were included. The average annual percentage of nests with either extra-pair paternity or extra-pair maternity was 4.6 and 6.4, respectively. No evidence of cooperative breeding was found in the provisioning videos analysed. Our work confirms for the first time that European Rollers are not exclusively genetically monogamous, opening new avenues in the study of the breeding biology of this near-threatened species.

Key words: *Coracias garrulus*, Coraciiformes, extra-pair maternity, extra-pair paternity, mating system, microsatellites

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It is not long ago when most bird species were considered monogamous (Lack 1968). However, the increasing use of molecular tools for the study of parentage has allowed to detect alternative breeding strategies such as extra-pair paternity, extra-pair maternity or conspecific brood parasitism in many bird species (e.g. Burke & Bruford 1987, Arnold & Owens 2002, Griffith et al. 2002, Westneat & Stewart 2003, Griffith et al. 2004). This advancement has considerably challenged our understanding of avian mating systems (e.g. Hughes 1998).

Extra-pair paternity occurs when a female copulates with a male other than her social partner, and thereby part of her offspring is sired by the extra-pair male (e.g. Pied Flycatcher *Ficedula hypoleuca*, Canal et al. 2012, House Sparrow *Passer domesticus*, Hsu et al. 2014). Males siring extra-pair offspring in different nests would presumably increase fitness without incurring the costs of parental care. Why females would seek extra-pair copulations remains unclear; but most adaptive hypotheses have been focused on indirect genetic benefits (Petrie & Kempenaers 1998, Griffith et al. 2002, for non-adaptive explanations see Forstmeier et al. 2014). Extra-pair maternity or quasi-parasitism occurs when a male copulates with a female other than his social partner and the extra-pair female lays eggs in the male's nest (e.g. Water Pipit *Anthus spinoletta*, Reyer et al. 1997, Kentish Plover *Charadrius alexandrinus*, Blomqvist et al. 2002). Several possible explanations ranging from 'female-driven extra-pair maternity' to simple chance have been proposed to explain this breeding strategy (Alves & Bryant 1998). Finally, conspecific or intraspecific brood parasitism occurs when a female lays one or more eggs in a conspecific's nest and her offspring is then raised by genetically unrelated foster parents (e.g. Black-headed Gull *Chroicocephalus ridibundus*, Ležalová-Piálková 2011). Compared to extra-pair maternity, conspecific brood parasitism is a more common