

The response of northern taiga birds to storm disturbance in the Koilliskaira National Park, Finnish Lapland

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Introduction

The structure of north-boreal virgin forests changes through time as a consequence of disturbances, such as fires, insect outbreaks and storms (Bonan & Shugart 1989). Due to natural disturbances large continuous forests are structurally heterogeneous and diverse (Zackrisson 1977). The ecology of north-boreal forests should, therefore, be understood in relation to these natural disturbances (Bonan & Shugart 1989). In this paper we study the occurrence of birds in a virgin forest area where a storm had felled trees.

In October 1985 a storm raged in Northern Finland (Lapland). In Koilliskaira National Park (Northeastern Lapland) the storm felled about 30-40% of the trees in an area of 50-100 km². In consequence of the storm, numerous dying trees were available to the birds. In the following summer birds were censused in the storm-felled area.

We include in this study three species of the northern taiga (see Haila 1985): the Three-toed Woodpecker *Picoides tridactylus*, Siberian Tit *Parus cinctus* and Siberian Jay *Perisoreus infaustus*. All these species prefer old, virgin

coniferous forests (von Haartman et al. 1963-72, Virkkala 1987a, 1991). They have declined in northern Finland during the last few decades probably owing to the intensive forestry started in Lapland in the 1950s (Järvinen & Väisänen 1979, Helle & Järvinen 1986, Väisänen et al. 1986). The Three-toed Woodpecker feeds on wood-boring insect larvae in coniferous trees, mainly beetles but also moth larvae (Bent 1939, Cramp 1985), and, therefore, requires dead or dying trees with an abundant insect fauna. The Siberian Tit and Siberian Jay are foliage-gleaners, preferring to feed on coniferous trees (Virkkala 1988). Both the Three-toed Woodpecker and the Siberian Tit are hole-nesters.

We shall compare the abundance of these species in the storm-felled area with estimates from other Northern Finnish virgin forests not affected by the storm (Virkkala 1987b, 1991).

Methods and study areas

We used the Finnish line transect census in counting the birds (for details, see Järvinen &

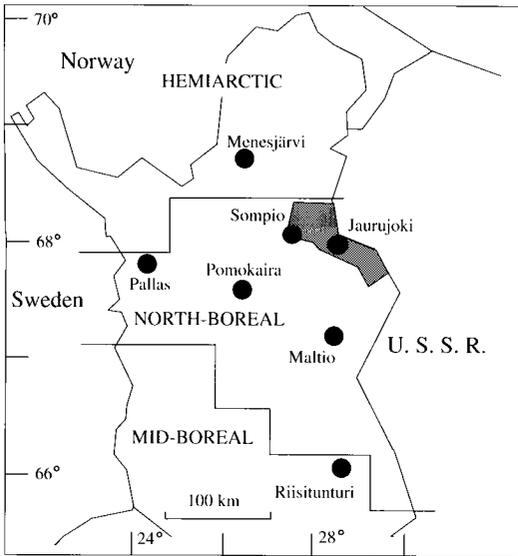


Fig. 1. Situation of the censuses areas in Northern Finland. The shaded area is Koilliskaira National Park (in size 2 500 km²). The ornithogeographic zones (mid-boreal, north-boreal and hemiarctic) of Järvinen & Väisänen (1980) are presented.

Väisänen 1976, Järvinen et al. 1991). The species-specific correction coefficient (K) presented by Järvinen & Väisänen (1983) was used for calculating the survey belt density of the Three-toed Woodpecker (K = 7.53), but new correction coefficients were adopted in the much larger data sets for the Siberian Tit (K = 13.53) and Siberian Jay (K = 8.30); these coefficients were based on censuses made in 1982–89 in different virgin forests in Northern Finland (Virkkala 1987b, 1991).

The storm-felled area was situated in Jaurujoki, Koilliskaira National Park (68° N, 29° E,

Fig. 1). Altogether 67.6 km of line transects were counted in June 1986, 51.3 km (75%) lying in pine-dominated forests and the rest in spruce forests. The proportion of felled trees in the stands censused varied between 5 and 90%, with a mean of 30–40% (see also Kauhanen 1991). The age of the forest was over 200 years (the oldest age-class in silvicultural files).

The characteristics of the other virgin forests (Fig. 1) have been presented in detail in Virkkala (1987b). In Maltio, Sompio, Pallas and Riisitunturi both spruce- and pine-dominated forests were censused; Pomokaira consisted only of spruce-dominated and Menesjärvi of pine-dominated forests. In Northern Finland the Three-toed Woodpecker, Siberian Tit and Siberian Jay inhabit both pine- and spruce-dominated forests (von Haartman et al. 1963–72, Virkkala 1987a, Virkkala 1988, Virkkala & Liehu 1990).

The different censuses were carried out at the same time, 10–30 June. The censuses in Jaurujoki and in Pomokaira were carried out by MH and PR, and the other censuses by RV (except in Riisitunturi). The significance of the differences in the density of the species was tested by using nonparametric tests, which were based on the number of observations of species on the transects.

Results

The Three-toed Woodpecker was significantly more abundant in the storm-felled area than in the other virgin forests of Northern Finland in 1986, whereas no differences were observable in the densities of the Siberian Tit and Siberian Jay

Table 1. Densities (pairs/km²) and number of observations (survey belt) of the Three-toed Woodpecker, Siberian Tit and Siberian Jay in storm-felled forest in Jaurujoki (67.6 km of transects) and in other virgin coniferous forests (Sompio, Pomokaira, Pallas; 64.4 km) in 1986. The statistical significance (χ^2 -test with Yates correction) of the differences in the number of observations between Jaurujoki and other forests is presented.

	Jaurujoki		Other forests		P
	Density	n	Density	n	
Three-toed Woodpecker	1.2	11	0.1	1	<0.01
Siberian Tit	2.8	14	3.6	17	ns
Siberian Jay	1.0	8	1.3	10	ns

(Table 1). The Three-toed Woodpecker has been relatively scarce every year in the virgin forests of Sompio: in repeated transect censuses in 1982–89 it has been observed only once or twice a year (see Virkkala 1991). Table 2 presents densities of the Woodpecker in virgin forests situated in different parts of Lapland (see Virkkala 1987b, for details). The weighted mean (in transect km) density for all the areas was only 0.25 pairs/km² according to the survey belt records and 0.33 p/km² according to the main belt observations. In the storm-felled area the density of the Three-toed Woodpecker was 1.2 pairs/km². The high density of the species in this area is probably not caused by any local factor independent of the effects of the storm.

Discussion

The increase in the amount of dying, wind-felled trees seems to be advantageous for the Three-toed Woodpecker. This is probably due to the extra food resources available in the dying trees, such as wood-boring beetles (e.g. Scolytidae). In North America, Massey & Wygant (1973) observed that during insect infestations Three-toed Woodpeckers congregated in large numbers and that their numbers correlated positively with the occurrence of the Spruce Bark Beetle *Dendroctonus obesus*.

The Three-toed Woodpeckers in the storm-felled area were not non-nesting, floater individuals, because several nests were found in this area. Three-toed Woodpeckers probably nest at the age of one year, as do many other wood-

pecker species (Short 1982, Cramp 1985). Juveniles disperse and migrate for long distances in the autumn, when the storm-felled area was probably found by the Woodpeckers. The interval between the storm and nesting of the Woodpeckers was too short for the wood-boring insect populations to increase clearly in numbers (P. Helle, pers. comm.). In 1986, wood-boring beetles did not have a peak until mid and late summer, when the breeding of Woodpeckers was over (J. Espo, pers. comm.). It might well be that woodpeckers selected the storm-felled area due to its structural characteristics as these forests do provide extra food in later years. The structure of forests can be considered a proximate factor and the food in dying trees an ultimate factor in the habitat selection of woodpeckers (see Hildén 1965). Unfortunately, no censuses were carried out in later years, when the wood-boring insect populations were at a high level.

The numbers of the Siberian Tit and Siberian Jay in the storm-felled area did not differ from those in other virgin forests. The effect of the storm on these species is very different, however, from that of forest thinning. In managed areas, where all the large and dead trees have been removed, the densities of these species are less than 0.5 pairs/km², and the species clearly suffer from the effects of forestry (Virkkala 1987a, 1990, 1991).

The Three-toed Woodpecker in the northern taiga is probably well adapted to and may even be dependent on the effects of disturbances. Fires and storms damage trees, thus creating extremely good feeding and nesting habitats for the species. Storm-felled and forest fire areas may act as high-quality 'hot spots' for the Woodpecker in the large taiga belt.

Modern forestry also causes disturbances, but, forestry practices cannot be compared to natural disturbances; in managed, thinned forests, for instance, particularly dead and dying trees are removed.

The storm-felled area in this study sheds light on the conflict between foresters on one hand and conservationists and scientists trying to preserve the biodiversity of the north-boreal coniferous forests on the other: although the area was situated in the heart of one of the most important National Parks of Finland, foresters still wanted

Table 2. Densities of the Three-toed Woodpecker in different virgin forest areas in Lapland. The number of observations, census years and transect kms are presented.

	Density	n	Years	Kms
Riisitunturi	0.3	2	1985–86	43.6
Maltio	0.2	1	1985	35.8
Pomokaira	0.2	1	1983–88	40.0
Pallas	–	–	1986	37.4
Sompio	0.3	8	1982–89	187.5
Menesjärvi	–	–	1983–85	15.2

to cut and remove the 'sick', fallen trees. Fortunately, the foresters lost this battle and the trees and Woodpeckers remained in the area.

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Selostus: Pohjoisten taigalajien esiintymisen Koilliskairan kansallispuiston myrskytuhoalueella

Syksyllä 1985 Pohjois-Suomessa raivosi myrsky, joka kaatoi puita laajalta alueelta myös Jaurujoella, Koilliskairan kansallispuistossa. Myrsky kaatoi keskimäärin noin kolmanneksen puista 50–100 km² alueella. Kesällä 1986 myrskytuhoalueella suoritettiin lintulaskentoja samaan aikaan kuin muissa Lapin vanhoissa havumetsissä, joissa myrsky ei ollut vaikuttanut. Tässä työssä verrataan pohjantikan, lapintiaisen ja kuukkelin tiheyksiä myrskytuhometsien ja muiden vanhojen havumetsien välillä. Nämä lajit suosivat vanhoja havumetsiä ja ovat vähentyneet metsien hakkuiden seurauksena. Lapintiaisen ja kuukkelin tiheyksissä ei ollut eroja myrskytuhometsien ja muiden metsien välillä, sen sijaan pohjantikan tiheys myrskytuhometsissä (1.2 paria/km²) oli korkeampi kuin muualla Lapin vanhoissa havumetsissä (noin 0.3 p/km²). Pohjantikka on esiintymisessään riippuvainen puuaineksessa olevista hyönteisistä, joita se käyttää ravinnokseen. Myrskytuhojen ja kulojen seurauksena syntyy paljon kuolevaa puustoa, joihin kolonisoituu runsaasti pohjantikan ravinnokseen käyttämiä kovakuoriaisia ja muita hyönteisiä. Myrskytuhot, kulot ja muut luonnon 'häiriöt' ovat olennainen osa pohjoisen havumetsäluonnon dynamiikkaa, joiden vaikutuksista mm. pohjantikka on riippuvainen. Myrskytuhoalueiden kaatunutta puustoa ei näin ollen missään nimessä saa poistaa suojelualueilta.

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