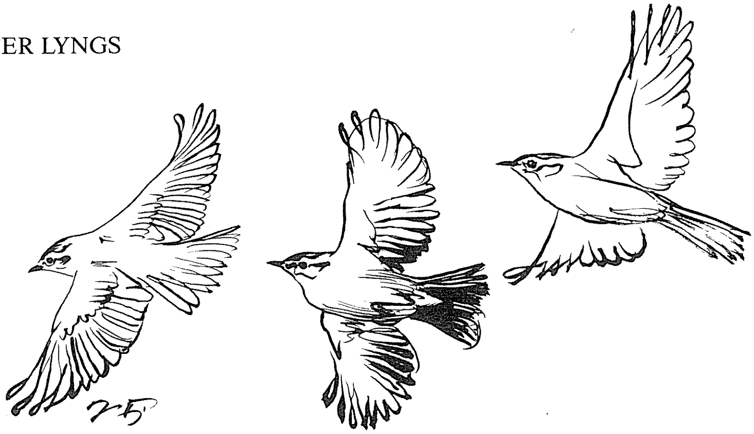
Monitoring Baltic passerine populations by ringing of migrants on Christiansø

JØRGEN RABØL and PETER LYNGS



(Med et dansk resumé: Ringmærkning af trækfugle på Christiansø: En metode til belysning af variationerne af bestandsstørrelserne i Østersø-området)

Skov- og Naturstyrelsens forskningsrapport nr. 2 fra naturreservaterne

Introduction

In these years there is much change in our ecosystem. Pollution, urbanization, and shifts in the ways of agriculturing and foresting have profound influences on the plants and animals. It seems an important purpose to follow the development in the local and global ecosystems, and as engaged ornithologists our part of the job could be to follow the wellfare and changes in the bird populations.

A basal procedure is to measure/estimate the population size of different bird species, and the most obvious way to do so is point counts or mapping censuses in the breeding season and breeding areas of the populations in consideration. An alternative – or supplementary – method is counting of migrating birds or grounded migrants on islands or peninsulas, where the concentration of migrants is so high that it is rewarding to sum up the daily number of migrants and use the seasonal total as an index of the size of the »population« (which of course is more loosely defined/less geographically demarcated than in case of the regional point counts and mapping censuses).

In 1976 »The National Forest and Nature Agency« established a bird ringing station on Christiansø with the declared purpose of using ringing figures as a way of monitoring the Baltic (breeding) populations of migrant passerine birds. The results of the activities have since been published in yearly reports. Lyngs & Faldborg (1984) and Lyngs et al. (in prep.) have presented more comprehensive surveys.

In the present contribution the results of the monitoring work in the nine years 1976-1984 are presented and discussed. Only part of the species are considered, with the selection of species dependent on which species are available for comparison in the Swedish and Danish bird census indices.

The main purpose of the present paper is to document that ringing figures from Christiansø are valuable as indices of the true population sizes of several species in the Baltic region. Some attention is also paid to the question whether there is a general decline of the European bird populations (e.g. Berthold et al. 1986, Nøhr & Braae 1987).

Material and methods

Resting migrants were captured and ringed on Christiansø in the years 1976-1984 in both spring and autumn. The birds were captured in mist nets, and the nets operated daily in the periods 15 March - 15 June and 1 August - 15 November (except in parts of the autumn 1979, for which reason the autumn of 1979 is omitted from the analyses).

Every day at least 60 meters of net were in use, and the nets were in operation for at least 5 hours starting from sunrise. The nets (no. 1012 and 1013 from Heindl Versand, Detmold) were 6 and 12 meter long and about 2 meter high when capturing. The nets were scattered all over the middle and eastern part of Christiansø in both wooded and more open and bushy country in order to be efficient for trapping all kinds of migrants. Nets freely exposed to the wind were not opened, but it was always possible to open a sufficient number of nets in calm or nearly calm positions. The bird-ringer was allowed to open more than 60 meters of net in more than 5 hours, but then a correction was carried out: 1) Only birds ringed during the first 5 hours were considered. 2) The number ringed in this 5 hour period was corrected to a theoretical number ringed in 60 m net. An example should be given: A certain day 123 (r) Garden Warblers *Sylvia borin* were ringed using 108 m net during the first 5 morning hours. This number (r) corresponds to 123/108 × 60 = 68.3 Garden Warblers in 60 m net. 68.3 is called r* (the corrected number of ringed birds), and the sum of all daily r* values of the spring or autumn is designated R*.

In Fig. 1 is shown two examples on the variation in R* from season to season. The eye easily detects a greater variance in R* from one year to the next in one of the species (the Robin *Erithacus rubecula*). This corresponds to a higher coefficient of variation in the Robin (35.3) compared to the Garden Warbler (18.1). Tab. 1 should be consulted of readers unfamiliar with the concept of the coefficient of variation.

The central question now is whether these seasonal R* values from Christiansø are appropriate indices of the true (but unknown) population size? In practice this question may be answered by the following investigations and comparisons.

1) Is the year to year variation in R* significantly and positively correlated to the variation in the bird census indices from the same population (supposing the bird census indices track the true population sizes tightly)?

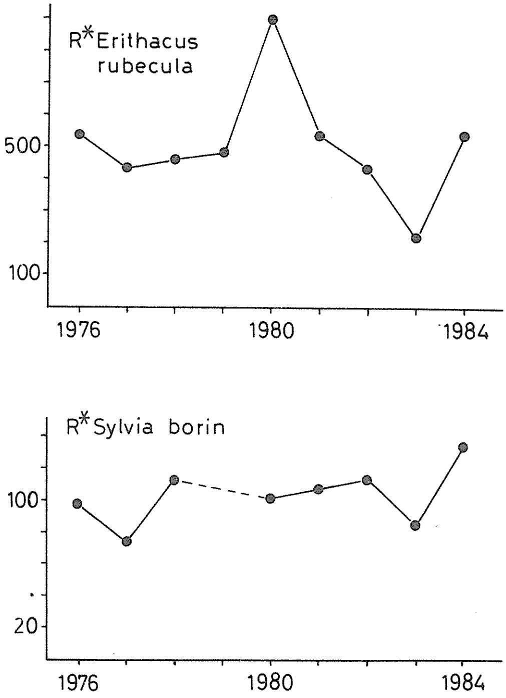


Fig. 1. R* in the Robin *Erithacus rubecula* (spring) and Garden Warbler *Sylvia borin* (autumn). The coefficients of variation are 35.3 and 18.1, respectively. *Den korrigerede ringtotal R* for Rødhals* Erithacus rubecula *om foråret og Havesanger* Sylvia borin *om efteråret. De to variations-koefficienter (se Tab. 1) er henholdsvis 35,3 og 18,1 – altså størst for Rødhalsen, hvad der svarer til den større variation fra år til år og igennem tidsforløbet, som øjet umiddelbart fanger selv ved et hurtigt blik på figurerne.*

2) Is the coefficient of variation in R* reasonably low, i.e. not too much higher than the coefficients of variation in the bird census indices?

Through ringing recoveries in the breeding season it is known that most migrant populations of the species resting on Christiansø breed in the Baltic region (Lyngs et al. in prep.). The main areas seem to be southern and eastern Sweden and the southwestern part of Finland, with some differences from one species to the next.

For comparison we have used the Swedish bird census indices from the years 1976-1984 (point counts and mapping censuses, kindly delivered by Sören Svensson), and for comparison with another Baltic bird ringing station we used ringing figures from Ottenby from the same years (kindly delivered by Jan Pettersson). The Ottenby data are not corrected for variation in the daily capture effort, and the daily ringing numbers r are summed to a seasonal R comparable to R* from Christiansø. For comparison we also included the Danish bird census index (point counts) from the years 1976-1984 (Nøhr et al. 1983, Andersen & Klug-Andersen 1984, Klug-Andersen 1984a, Klug-Andersen 1984b, Kayser 1985).

Tab. 1. This table relies on constructed figures. The intention is twofold: 1) To demonstrate the effects of variation, and 2) to explain the meaning of the coefficient of variation.

The mean population size during the nine years is 100,000, and fluctuates randomly around this value (the correlation coefficient r between population size and year is +0.10). The coefficient of variation is defined as $s \times 100/\bar{x}$, i.e. the standard deviation s times 100 divided by the mean $\bar{x}$.

Actually, the true population size is not known, but the population is available for sampling. Such sampling could be visualized as a capture-ratio, and if this ratio is the same from year to year, the same coefficient of variation emerges in the sample as in the true population size. However, in the real world the capture-ratio is never the same from year to year because of differences between the years in capture effort/efficiency and weather. In the present example the capture ratio varies between 0.010 and 0.018 in the 9 years.

Now the right column shows the product between the true population size and the capture-ratio of the year. The coefficient of variation in the captures is higher than in case of the true population size. This is the general outcome when a variable is burdened with additional variation.

In spite of the fairly high variation in the capture-ratio, the correlation coefficient between the true population size and the number of captures is high and significant (r = +0.81). The lesson learned from that story is that the captures (normally) track the true population and may be useful as measures of the long-term trend in the population development.

Tabellen bygger på konstruerede tal, og skal primært forklare meningen med begrebet variations-koefficient.

Den anden søjle viser bestandsstørrelsen i de 9 år fra 1976 til 1984. I gennemsnit er bestandsstørrelsen 100.000, og der er ingen tendens til op- eller nedgange over de 9 år (se Fig. 3A). Man kan beregne en variations-koefficient som spredningen (standardafvigelsen) gange 100 divideret med middelværdien. For den viste bestand beregnes variations-koefficienten 27.386 × 100/100.000 = 27,4.

I praksis kender man ikke bestandsstørrelsen, men man kan få et relativt mål for den ved hjælp af en eller anden form for prøvetagning. Hvis man altid fanger eller optæller en konstant del af bestanden, vil disse fangst/optællingstal fremvise den samme variations-koefficient som den sande bestand. I praksis vil der imidlertid altid være variation i prøvetagningen, der i tredie søjle er anskueliggjort som en fangst-ratio. Variationen kan skyldes både forskelle i fangstindsats og i vejret, der har stor indflydelse på hvor mange fugle, der fanges eller registreres. I eksemplet stiger fangst-ratioen jævnt fra 0,010 til 0,018 i løbet af de 9 år.

Søjlen til højre viser antallet af fangster pr år. Tallene fremkommer som et produkt af søjlerne to og tre. Hvis vi beregner variations-koefficienten af fangsterne fås et større tal end i den tilsvarende beregning for bestanden (499 × 100/1407 = 35,5). Eksemplet er typisk: Der vil altid fremkomme en større variations-koefficient, hvis man overlejrer yderligere variation på en faktor, der selv varierer.

Til trods for den betydelige variation i fangstratioen er der imidlertid alligevel stor sammenhæng mellem det årlige fangsttal og bestandsstørrelsen (korrelations-koefficienten er +0,81). Og det er godt, for det viser, at fangst/ringmærkningstal til trods for forstyrrende indflydelse fra fangstindsats, vejr og tilfældigheder ihvertfald normalt vil variere pænt i takt med variationerne i den sande bestandsstørrelse. Dette gælder, hvis vi betragter tallene over en længere årrække. Derimod skal man ikke lægge for megen vægt på op- eller nedgange fra et år til et andet. Her får de forstyrrende faktorer for stor indflydelse.

Year	True population size	Capture-ratio	Number of captures
1976	120,000	0.010	1200
1977	80,000	0.011	880
1978	60,000	0.012	720
1979	140,000	0.013	1820
1980	100,000	0.014	1400
1981	110,000	0.015	1650
1982	70,000	0.016	1120
1983	90,000	0.017	1530
1984	130,000	0.018	2340
Mean	100,000		1407
Standard deviation	27,386		499
Coefficient of variation	27.4		35.5

Results

Tab. 2 compares the coefficients of variation based on R* from Christiansø, R from Ottenby, and the Danish and Swedish point counts and mapping cesuses. The lower row of the table should be consulted for a summary of the order of magnitude of the coefficients. In general, R* and especially R show higher variation than the bird census indices, and even R* in the spring displays a significantly higher variation than the Danish point counts ($P < 0.01$, Wilcoxon matched pairs test, two-tailed). Now only 5 species are available for calculating the coefficients of variation in the Swedish point counts and mapping censuses, but these indices and the Danish point counts clearly show coefficients of the same order of magnitude.

The coefficients of variation based on R* (Christiansø) are generally lower than those based on R (Ottenby), and in case of spring the difference is statistically significant ($P < 0.01$, Wilcoxon matched pairs test, two-tailed). The difference between other combinations of R* and R are not significant.

Tab. 3 shows the correlation coefficients between R* and R, and the Danish and Swedish breeding season census indices. The lower part of the table gives a summary and one should notice the significant correlation between R* (especially spring) and the Swedish indices. The correlation between R* and the Danish point counts is totally lacking in case of the Robin and the Pied Flycatcher *Ficedula hypoleuca* in the spring, and all species except the Willow Warbler *Phylloscopus trochilus* in the autumn. R* (Christiansø) seems to be much better correlated to the Swedish indices than R (Ottenby), except in case of autumn captures and the mapping census.

Tab. 4 shows some other correlation coefficients. The lack of correlation between the Danish and Swedish point counts in two of the five species is remarkable. If the point counts and mapping censuses are both good relative estimates of the true pre-breeding population, the correlation coefficients between the measures in some of the species are surprisingly »low«. All five correlation coefficients between autumn R* (Christiansø) and R (Ottenby) are significantly positive, whereas three of the spring coefficients show no clear tendency.

Tab. 5 shows the trends of increase or decrease in R* during the years 1976-1984. Most species increased. In contrast to this, about 2/3 of the species decreased during 1974-1983 in a German/Austrian investigation (Berthold et al. 1986).

Tab. 6 shows the trends of increase or decrease in seven indices of five species during the years 1976-1984. These correlation coefficients should be compared with the correlation coefficients between the indices in Tab. 3. Further-

Tab. 2. Coefficients of variation of 7 different indices through the years 1976-1984. The arithmetical means of the coefficients are denoted in the two lower rows. The latter row shows the means of the 5 species denoted by an asterisk. S and A are spring and autumn, and R and R* the seasonal number of ringed birds on Ottenby (R) and Christiansø (R*).

Variations-koefficienter for årene 1976-1984. De to nederste rækker viser gennemsnitsværdierne for alle arter og (nederst) særskilt for de 5 arter mærket med stjerne. S og A betyder forår og efterår, R og R antallet af ringmærkede fugle på henholdsvis Ottenby og Christiansø, og point og map betyder henholdsvis punkt- og kortlægnings-optællinger.*

	Denmark point	Sweden point	Sweden map	Chr.ø R* S	Chr.ø R* A	Ottenby R S	Ottenby R A
*Troglodytes troglodytes**	36.9	45.1	59.2	33.6	54.6	36.3	52.2
Prunella modularis	33.1			43.3	36.1	74.2	53.1
*Erithacus rubecula**	17.9	12.9	15.7	35.2	41.3	36.6	65.4
Turdus philomelos	15.7			25.7	46.3	38.0	33.4
Sylvia curruca	20.6			35.3	37.5	72.2	35.9
Sylvia borin	17.0			31.3	18.1	42.0	42.1
*Sylvia atricapilla**	13.8	28.7	14.0	35.8	22.4	63.0	43.3
Phylloscopus collybita	19.7			30.4	47.4	30.3	61.8
*Phylloscopus trochilus**	10.1	8.6	9.6	27.6	35.5	57.3	29.3
Regulus regulus	42.6			47.8	38.2	57.0	58.2
*Ficedula hypoleuca**	27.9	6.8	8.6	25.8	34.0	57.2	27.3
Mean, all species	23.2			33.8	37.4	51.3	45.6
Mean, 5 species (*)	21.3	20.4	21.4	31.6	37.6	50.1	43.5

more, for a proper consideration of the coefficients of variation in Tab. 2, Tabs 5-6 should be consulted. As mentioned in Fig. 3 a high coefficient of variation necessarily arises when the index is significantly increasing or decreasing in the course of time.

Tab. 3. Correlation coefficients between the three bird census indices and the four indices from the ringing stations Christiansø and Ottenby in the years 1976-1984 (S spring, A autumn). P = 0.05 (two-tailed) corresponds to r = 0.71 (n = 8, R* A), and r = 0.67 (n = 9, R* S, R S, and R A). The lower part of the table is a summary showing arithmetical means of the correlation coefficients. Note the good correlations between R* Christiansø in the spring and the two Swedish bird census indices.
Korrelations-koefficienter mellem på den ene side punkt- og kortlægnings-indices fra Sverige og Danmark og på den anden side ringmærkningstallene fra Christiansø og Ottenby (S = forår, A = efterår). Nederst ses gennemsnitsværdierne for de 5 arter. Bemærk hvordan specielt Christiansø forår korrelerer pænt med de svenske tællinger. Derimod er der ingen klar sammenhæng mellem Christiansø og de danske punkttællinger. Bemærk også hvordan Christiansø korrelerer bedre end Ottenby med de svenske tællinger.

		Chr. ø	Chr. ø	Ottenby	Ottenby
		R* S	R* A	R S	R A
Troglodytes troglodytes	Sweden point	+0.84	+0.30	+0.69	+0.39
	Sweden map	+0.69	+0.42	+0.33	+0.59
	Denmark point	+0.74	−0.01		
Erithacus rubecula	Sweden point	+0.54	+0.39	+0.47	−0.07
	Sweden map	+0.23	−0.15	+0.16	−0.17
	Denmark point	−0.37	−0.49		
Sylvia atricapilla	Sweden point	+0.63	+0.17	−0.13	−0.03
	Sweden map	+0.65	+0.31	+0.46	+0.64
	Denmark point	+0.57	+0.10		
Phylloscopus trochilus	Sweden point	+0.66	+0.54	−0.04	+0.30
	Sweden map	+0.53	+0.83	+0.39	+0.38
	Denmark point	+0.41	+0.63		
Ficedula hypoleuca	Sweden point	+0.78	+0.53	−0.11	+0.23
	Sweden map	+0.55	+0.83	−0.22	+0.35
	Denmark point	−0.22	−0.44		
Mean, all species	Sweden point	+0.69	+0.39	+0.18	+0.16
Gennemsnit, alle arter	Sweden map	+0.53	+0.45	+0.22	+0.36
	Denmark point	+0.27	−0.04		

Tab. 4. Correlation coefficients between some of the indices through the years 1976-1984 (S spring, A autumn). The correlation between the two Swedish measures are surprisingly low as both indices are supposed to track the same populations. Perhaps it is only partly so, as the population tracked by the mapping censuses is particularly the territory holders which only is a part of the total population tracked by the point counts.
Korrelations-koefficienter mellem diverse indices (S forår, A efterår). Bemærk de helt manglende sammenhænge mellem de danske og svenske punkttællinger for Rødhals Erithacus rubecula *og Broget Fluesnapper* Ficedula hypoleuca. *Sammenhængen mellem de svenske punkt- og kortlægnings-tællinger er vel også overraskende lav. For en overfladisk betragtning registrerer de to metoder jo den samme bestand. Men det er måske lige netop, hvad de ikke gør: Kortlægningerne vil nemlig især registrere de territorie-hævdende hanner, og disse udgør kun en mindre del af den totale bestand, der også omfatter hunnerne og de unge og ikke-ynglende fugle. Punkttællingerne registrerer i princippet hele bestanden selv om de territorie-hævdende hanner givetvis vil have den største registerings-sandsynlighed. Bemærk hvordan Christiansø og Ottenby korresponderer bedst om efteråret. Dette hænger nok sammen med, at Ottenby for nogle arters vedkommende kun i ringe/svingende grad opsamler det forbipasserende forårstræk.*

	Sweden point/ Denmark point	Sweden point/ Sweden map	Chr. ø S/ Ottenby	Chr. ø A/ Ottenby
Troglodytes troglodytes	+0.88	+0.62	+0.68	+0.96
Erithacus rubecula	+0.02	+0.65	+0.90	+0.78
Sylvia atricapilla	+0.83	+0.94	+0.26	+0.76
Phylloscopus trochilus	+0.74	+0.49	+0.46	+0.73
Ficedula hypoleuca	−0.00	+0.70	−0.16	+0.71
Mean, all species *Gennemsnit, alle arter*	+0.49	+0.68	+0.43	+0.79

Tab. 5. Correlation coefficients between R* and year (1976-1984) on Christiansø. A positive sign means an increasing number in course of the nine year period. Most of the coefficients are positive, contrary to the trend shown in the right column (based on material from three German/Austrian ringing stations, after Berthold et al. 1986). In the right column a sign within brackets means that the tendency was opposite in one of the three stations. In case of the correlation coefficients, |r ≥ 0.50 signals a clear increase or decrease.
Korrelations-koefficienter mellem R fra Christiansø og årstallet 1976-1984. En positiv korrelations-koefficient betyder, at R* viser en stigende tendens gennem disse år. Især om foråret viser R* for de fleste arter en stigende tendens, medens de fleste arter i en tysk/østrigsk undersøgelse (højre søjle) viser en faldende tendens i den behandlede årrække.*

	R*/year spring	R*/year autumn	Tendency Central Europe
Anthus trivialis	+0.52	−0.11	
Troglodytes troglodytes	+0.01	−0.53	−
Prunella modularis	+0.41	+0.06	(−)
Erithacus rubecula	−0.16	−0.47	(−)
Turdus philomelos	−0.25	−0.56	+
Hippolais icterina	+0.79	+0.73	−
Sylvia curruca	−0.20	+0.05	−
Sylvia communis	+0.16	+0.01	−
Sylvia borin	+0.54	+0.47	(+)
Sylvia atricapilla	+0.60	+0.15	+
Phylloscopus collybita	+0.75	+0.07	(−)
Phylloscopus trochilus	+0.60	+0.18	−
Regulus regulus	+0.41	+0.07	(−)
Ficedula hypoleuca	+0.33	+0.73	(−)
Emberiza schoeniclus	−0.16	−0.69	(+)
Mean, all species	+0.29	+0.02	
Number of clear increases	6	2	2
Number of slight increases	5	8	2
Number of slight decreases	4	2	5
Number of clear decreases	0	3	5

Discussion

General discussion and the »goodness« of R* as a population index

The true population size in case of a Baltic passerine species is never known - for several reasons: The problems in defining and delimiting the population of a migrant species are obvious. The population size fluctuates in course of the year, and different categories of birds within the population have different probabilities of registration.

For practical reasons the best time for counting or estimating an index of the population size is the breeding season when the singing and territorial males are obvious objects for registration.

Probably, the variation from year to year in the number of singing and territorial males within a certain area/country is less than the variation of the total population of the species. The total population also includes the juveniles and other non-breeding birds. For that reason

Tab. 6. Correlation coefficients between 7 indices and the year (1976-1984). The negative sign in the Robin *Erithacus rubecula* R* (autumn) is surprising in relation to the very significant positive trend in the Swedish mapping census index.
Korrelations-koefficienter mellem 7 indices og årstallet i perioden 1976-1984. En positiv korrelations-koefficient betyder, at indexet viser en stigende tendens gennem disse år. I relation til den meget klare positive tendens i det svenske kortlægnings-index (map) for Rødhals Erithacus rubecula, *kan man undre sig over den negative tendens i R* fra om efteråret (bemærk dog her en korrelations-koefficient på -0,15 mellem de to indices i Tab. 3).*

	Denmark point	Sweden point	Sweden map	Chr. ø R* S	Chr. ø R* A	Ott. R S	Ott. R A
Troglodytes troglodytes	+0.30	+0.31	−0.36	+0.01	−0.53	+0.16	−0.64
Erithacus rubecula	+0.87	+0.32	+0.81	−0.16	−0.47	−0.11	−0.27
Sylvia atricapilla	+0.90	+0.97	+0.90	+0.60	+0.15	−0.18	+0.51
Phylloscopus trochilus	+0.52	+0.75	+0.13	+0.60	+0.18	−0.11	+0.20
Ficedula hypoleuca	−0.63	+0.67	+0.51	+0.33	+0.73	+0.25	+0.65

Standardized trapping and ringing on Christiansø is usable for monitoring migrant passerine populations in the Baltic area. Photo: Peter Lyngs
Standardiseret fangst og ringmærkning på Christiansø kan bruges til at overvåge bestandene af trækkende småfugle i Østersøområdet.

the coefficient of variation should be less in the breeding bird indices (and especially in the mapping censuses) than in the true population of all individuals. Actually, however, the coefficient of variation from year to year in the true population size within a large region may still be less than in case of the mapping or point count indices because the latter are *burdened with sampling errors* (see later).

Probably the proportion of experienced and adult birds is low on Christiansø in the spring – mainly because they are less inclined than younger birds to descend to the (inhospitable) island when passing. If so this could be part of the explanation why the coefficient of variation in R* is higher than in case of the Swedish mapping census or point count indices. The coefficient of variation in the autumnal R* should be even higher because of the strong contribution to R* of juveniles of the year (80-95%, Lyngs et al. in prep.) and a significant variation in the production of juveniles from one year to the next, both in total number and average number of juveniles produced per pair.

In accordance with these considerations Busse (1980) and Svensson et al. (1986) believe that the main factor explaining the higher variation in migration counts compared to breeding counts is the inclusion of all kind of birds in the former, whereas the breeding counts include only the territory holders.

Another contribution to the variation in R* could be that the migratory population involved is more or less different from one year to the next. In years with frequent easterly winds, more easterly populations will dominate compared to years when westerly winds prevail. Such differences increase the coefficient of variation of R* compared to the coefficient of variation in a bird census index from a fixed area.

Anyway, the close positive correlation between the Swedish bird census indices and R (especially spring) gives a clear indication that R* tracks the year to year variation in the true population size. Furthermore, the coefficients of variation in R* (especially spring) are also not »too much higher« than in the breeding bird indices.*

In Tab. 3 one should notice the high correlation between R* *spring* and the Swedish *point*

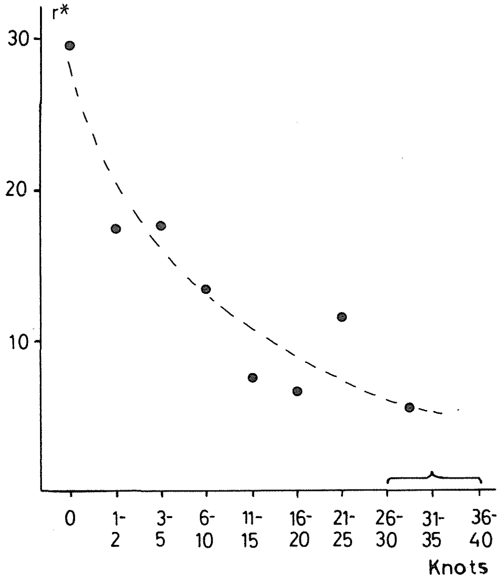


Fig. 2. The relation between the daily number of ringed birds r* and the wind force measured in knots, Robin *Erithacus rubecula*, spring 1976-1984. The dots refer to mean values of the groupings denoted on the abscissa. The number of days in the ten groupings are 11, 15, 34, 84, 69, 47, 24, 7, 1 and 2. The three last groups are further grouped. The hatched line shows the relation (fitted by eye) between the two variables and is indicative of a strong negative influence of wind force on r* – presumably because of a small fraction of immigrating birds when the wind force is high.

In the same way we sought evidence for influence of visibility, wind direction, temperature, barometric pressure, cloudiness and precipitation. Only in case of the two former, clear and simple patterns emerged. r* was highest in visibilities below 2 km, presumably because of a high fraction of immigrating birds at low visibilities. r* was also high during southwesterly (tail) winds, possibly because the higher groundspeed increased the number of passing birds.

Sammenhængen mellem det korrigerede, daglige ringtal r og vindstyrken målt i knob, Rødhals, forår 1976-1984. De 8 prikker viser gennemsnitsværdierne for de 8 grupper af vindstyrker. Der ses en klar tendens til sammenhæng mellem stor r* og svag vindstyrke – og/eller mellem lille r* og stor vindstyrke.*

counts, and between R* *autumn* and the Swedish *mapping census*. These tendencies may arise because: 1) The population measured by the point counts corresponds more closely to the pool available for trapping on Christiansø in the spring than the population registered by the mapping census. 2) The production of juveniles is the outcome of the »mapping census population«, and the autumnal R* is strongly dominated by the juveniles of the year.

Influence of weather and the sampling procedure

Besides the different sources of »natural« variation in the true population size, several other factors may influence the daily and seasonal number of ringed birds on e.g. Christiansø. One of these factors – the capture effort – is already corrected for in the calculation of r* and R*. The most important other factor influencing the number of ringed birds is *weather*, which has a profound – and complex – influence on bird migration (Fig. 2). We have reasons to believe (e.g. Hansen & Rabøl 1984) that the weather, especially in the period of descent/immigration of the nocturnal migrants, has a strong influence on r*.

If weather has a strong influence on r*, and if the main migratory period is short, weather must exert a strong influence on the year to year variation of R*. In principle it is possible to correct for part of the effect of weather, and we are working to develop methods which make such corrections possible.

In combination with the influence of weather an overlooked factor behind the high variation in R* (and R) is the *sampling procedure* itself. The standard error ($s/\sqrt{n}$) of the daily mean number of ringed birds is much higher than the standard error of the mean basic unit in the bird census indices. The number of days contributing to the seasonal R* is low (about 90-95% of the birds of a given species pass within 3-5 weeks), and the variation in r from day to day is enormous: From 0 to more than 500 in species like the Robin, the Willow Warbler and the Goldcrest *Regulus regulus*.

A major part of 80-95% of the birds trapped and ringed on a certain day on Christiansø are immigrants which arrive on the same day, a few hours before being trapped (Rabøl & Petersen 1973, Hansen & Rabøl 1984). The number of immigrants on a certain day (night) is the product of 1) the *number of birds passing* the area within the hours of descent/immigration, and 2) the *fraction* of birds actually descending/immigrating. Both 1) and especially 2) are highly influenced by weather. Appendix gives more details and discusses the reasons for the high variation in R*, and also investigates whether $R^* = \Sigma_1^n r^*$ should be considered the best index of the migrating population.

Long-time changes in the population sizes

As shown in Fig. 3 the coefficient of variation is not (necessarily) an appropriate measure of the year to year variation: A steady increase or decrease of R* may produce a high coefficient in spite of only small changes from one year to the next. Tabs 5 and 6 show the time-trends from 1976-1984 in different species and indices. One should note, that the coefficient of variation in the Blackcap *Sylvia atricapilla*, Garden Warbler, Willow Warbler, and Chiffchaff *Phylloscopus collybita* could be significantly »reduced« if the fairly high correlation coefficients between R* and year were »eliminated« (Fig. 3B). On the other hand, the fairly high coefficients of variation in the Wren *Troglodytes troglodytes* and the Robin in principle arise from fluctuating patterns like Fig. 3A.

The time trends in R* should be compared to the alarming tendencies in almost the same period (1974-1983) in the number of birds on three German/Austrian stations (Tab. 5, Berthold et. al. 1986). In general, the Baltic populations are not decreasing but increasing (Tabs 5-6). The lack of correspondence between the Baltic and Central-European stations (Tab. 7) may be caused by the different populations involved, and by a more severe influence of man on the Central-European ecosystems. Even spurious influences may account for the differences.

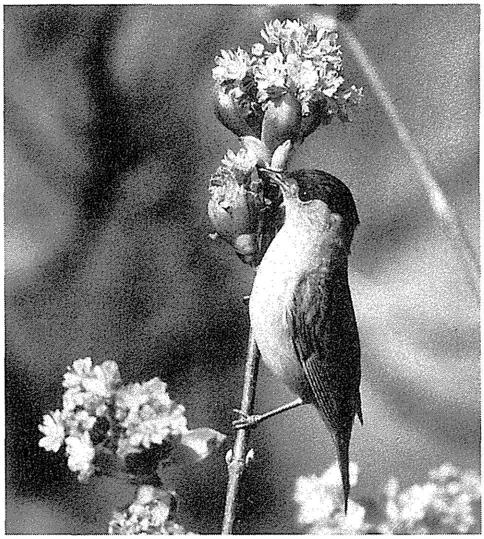


Photo: Peter Lyngs

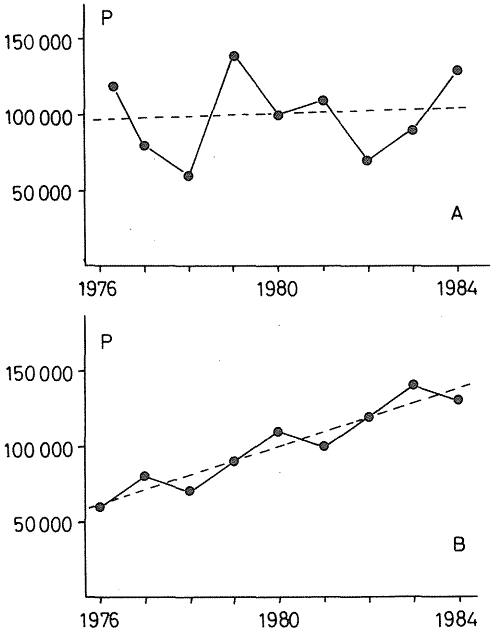


Fig. 3. A shows the population of Tab. 1 throughout the nine years. The hatched line is the regression line, and the correlation coefficient is quite insignificant (r = +0.10). The coefficient of variation is 27.4. B shows the same nine population sizes arranged in another way: Clearly, the population is now increasing in the course of the years (r = +0.95). However, the coefficient of variation remains (of course) unchanged. The point is that a high coefficient of variation may arise in two ways: 1) Because of a high degree of variation between the years in a population which on the average is neither decreasing nor increasing through the years, or 2) because of a significantly decreasing or increasing population with small variation layered upon the trend of development.
Den øverste figur viser bestandsstørrelserne fra Fig. 1 afbildet som funktion af årstallet. Den stiplede regressionslinie er næsten vandret, d.v.s. der er ingen klar og statistisk holdbar tendens til stigning (eller fald) af bestandsstørrelsen gennem de 9 år (dette udtrykkes også af korrelations-koefficienten r = +0,10). Den nederste figur viser de samme 9 bestandsstørrelser arrangeret således, at der fremkommer en klar stigning gennem årene. Dette fremgår også af den stiplede regressionslinie og korrelations-koefficienten, der kan beregnes til +0,95. Da der er tale om det samme sæt af bestandsstørrelser, bliver de to variations-koefficienter i A og B naturligvis ens.

Meningen med eksemplet er at vise, at en stor variations-koefficient kan opstå som følge af 1) en stor variation i bestandsstørrelsen fra år til år, eller 2) en stor op- eller nedgang af bestanden i den undersøgte periode. Man kan selvfølgelig også tænke sig alle mulige kombinationer af 1) og 2).

Budskabet med eksemplet er, at en stor variations-koefficient i R ikke i sig selv er en entydig indikation på, at R* er et dårligt mål for den sande men ukendte bestandsstørrelse. Man bør altid vurdere variations-koefficienten af R* i relation til korrelations-koefficienten mellem R* og årstallet i den undersøgte periode. Hvis korrelations-koefficienten er stor, bliver variations-koefficienten alene af den grund stor.*

Compared to Christiansø, situated in a uniform and inhospitable sea, the vegetational state in the surroundings of the inland stations in Central Europe probably changed in course of the period considered. Such changes could influence the number of captured migrants despite an unchanged vegetational state within the area of trapping.

Also the Danish bird census indices in general are claimed to show tendencies for decrease during recent years - or at least much weight is laid on the decreases of some species (e.g. Nøhr & Braae 1987). However, also here spurious correlations on the time trends could be involved: According to Nøhr & Braae (1987) the number of bird count routes have increased steadily from about 25 in 1975 to 189 in 1986, and almost certainly this must have had some influence on the relative representation of different habitats - and thus indirectly on the calculated index numbers.

Outlook

The next step should be analyses of weather-corrected values of R* for »all« species in the period 1976-1988.

In this investigation we will aim at a balanced view on the change, and especially the decreases, in the population indices. At present some people seem much concerned about decreases in some populations. Part of this concern might be unwarranted and rooted in a lack of insight in »natural« population fluctuations and stochastic processes. On the other hand (cf. Persson 1986) the bird communities and ecosystems are not super-organisms which recover from any perturbation within a large domain. There are no determined equilibria, fixed carrying capacities, or super-organisms in the real world. These phenomena and creatures are just phantoms in the head of some ecologists. However, some of the decreases may be real and catastrophic for the species/population involved, and in such cases we should be concerned.

Appendix

Causes of variation in R*

Most of the variation in R* is *spurious,* i.e. the result of processes other than variation in the true population size.

Imagine a population size which is constant throughout the years, and a general weather situation which is basically the same, i.e. no systematic differences are found between the years. However, the *daily* weather varies, and weather has a strong influence on r*. As shown by the following two examples the variation in R* will still be significant, and in fact it looks like most of the variation in R* could be explained by this simple model:

Tab. 7. Correlation coefficients between R* (autumn) on Christiansø and figures from Reit (south of Hamburg) and Mettnau (in southern Germany) in the years 1976-1983. The 5% significance level (two-tailed) corresponds to r = 0.75 and 0.71 for n = 7 and 8, respectively. There seems to be absolutely no (positive) correlation between R* and the number of ringed birds at the German stations. In fact, the negative correlation between R* and Mettnau is statistically significant! (P = 0.012, Sign-test, p = q = 0.50).
Korrelations-koefficienter mellem R fra Christiansø og tal fra Reit (syd for Hamburg) og Mettnau (Sydtyskland). Bemærk den totalt manglende sammenhæng mellem R* og de tyske ringmærkningstal.*

	R* A/Reit n = 7	R* A/Mettnau n = 7	Reit/Mettnau n = 8
Troglodytes troglodytes	+0.50	−0.28	−0.28
Prunella modularis	+0.82	+0.84	+0.58
Erithacus rubecula	+0.36	−0.04	+0.46
Turdus philomelos	+0.32	−0.04	+0.37
Hippolais icterina	+0.15	−0.26	+0.25
Sylvia curruca	−0.45	−0.81	+0.68
Sylvia communis	−0.67	−0.50	+0.55
Sylvia borin	−0.93	−0.47	+0.69
Sylvia atricapilla	+0.44	+0.05	+0.78
Phylloscopus collybita	−0.13	−0.02	+0.56
Phylloscopus trochilus	−0.19	−0.61	+0.50
Regulus regulus	+0.59	−0.06	−0.08
Ficedula hypoleuca	−0.33	−0.43	−0.34
Emberiza schoeniclus	−0.16	−0.43	+0.36
Mean, all species	+0.02	−0.22	+0.36
Number of positive signs	7	2	11
Number of negative signs	7	12	3

As most migrants wintering in Africa, the number of Willow Warblers ringed on Christiansø has increased. Photo: B. Bruun
Som de fleste Afrika-trækkere er antallet af ringmærkede Løvsangere på Christiansø steget siden 1976.

a) In the eight springs 1976-1983 the main migratory period of the Pied Flycatcher varied between 15 and 25 days. The mean – which could be considered as n (see above) – was 21 days.

The 167 values of r^* were grouped, and the following frequency distribution emerged: $r^* = 0$ (0.05), 0.3 (0.11), 0.5 (0.08), 0.9 (0.08), 1.2 (0.10), 1.7 (0.07), 2.3 (0.11), 2.8 (0.08), 3.2 (0.07), 3.9 (0.03), 4.6 (0.08), 6.0 (0.07), 7.5 (0.02), 9.0 (0.03), and 15.0 (0.02). The mean and standard deviation of this grouped distribution is 2.71 and 2.80 respectively.

We next drew 21 values of r^* at random, the probabilities of r^* following the grouped frequency distribution just mentioned. The procedure was repeated 9 times, and the following simulated values of R^* appeared: 50.5, 48.6, 71.6, 47.5, 51.8, 57.6, 40.2, 50.0, and 69.0. The mean is 54.1 (close to the theoretical mean of $2.71 \times 21 = 56.9$), the standard deviation 10.3, and the coefficient of variation 19.0.

The latter comes close to the observed coefficient of variation (25.8) for the Pied Flycatcher in 9 springs on Christiansø (Tab. 2), indicating (as already mentioned) that the major source to the between-year variation in R^* is the sampling procedure.

b) We repeated the procedure with the 303 values of r^* found in the Robin in the autumns 1976-1983. Here the main migratory period (n) was 40 days.

In the Robin r^* varied much more, between 0 and 225.1. The mean was 22.13 and the standard deviation 32.96. The 9 simulated values of R^* were: 563, 589, 1143, 1045, 920, 746, 877, 914, and 676. The coefficient of variation is 24.2, whereas the observed coefficient was 41.3 (Tab. 2). The reason for this high observed coefficient is the extremely low value of R^* in the autumn of 1983, where strong and persistent westerly winds prevailed in the main migratory season of the Robin.

Another important question is whether $R^* = \Sigma_1^n r^*$ is the most appropriate index of the true population size.

The problem is that the upper tail of the r^*-distribution contributes so much to the value of R^*: If the number of days with very favourable weather conditions and consequently high values of r^* are say 2, 5 or 8, the resulting values of R^* could be e.g. 300, 500 or 700 for that reason alone.

Clearly the upper tail of the r^*-distribution should be damped in some way if the seasonal values of R^* should be made to track the true population size properly.

However, the problem is that all transformations which damp the variation in r^* (and R^*) also damp the variation in the true population size – and this is an undesirable effect.

In practice one has to carry out simulations, and in a preliminary investigation we focused on square roots and logarithms, i.e. on R^* defined as $\Sigma_1^n \sqrt{r^*}$ and $\Sigma_1^n \ln r^*$, respectively. The latter, however, turned out to damp the variation too much.

The square root transformation was more promising, and the next step was to calculate the correlation coefficients between the Swedish point and map counts on the one hand and R* based on either $\Sigma_1^n r^*$ or $\Sigma_1^n \sqrt{r^*}$ on the other hand (Robin and Pied Flycatcher, spring and autumn). There seemed to be no significant differences between the »goodness« of the two indices, i.e. the corresponding correlation coefficients were of the same order of magnitude.

Clearly, many more transformations, simulations and investigations have to be carried out in order to find the best definition of R*.

Resumé

Ringmærkning af trækfugle på Christiansø: En metode til belysning af variationerne af bestandsstørrelserne i Østersø-området

Ved hjælp af punkt- og kortlægnings-optællinger i yngletiden kan man få besked om bestandsudviklingen for en lang række arter (se f.eks. Nøhr & Braae 1987). I Danmark har sådanne undersøgelser kørt i DOF-regie siden 1975.

Nu er optællinger i yngletiden ikke den eneste metode til påvisning af variationer i bestandsstørrelserne. Man kan også optælle antallet af forbiflyvende *dagtrækkere* eller fange og *ringmærke trækfugle* på steder, hvor koncentrationerne af trækkende og rastende fugle er store (f.eks. ved Falsterbo eller på Christiansø). Man kan så bruge *sæson-totalen* som et index for bestandsstørrelsen i »baglandet«.

Det forekommer mange mennesker vigtigt at følge med i, hvad der sker i økosystemerne, hvor vi mennesker indgår som en stadig mere forstyrrende og manipulerende faktor. Som ornitologer kan vi være med til at påvirke udviklingen ved at »overvåge« fuglebestandene og komme med konstruktive forslag til, hvad der skal gøres, hvis en bestand gennem en længere periode har været for klart nedadgående.

Dette rimelige ønske står dog og falder med, at man *kan dokumentere sin påstand*: At en given bestand rent faktisk *er* for nedadgående. Og medens dette kan være simpelt nok på *lokalt* plan, er det straks meget sværere på *regionalt* eller *globalt* plan. Hvis det således drejer sig om den lokale bestand af Toppet Lappedykker i Brabrand Sø, kan man totaloptælle den, og dermed vise udviklingen i bestandsstørrelsen gennem årene. Optællingstallene er absolutte og forbundet med ingen eller kun meget ringe usikkerhed. Når det drejer sig om den regionale bestand af Skovsangere i Danmark eller verdensbestanden af Stære, kan man imidlertid ikke totaloptælle bestandene. Man må nøjes med et *index-tal* for bestanden, og dette index kan man så med større eller mindre ret hævde er et godt udtryk for den sande, men ukendte bestandsstørrelse. I Tab. 1 er gennemgået et eksempel med et index som mål for en bestandsstørrelse.

Vi skal her beskæftige os med ringmærkningstal fra Christiansø som index-tal for bestande af trækkende fugle, der passerer Østersø-området (se også Lyngs & Rabøl 1988).

Det er ikke umiddelbart indlysende, at ringmærkningstal fra en lille ø langt ude i havet kan bruges til at sige noget om Østersø-landenes bestandsstørrelser af f.eks. Rødhals og Løvsanger. Er det ikke alt for tilfældigt og spredt, hvad der går ned på Christiansø? Skyldes variationerne fra år til år ikke blot forskelle i 1) *fangstindsats* og 2) *vejret*?

Med hensyn til 1) må man starte med at standardisere fangst- og ringmærkningsvirksomheden, så der kompenseres for forskelle i fangstindsats fra dag til dag og fra sæson til sæson. På Christiansø har vi gjort det på den måde, at vi for hver dag og art beregner et r*; r* er det antal fugle, vi ville have fanget i 60 meter net i de første 5 timer efter solopgang (i praksis slår man næsten altid mere end 60 meter net ud i mere end 5 timer – hvor meget afhænger af vejret og antallet af fugle og ringmærkere). Fanger man således 65 Havesangere i 89 meter net i de første 5 timer, bliver dagens r* for Havesanger 65 × 60/89 = 43,8. Man lægger nu alle de daglige r* -værdier sammen for hele foråret eller efteråret og får derved en forårs-R* og en efterårs-R*. Disse sæson-totaler kan så bruges som et index for henholdsvis forårs- og efterårsbestandens størrelse.

Vejret har også stor indflydelse på antallet af fangne og ringmærkede fugle (se Fig. 2), men i princippet kan man korrigere for denne indflydelse. Da vi ved, at vejret kan være meget forskelligt fra år til år (bl.a. var der meget få Rødhalse i efteråret 1983, givetvis på grund af vedvarende og kraftige vinde fra vest), beskæftiger vi os ikke med at sammenligne R* fra år til år. Vi nøjes alene med at betragte og analysere på udviklingen over en længere årrække, hvor vi antager, at vejret godt nok indvirker betydeligt på variationen i R*, men ikke øver indflydelse på langtids-mønstret af op- eller nedgange i R* (se også Tab. 1).

I 1976 startede Skov- og Naturstyrelsen en fuglestation på Christiansø. Det erklærede formål med stationen var at ringmærke rastende trækfugle og bruge ringtallene i overvågnings-øjemed. Med udgangen af 1984 havde vi indsamlet materiale for 9 forår og 8 efterår, og hermed mener vi, at materialet er tilstrækkeligt stort og omfattende til, at vi kan sige noget om, hvorvidt det kan bruges til noget – og om stationen har opfyldt sit formål!

Fig. 1 viser to eksempler på variationerne i R* gennem årene. Udtrykker disse variationer nu variationerne i den sande bestandsstørrelse af de to arter i Østersø-området? Det kan man ikke få et direkte svar på, men der er to indirekte indgange til en besvarelse af spørgsmålet.

1) Der skal være en positiv sammenhæng mellem R* fra Christiansø og index-tallene fra punkt- og kortlægnings-optællingerne i bestandens yngleområde. Her har det været indlysende at bruge de svenske index-tal, idet vi udfra genmeldinger af ringmærkede fugle fra Christiansø ved, at disse overvejende træffes i Sverige (og det sydvestlige Finland) i yngletiden. Analyse-proceduren er beregning af *korrelationskoefficienter*. Som det fremgår af Tab. 3 er der gennemgående meget fin overensstemmelse mellem specielt R* fra om foråret og de svenske index-tal.

2) Man kan også beregne den såkaldte *variations-koefficient,* der er et udtryk for variationen fra sæson til sæson omkring middelværdien i den betragtede periode. Tab. 1 giver et eksempel på beregning af en variations-koefficient. For de fleste sande bestandsstørrelser vil variations-koefficienten mellem årene nok variere fra ca 8 til ca 20. En væsentlig større variations-koefficient i R* vil således være en indikation på en betydelig vejrindflydelse. Dette er givetvis årsagen til den noget større variation i R* end i indextallene hidrørende fra punkt- og kortlægnings-optællingerne i Danmark og Sverige (Tab. 2). Specielt forårs-R* viser dog en rimelig lav variations-koefficient.

Konklusionen er således, at R* fra Christiansø synes at være et godt og signifikant index-tal for en lang række småfugle-bestande i Østersø-området. Vi kan yderligere konstatere, at disse bestande synes at have det godt: De fleste viser opgange i perioden 1976-1984. Hermed kontrasterer de noget mod de danske punkt- og kortlægningsoptællinger (men ikke med de svenske!), og vel især med beretningerne fra Mellemeuropa (Tab. 5, 7). Vi skal dog ikke gå ind i en diskussion af årsagerne hertil. Det må vente til næste skridt, der bliver en mere omfattende analyse af R* for Christiansø fra årene 1976-1988 - for *alle* arter. I den analyse skal vi også forsøge at korrigere for vejrindflydelsen på r* (og dermed R*). Den således fremkomne korrigerede R* må så formodes at følge den sande bestandsstørrelse på (endnu) bedre vis end den nuværende R*.

Til slut nogle bemærkninger til dem, der siger: »Hvad skal vi med Christiansø? Den station overvåger jo ikke danske fugle! Lad os nøjes med punkttællinger m.v. i Danmark«.

For det første skal vi gøre os klart, at punkttællinger m.v. ikke overflødiggør træktællinger. De to metoder supplerer hinanden, og specielt forårstræktællingerne er bedre end punkttællingerne til at fortælle om, hvad der er sket undervejs på trækket og i vinterkvarteret. Efterårstræktællingerne giver desuden oplysninger om årets ungeproduktion. Endelig er der mange fåtallige og/eller skjult levende arter, der bedre lader sig registrere på træksted end på yngleplads.

Hvis vi efter denne gennemgang kan acceptere, at træktællinger er vigtige og skal foretages, må vi se i øjnene, at der findes ingen dansk træk- eller ringmærkningsstation, der helt eller bare overvejende registrerer danske ynglefugle. Danmark er et lille bagland, så trækket over og gennem vort land vil altid mestendels bestå af fremmede fugle.

Til sidst: Ringmærkningen på Christiansø kaster meget andet af sig end overvågning - ikke mindst oplysninger om trækveje og beliggenheder af ynglepladser og vinterkvarterer udfra genfund af ringmærkede fugle. En fuglestation som Christiansø fungerer også som et »kraftcenter«, hvor folk mødes og inspirerer hinanden til andre undersøgelser, f.eks. orienteringsforsøg med trækfugle og yngleundersøgelser af Ederfugl og Alk.

References

Andersen, J. B. & B. Klug-Andersen 1984: Ynglefugletælling 1983. - Dansk Ornitologisk Forening.

Berthold, P., G. Fliege, U. Querner & H. Winkler 1986: Die Bestandsentwicklung von Kleinvögeln in Mitteleuropa: Analyse von Fangzahlen. - J. Orn. 127: 397-437.

Busse, P. 1980: Breeding bird censuses contra counts of migrating birds - is it a real contradiction? Pp. 55-65 in: Oelke, H. (ed.): Bird census work and nature conservation. - Dachverband Deutscher Avifaunisten, Lengede.

Hansen, K. & J. Rabøl 1984: Spring migration of the Robin (*Erithacus rubecula*) on the island of Hjelm, Denmark. Influence of weather on the emigration ratio and the number of immigrating birds. - Fredningsstyrelsen, Miljøministeriet.

Kayser, B. 1985: Ynglefugletælling 1984. - Dansk Ornitologisk Forening.

Klug-Andersen, B. 1984a: Populationsindekser for danske ynglefugle 1980-1981. - Dansk Orn. Foren. Tidsskr. 78: 41-44.

Klug-Andersen, B. 1984b: Populationsindekser for danske ynglefugle 1981-1982. - Dansk Orn. Foren. Tidsskr. 78: 45-49.

Lyngs, P. & J. Faldborg 1984: Ringmærkningen på Christiansø 1976-1982. - Speciel rapport nr. 1, Fredningsstyrelsen, Miljøministeriet.

Lyngs, P. & J. Rabøl 1988: Bestandsændringer hos nordiske småfugle - et overvågningsprojekt på den økologiske feltstation på Christiansø. Pp. 133-148 in: Meltofte, H. (ed.): Naturpejlinger. 16 undersøgelser af planter og dyr på danske naturreservater. - Skov- & Naturstyrelsen, Miljøministeriet.

Nøhr, H. & L. Braae 1987: Ynglefugletællingen 1986: Overvågning af fuglenes livsvilkår. - Fugle 1987(2): 16-17.

Nøhr, H., L. Braae & B. Klug-Andersen 1983: Populationsindeks for danske ynglefugle 1979-80. - Dansk Orn. Foren. Tidsskr. 77: 95-106.

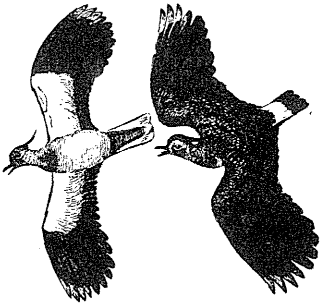
Persson, C. 1986: Ringmärkning och häckfågeltaxeringer - en kritik af PMK-relaterat strunt från Ottenby. - Fågelstudier 3(2): 93-96.

Rabøl, J. & F. D. Petersen 1973: Lenghts of resting time in various night-migrating passerines at Hesselø, Southern Kattegat, Denmark. - Ornis Scand. 4: 33-46.

Svensson, S., C. Hjort, J. Pettersson & G. Roos 1986: Bird population monitoring: a comparison between annual breeding and migration counts in Sweden. - Vår Fågelvärld Suppl. 11: 215-224.

Received 23 February 1988

Jørgen Rabøl and Peter Lyngs
Inst. for Population Biology
Universitetsparken 15
DK-2100 Copenhagen Ø, Denmark



Vil du være med?

Dansk Ornithologisk Forenings Tidsskrift skal udvides

Vi er en lille gruppe DOF-medlemmer, der laver dette tidsskrift i vores fritid. Det gør vi, fordi vi synes det er sjovt at lave bladet, og fordi vi mener det er et godt og vigtigt tidsskrift for foreningen.

Repræsentantskabet har dette forår besluttet, at DOFT skal udvides med mere aktuelt og feltornitologisk stof, og at tidsskriftet skal »moderniseres«. Derfor leder vi efter en eller to personer, som kunne tænke sig at hjælpe os.

Der er især behov for bistand med det feltornitologiske stof, fremskaffelse af fotos, layout af bladet og evt. sponsorbidrag til farvetryk m.v.

Ønskede kvalifikationer er derfor gode kontakter til skrivende feltornitologer og til fuglefotografer, og/eller lyst og evne til at arbejde med bladets layout. Og naturligvis lyst til at deltage i fremstillingen af et godt fagligt tidsskrift for foreningens 8000 medlemmer.

Vil du være med, så skriv til DOFTs redaktion, Dansk Ornitologisk Forening, Vesterbrogade 140, 1620 København V; eller kontakt et af redaktionsmedlemmerne (se omslagets inderside).

På gensyn
redaktionen