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Bird communities in three oak-dominated woodlands in southern Sweden

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Bird communities were censused by the territory mapping method in three oak-dominated woodlands in S. Sweden in spring 1982. The study plots (11-17 ha) were on poor, heterogenous and rich soils respectively. Total abundance of breeding birds and species diversity followed the poor-to-rich soil gradient, while species number was the same in all three plots. Among the bird species, densities of thrushes, some warblers and the Chaffinch (*Fringilla coelebs*) were also positively correlated with soil fertility, while supply of natural cavities seemed to be more important to hole-nesters. The results are discussed in comparison with some other bird studies in deciduous woodlands.

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1. Introduction

Over the last few years there has been a growing concern in Sweden about the rapid disappearance of certain natural, semi-natural and traditionally managed habitats. One such group of habitats is broadleaved deciduous woodlands (southern boreal). Beech, *Fagus silvatica*, woodlands are already protected by law in Sweden, but not other types of such woodlands. The majority of these are dominated by oak, *Quercus robur*. There were about 50 000 ha of oak dominated woodlands left in Sweden by 1979 (SNV 1982), making up not more than about 0.25 % of all forests. The rate of disappearance during 1960-1975 was about 1500 ha/year, increasing during the period (SNV 1982).

To obtain a factual base for a conservation policy regarding these woodlands, the National Swedish Environmental Protection Board ("SNV") initiated a series of investigations of the fauna in broadleafed forests in 1981. In order to facilitate easy categorization of the woodlands, one question asked was: how important is soil fertility for species composition and community structure of different animal taxa? Such knowledge was judged valuable when deciding protection priorities. Besides, in a more general context, it might increase our understanding of the ultimate factors determining animal community structures (MacArthur 1964).

Here we report on the bird species composition during 1982 in three oak dominated woodlands, with varying soil fertility. This is the first, preliminary report regarding this question.

2. Materials and methods

The bird communities were studied in three oak dominated forests in southern Sweden using territory mapping according to Svensson (1975). Ten censuses were made in each area during the period 2.V-20.VI.1982. The three study areas were all situated in central Skåne. They were formerly grazed open woodlands, but not utilized during the last 20-40 years.

Study plot A was 15 ha on poor soil. The oaks were 50-100 years old, most of them in the lower end of the range. Other tree species were mainly *Fagus silvatica, Alnus glutinosa, Pinus sylvestris, Picea abies* and *Betula* spp. The ground was sparsely covered by *Vaccinium myrtillus, Deschampsia flexuosa, Pteridium aquilinum* and *Maianthemum bifolium*. Small wet areas occurred with *Sphagnum*- and *Carex*-species.

Plot B was 17 ha. The soil was in parts more fertile than at the former area. The oaks were 50-100 years old. Other tree species are *Fagus silvatica, Betula* spp., *Alnus glutinosa, Carpinus betulus* and *Fraxinus excelsior*. The ground is more densely covered by vegetation than in the former plot and is mainly *Deschampsia flexuosa, Anthoxanthum odoratum, Rumex acetosa, Gymnocarpium dryopteris, Oxalis acetocella* and *Lamium galeobdolon*. A small wet area dominated by *Alnus* and *Fraxinus* is situated in the middle of the plot.

Plot C was 11 ha on rich soil. The oaks were 50–100 years old, many of them in the older age classes. Other tree species were *Fraxinus excelsior, Alnus glutinosa, Betula* spp., *Fagus silvatica* and *Ulmus glabra*. The ground was densely covered by *Deschampsia caespitosa, Geum rivale, Filipendula ulmaria, Galium odoratum, Lamium galeobdolon, Mercurialis perennis* and *Convallaria majalis*.

The shrub layer was dense in all three areas, especially in plot C. No nestboxes occurred in the areas.

3. Results and discussion

Total abundance of breeding birds was about 30 % higher in the rich plot (C) than in the other two (Table 1), while species number was about the same in all three plots (Table 2). The three bird communities had a similar species composition. The three most common species (*Phylloscopus trochilus, Fringilla coelebs, Erithacus rubecula*) were the same in all three plots, and no species that occurred frequently (>20 pairs/km²) in any of the plots was missing in any of the others. Some species followed the soil fertility trend e.g. the ground-feeding thrushes *Turdus merula* and *T. philomelos*, the foliage gleaning warblers *Sylvia borin* and *S. atricapilla* and the generalist finch *F. coelebs*. Also some of the hole-nesters followed this trend, but here we believe that the supply of natural cavities appropriate for nesting was more important. This supply was low in plot A and higher in B and C. *Parus major* had the same density in all three plots while *P. caeruleus* had a much lower density in plot A than in the others. We interpret this as a result of interspecific competition for nest-holes, where the larger *P. major* had the first choice (van Balen et. al. 1980). *Ficedula hypoleuca* showed the same density trend as *P. caeruleus*, although this species is known to destroy competitors' nests (Löhrl 1977). However, this species probably arrives too late in the breeding area to be able to compete with *P. major* in that way. *P. palustris* showed the same density in all three plots, thereby indicating no competition with other hole-nesters, which is expected since this species is able to use cavities not at all appropriate to other hole-nesting passerines (van Balen et. al. 1980). Neither *Sitta europaea* nor *Certhia familiaris* are likely to compete strongly for nest-holes with either *P. major* or *P. caeruleus*.

Bird species diversity increased along the poor - rich gradient of soil fertility in the same way as total abundance (Table 2). This correlation between habitat productivity and abundance as well as diversity of bird communities was also suggested by Terborgh (1977) and Nilsson (1979). It is also consistent when our areas are compared with two other Swedish woodland areas (plots M and MD in Nilsson 1979) with relatively high productivity (Table 2). Also in the Białowieża National Park in Poland, a primeval broadleafed forest on relatively rich soils, species diversity was high (Tomiałojć et al. 1977, Wesołowski pers.

Table 1. Densities (territories/km²) of breeding birds in the different plots (+ notifies observations of the species in the plot without evidence of breeding there).

	Plot A	Plot B	Plot C
Buteo buteo	+	+	+
Tetrao urogallus	+		
T. tetrix	+		
Gallinago gallinago	+	+	
Scolopax rusticola		+	9
Tringa ochropus	+	+	
Columba palumbus	13	6	19
Cuculus canorus	7	6	+
Dendrocopus major	20	17	19
Anthus trivialis	66	35	66
Motacilla alba	+		
Troglodytes troglodytes		6	9
Prunella modularis	7	+	19
Erithacus rubecula	86	126	104
Luscinia luscinia			9
Phoenicurus phoenicurus	+		
Turdus merula	26	40	47
T. pilaris	+	+	
T. philomelos	13	17	28
Hippolais icterina			9
Sylvia borin	13	40	38
S. atricapilla	13	29	66
Phylloscopus sibilatrix	46	23	
Ph. trochilus	211	121	208
Regulus regulus	7		
Muscicapa striata	+		
Ficedula hypoleuca	13	69	76
Aegithalos caudatus			+
Parus palustris	20	17	19
P. caeruleus	13	35	57
P. major	40	35	38
Sitta europaea	13	12	38
Certhia familiaris	13	12	9
Garrulus glandarius	7	6	9
Pica pica			+
Corvus monedula			+
C. corone		+	+
Sturnus vulgaris	13	6	9
Fringilla coelebs	112	132	170
Carduelis chloris	+		
C. spinus	+		
Coccothraustes coccothraustes	7	6	+
Emberiza citrinella	3		+
Total	782	796	1075

Table 2. Characteristics of the bird communities in the three study plots of the present study, and of two other Swedish and one Polish studyplot in deciduous broadleafed woodlands.

	Present study			Småland, Sweden (Nilsson 1979)		Białowieża, Poland
	Plot A	Plot B	Plot C	Plot M	Plot MD	(Wesołowski, pers.comm.)
Relative soil productivity	poor	hetero-genous	rich	rich	rich	hetero-genous
Area (ha)	15.2	17.4	10.6	15.9	16.2	127.5
Density, pairs/km²	782	796	1075	1445	925	701
Species with ≥ 5 pairs/km²	23	22	23	31[1]	27	27[2]
Diversity $(\Sigma p_i^2)^{-1}$	8.8	10.1	10.6	14.3		
Four most abundant species (%)						
Ph. trochilus	27	15	19	15	11	
F. coelebs	14	17	16	12	11	20
E. rubecula	11	16	10	11		10
Ph. sibilatrix				8	5	11
F. hypoleuca		9	7			
A. trivialis	8					
S. vulgaris					9	
F. albicollis						10[3]
Dominance of the four most abundant species (%)	60.6	56.3	51.7	45.7	36.6	50.0

[1] Three typical beach or open land species (the plot was an peninsula in a lake) and one species ≤ 5 pairs/km² were excluded from the original list.
[2] 26 species ≤ 5 pairs/km² were excluded from the original species list.
[3] *Ficedula albicollis*, a species that at least partly replaces *F. hypoleuca* in eastern Europe.

comm.). Nilsson (1979) suggested that one important effect of high soil productivity is to increase productivity in the shrub and field layers, thereby increasing foliage diversity, a factor long considered to contribute significantly to the diversity of bird communities (MacArthur & MacArthur 1961).

The total abundance of birds in Białowieża was remarkably low, indicating that this measure would not be correlated with high soil productivety alone or directly. However, other factors may also be important. Tomiałojć et al. (1977) have suggested that predation would be higher Białowieża than in many other European woodland plots, because Białowieża, being an unusually large tract of primeval and natural forests, has a more complete predator fauna than is usual in other European woodlands. The Białowieża study area also has a lower proportion of edges than the other study plots in Table 2.

We conclude that soil fertility might be such an important factor influencing bird communities, that further studies are justified.

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