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SEASONALITY AND SOCIALITY
IN TREE SPARROWS *PASSER MONTANUS*

ABSTRACT

Despite the fact that the tree sparrow is often the object of behavioural studies and is a well-investigated species, no specific investigations were performed on the seasonal and daily pattern of the changes in flock size. Several observations suggest clear seasonal and daily periodicity of social organisation, and in connection with these changes, a similar periodicity in flock sizes. In this paper we present the results of a three-year observational study on the flock sizes of a suburban tree sparrow population. Our investigation resulted in statistical evidence for seasonal and daily periodic changes in the social organisation of the species. In the breeding season and in the mornings tree sparrows form smaller flocks than outside the breeding season and in the afternoons. Our results are consistent with the previous, non-systematic observations.

INTRODUCTION

Tree sparrow is well known as a social species that often forms flocks of various sizes (e.g. Pinowski 1968, Summers-Smith 1995, Barta et al. 2004). Several observations suggest that the size of tree sparrow flocks may change periodically during a year and also during a day (Pielowski & Pinowski 1962, Summers-Smith 1995, Pinowski 1968). Social organisation of tree sparrows also shows seasonal (Pielowski & Pinowski 1962, Pinowski 1966, 1968, Summers-Smith 1995) and daily periodicity (Pinowski 1968, Summers-Smith 1995). Several authors suggest that flock size may change according to the periodicity of social organisation (Summers-Smith 1963, 1995, Pinowski 1968). To our knowledge, no specific studies were published on the seasonal and daily pattern of changes in flock sizes, although flock size is undoubtedly an important factor affecting social life (e.g. Beauchamp 2002), and tree sparrow is often the object of studies investigating social behaviour (e.g. Barta et al. 2004, Torda et al. 2004, Mónus & Barta 2008). In this paper we seek statistical evidence on the periodic changes of the flock sizes of a suburban tree sparrow population.

MATERIAL AND METHODS

Study area – Capturing and marking of tree sparrows were performed in the Botanical Garden of the University of Debrecen, in Hungary. The Garden is mainly an open, bushy area of 0.12 km², containing some buildings and diverse, dispersed patches of coniferous and deciduous trees. The size of the Garden represents the size of an average breeding colony area of tree sparrow, which changes from 0.01 to 0.30 km² (Summers-Smith 1995). Sparrows were observed in the Garden and its surrounding area (0.82 km²). Observation area were slightly more urban than the Garden, containing more buildings, fewer tree patches, but always numerous open, bushy clearings, which are suitable for sparrows to forage and allow easy observation of birds. For a more detailed description of the studied system see Barta et al (2004).

    Capturing and marking – During a three years' period (1998-2000), tree sparrows were captured with mist netting (189 hours total capturing time). All adults were marked with a numbered metal ring of The Hungarian BirdLife Association and a unique combination of three colour rings.

    Data collection and analysis – From 01.03.1998 to 28.02.2001 searches for colour ringed individuals were performed, twice a week on average (247 hours total observation time). Estimated flock sizes were always recorded, when tree sparrows were observed, even if no colour-ringed individuals were identified. In order to investigate daily changes in flock sizes we divided the day in two parts – morning (until 12:00 AM) and afternoon (after 12:00 AM). Flock sizes approached log-normal error distribution; therefore we analyzed the log-transformed data. Statistical procedures were performed by SPSS for Windows 9.0.

RESULTS

We ringed 281 adults and collected 1059 and 372 records on colour ringed individuals and on flock size, respectively. 23 birds (8.19%) were recaptured and 45 birds (16.01%) were detected (recaptured or seen) after one year of their first capture. 154 birds (56.83%) were detected at least once after the first capture.

    Mean flock sizes (Fig. 1) significantly differed both among months and between daily periods (two-way ANOVA; months: F=15.615, df=11, P<0.001; daily periods: F=4.732, df=1, P=0.030; interaction: F=0.993, df=11, P=0.452).

DISCUSSION

Our results suggest periodic changes in the life of tree sparrows. Firstly, mean flock sizes significantly differed between months; the monthly distribution of mean flock sizes (Fig. 1) suggests three periods during the annual cycle of tree sparrows, which accord to reproductive cycle and foraging behaviour: (1) from April to July – reproductive

season, match to the period of egg laying and offspring feeding, is a strictly solitaire and sedentary period, social behaviour comes down to the sexual interactions; (2) from November to February – winter season, a social period characterised by flocking, frequent social interactions among members of foraging and roosting groups and intensive movements, in the course of which birds range through greater areas than in the breeding season; (3) March and from August to October – two intermediary periods matching to the period of nest building; and moult, dispersal of young, formation of roosting and foraging groups; respectively. These are consistent with previous founding, namely, that outside the breeding season, sparrows form feeding flocks. These flocks are made up of birds of neighbouring breeding colonies and forage in a certain area, in the home range, which consists of the breeding colony areas of the birds which made up the flock (Summers-Smith 1995).

However, in previous studies investigating mainly agricultural areas, the greatest flock sizes were found in September and October, during the period of dispersal of young birds (Pinowski 1967, Summers-Smith 1995). In a study systematically investigating the number of individuals present in two breeding colonies, but not directly the flock sizes, during the whole year, colony size was found to be the greatest also in September and October (Pielowski & Pinowski 1962). Our study, in contrast to the abovementioned ones, was performed in a suburban area; and flock sizes observed during the period of dispersal were not found to be markedly higher than during the winter.

We suppose that the annual cycle reported in our study may be characteristic to the social behaviour of tree sparrow, however, in different areas flock sizes may be different, and perhaps may be dependent on food distribution. For instance, flock sizes out of the breeding season may inflate up to 2000 individuals during autumn in some agricultural areas (Pinowski 1967, Summers-Smith 1995), and may be as low as 10-20 individuals during very severe winter conditions (Pielowski & Pinowski 1962, Pinowski 1968, Summers-Smith 1995).

Secondly, pattern of mean flock sizes suggests similar periodicity during the daily routine of tree sparrows. We observed consistently greater flock sizes during the afternoons than during the mornings. As one of the main reasons of flocking may be an increased success of foraging (Summers-Smith 1995), the increased size of groups during the afternoon may originate from an increased intensity of food searching. For instance, Pinowski (1968) observed that tree sparrows in autumn after the moulting stay in the colony area during the morning, but form foraging flocks in agricultural fields in the afternoon. These daily changes in flock sizes suggest, similarly to previous authors (McNamara et al. 1994, Dall and Witter 1998), that the afternoon hours have appreciable importance during the daily routine of foraging small passerines.

16.01% of adults were recaptured or observed in the studied area in the subsequent year of their ringing. This result compares reasonably with previous studies reporting
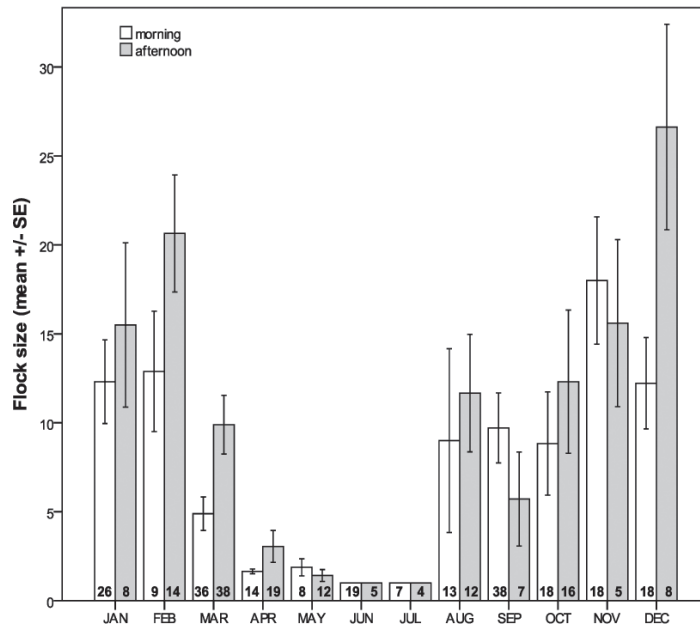
Fig. 1. Flock sizes observed during tree years in a semi urban Tree Sparrow population.
Observation numbers are shown in the bars.

that at least 20, 21 or 23 percent of ringed breeders were later detected in the breeding area (Scherner 1972, Bethune 1961 and Weise 1992, respectively). On the other hand, our results show that against the great efforts made to capture sparrows in a little area, there is an important difference between the proportions of birds detected (16.01%) and recaptured (8.19%). Difference does not arise from the difference between the size of the Garden (capturing area) and the whole observation area, because 88.2% of detected birds were recorded in the capturing area. This report draws attention to the need to treat data gained by mist netting or other bird capturing methods cautiously.

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REFERENCES

Barta, Z., Liker, A. and Mónus, F. 2004 – The effects of predation risk on the use of social forag-ing tactics – Anim. Behav., 67: 301-308.

Beauchamp, G. 2002 – Higher-level evolution of intraspecific flockfeeding in birds – Behav. Ecol. Sociobiol., 51: 480-487.

Bhetune, G. de. 1961 – Notes sur le moineau friquet, *Passer montanus* (L.) – Gerfaut, 51: 387-398.

Dall, S.R.X. and M.S. Witter. 1998 – Feeding interruptions, diurnal mass changes and daily routines of behaviour in the zebra finch – Anim. Behav., 55: 715-725.

McNamara, J.M., A.I. Houston and S.L. Lima. 1994 – Foraging routines of small birds in winter: a theoretical investigation – J. Avian Biol., 25: 287-302.

Mónus, F. and Barta, Z. 2008 – The effect of within-flock spatial position on the use of social foraging tactics in free-living tree sparrows – Ethology, 114: 215-222.

Pielowski, Z. and Pinowski, J. 1962 – Autumn sexual behaviour of the Tree Sparrow – Bird Study, 9: 116-122.

Pinowski, J. 1966 – Der Jahreszyklus der Brutkolonie beim Feldsperling (*Passer m. montanus* L.) – Ekol. Pol. A, 14: 145-172.

Pinowski, J. 1967 – Experimental studies on the dispersal of young tree sparrows – Ardea, 55: 241-248.

Pinowski, J. 1968 – Fecundity, mortality, numbers and biomass dynamics of a population of the Tree Sparrow (*Passer m. montanus* L.) – Ekol. Pol. A, 16: 1-58.

Scherner, E. R. 1972 – Untersuchungen zur Okologie des Feldsperlings (*Passer montanus*) – Vogelwelt, 93: 41-68.

Summers-Smith, J.D. 1963 – The house sparrow – London: Collins.

Summers-Smith, J.D. 1995 – The tree sparrow – Published by J.D. Summers-Smith.

Torda, G., Barta, Z. and Liker, A. 2004 – Dominance hierarchy and status signaling in captive tree sparrow (*Passer montanus*) flocks – Acta Zool. Acad. Sci. H., 50: 35-44.

Weise, R. 1992 – Ortstreue, Paarbildung und Geschlectsdimorphismus beim Feldsperling *Passer montanus* – Vogelwelt, 113: 47-51.