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Flock size of the Siberian Tit *Parus cinctus* during the non-breeding season

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Introduction

Tit species occur in small flocks during non-breeding season. Ekman (1989) has recently reviewed this non-breeding social system of parids. Most of the species live in discrete social units in exclusive flocks. However, in contrast to other species, the Great Tit *Parus major* and the Blue Tit *P. caeruleus* form loose intermingling flocks. An important ecological difference in the behaviour of individuals between these two flock systems is that individuals in discrete flocks hoard food, as opposed to those in loose flocks (Ekman 1989). Because information on the non-breeding flocks of the Siberian Tit *Parus cinctus* is scanty (see, however, Alatalo & Carlson 1987), I present here the results of studies dealing with the non-breeding ecology of this species in northern Finland.

Material

I observed flocks of Siberian Tits in northern Lapland near Vuotso village (68°N, 27°E), in Sodankylä commune in the autum (23 September – 3 October) and winter (8 – 16 December) of 1988. I visited nest-box areas where the breeding biology of the Siberian Tit had previously been studied (see Virkkala 1990). I did not catch the flocks, but I recorded the occurrence of individuals ringed in summer.

Results and discussion

In autumn the mean flock size (N = 20, different flocks) of tits consisted of 3.3 individuals including 2.8 Siberian Tits (Fig. 1, in five flocks there were also two Willow Tits *Parus montanus*). In December the mean flock size (only Siberian Tits, N = 16, Fig. 1) was 2.2 birds. Hogstad (1988) has observed that at air temperatures near 0°C flocks of Willow Tits may temporarily split into subflocks. However, during the days of my observation period in December the ambient temperature was very low, –10 to –35 °C. Therefore, I do not consider these flocks to be subflocks. Both in autumn and winter there were four flocks consisting of only two adult individuals (colour-ringed, earlier bred pairs) and one flock with a pair and an adult male (colour-ringed birds). These flocks were observed both in autumn and winter at a distance of less than 500 m from an earlier breeding site(s) of birds. The age distribution in other flocks was unknown. Birds ringed as nestlings (altogether 97 in 1988) were not observed either in autumn or winter.

The Siberian Tit is similar in size and ecology to the other tit species occurring in northern coniferous forests, the Willow Tit. The mean flock size of the Siberian Tit was smaller than that of the Willow Tit in Fennoscandia. The mean flock size of the Willow Tit in winter was four in northern Finland and northern Sweden (Koivula & Orell 1988, N = 18, Alatalo & Carlson 1987, N = 53,

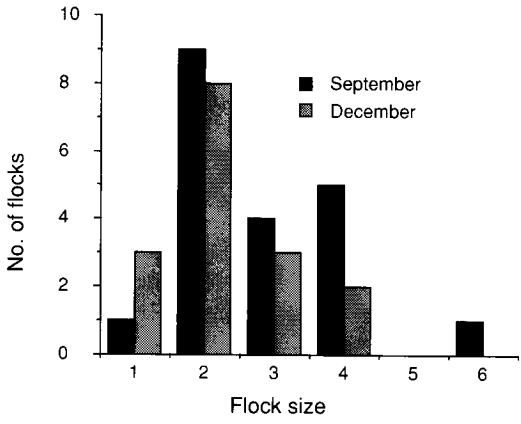

Fig. 1. Number of Siberian Tits in tit flocks in September and December of 1988.

respectively), four in southern Sweden (Ekman 1979, N = 32) and six individuals in central Norway (Hogstad 1988, N = 30). Mixed-species flocks of the Willow and Siberian Tit also averaged four individuals in northern Sweden (Alatalo & Carlson 1987).

The Siberian Tit can be considered as a typical species of discrete flocks. Adult birds occur yearround in their territory having exclusive territories (Virkkala 1990). The Siberian Tit also hoards food in non-breeding season (Alatalo & Carlson 1987).

There are two possible explanations for the small flock size of the Siberian Tit. First, flocking behaviour in birds can be explained by the reduced risk of being preyed upon. Caraco et al. (1980) found that in the presence of a predator, the flock size of the Yellow-eyed Junco *Junco phaenotus* increased. The most common bird predators in Fennoscandia are the Sparrow Hawk *Accipiter nisus* and the Pygmy Owl *Glaucidium passerinum,* both of which are very rare or even absent from my study area. Therefore, possibly due to reduced avian predation non-breeding flocks of the Siberian Tit were small. Larger flocks have disadvantages in increasing the aggressive behaviour between individuals, which may overcome the advantages of the increased vigilance of large flocks ("many eyes hypothesis") in relation to predators. The time spent on foraging is especially critical in the north, where the days are very short in mid-winter.

The other explanation is that proposed by Ekman (1989): habitat constraints limit flock size, and flock size varies with habitat structure. As northernmost coniferous forests are structurally less heterogeneous with also less food resources than those in more southern areas, flock size may be rather small and the habitat may well be saturated by only two or three individuals.

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Selostus: **Lapintiaisen syksyisestä ja talvisesta parvikoosta**

Lapintiaisparvien kokoa selvitettiin syys- ja joulukuussa 1988 Sodankylän Vuotson ympäristössä. Lapintiaisparvissa oli syksyllä keskimäärin kolme ja talvella vain kaksi lintua. Parvien koko oli pienempi kuin hömötiaisella (4–6 yksilöä). Eron oletetaan johtuvan joko lintupetojen vähälukuisuudesta tai ravinnon niukkuudesta pohjoisilla ääri-alueilla.

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