TÜBİTAK

Short Communication

Turk J Zool
2011; 35(6): 879-882
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doi:10.3906/zoo-1003-106

Roosting of tree sparrow (*Passer montanus*) and house sparrow (*Passer domesticus*) in white stork (*Ciconia ciconia*) nests during winter

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Received: 04.03.2010

Abstract: Presented are the results of a preliminary study on wintering and roosting sparrows in white stork nests. The study was conducted in the winters of 2005/2006 and 2006/2007 in the agricultural landscape of western Poland. Wintering sparrows occupied 71% of the white stork nests on at least 1 visit; tree sparrows occurred in 27% of the nests at least once and house sparrows occurred in 66% of the nests at least once. No relationship was found between weather conditions, date, age, or size of the white stork nests and the number of sparrows roosting in them. This may have to do with population structure, age, social hierarchy, or individual preference. This phenomenon needs further and more intensive study.

Key words: Tree sparrow, *Passer montanus*, house sparrow, *Passer domesticus*, white stork, *Ciconia ciconia*, wintering, roosting, Poland

Winter is a critical period for the survival of many sedentary bird species, mainly because of decreasing temperatures and food availability and longer nights, which increases energy demands (Blem, 1990; Pravosudov and Grubb, 1997; Ekner and Tryjanowski, 2008).

Good examples of birds at risk include tree sparrow *Passer montanus* and house sparrow *P. domesticus*, species strongly associated with human settlements (e.g. Tryjanowski and Kuczyński, 1999; Summers-Smith, 2005). Their survival is strongly related to weather conditions, food supply, and predation.

Both the house sparrow and tree sparrow are now declining in Europe, mainly due to the intensification of agriculture and changes in building design reducing nest sites and food supplies (Mitschke et al., 2000; Hole et al., 2002; Summers-Smith, 2003, 2005; Robinson et al., 2005; Shaw et al., 2008). However, Shaw et al. (2008) suggested that the decline of house sparrows in urban areas was more complicated, being influenced by urban structure, garden management, housing density, nest-site availability, and human socioeconomic status. Increasing predation risk could also be a very important cause of declining sparrows in urban areas in Britain (Bell et al., 2010), or at least of behavioral and body mass changes during winter (MacLeod et al., 2006).

Although the majority of studies have focused on sparrows during the breeding season, it has been suggested that winter is a crucial period in

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understanding the species population dynamics and, in consequence, recent declines (Pinowski et al., 2008). Pinowski et al. (2006) suggested that the thermal conditions of roosting places may be an important factor in understanding roost-site selection, such as nest holes, holes in old buildings, and eaves, even within the large nests of large avian species like the white stork.

White stork (*Ciconia ciconia*) nests are known as good sites for nesting passerines, including the house sparrow, tree sparrow, great tit *Parus major*, reed bunting *Emberiza schoeniclus*, redstart *Phoenicurus phoenicurus*, starling *Sturnus vulgaris*, pied wagtail *Motacilla alba*, blackbird *Turdus merula*, collared dove *Streptopelia decaocto*, wood pigeon *Columba palumbus*, and magpie *Pica pica* (Indykiewicz, 1998, 2006; Bocheński, 2005; Kosicki et al., 2007). However, to my knowledge, there is no published information on the use of white stork nests by small passerines during winter.

Therefore, the main goal of this paper is to describe the phenomenon of wintering sparrows in white stork nests. The study focused on the proportion of white stork nests used by sparrows and discusses this process to understand the role of the white stork in providing an "umbrella" to protect declining sparrow species (see also Kosicki et al., 2007).

The study was conducted in the winters of 2005/2006 and 2006/2007 in the agricultural landscape of western Poland near Leszno (51°51′N, 16°35′E) and Kościan (52°05′N, 16°39′E). The study plot covered 750 km². This is an area of arable fields interspersed with meadows, pasture, human settlements, and woods. The white stork builds nests mainly on electricity poles, chimneys, and roofs of buildings (Kuźniak, 1994; Kosicki et al., 2007).

A total of 33 and 36 nests in the winters of 2005/2006 and 2006/2007, respectively, were each recorded twice to record sparrow flight into the nest before sunset. Sparrows flying into the nest were counted during a 15-min observation before sunset, using binoculars. Sparrows spending the night outside the nest or choosing other sites on the same farm or within 50 m of the nest (e.g. bushes, building apertures, etc.) were also recorded. Sparrows outside the nest were also counted during a 15-min observation and for 10 min after sunset, to confirm that they spent the night outside. The locations and ages of the nests were variable. Also noted were precipitation, snow cover, temperature, and data on the age of the nest and its occupation by white storks in the preceding season. Information on the age of white stork nests was obtained from S. Kuźniak, who has studied the white stork population in this area since 1973 (Kuźniak, 1994; Kosicki and Kuźniak, 2006; Kosicki et al., 2007).

During the study period, 71% of the white stork nests were occupied by wintering sparrows on at least 1 visit; tree sparrows occurred in 27% of nests at least once and house sparrows in 66% of nests at least once. The total number of recorded birds in white stork nests was 433 (73 tree sparrows, 357 house sparrows, and 3 starlings, the last species excluded from further analyses). The maximum number of roosting sparrows observed in 1 nest was 40; the maximum number of roosting tree sparrows was 27 and the maximum number of house sparrows was 33. A histogram of the total number of sparrows per visit is shown in Figures 1 and 2. There was no significant correlation between tree and house sparrow numbers (Pearson correlation, $r = 0.086$, $p = 0.265$; Spearman rank correlation, $r_s = -0.040$, $p = 0.641$) or association between their presence and absence ($\chi^2 = 0.19$, $p = 0.664$). Also recorded were 880 sparrows roosting outside of the white stork nests, in bushes, in holes in buildings, and in the eaves of buildings.

The results suggest that white stork nests are very attractive places for roosting. They are sheltered from precipitation, low temperatures, and wind. Therefore, the nest plays an important role in the survival of small passerine birds in winter, even though the owner is not present at the time. Moreover, similar to results obtained during the breeding season (Kosicki et al., 2007), the white stork nest may be important for the survival of sparrows.

Sparrows spending the night in the white stork nest, as in nest boxes, use much less energy warming themselves (Pinowski et al., 2008). However, the number of these sites is very limited. On the other hand, the white stork nest is very exposed, being located on electricity poles, high chimneys, and the tops of buildings, and therefore increasing the risk of predation during flight into the nest (e.g. by sparrowhawk *Accipiter nisus*; see Tobolka, 2007).

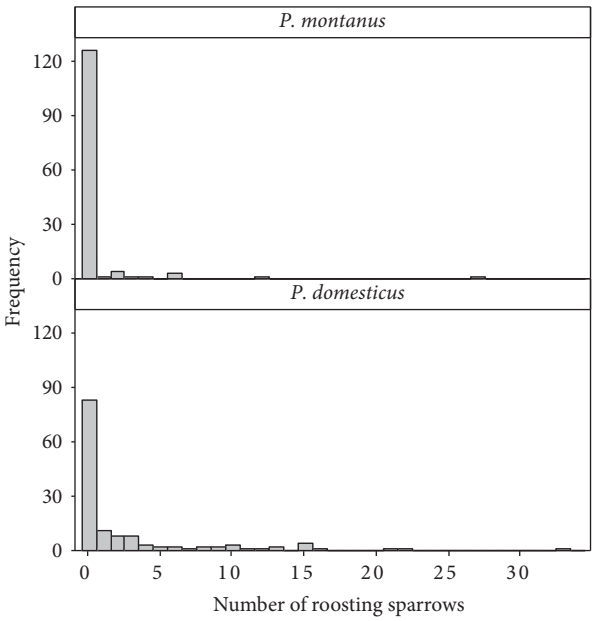

Figure 1. A histogram of the number of sparrows (tree and house sparrows) observed per visit roosting in white stork nests.

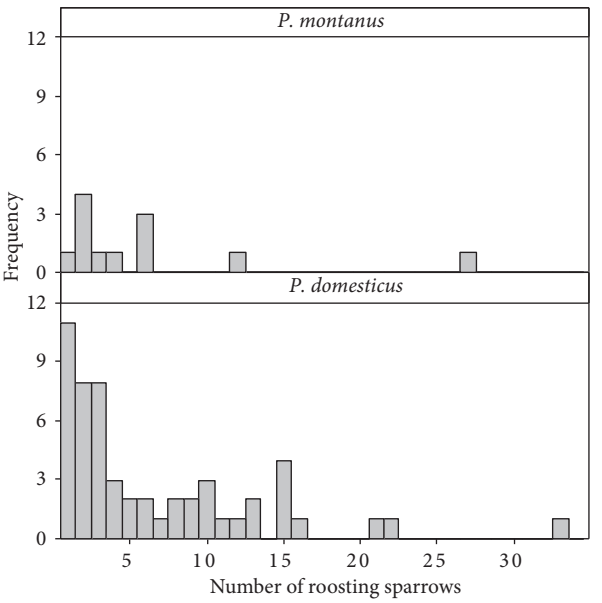

Figure 2. Alternative histogram of the number of sparrows (tree and house sparrows) observed per visit roosting in white stork nests, excluding 126 and 84 zeroes.

Sparrows looking for roosting sites in the nest are more vulnerable than sparrows spending the night in bushes. They make a decision to either spend the night in a big flock in the bushes, where the temperature is very low at night, or run the risk of being attacked by raptors on route to the stork nest, where the conditions are more favorable (Tobolka, 2007). We do not know the mechanism by which sparrows choose between bushes and the stork nest. Furthermore, no relationship between weather conditions, date, or age or size of the white stork nest and the number of sparrows roosting in it was found.

Currently, we can only guess the reasons for the sparrows' choices. These may have to do with population structure, age, social hierarchy, or individual preference. This phenomenon needs further and more intensive study.

Acknowledgements

Special thanks go to S. Kuźniak for his information on the local population of the white stork. Thanks also go to K. Furmańczak, P. Szymański, A. Tobółka, and K. Żołnierowicz for their help with the fieldwork, and T.H. Sparks for critical comments on an earlier version of the manuscript.

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