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Autumn sexual display in Tree Sparrows (*Passer montanus*) and its role in winter survival

*Jesenný tok vrabcov poľných (*Passer montanus*) a jeho úloha v prežití zimy*

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*Tree sparrows (*Passer montanus*) leave their breeding colonies after the fledging of the young. In first days of September, the moulted birds come round back to the breeding colonies: males followed by females and fledged young. They perform their autumnal courtship – creating pairs, building nests and copulating. The young hatched at the second or the third breeding, in dependence on the onset of winter, stop the nest building in different phases or they completely abandon the finishing. The tree sparrows have their winter roosting sites in nests built at time of their autumnal courtship. There have been conducted experiments showing that, unlike in the roosting outside holes, the energy savings are directly proportional to the stage of the building accomplishment, and the completely finished nests feathered with own feather provide energy savings up to 36%. It is possible that the just described confirmed wintering of sparrows from earlier hatchings results from their more favourable odds to build their own autumnal nests.*

The Tree Sparrow (*Passer montanus*) belongs to the group of species performing autumn sexual behaviour typical of the breeding period. Similar behaviour occurs in several ten bird species (Morley 1943, Kalela 1958). In the zone of temperate climate, cool weather in autumn ceases this behaviour, but in warm climate breeding in autumn can be continued if it is facilitated by human activity such as irrigation (Orians 1960, Selander, Nicholson 1962). It is considered to be an effect of the autumnal equinox that triggers hormonal changes in birds (Hegner & Wingfield 1986, 1990). Hormonal changes give rise to the behaviour characteristic of the breeding period, such as 1) mating , 2) nest construction, 3) recognition of territory and 4) evaluation of nest (public information).

In species living under climatic conditions precluding autumnal breeding such behaviour should be eliminated in the course of evolution because of energetic costs. However, it persisted, which implies that it has some advantages for birds. One of them can be the nest that provides shelter in winter.

The study was conducted in an area situated between the Kampinos Forest and the river Vistula (52°20'N, 20º50'E) during the recent 45 years. Tree Sparrows nested in colonies in nest boxes. They reared two-three broods a year. During the breeding season from April to August they occurred in the area of the colony. After breeding they moved to crop fields where they foraged in flocks, and roosted together in young woods and dense shrubs at the verges of crop fields. In that time they also moulted (Pinowski 1966). After moult at the beginning of September, old males appeared in the breeding colony, followed by old females, and later by the

young of both sexes from the early first broods. The males occupied nests and attracted females. The females selected males, mated, and the pairs constructed nests, but never laid eggs in our study area. With time, younger and younger Tree Sparrows arrived to the breeding colony, and behaved in a similar way. The youngest birds of the third brood arrived with a delay of even several weeks, and occupied marginally located nest boxes, as the best located boxes were already occupied (Pinowski 1965). They mated but only started building nests or even did not start building at all. Cold weather ceased this behaviour. Courtship and nest building were continued from the early morning until noon, and the duration of these activities was dependent mostly on insulation. On sunny and even cooler days, Tree Sparrows were active at nest boxes for a longer time than on cloudy days. In the afternoon they foraged on crop fields (Pielowski & Pinowski 1962, Pinowski 1965, 1966, 1967, Pinowski & Noskow 1989). Among the activities discussed above, we will concentrate upon nests.

Tree Sparrows that started courtship early in the season (in September) could build a complete nest, made up of three layers: the base comprising mainly grasses, the dome made of long grasses, and the cavity lined with feathers and down (Wasylik & Pinowski 1970, Országhová & Puchala 1997, Wais & Fahnert 1992). Younger Tree Sparrows of the second and third broods could stop nest building at different stages. They constructed only the base, or put only a few stalks, or left an empty box. The type of the nest left after the end of courtship also depended on the original situation in the nest box. Tree Sparrows did not remove the old nest disturbed by earlier broods (Deckert 1962, 1968), but they could exchange lining or supplement the old nest so that nest material filled the whole nest box, and only a small cavity was in it.

In winter, Tree Sparrows foraged mainly outside the colony area, and did not roost in nest boxes during the day. They returned to the colony to overnight, and a part of them, mostly old birds, roosted in nests. Among the birds captured on nests, 78% (n = 187) were represented by old birds, a which at the same time contributed to 41% of the population (n = 222). Younger birds roosted in close trees and in nests on frosty nights (Pinowski 1966, 1967). On frosty nights, Tree Sparrows can roost in groups (Creutz 1949, Busse & Olech 1968). The nest built in autumn serves as roosting place at night.

To estimate the value of a nest as thermal isolator during winter nights, and to determine energy savings by a bird roosting in the nest box during night, we conducted an experiment with the use of an "artificial sparrow" that emitted the amount of energy similar to that emitted by a living bird. It has been found that the amount of energy saved depended on the stage of nest building. Already the birds roosting in an empty box saved 18% of energy as compared with the birds roosting on a branch. The birds roosting in complete nests saved 36% of the energy (Pinowski et al. 2005). So far, it has been found that Tree Sparrows that fledged early in the season have a greater chance to survive until the following breeding season than sparrows that fledged later. About 14% of the birds of the first brood survived until May of the following year, as compared with about 5% of the birds of the second and third broods (Pinowska et al. 1995). It can be concluded that Tree Sparrows fledged earlier in the season survived the winter better because they had a greater chance to occupy the best nest sites and to build complete nests providing a better protection in winter.

Tree Sparrows expanded over large areas and are capable of living under extreme climatic conditions (Nachodkin 1988). Energy savings due to night-time roosting in nests is likely to outweigh the costs incurred by autumn courtship and nest constructing. Spring is the time of breeding dispersal and mixing of individuals in the population (Pinowski, unpublished). About 15% of the Tree Sparrows survive until the future breeding season (Pinowski 1968), thus many nests are unoccupied, also in the best part of the colony. These nests are likely to be occupied by birds from less suitable parts of the colony, especially by young birds. The nest built

in autumn may thus be most important in winter. The period of autumnal display is likely to be used (public information) for future breeding habitat selection (Doligez et al. 2004).

Súhrn

Vrabce poľné (*Passer montanus*) opúšťajú hniezdne kolónie po vyletení mláďat. Začiatkom septembra sa už preperené vracajú do hniezdnych kolónií postupne staré samce, samice, a tiež mláďatá vyliahnuté v jednotlivých hniezdeniach a prevádzajú jesenný tok, počas ktorého tvoria páry, budujú hniezda a kopulujú. Mláďatá vyliahnuté v 2. a 3. hniezdení, v závislosti od nástupu zimy, prerušujú stavbu hniezd v rôznom štádiu, resp. ho nedokončia. V zime vrabce poľné nocujú v hniezdach postavených počas jesenného toku. Experimentálne bolo dokázané, že v porovnaní s voľným nocovaním mimo dutiny, úspora energie rastie spolu s mierou rozostavanosti hniezda a v dokončenom hniezde vyplneným vlastným perím sa ušetrí až do 36 % energie. Je možné, že potvrdené vyššie prežívanie zimy vrabcov zo skorších znášok je výsledkom ich väčších šancí na vybudovanie jesenného hniezda.

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