Breeding bird communities in relation to distance from winter food supply

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During the breeding time, birds fed at houses in winter, but dependent only on the breeding habitat in spring, were more common in conifer woods adjacent to and 500 m away from the feeding area than in more distant woods. Other bird species, also dependent only on the breeding habitat in spring, but mainly migratory, did not show corresponding spatial differences in density. The bird communities thus differed independently of habitat structure or habitat productivity. These observations on rather sedentary species are consistent with findings for more mobile species and indicate the necessity of taking a geographically wider view in examining the causes behind density changes.

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Introduction

Densities of breeding birds are at least partly determined by habitat characteristics, but the numbers may also be affected by factors operating outside the breeding season and in other habitats. Hansson (1979) suggested that the distance from the breeding area to winter food resources was very important in this respect. Recent studies have also shown that winter food conditions affect spring breeding densities in many passerine species, especially those wintering in boreal-temperate environments (Svensson 1977, 1981).

Many passerines and a few other bird species are fed at human habitations in winter. Such winter support should affect breeding numbers locally, but no comprehensive studies seem to have been performed. Furthermore, spring densities might also be increased some distance away from the feeding places. To examine such effects, bird densities were censused at different distances from feeding areas in central Sweden.

Methods

Birds are fed in winter at almost every house in some suburbs of Uppsala, central Sweden. These suburbs border on pastures with conifer woods. The woods were grazed in former days, but bushes and deciduous trees have grown up during the last 30–40 years. Similar pastures and woods can also be found at some distance from Uppsala. During the springs of 1982–84, birds were censused in two woods adjoining bird-feeders, in two woods almost 0.5 km from the feeders and in two woods at least 5 km from any bird-feeder. The woods were censused by mapping territories (Svensson 1975), 10–12 times in late March to late June. The woods were chosen on land-use maps from the 1940–60's, so as to represent the same habitat (forests in the thinning stage regenerated from grazed woodland), to be of similar size and to contain no nest boxes. However, the distant woods had to be somewhat larger than the others. All species feeding only within the woods in spring–summer were censused and corvids and columbids, for example, were excluded.

Comparisons were made between the densities of the winter-fed and other species in the woods at different distances from the feeders and between the proportions of the winter-fed species in the total bird communities.

Results

The following species appeared in large numbers at the bird-feeders: *Chloris chloris, Dryocopus major, Emberiza citrinella, Parus caeruleus, P. major, P. palustris* and *Sitta europea.* They were regarded as the "winter-fed community". There were very few *Fringilla coelebs* and *Turdus merula* feeding in winter, these two species being mainly migratory.

The densities of the winter-fed species were considerably higher in the woods adjacent to and within 500 m of the feeders (Table 1). The differences between these and the distant woods were significant in 1982 ($F = 12.27$, $P < 0.05$) and 1984 ($F = 15.31$, $P < 0.05$) and almost significant in 1983 ($F = 3.85$). The densities of the other species did not show any significant differences between the woods in 1982 or 1983 ($F = 0.52$ and 0.83 respectively), but significantly lower densities were found in the distant woods in 1984 ($F = 105.5$, $P < 0.01$). When the whole material was examined with respect to both woods and year with the Friedman two-way analysis of variance, a significant difference emerged for winter-fed bird species ($\chi_r^2 = 12.76$, $P < 0.05$) but not for the others ($\chi_r^2 = 8.19$, $P > 0.10$).

The proportions of the winter-fed species in the whole community differed very clearly between the woods at different distances (Table 2). Analyses within years (Kruskal-Wallis one-way analysis of variance and Mann-Whitney U-test, the latter with the two closest wood pairs pooled) showed almost consistently a significance level of $P = 0.067$, which is the lowest level possible with six samples. Again, a Friedman two-way analysis of variance demonstrated a still lower agreement in the proportions ($\chi_r^2 = 11.81$, $P < 0.05$). No significant differences emerged upon further subdivision of the data.

Discussion

In all the woods the dominant species were *Phylloscopus trochilus, F. coelebs* and *Erithacus rubecula,* i.e. migrating species. These species did not differ in density with distance from the feeders. Thus, although the number and especially the proportion of winter-fed birds were higher in the adjacent and nearby woods, there was no evidence of competition between species with different migration stategies. On the other hand, as maintained by Hansson (1979) and Svensson (1981), spring bird communities may often be unsaturated (i.e. with a surplus of resources permitting higher numbers of both species and individuals), unlike winter communities, and changes in winter resources may strongly affect breeding community structure without any accompanying habitat change. This interpretation is supported by the fact that the total number of long-distance migrants affects proportions more than densities.

The effect of winter resources may vary geographically; Schmidt & Wolff (1985) did not discover any evidence that winter feeding influences the survival of *P. major* in southern Germany, but the food conditions may be more critical in the harder climate in Sweden. Jansson et al. (1981) doubled the local populations of *Parus montanus* and *Parus cristatus* in south-central Sweden by providing extra food in winter. The annual variation of the total bird densities was three times as great in north as in south Fennoscandia (Järvinen 1980). On the other hand, this may not necessarily be due to variation in survival; winter feeding may also influence the spatial distribution of breeding birds. The spring dispersal was evidently limited in the rather sedentary species examined here, since woods at a distance of 5 km were not affected.

Bird numbers and species composition are often considered to depend upon the characteristics of the habitat. This may not be the general case if bird communities are seasonally or intermittently unsaturated. Järvinen and Ulfstrand (1980) compiled lists of species recently colonizing Scandinavia and many of these were migrants, both intra-palaearctic and tropical ones. It was suggested that changed winter conditions had caused increases in Scandinavia, especially for the tropical migrants. Enemar et al. (1984) found correlations in fluctuation patterns in north Swedish breeding passerines which were related to the wintering areas of the various species. Järvinen (1978, 1980) demonstrated that changes in bird numbers on a large undisturbed Finnish mire could be due to improved conditions in winter quarters or to population pressure from other habitats, but not to changes in the mire itself or to local climate conditions.

Other evidence of unsaturated spring communities has been provided by nest-box experiments (e.g. Enemar & Sjöstrand 1972) and by faunal changes on islands (e.g. Haila et al. 1979), that are clearly related to changed population pressures on the mainland. In the latter case very mobile birds were affected; the spatial effects evidently vary with both specific motility and the extent of support in critical situations. Breeding densities and community structure in a certain habitat may well be determined by "ecological crunches" (Wiens 1977, 1984), occurring at a greater or lesser distance from the study area.

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Selostus: **Talviruokinnan vaikutus pesimälintuyhteisöön**

Kirjoittaja tutki talviruokinnan vaikutusta pesimälinnustoon Uppsalassa vuosina 1982–84. Linnut kartoitettiin kahdella koealalla aivan ruokintapaikkojen tuntumassa, kahdella alalla puolen kilometrin päässä ja kahdella yli 5 km etäisyydellä sijainneella alalla. Laskentoihin otettiin mukaan vain ne lajit, jotka ruokailivat tutkituissa metsissä lisääntymisaikanaan.

Table 2. Proportions (%) in the bird communities of species with different wintering strategies, including some typical and common species.

	Bordering feeding areas	300–500 m away	5–6 km away
Parus major	10	9	2
Other winter-fed species	23	24	10
Fingilla coelebs	14	20	22
Erithacus rubecula	10	7	10
Phylloscopus trochilus	18	18	22
Other migrating species	19	17	23
Regulus regulus	4	5	5
Other wintering species	1	1	5

Table 1. Breeding densities (territories/ha) of winter-fed bird species/species not fed in winter in woods at different distances from the feeding places.

	Bordering feeding areas		300–500 m away		5–6 km away	
	7.4 ha	5.6 ha	6.5 ha	5.0 ha	10.6 ha	15.2 ha
1982	1.5/2.8	1.6/4.5	2.3/3.2	1.6/3.0	0.6/3.0	0.3/3.4
1983	1.5/2.8	2.9/5.0	2.2/3.8	1.6/3.8	0.7/2.8	0.4/2.9
1984	1.6/3.4	2.0/3.4	1.5/3.7	1.0/3.6	0.4/2.5	0.3/2.3

Talviruokintapaikoilla käyneiden lajien tiheydet olivat suuremmat aivan asutuksen viereisillä tai lähellä sijainneilla aloilla kuin kaukaisessa metsässä. Muuttolintulajeilla ei vastaavia tiheyden muutoksia havaittu. Kirjoittaja korostaa, että paikallisesti havaittuja linnuston tiheyden muutoksia on tarkasteltava laajemmassa maantieteellisessä yhteydessä.

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