On the constancy of annually repeated bird censuses

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An area of 16 ha (14 ha forest) was studied almost daily for 1.5–2 months in 1981–86. Changes in a small study area may be rather stochastic but the data did reveal a general decrease from 65 to 41 breeding units. The loss in the numbers of individual species tended to tally with trends known from other areas in Finland or from the national monitoring program. The data also show that single-year censuses do not give a reliable picture of the bird species of an area, as the numbers fluctuate annually and there are many species that are only occasionally present.

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Introduction

In an earlier paper (Palmgren 1981), I presented the results of bird territory mapping in an area of 16 hectares (14 hectares forested including 2 hectares of young plantations not attractive to birds). The chief aim was to elucidate how much the numbers of birds change in the course of a breeding season. The total population differed by only 15% for 5-day periods in June, in spite of a fairly active turnover on the species level. The aim of the present study is to compare the census results of successive years in order to (1) estimate how representative censuses of single years are, and (2) to ascertain whether changing trends in the bird fauna are mirrored even in small areas that have remained unchanged.

Methods

The habitats of the study area are shown in Fig. 1, with an accuracy of 20 m × 20 m. The forest edges measure 600 m. During the years 1982–1986 census work was continued over periods of 1.5–2 months, using the same field work practice as in 1981, when the mapping was carried out almost daily for 2.5 months in the summer. I am convinced that no territories were lost, although breeding pairs and single males could not always be listed separately.

For additional details on the method, see Palmgren (1981).

Results and discussion

In Table 1 the numbers of occupied territories are listed, regardless of how long they were occupied. The results reveal that species composition has remained fairly constant, which was to be expected. Only species never represented by more than one territory, situated completely within the research area, were absent in some years (*Carpodacus erythrinus, Pyrrhula pyrrhula, Parus cristatus, Regulus regulus, Phylloscopus collybita, Sylvia communis, S. curruca, Phoenicurus phoenicurus, Jynx torquilla, Columba palumbus, Scolopax rusticola, Tetrao urogallus*). Of the sometimes more abundant species, *Phylloscopus sibilatrix, Turdus pilaris* (irregular) and *Tetrastes bonasia* failed to breed in the area during one season.

Nordström (1953) found a similar variation in three forest census areas (20, 25 and 25 ha) during 5 successive years (1948–1952). Siivonen (1948) noted annual differences of the same order of magnitude. The sometimes astonishing variation in the abundance of *Phylloscopus trochilus* has aroused interest (Pynnönen 1949, Siivonen 1949, 1952, Sovinen & Sovinen 1949). In my census area the population of the Willow Warbler has fluctuated between 11 and 4 breeding units. The marked decrease of the Willow Warbler in the summer of 1984 was stressed by Väisänen (1984). In spite of the general uniformity of the species assemblage, the census shows a continuous decrease from 65 to 41 breeding units.

The census method makes it hardly probable that a gradual weakening of my optic or acoustic capacity is responsible for the general decline. The dominance values of *Fringilla coelebs* (16%) and *Phylloscopus trochilus* (14 %) seem low but, for the closed forest area east of my estate, I recorded in line transect censuses values of 30% and 26%, respectively, which are typical figures for southern Finland (e.g., Palmgren 1930). Solonen (1981) and Helle & Helle

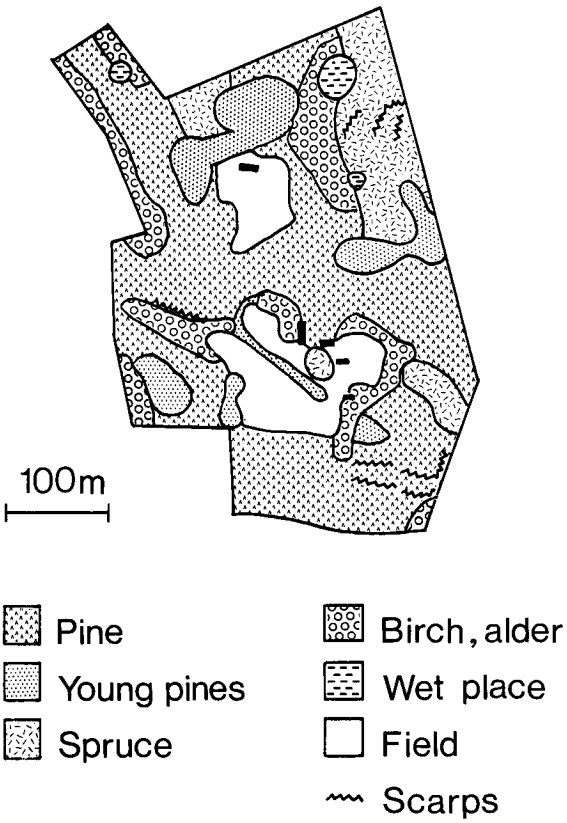

Fig. 1. The study area. For a more detailed map, see Palmgren (1981). In the south, the study area borders to a lake.

(1979) published results showing decreasing population numbers in habitats more or less resembling those from my study area (especially for *Sylvia borin* and *Phylloscopus trochilus*), although for a slightly earlier period.

Large-scale changes in bird fauna have occupied Finnish ornithologists for a fairly long time (Siivonen & Kalela 1937, Kalela 1949, 1952, Merikallio 1951, Palmgren 1960, v. Haartman 1973, Järvinen 1974, Järvinen & Väisänen 1977, 1978a, 1978b, 1979). Helle & Järvinen (1986) recently presented a comprehensive literature review and a penetrating discussion concerning these questions. The decrease in the bird population of my small study area may be stochastic and cannot, of course, contribute essentially to the discussion of large scale trends, however some comments can be made.

Can a changing trend in such a small area correspond to regional changes? In evaluating the results of line transects covering large areas or in comparing successive bird atlas mappings (see Hyytiä et al. 1983) it may be difficult to decide if changes are due to climatic changes or if, for example, they are due to the type of forestry. Censuses covering small areas which are known to have remained undisturbed for a couple of decades (as is the case with my study area) are perhaps valuable as a complement. On the other hand, habitat changes (for example, timber volume, forest density, crown cover in per cent or proportion of conifers/deciduous trees) in such delimited areas can

Table 1. Breeding bird populations in the study area (Mäkelä) in 1981–86. In summarizing the numbers, territories situated completely within the borders of the census area were noted as whole units, territories extending to about 50% beyond the borders as 0.5 units. The sums are rounded off to the next integer (for this reason the totals are slightly less than the data for single species would suggest). Birds from territories mainly extending outside the research area, but visiting it regularly, are marked with crosses. The following species have nested in earlier years (1964–1980): *Accipiter nisus, Tringa ochropus, Turdus viscivorus, Aegolius funereus, Garrulus glandarius, Sturnus vulgaris* (max. 10 pairs).

	1981	1982	1983	1984	1985	1986
Bonasa bonasia	5	2	4	2	–	1
Tetrao urogallus	–	1	1	–	–	–
Scolopax rusticola	x	1	x	x	x	x
Columba palumbus	xx	xx	xx	1	1	–
Cuculus canorus	x	x	x	x	x	x
Jynx torquilla	1	–	–	–	–	1
Dendrocopus major	x	x	x	x	x	x
Anthus trivialis	3x	2	3	3x	2x	2
Prunella modularis	1	2	1	1	1	1
Erithacus rubecula	4xx	3x	3	2	2x	2
Ph. phoenicurus	–	1	1	–	1	1
Turdus merula	1x	2	xx	xx	1x	1
T. pilaris	1	1	2	1	–	1
T. philomelos	1xxx	1xxx	1	3	2	2
T. iliacus	4x	6	2	2	2	3
Sylvia curruca	1	x	1	1	–	–
S. communis	1	–	–	1	–	–
S. borin	4xx	3	3	3	2x	2
S. atricapilla	2	1	2	1	1	2
Phylloscopus sibilatrix	3	2	2	2x	2x	–
Ph. collybita	–	1	1	–	1	1
Ph. trochilus	11	8	7	4x	7x	5
Regulus regulus	x	1	x	–	1	–
Muscicapa striata	3	2	2	2	1	1
Ficedula hypoleuca	7	6	6	7	5	3
Parus montanus	1xxx	1x	2	2	1	2
P. cristatus	–	–	–	1	–	–
P. major	1x	2	2x	2x	2	2
Fringilla coelebs	10	8	8	9	10	8
Carduelis spinus	2	1	2	1x	3x	2
Carpodacus erythrinus	–	1	–	–	–	x
Pyrrhula pyrrhula	x	1	–	1	1	x
Total	65	56	53	49	46	41

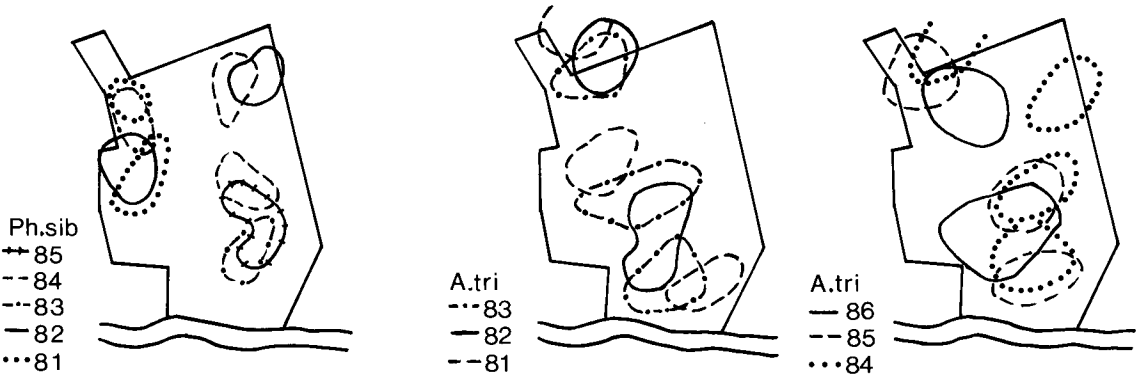

Fig. 2. Locations of the territories of *Phylloscopus sibilatrix* and *Anthus trivialis* in the study area in 1981–86. The territory limits are based on almost daily observations of the area during the breeding season. Note that the territory locations have varied greatly from year to year, even though the habitat has remained stable.

be quantitatively evaluated as causes for changes in the bird populations.

The summer of 1981 was extremely unfavourable with mean temperatures of about 10°C over an extended period, even in July, and with frequent rain and strong winds. The negative influence on the breeding results was recognized in many, but not all, species (Hildén et al. 1982, Marjakangas 1982) and was noted even in the newspapers. This might have been the cause of the decrease in many populations in my census area from 1981–1982 (65 to 56 breeding units), but the population should have recovered in 5 years.

The unfavourable weather conditions in Central Europe during some of the winters from 1981–1985 (especially 1985) have, perhaps, contributed to the losses of such species as *Erithacus rubecula* and the thrushes. *Muscicapa striata*, perhaps also *Jynx torquilla*, may belong to the species suffering during their migration as a result of the broadening of the arid belt (Sahel) in northern Africa. The numbers of *Ficedula hypoleuca* are, of course, dependent on the number of nest boxes but their numbers have been constant. In contrast, the nest box predation by the Great Spotted Woodpecker has been an uncalculable factor. The population losses of species in Central Europe, for example, *Sylvia borin, S. communis* and *Jynx torquilla* (Bauer & Thielcke 1982), can perhaps have as their consequence a weakened recruiting from south to north.

Bonasa bonasia has suffered from population fluctuations, with a decreasing trend in southern Finland (Lindén & Rajala 1981, Tiainen 1985). Forestry management, as practised today, will inevitably result in the destruction of dense forest stands frequented by the grouse. This will, no doubt, be reflected also in adjacent unchanged forest sites. The decrease in the Capercaillie (*Tetrao urogallus*) is a general phenomenon.

Helle & Järvinen (1986, p. 114) observed that "the overflow principle invoked above does imply a degree of saturation in the source populations..." They used the principle as an explanation of the increase in spruce forest birds in northern Finland. In my paper of 1981, I showed that if territories known to have been occupied sometimes in the years 1964–1980 but empty in 1981, are supposed to have been potentially habitable even that year (as seems most likely) there was a deficit of about 30 breeding units in 1981 (actual population 66). It seems that such a deficit can be considered quite normal. The very frequent settling of new breeding pairs late in the season does not support the idea of saturation as a rule (see also Helle & Järvinen 1986, pp. 113–114). This makes the overflow principle a little dubious. It is, of course, possible that migrating birds encountering a fair number of singing conspecific males in the places where they first try to settle, are provoked into setting out for a prolonged migration even if the first places are not really saturated with already occupied territories (see also Järvinen 1978).

Fig. 2 shows, as an example of the incomplete filling up of an area, the territories of *Phylloscopus sibilatrix* and *Anthus trivialis* known to me during earlier years, as compared with the situation in 1986. The same conclusion can be drawn from Figs. 3–4 on *Fringilla coelebs* and *Phylloscopus trochilus*. The Chaffinch and the Willow Warbler have been the dominating species during the course of this investigation. The Chaffinch is known as a long-lived, hardy species with great site fidelity (Bergman 1956), compared with the Willow Warbler. I was,

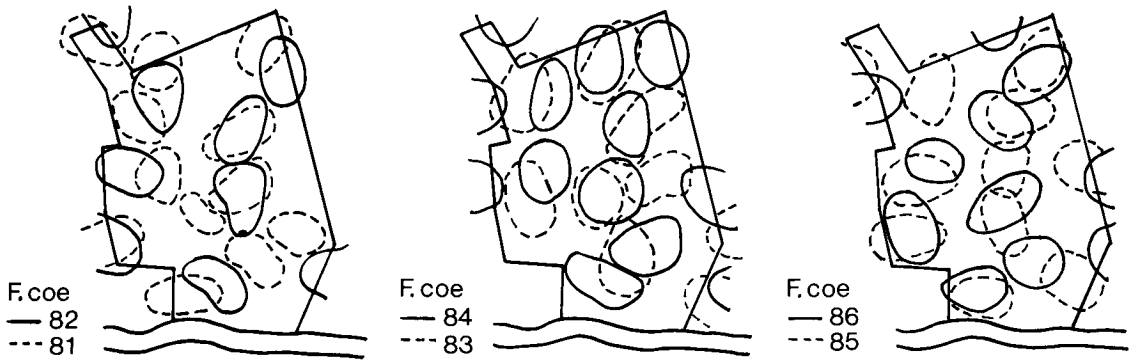

Fig. 3. Locations of the territories of *Fringilla coelebs* in the study area in 1981–86.

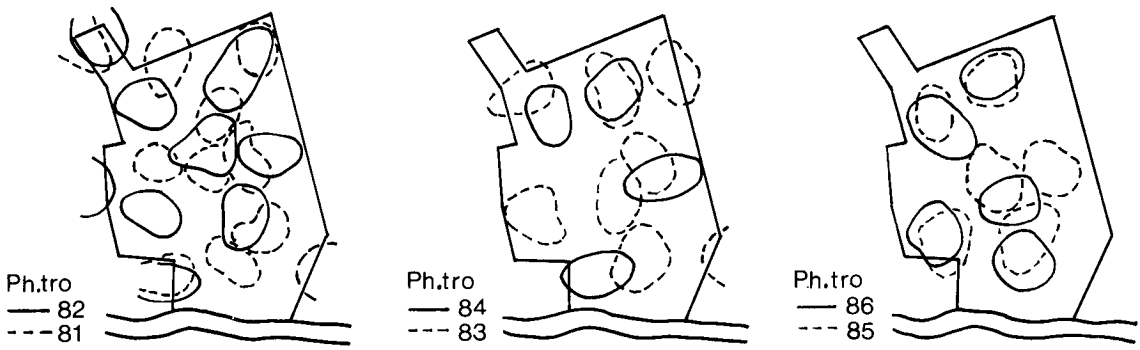

Fig. 4. Locations of the territories of *Phylloscopus trochilus* in the study area in 1981–86.

therefore, inclined to expect a greater constancy in the territory location of the Chaffinch as compared with the Willow Warbler. According to Figs. 3–4 (which should be compared with the habitat map in Fig. 1) this seems not to be the case. Probably the choice of territory is, in both species, influenced to the same degree by some factor of attractiveness in the microhabitats (for example, food) at the very beginning of breeding activities. The comparison of the territory location of Chaffinch males for 4 years in a northern Finnish area presented by Mikkonen (1985, p. 113) contributes to the study of the interesting problem of territorial fidelity vs. the influence of the temporal state of habitat conditions.

In spite of the very limited scope of my census work in 1981–1986 I feel that annually repeated censuses in restricted areas, with a sufficiently exact method, will be valuable as a complement to the extensive line transects which no doubt will form the main key for monitoring our bird fauna in the future.

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Selostus: **Eri vuosina suoritettujen linnustolaskentojen tulosten vakioisuudesta**

Vuonna 1981 suoritin Mäntyharjulla sijaitsevan, 16 ha suuruisen (14 ha metsää) alueen linnuston reviirien kartoituksen (Palmgren 1981). Kartoitus perustui 2,5 kuukauden aikana melkein päivittäin karttakaavioon merkittyihin havaintoihin. Tarkoitus oli selvittää, missä määrin lintukanta muuttuu pesimäkauden kuluessa ja kuinka merkittävä siis esim. yhden viikon aikana tehty laskenta on.

Vuosina 1982–86 sama alue tutkittiin samaa menetelmää käyttäen toukokuun lopusta heinäkuun puoliväliin. Tulokset esitetään taulukossa 1. Reviirit, jotka sijaitsevat puolittain alueen rajojen ulkopuolella on laskettu puoliyksikköinä; summat on pyöristetty ylöspäin. Jos reviirin valtaosa on naapurimaastossa mutta niiden haltijat satunnaisesti vierailevat alueella, tämä on merkitty x-merkillä.

Lintukannan asteittainen väheneminen tutkimusjakson aikana tuntuu varmistetulta. Havaintokertojen lukuisuus sulkenee pois havainnoitsijan kuulon tai näön heikkenemisen selityksenä. Suunta vastaa monilla muilla alueilla sekä Suomessa että Keski-Euroopassa todettua. Alueeni luonto on pysynyt muuttumattomana, joten linnuston muutokset heijastanevat yleistä ilmiötä.

Esitetyt karttaesimerkit (kuvat 2–4) tuntuvat osoittavan, että alueen toimeentulomahdollisuuksia ei käytetä lintujen

tarpeisiin tyhjentävästi. "Tyhjiä" reviirejä on aina. Tätä voitaneen pitää yleisenä sääntönä. Yleiseltä ekologiselta kannalta tämä on huomionarvoista. Se viittaa siihen, että ainoastaan poikkeustapauksessa lintulajin runsaus aiheuttaa levinneisyysalueen laajenemisen ylikansoituksen välttämisreaktiona.

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