The need for greater use of historical population data

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Ecologists have long understood the value of long-term studies in reaching a better understanding of population processes and have lamented that so few have been undertaken. For waders, however, there already exist several long-term datasets that could be utilised to much greater effect. Taking two examples, I consider how such datasets might be used in conservation research.

INTRODUCTION

Among the Big Issues should be a determination to make more and better use of historical information. In 1990, Dr C.J. Krebs spoke at a British Ornithologists' Union conference about the value of long-term studies, taking the position that "ecologists, like all scientists, ought to be experimentalists, testing hypotheses", while complaining that in long-term studies evidence *against* your ideas is slow to accumulate, in line with Popper's (1959) insistence that contrary evidence is crucial. Krebs identified five valid reasons for long-term studies: (1) there are likely to be long-term trends in ecosystems; (2) many ecological processes are slow; (3) some species are long-lived; (4) some events are rare; (5) some systems may be highly variable. He asserted that long-term studies should not be undertaken either to assess density-dependence (while noting that Robert May took the opposite view) or to monitor ecosystem health (which continues to be a common justification for them). He insisted that we must identify the causes of changes, while noting that "This is a *non-equilibrium* world."

This instability, and the complexity of ecosystems, ensures that often it will not be possible to identify causes of change with much confidence, and explanations that seem satisfactory today will be overturned tomorrow. There are two very different reasons for this. First, as knowledge increases, theoretical paradigm changes will occur. Second, and more importantly, in ecology the occurrence and relative importance of particular causes may change greatly over time. This should be a cause of delight, because it ensures that our work will never be finished!

Here I look at two long-term datasets that record changes in wader populations over time, to see what suggestions for research they offer and what benefits such research may offer to countryside managers.

CASE STUDIES

Die Welt der Seevogel (Schulz 1947) summarised the findings of many naturalists over many years, the longest run being from 1907 to 1947. They described the breeding bird populations of the German North Sea coast and its islands, many of them bird reserves. Waders received less attention than terns, gulls and ducks, but enough to provoke a lot of questions. Looking at the number of pairs of waders found nesting on nine islands off the North German coast for which there were most records, I began by asking: (1) how wide were the fluctuations in numbers of breeding pairs? (2) did the numbers of a single species at different sites vary in similar ways? and (3) did the numbers of different species vary together, or independently? The census methods are not described, and at some sites in some years population estimates seem to have been little more than guesses. Few series were uninterrupted for 40 years. However, those weaknesses are not important at the level of generality with which I am now concerned. There were five locally widespread species. Eurasian Oystercatchers *Haematopus ostralegus* accounted for half the breeding pairs, Redshanks *Tringa totanus* for about 20%, Kentish Plovers *Charadrius alexandrinus* 17%, Lapwings *Vanellus vanellus* 9% and Ringed Plovers *Ch. hiaticula* for only 2.5%. The German North Sea coast is near the western centre of the breeding range of the Oystercatcher, Lapwing and Redshank, near the southern limit of the Ringed Plover and at the northern limit of the Kentish Plover. It would have been surprising if the numbers of all five species varied in the same ways. In the period 1928–1941, for which the published numbers from the nine islands were most complete, the numbers of breeding waders doubled and all five species increased. After allowing for that general trend, the numbers of Redshanks, Lapwings and Kentish Plovers tended to vary together, while those of Oystercatchers and Ringed Plovers did not. Would such generalizations hold over wider areas? And while numbers were falling?

Why have analyses of data collected by different people over long periods been so rare? 1947 was a low point in the history of Germany and Europe. Yet somehow Schultz and his collaborators managed to bring together, discuss and publish data collected during the two most damaging European wars, as well as before and between them. The subsequent 55 years have seen the growth of extensive counting schemes in many countries, with the production of annual reports by, for example, the British Wetland Bird Survey (WeBS) and the Irish Wetland Bird Survey (I-WeBS) and the less frequent, though larger-scale, reports from the International Waterbird Census (IWC). Similarly a great deal of effort has gone into the compilation and publication of atlases of breeding birds (e.g. Teixiera 1979, Gibbons *et al.* 1993) and wintering birds (e.g. Lack 1986, Bekhuis *et al.* 1987).

In comparison with the effort that has gone into collection, storage and publication of data, much less has been put into

its interpretation. Gerard Boere and David Stroud (1997), in their foreword to the IWC report for 1995 and 1996, unintentionally identified one of the problems: "Wetlands International through its staff of compilers and editors of this report is to be congratulated for their painstaking work and fine publication." Even in these days of desk-top publishing, it takes a great deal of effort to bring together counts by networks of volunteer counters, to compile the data in orderly ways and push them through to publication. Though Gerard and David are notable counter-examples, it is easy for "compilers and editors" to turn into bureaucrats, preoccupied with "process" and seeing their reports as end products. For scientific exploration of the processes that really matter, those compilations can be no more than starting points.

Dick Loxton asked recently "Whither the Observatories?" (Loxton 2002). As a former warden, I have long been troubled by the inaccessibility of most of the records collected at British bird observatories over the last 60 years, and the continuing failure to secure funding to convert them into a modem database. The last sentence of Dick's note reads: "As an academic once observed to me . . . 'If you only had your data available, I'd put two PhD students to work on it at once' ". That quote reflects another problem. Much research is in the hands of people learning their trade, who are inclined to "play it safe" by going along with the scientific fashions of the day. One of the simplest and surest ways of playing safe is to devise "new and improved" methods – of censusing in this case. That is a major threat to historical analysis, because it leads to series that are, by intent, not fully comparable. As a result, older data are discounted, not prized as they should be. Census-takers should ensure that earlier methods are run in parallel with their improvements. Yet few do.

Most bird counters are busy earning a living in other ways and lack the time to do anything with their results. The compilers may have the necessary analytical skills, but are usually struggling with deadlines and are unable to think long and hard about what the data they have assembled tell us about population ecology. They must also devote effort to "tuning" the surveys and samplings for which they are responsible, which are liable to fall apart as counters drop out and the birds change their distributions. Recent changes in ringing strategies and techniques by the Wash Wader Ringing Group show how these things should be done.

Schultz's book brought together many local studies of breeding waterbirds, but made no sustained attempt at comparing their results. The study by Meltofte (1987) of changes in the use by waders of the Tipperne reserve, on the west coast of Denmark, between 1928 and 1982 was more detailed and thorough. While looking at the phenology of migrants he could not avoid questions about exactly which individual waders were passing through Tipperne, and how they might be related to the summer residents. This leads us to the question: how suitable are numerical data from a single station – or from a network of sites (as in WeBS) – for the study of population changes amongst the many species for which breeding censuses across their entire breeding ranges will never be possible?

CONCLUSIONS

Pragmatism must take precedence over perfectionism. There are many difficulties in historical analyses based on counts, or sampling by catching and ringing, in staging and wintering areas. For example, most of the Golden Plovers *Pluvialis apricaria* passing through the Netherlands in autumn breed in Fennoscandia and western Siberia and are of the form *altifrons* (Jukema *et al.* 2001), which also breeds in Iceland. Some plovers ringed in Iceland have been found in the Netherlands, though most Icelandic plovers pass through the British Isles on their way to wintering grounds in western France and Iberia (Gudmundsson 1997), which they share with those from the north-east. More remarkably, small dark Pacific Golden Plovers *P. fulva*, presumably from eastern Siberia, used to be trapped in the Netherlands, though few have been detected since 1940 (Jukema *et al., loc. cit.*). With *P. a. apricaria* also moving through, though no longer breeding in, the Netherlands, what is the active monitoring-by-wilsternetting programme now in place there really tracking? The great advantage of catching over counting is that handling the birds provides opportunities to use modern technology to distinguish the different components of mixed populations, including the only recently solved DNA technique of determining the sex of Knots and Golden Plovers caught when not in breeding plumage.

One of Meltofte's complaints about the Tipperne material was that, though the wader data were plentiful and reliable, the recording of environmental changes in and around the reserve had been insufficient. This will almost always be so. It is difficult to assemble teams with the wide range of skills needed (which bird-counters are unlikely to possess, or have time to carry out) and it is even harder to hold teams together for many years, or reassemble them every few years. It is also difficult to agree on what to measure. And, as I recall from being a member of two teams in the International Biological Programme – a biological survey of Loch Leven in the 1960s, and a study of unploughed grasslands in the Canadian prairies in the 1970s – there is a strong likelihood that birds, near the top of the food chains, may prove to be only minor players in the functioning of ecosystems. There are regrettably few ecologically minded bacteriologists able to measure the real driving forces in ecosystems. Even sticking with the readily visible, it is hard to predict, at any scale, the ecological consequence of changes in agriculture, or other human uses of land, so that many environmental measurements may turn out to have been irrelevant. We bird counters should stick to our knitting, not embark on tasks beyond our means.

Records of changing numbers of waders at staging and wintering sites are unlikely to be an accurate reflection of what is happening to whole populations, because they are samples drawn in arbitrary ways from ill-defined and ever-changing entities. This may trouble the tidy-minded, particularly those who want to apply a 5% or 1% rule in justifying the status of an existing or proposed reserve. But this uncertainty should stimulate those of us who are more concerned with big pictures than with the third place of decimals. Many of us work for government departments, quasi-governmental organisations such as English Nature, or Naturalists' Trusts, in which most funding decisions are political and scientific rigour is not highly esteemed. We have to keep on trying to insert our hard-won ecological knowledge into the processes of decision-making. Rebuffs are likely to be more frequent than successes. Dogged persistence and ingenuity are essential, because ignorance of, and disdain for, science are firmly embedded in high-level politics and administration.

Fortunately, some academics enjoy studying bird population ecology as a relaxation from their professional work. Derek Yalden, of the University of Manchester, with the help

of local birdwatchers, has followed the fortunes of small groups of Common Sandpipers *Actitis hypoleucos* and Golden Plovers breeding in the Peak District of Derbyshire, UK, for more than twenty years, with rich and unexpected results (Yalden, this volume). We need more Yaldens. We also need people with the energy and drive to bring together miscellaneous studies, made in many places and over long periods, in order to construct broad pictures of changes over time, and to identify their current causes. Where are the desk-top Mintons?

Forty years ago (Boyd 1962) I brought together all the evidence I could find that dealt with the mortality and effective fertility of European waders. Much has been learnt since about wader productivity and survival, so that another similar exercise would be laborious, even with the aid of computers, which make literature-searching and survival calculations much easier than in those days of card indexes and log tables. My models were like toy trains made of blocks of wood. They must be replaced by dynamic studies of demographic changes over time. However, for some years yet, we will have to depend largely on whatever data happen to have been recorded by others, rather than on the outcomes of designed experiments.

How might broad-scale reviews of the details of population changes be helpful in conservation? In the first place, by stimulating thought by the curious, from whom most new ideas emerge. Second, and less probably, by encouraging administrators and wetland reserve managers, and the people who advise or instruct them, to be less parochial in their concerns than most of them now are. A few years ago I was a member of a Wildfowl and Wetlands Trust team that had been asked to suggest what waterfowl research could be undertaken by, or for, the staff of the Loch Leven National Nature Reserve in Scotland. I was dismayed, though not surprised, to find that the local staff did not know of any operational plans defining collectively the management objectives for the wetland reserves of Scottish National Heritage, nor of any central identification of the research opportunities the Scottish NNRs might provide.

Earlier I had suggested, to very different audiences, that water levels in wetland reserves throughout the interior of North America could be managed so as to ensure that waders migrating north in spring found successive staging areas in prime condition. The idea of operational collaboration between states and provinces and across international borders was thought strange. So far as I know, no such exercises have yet been attempted. Practical nature conservation moves very slowly, administrators and reserve managers rarely being quick on their feet, and top-down instructions usually being based on political pressures.

Members of the International Wader Study Group have been exceptionally successful in promoting and carrying out collaborative projects in many parts of the world. I hope that these enterprises continue to expand. After you have achieved spectacular, or obviously useful, results, it may even be possible to secure the approval of senior officials, and even ministers, for these international exercises. But carry on, regardless, so that the next 100 issues of the *Bulletin* are even more interesting than the first.

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