SYMP11: Large scale and long term monitoring: Value and perspectives

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Monitoring has been important part of ornithology for a long time. Traditionally, population levels and geographical distribution of bird species have been monitored at areas of states or large regions using a network of experienced and dedicated volunteers. Most typically, breeding numbers and distributions are the focus of monitoring schemes, although schemes focused on winter or migration periods also exist. Schemes monitoring other aspects of birds' life cycle (e.g. reproductive success, survival, spring arrival) are in place in several European countries.

Survey design (field methodology, sampling design data analysis etc.) varies greatly across countries depending on the goals of the particular schemes. Results of such monitoring schemes have begun to be used for identification of species of conservation concern and as a first step towards identification of reasons for detected population changes. Large-scale and long-term monitoring schemes have shown a negative effect of land management practices, particularly intensive agriculture, on bird populations in N.W. Europe and the importance of monitoring common bird species. Oral papers on large-scale international programmes, International Waterbird Census and Pan-European Common Bird Monitoring, will show the potential of such programmes for nature conservation using bird numbers as indicators of environmental change. Population trends obtained by large-scale monitoring schemes have been used as indicators of state of environment in some countries (e.g. United Kingdom & Netherlands) and such data are of great value to decision makers. However, this is not yet the case in many countries either because such data do not exist or their value is not yet recognised. Monitoring has undergone considerable progress in methodology during the last decades; this can be demonstrated by oral papers presented by D. NOBLE or F. JIGUET. New national schemes using better design and methodology have been initiated – an example will be shown by P. CHYLARECKI and his paper on monitoring of common breeding birds in Poland. How to cope with old designed and possibly biased monitoring schemes will be shown in the presentation by CHRIS VAN TURNHOUT and his collegues. Demography monitoring using marked individuals will be represented by two oral papers – by ARIE J. VAN NOORDWIJK and VLADIMIR A. PAYEVSKY. Several poster presentations submitted to the symposium will show results of various single-species or multi-species national monitoring programmes.

SYMP11-1 Breeding bird survey, capture-recapture and spatial modelling: towards new conservation tools

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Estimating correctly species richness is crucial when dealing with the conservation and management of biodiversity, and the use of probabilistic models, when handling data from censuses where not all species are detected and where not all species have the same detection probability, is highly recommended. Here we used data from the French breeding bird survey to estimate local bird species richness within sampled sites, using probabilistic capture-recapture models that permit heterogeneity in detection probabilities among the different species in the sampled community. We further aimed to use geostatistical tools based on spatial autocorrelation to interpolate estimated species richness over the entire country and illustrate spatial trends at that scale, providing an opportunity to predict the location of biodiversity hotspots (e.g. bird species-rich areas here). We investigated the possible effects of habitat structure and composition (landscape fragmentation, habitat cover, habitat diversity) on species richness at a local scale, and we then used the identified trends to help with modelling species richness at a larger spatial scale, e.g. an entire country. So we tested a simple method using geostatistics – cokriging models – to predict species richness at a large spatial scale, without relying on time-consuming exhaustive inventories such as atlas works. We further compared species richness obtained with such a method with that obtained using the national atlas of breeding birds. This should help in easily identifying species-rich areas for various taxa and locating biodiversity hotspots to be protected as high conservation value areas, especially in the temperate zones where diversity hotspots are more likely to match centres of high species richness because of very few centres of high endemicity.

The same spatial interpolating methods are being developed to model the geographical variations in the relative abundance of species over the entire country. A few examples will be presented, either with raw data or using broad-scale landscape parameters as co-variables.

SYMP11-2 Monitoring of common breeding birds in Poland

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The Polish Common Breeding Bird Monitoring Scheme started in 2000 as a collaborative program of RSPB, OTOP and Institute of Ornithology. In 2002, the third year of data collection, 160 volunteers participated in the project, surveying over 270 randomly selected study plots (1 km x 1 km squares) across the country. Project design and field methods follow closely those used in other European schemes based on distance sampling (British BBS and Irish CBS). Four years after its inception, the project provides representative, countrywide indices of bird populations for 80–90 most widespread species.

Project's time frame is still too short for reliable trend estimates. However, for typical farmland birds (e.g. skylark), the data recorded so far, show that across geographical regions, changes of abundance indices are related to differences in intensity of agriculture. Species richness recorded within individual study plots was relatively constant across years, with over 70% of variance explained by consistent, habitat-related differences between survey plots. Also, prevalence of individual species, as recorded during the survey, was very consistent across years, with repeatability over 90%. Small between-year differences in species prevalence were correlated with parallel changes in indices of their abundance.

Collectively, the data collected show that survey methods used provide sound, highly repeatable estimates. For monitoring of bird populations, the project has set up a reference line in the country that soon may face rapid habitat changes following EU-accession. Linking bird abundance data with habitat variables recorded during the survey provides rich opportunities for further, more detailed research.

SYMP11-3 The feasibility of routine production of survival indices for passerines

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We compared survival estimates based on three different types of ringing data available from the national database. Our objective was to check the feasibility of routine calculation, rather than to conduct in-depth interpretation. We selected only mark-recapture data for the months May, June and July. Within this, we examined and compared survival using three different types of data: (1) Recaptures only. (2) Birds ringed as adults or recaptured as adults. (3) Birds ringed in their first year with survival estimates for two age classes, to separate juvenile and adult survival. Data were used for 11 years: 1990–2000.

Using all three data-selections, models based on time-dependent survival give a significantly better fit than constant survival for most species. Using only estimates for which a realistic standard error could be estimated (0.01 < s.e. < 0.2), the correlation between the estimates is around 0.8 (range 0.57 – 0.997 for 10 species). The correlation is higher for species with more precise estimates with smaller standard errors. In view of making time series of survival estimates, the proportional change in survival estimate from one year to the next is an important parameter. The correlation between these proportional change estimates is high, around 0.85 (range 0.70 – 0.975) and this correlation seems to depend on sample size rather than on overlap between the adult and recapture data set.

In conclusion, it seems that variation in annual survival can be demonstrated and that the estimates obtained are consistent across different approaches.

SYMP11-4 The International Waterbird Census: Global waterbird monitoring for waterbird and wetland conservation

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The International Waterbird Census (IWC) is a long-term monitoring scheme for waterbirds in the non-breeding season organised by Wetlands International. It is one of the longest running and geographically most extensive ecological monitoring schemes in the world. Currently there are four regionally co-ordinated censuses, in the Western Palearctic and Southwest Asia, Africa, Asia and the Neo-tropics, with a fifth in North America in development, comprising a network of more than 10,000 counters in more than 100 countries. The goal of the International Waterbird Census is to contribute significantly to international efforts to conserve waterbirds and their wetland habitats. To achieve this, it uses information collected over the long term: (1) To monitor the numerical size of waterbird populations; (2) To describe changes in numbers and distribution of these populations; (3) To identify wetlands of international importance for waterbirds at all seasons; (4) To provide information to assist protection and management of waterbird populations through international conventions, national legislation and other means.

Recently published results for the Western Palearctic and Southwest Asia (WP&SWA) from 1997, 1998 and 1999 included totals of more than 23 million waterbirds of more than 230 species. These results have been used to update population estimates and to assess the value of waterbird numbers as indicators of environmental change. Currently Wetlands International is working on a project to calculate updated trends of all waterbird species in the WP&SWA from the 1970s up till 1999.

In the future the IWC data will be made more accessible through web application and GIS linking. Cooperation with other monitoring schemes and linking of databases will enhance its usability and effectiveness.

SYMP11-5 Pan-European Common Bird Monitoring: towards delivering trends and indices for common birds across Europe

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The Pan-European Common Bird Monitoring Project has commenced in 2002. The goal is to use common birds as indicators of the general state of nature using data on changes in breeding populations across Europe. As a first step, data from 18 European national breeding monitoring schemes have been collected. A standardised procedure using loglinear models has been used to produce Pan-European yearly indices and trends since 1990 for 24 farmland and 24 woodland species. Indices have been produced for each species and country, for groups of countries (Northern, Western, Central and Eastern, and South-Western Europe) and for the whole Europe. Estimated size of breeding population in each country has been used as a weighting factor to combine the results of the individual countries to get Pan-European indices. This is the first larger set of Pan-European indices for common bird species enabling comparison between countries and regions across Europe and identification trends at nearly Pan-European scale. Trends and indices of individual species will presented and discussed.

SYMP11-6 The development of bird population trend analyses and alert limits in the UK

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Over many years of bird monitoring in Europe, there has been considerable development of sampling designs, field recording methods and the deployment of volunteers. Procedures for analysing bird count data to estimate changes in numbers over time have also evolved as new analytical techniques become available. Using examples from the UK and elsewhere, I review some of the indexing methods used to monitor bird populations, discuss their advantages and disadvantages with respect to the aims of the scheme, and describe methods for smoothing population trends to reduce the effects of fluctuating environmental factors such as weather. I then describe a system developed by the BTO for triggering alerts when bird population declines exceed particular thresholds. Alerts, ranked by severity and reliability, are used to identify new potential problems and for setting conservation priorities. The indexing model, the precision of the estimates, the representativeness of the underlying data, and the ecology and demography of the species, should all be considered in responding to these alerts.

SYMP11-7 Weighing and stratifying population monitoring data, does it give us robust trend indices?

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In The Netherlands in 1984 SOVON started a breeding bird monitoring project. By means of territory mapping volunteers yearly estimate the number of breeding territories of all present species in census plots. Up to now in about 2000 census plots data have been collected, the half counted yearly. The aim of the monitoring scheme is to sketch the changes in the national population changes. Therefore, with help of Statistics Netherlands, from the data yearly population indices are derived. The statistical techniques and methods for these procedures strongly improved in the last decade. Problems not yet solved concern (1) the over- or under representation of certain habitats and/or regions and (2) the deliberate selection of ‚best' areas by the observers. Volunteers can select their census plots without a rigid underlying randomisation and stratification scheme. This can lead to bias in the national population indices. The remove an important part of this bias we developed a weighing and stratification procedure. Census plots are assigned to habitat type and region and subsets are created. Indices for each of the subsets are weighed according to their population size and summarized to calculate a national index. For deriving the weighing factors we used the results of the national breeding bird atlas project that recently was carried out in The Netherlands. We will present some results of the weighing procedure and discuss the relevance of applying the weighing procedure. Our conclusion is that the procedure results in more realistic population trends. It also demonstrates the surplus value of atlas projects mapping the distribution and numbers of breeding birds. These data are necessary to regularly update the population estimates and consequently the weighing factors.

SYMP11-8 Long-term monitoring of a declining population of barred warbler (*Sylvia nisoria*): comparison of demographic parameters across time periods

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Some methods using for the diagnosis of the causes of bird population declines rely on comparisons across time periods with different population trends. The comparisons of breeding success, local survival rates, morphometric measurements of trapped birds, and plausible external factors between the periods of stability and decline provide a valuable check on this diagnosis. Such approach was used for some populations on the Courish (Curonian) Spit of Baltic Sea (Kaliningrad Region, Russia). The study of breeding biology and the bird trapping has been conducted by the team of the Biological Station Rybachy since 1959. Among bird species recorded annually as breeding, a drastic decrease to the point of extinction in the late 1980s was recorded in the barred warbler, which was numerous up to the middle of 1970s. We analysed demographic parameters obtained during thirty years separately in periods of stability and decrease. We used capture-recapture methodology to estimate local annual survival rates and recapture probabilities. No differences were found neither for morphometrics (wing length, body mass, and fat score for adults and juveniles separately), nor for clutch size and breeding success. The annual local survival rate alone was a good index: the series of the survival for 1966–1981 predicts an inevitable extinction. Actually, the extinction of the local population takes place during 1986–1989. The possible reasons of this dramatic collapse of the population are discussed.

SYMP11-P1 Long-term changes in the distribution and numbers of the black grouse in the Czech Republic

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In the former Czechoslovakia, black grouse was apparently most numerous around the year 1900, when almost 9,000 males were shot annually. Its high numbers have been correlated with the introduction of clear-cutting of forests and subsequent natural plant succession. In the 1930ies, this circumstance favouring the occurrence and dynamics of black grouse was intensified by spontaneous clearings that resulted from extensive infestations of spruce forest with overcrowded gypsy moths. A bag of 7,000 males was reported still in 1933. Since the 1930ies the numbers of black grouse have been in steady decline, which has been especially dramatical in the past five decades. Compared to 1955, the areas of its occurrence dropped to a mere 15% in 1977. In 1973–1977 black grouse was only reported from 22% of the quadrats (12 x 11,1 km) covering the Czech Republic, and their number was estimated at 2,500–4,500 males; in the 1985–1989 from only 15% of quadrats with an estimate of 1,100–2,200 males. At present, black grouse shows irregular distribution chiefly in borderland mountain ranges. The only places in which viable black grouse population are still maintained include extensively growing-up clearings which came into being due to woodland mortality caused by industrial air pollution, and former military areas damaged by heavy machinery. The numbers of black grouse in the CR in 2000 and 2001 were estimated at 800–1,000 cocks. Of these, about one half occurs in the Krušné hory Mts. (400–450 males).

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SYMP11-P2 What we learnt from 30–year monitoring heron populations in Italy and France

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Heronries have been censused regularly since 1967 in the Camargue, S France, and since 1972 in NW Italy where rice fields support abundant populations. Counts were not complete in some years, but the trends were studied using a population index. Breeding success was concurrently studied at several colonies.

During the past 30 years, grey herons, and little and cattle egrets, that are largely resident, showed a marked and regular increase in their breeding population. Minor fluctuations for these three species were related to mortality during a hard winter.

On the contrary, species that overwinter in Africa, night, purple, and squacco herons, showed variable level of their breeding population. Their fluctuations are explained partially (only for 10–20 % of their variance) by the amount of rainfall in sub-Sahara Africa during the preceding winter, that may affects survival.

One aim of these monitoring programs, understanding population regulation, is not yet fulfilled after so many years, and several aspects remain unexplained, e.g. the same species does not show coincident fluctuations in different breeding areas in Southern Europe, and multiple factors, not yet well understood, influence reproduction and population levels. Another aim, gather information for conservation, was satisfactorily matched, and presently several heronries are protected in some areas.

SYMP11-P3 A method to characterize spatial synchrony in long term monitoring schemes with missing values. Example from wintering waterbird assemblages at a regional scale (1978–2002)

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The aims of the International Waterbird Census, organised annually in January, are to estimate population sizes of waterbirds species and to describe changes in numbers and distribution of the populations. Knowledge of population size and trend is of biological interest but also fundamental for conservation action. Most of the studies in this frame have been done at very large scale (e.g. Western Palearctic and Southwest Asia) and National scale (e.g. Great Britain, France).

Criterions were defined to identify important sites, but it is also important to define, in an ecological context, functional units, i.e. spatial scale of synchrony in trends and fluctuations of both populations and waterbird communities. However, defining such scale is difficult because every site is not counted every year. Missing values affect different sites in different years. It is common in such monitoring programmes to use interpolation techniques to estimate the missed values, but it may introduce sources of error because of the variability of the census.

We propose a method, already used in marine ecology, to define such functional units at the community level and at the regional scale (North of France – 13 000 km^2 – 1978–2002). This method is based on multivariate cluster analysis and instead of regularizing the data matrix by estimating the missed values, we only used the count data.

SYMP11-P4 Long-term monitoring of numbers of irruption species – long-tailed tit (*Aegithalos caudatus*) on the Courish Spit of the Baltic Sea

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The analysis of trends in numbers in an irruptive species – long-tailed tit (*Aegithalos caudatus*) on the Courish Spit of the Baltic Sea showed no long-term cycles in autumn numbers during 45 years (1957–2002). In different years, the numbers captured varied between 1 and 19768. In long-tailed tits irruptions were more frequent in the autumns of the 1960ies, 1980ies and late 1990ies, when comparatively early and warm winters and springs were recorded, as opposed to the 1970ies. A test for relationship between the mean monthly air temperature and index NAO (North Atlantic Oscillation) and autumn numbers revealed a significant positive correlation of numbers with April temperature and index NAO for February. A highly significant relationship was found between the autumn numbers of young birds and the numbers in next spring. This shows that after an irruption, some young birds not only survive the winter, but move back in spring, possibly towards their natal region. Ring recoveries available also support that the survivors after an irruption move in spring towards the breeding areas. We suggest that irruptions of young birds in long-tailed tit traditionally ranked among sedentary birds are no special form of movements. These irruptions are a genuine migration showing characteristic features of migration: large distance of movements, directional preferences (in autumn mainly towards the south, southwest and west; in spring towards the north, northeast and east), pronounced migratory disposition and corresponding migratory behaviour.

SYMP11-P5 Population trends of farmland and woodland bird species in the Czech Republic, 1982–2001

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Breeding bird census program in former Czechoslovakia started in 1981, however data only from the Czech Republic were subject of this study. The point count method has been used for census. All birds are registered on 20 counting points along a transect, five minutes on each point. Up to the year 2000, the indices were calculated using the same formula as in several other European countries: $I_x = I_{x-1}.A_x.(A_{x-1})^{-1}$, where A_x (resp.A_{x-1}) is the number of individuals of a given species recorded in year x (resp. x-1). Only transects checked in any two consecutive years were taken into account. Because of missing counts, loglinear modeling is used this study (in twenty-year period 1982–2001; the year 1981 is suspected to be only tentative). We used TRIM program, version 3.10., to calculate yearly indices and their standard errors. Indices of population trends were calculated for 48 species. Results are compared with indices obtained previously by chaining method in the Czech Republic and also with results from other European countries and regions. This study was supported by the Grant Agency of the CR (grants 206/97/0771, 206/01/1375).

SYMP11-P6 The third Atlas of breeding birds in the Czech Republic in 2001–2003

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Two Atlases of breeding bird distribution were published in the Czech Republic so far. The first contains the results from the period 1973–1977, the second from 1985–1989. The third breeding distribution of birds in the CR is mapped in 2001–2003 (only in three-year period) in the unified network of quadrates 10′ L. x 6′ Lat. in size (i.e. 12 x 11,1 km). The changes in the breeding distribution and quantity are periodically monitored every 10–15 years. The start of new mapping of avifauna was purposely stated on the year 2001. It was the beginning of the new century (and even millennium) and acquired data represent the basic material for the comparison of quantitative and spatial distribution changes of bird species which will occur in the 21st century. In addition to that, quite actual data are utilizable upon the planned entry of the CR into the European Union and in newly created network of protected areas NATURA 2000. According to the preliminary results (2001–2002) all 628 quadrates will be covered by ca 400 collaborators. Compared to the 1985–1989 Atlas, 5 new species (2,5 %) began breeding anew (*Aquila heliaca, Recurvirostra avosetta, Himantopus himantopus, Larus cachinnans, Phylloscopus trochiloides*), whereas 7 species (3,5 %) ceased to breed (*Ardea purpurea, Aquila pomarina, Aythya nyroca, Otis tarda, Burhinus oedicnemus, Coracias garrulus, Lanius senator*); 31 % of breeding birds increased in numbers, 17 % decreased, no such changes can be seen in 46 %.

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