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Increasing the conservation value of ringing studies of passerines, with emphasis on the non-breeding season

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Increasing the conservation value of ringing studies of passerines, with emphasis on the non-breeding season.

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The structuring of passerine ringing activity for conservation purposes has hitherto focused mainly on the breeding season; the Constant Effort Sites Scheme provides information on population trends, breeding productivity and survival rates. In this paper, we suggest a rationale for the structuring and targeting of ringing activity outside the breeding season, which will increase its ability to deliver data of conservation value, and make recommendations for its implementation. Ringers should be allowed and encouraged to submit all recapture data for computerised storage. Survival rate models incorporating both recovery and recapture data should be developed in order that recapture data from both within and outside the breeding season can contribute to increasing the power of survival rate estimation. The standardised collection and submission by ringers of biometric data (weight, wing length and fat scores) should be encouraged in order to facilitate studies to assess whether these attributes are correlates of survival probability. The re-distribution of current passerine ringing effort in favour of species of conservation concern should be encouraged (as already initiated by the new conservation priority-based ring pricing scheme) via i) the establishment of habitat-specific ringing study groups with wide representation of interest groups in order to develop and seek funds for new projects to be carried out by ringers either individually, as Ringing Groups or in collaboration with professionals, and ii) the appointment of a Ringing Projects Officer at the British Trust for Ornithology to co-ordinate the implementation of new projects within the Ringing Scheme. New projects outside the breeding season should be focused on the following general objectives: i) survival rate estimation, ii) improving understanding of patterns of movement and habitat use within local populations, outside the breeding season, iii) the collection of data on physical condition and diet as potential correlates of survival probability, and iv) studies of the ecological requirements of species breeding within the UK in their wintering areas outside the UK.

The capture and ringing of birds can provide information about the sex, age, morphology, plumage, physical condition, and even diet of the individuals concerned. The subsequent recapture alive, or recovery dead, of ringed birds provides further information on survival, movement, and changes in some of the attributes mentioned above. When pooled over large samples of birds, these data yield estimates of demographic parameters (eg age and sex ratios, survival rates) which characterise whole populations of birds and can be monitored over time. Environmental changes directly affect the demographic rates of bird populations (eg breeding success, survival rates), and these changes, in turn, determine population size. Thus the effects of environmental change on bird populations are much more likely to be detected

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and understood if demographic rates are measured as well as population size. The monitoring of survival rates is one of the most important conservation functions of ringing since it can alert conservationists to incipient population declines and indicate their demographic causes (Greenwood *et al.* 1994, De Sante & Rosenberg 1998). For example, work by the British Trust for Ornithology (BTO), Royal Society for the Protection of Birds (RSPB) and University of Oxford is examining long-term trends in the survival rates of a range of declining passerine birds in the UK (Thomson, Baillie & Peach 1997, Siriwardena *et al.* 1998a, 1999). Such work can identify where in the life cycle the demographic cause of a decline lies. This, in turn, will help to target studies designed to determine the ecological cause of that demographic change and may ultimately lead to proposals for practical measures to reverse the decline for a given species.

Ringing currently provides the only way to monitor the survival rates of a wide range of passerine species in the long-term. Thus the estimation of survival rates can be considered a 'keystone' contribution of ringing to conservation. Taken together with the wish of conservationists to understand the causes of trends in breeding populations, the result is the requirement that survival be estimated between consecutive breeding seasons and, thus, that the ringing period must span the breeding season (Peach *et al.* this volume). Moreover, at this time, most birds can be aged reliably (as breeding adults or recently fledged juveniles), sampled populations are least likely to include non-breeding passage birds or immigrants, and recaptures of ringed birds provide good information on natal and breeding dispersal and allow migratory movements to be directly linked to breeding populations (Paradis *et al.* 1998). For all these reasons, it is generally considered that "ringing during the breeding season is much more valuable for the purpose of survival monitoring than ringing during the non-breeding season" (Peach *et al*, this volume). The result, in the UK, has been the Constant Effort Sites (CES) Scheme which uses mist-netting catches at standardized ringing sites during the breeding season to measure long-term changes in i) the abundance of adults and juveniles, ii) breeding productivity, via the ratio of adults to juveniles in catches, and iii) survival rates (Peach *et al.* 1998).

Here, we argue that the focus on the ringing of passerines in Britain in the breeding season means that ringing at other times has yet to fulfil its potential to contribute to the science and practice of bird conservation. In particular, ringing outside the breeding season can contribute to monitoring survival rates, individual correlates of survival probability (eg physical condition, diet), and improving our understanding of seasonal variation in habitat use and bird movements. That this potential has not yet been fulfilled, reflects partly a lack of clear national focus on the conservation objectives of ringing outside the breeding season, and partly a lack of co-ordination of ringing effort at anything above the local scale. These problems are manifest in the following ways:

i) as yet, there has been no nationwide effort to structure ringing outside the breeding season, either in terms of effort, species coverage or habitat coverage;
ii) ringers are not currently required to collect some data of potential value, notably biometrics, and fat or muscle scores (Gosler 1991, Gosler *et al.* 1995). Over the country as a whole, such data are collected, at best, in a piecemeal fashion;
iii) many useful data that are collected by ringers have not consistently been collated centrally by the ringing scheme, notably biometrics and local recapture data; and
iv) there are imbalances in ringing effort relative to conservation need (Table 1). These imbalances exist across species, and across habitats, and apply as much to ringing during the breeding season as outside it. One of the consequences is that for some passerines of immediate conservation concern within Britain, the Ringing Scheme database is unable to contribute significantly to understanding the demographic causes of declines as the first step towards diagnosing their environmental causes and indicating possible remedial actions. Many of these species (eg Skylark *Alauda arvensis*, Corn Bunting *Miliaria calandra*, Yellowhammer *Emberiza citrinella*, House Sparrow *Passer domesticus* and Tree Sparrow *P. montanus*) are relatively sedentary within the British Isles.

Table 1. Ringing and recovery totals for farmland passerines up to and including 1995 from Appleton *et al.* (1997). Conservation status data from RSPB (1996); population decline data from Crick *et al.* (1998); breeding population data from Stone *et al.* (1997).

Species	*Conservation status*	*Percentage population decline,* 1972-1996+	*Estimated British breeding* territories	*Total ringed to end of 1995 / in 1995*		*Total recovered to end of 1995 / in 1995*	
Skylark	RED	-60 / -75	2,000,000	44,995	759	207	0
Song Thrush	RED	-52 / -66	990,000	520,451	7,318	11,397	79
Spotted Flycatcher	RED	-78 / -78	120,000	83,949	1,530	405	7
Red-backed Shrike	RED	-87**	2	3,769	10	17	0
Tree Sparrow	RED	-87 / -76	110,000	210,658	3,002	716	1
Linnet	RED	-41 / -40*	520,000	340,717	5,630	1,870	18
Bullfinch	RED	-62 / -62	190,000	244,313	5,612	3,043	26
Cirl Bunting	RED	-83**	380	888	16	6	0
Reed Bunting	RED	-64 / -40	220,000	314,499	7,425	2,045	52
Corn Bunting	RED	-74	19,800	12,678	614	83	0
Swallow	AMBER	+20 / +26*	570,000	1,282,972	30,078	8,455	134
Dunnock	AMBER	-31 / -40	2,000,000	577,333	17,199	5,048	96
Blackbird	AMBER	-33 / -31	4,400,000	1,454,591	25,173	49,073	562
Starling	AMBER	-45 / -32	1,100,000	1,192,667	18,191	37,447	346
Goldfinch	AMBER	+2 / +18*	220,000	141,064	4,580	1,176	18
Yellow Wagtail	GREEN	-25*	50,000	69,022	676	485	0
Pied Wagtail	GREEN	+5 / 0	300,000	214,579	5,085	3,633	38
Wren	GREEN	+4 / +4	7,100,000	374,016	18,273	1,495	53
Robin	GREEN	+21 / +17	4,200,000	641,425	22,666	8,370	15
Mistle Thrush	GREEN	-34 / -48*	230,000	41,308	702	1,273	8
Lesser Whitethroat	GREEN	-3 / -24	80,000	89,107	3,663	410	14
Whitethroat	GREEN	+83 / +105	660,000	255,240	14,457	872	47
Blue Tit	GREEN	+28 / +23	3,300,000	2,277,767	89,512	18,218	333
Great Tit	GREEN	+22 / +32	1,600,000	1,004,263	43,879	7,494	181
House Sparrow	GREEN	-64*	2,600,000	395,815	7,522	5,999	28
Chaffinch	GREEN	+25 / +27	5,400,000	780,249	36,859	5,623	169
Yellowhammer	GREEN	-60 / -37*	1,200,000	126,166	3,955	649	15

+ First figure is % change on all Common Birds Census plots. Second figure is farmland plots only.

* Species would currently merit a change in conservation status if RSPB (1996) listing was revised. Linnet to AMBER; Swallow to GREEN; Goldfinch to GREEN; Yellow Wagtail to AMBER; Mistle Thrush to AMBER; House Sparrow to RED; Yellowhammer to RED.

** Species too rare for CBC estimate of population decline. Figure represents decline in breeding range recorded by Gibbons *et al.* (1993).

Therefore, ringing outside the breeding season would be likely to target British breeding birds, and increased ringing effort on these species would have great potential to increase our understanding of their survival rates, fattening strategies and physical condition, winter movements, seasonal variation in habitat use, and location of wintering areas relative to breeding sites.

In this paper, we suggest ways to improve the ability of ringing to deliver data relevant to conservation objectives. We focus on the non-breeding season, although some of our ideas apply equally to ringing during the breeding season. We take the severe and continuing declines of populations of farmland passerines in Britain (Fuller *et al.* 1995, Siriwardena *et al.* 1998b) as an example of a pressing case for the application of these ideas, although we would emphasise that this does not imply that we believe that all future developments of ringing outside the breeding season should focus on agricultural habitats. We envisage these ideas as a contribution to moulding a Ringing Scheme that will service the needs of conservation practitioners well into the 21st Century, and help to obviate any future necessity for the 'emergency' targeting measures that are currently needed for the conservation of farmland bird populations.

HOW THE RINGING SCHEME CONTRIBUTES TO CONSERVATION: A CONCEPTUAL MODEL

Before considering how the contribution to conservation of passerine ringing outside the breeding season might be increased, it is important to understand how the current contribution is delivered. Fig 1 presents a schematic 'hydraulic' model of the routes via which ringing contributes to conservation. The overall data source derived from ringing (Step 1 in the model) relies on highly trained volunteers who pay for their own equipment, travel and rings, and contribute data to the British and Irish Ringing Scheme administered by the BTO. A much smaller number of ringers are also active as professionals within academic institutions, and statutory and non-governmental research and conservation bodies. The level of data generation is maintained by a training process (2), itself conducted voluntarily by experienced ringers, and a licensing process also administered by the BTO.

Most ringing effort contributes directly to the body of scientific knowledge via data analyses represented by the dotted line (3), although there is currently some wastage of effort (4) for the reasons discussed in this paper. Within the pool of scientific knowledge there are subsets of information; general knowledge (5) and conservation ('applied') knowledge (6).

The subset of general ornithological knowledge contains data on demography and movements that accrue from general ringing and also information on plumage, condition and behaviour from detailed studies. It is fed directly from ringing data, including dedicated projects run by academic and other research institutions (7). There is a widely held misconception that all the information in this subset is equally valuable to conservationists. This is not the case, although most of the data are *potentially* useful. When developing conservation plans, biologists need answers to specific questions about, for example, the origins of populations, site fidelity, habitat requirements, dispersal capability, and the importance of stop-over sites, for those species of greatest conservation concern. Data for species not of current conservation concern may, of course, be of value in the future. How many would have predicted 20 years ago that ringing data for House Sparrows would now be sought after by conservation biologists seeking to understand the causes of the recent decline of this species (Siriwardena *et al* in press)?

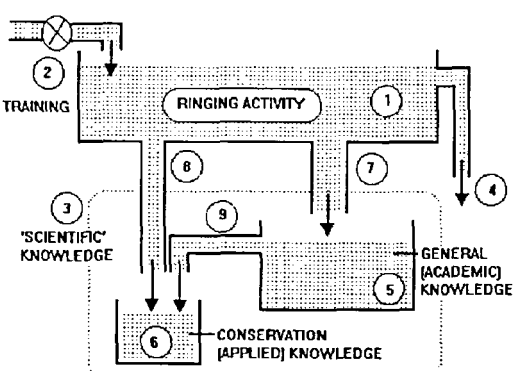

Figure 1. Hydraulic model of the contribution of information from the Ringing Scheme to conservation (see text for details).

There is a smaller subset of information (6) which contributes directly to conservation. It is currently fed primarily by dedicated projects undertaken by conservation bodies, universities, other research institutes and volunteers (8). It is also fed *via* the general knowledge subset (9).

The theme of this paper is how to increase the contribution of the Ringing Scheme to bird conservation so, in the terms of this model, how can we increase the flow of data into this 'conservation' data set?

INCREASING THE CONSERVATION VALUE OF RINGING OUTSIDE THE BREEDING SEASON

From the model, we can identify two general routes to achieving this aim within the constraints of the current resource levels within the ringing scheme.

1 Reducing 'wastage' of ringing effort (point 4 in Fig 1)

Many data currently collected by ringers are not collated centrally and either sit unused in notebooks or are used only in local studies and analyses by individuals or ringing groups. Prime examples of this wastage are local recapture data and biometric data, both of which have potentially valuable applications for conservationists if collated nationally. The current computerisation of all recovery data, and new ringing data, by the BTO make it possible to store all local recapture data and biometric data, and ringers should be encouraged to submit such data, for the reasons explained below.

Some 'wastage' occurs because ringers leave the Scheme or reduce their contributions. Perhaps some of this is due to a loss of motivation resulting from a lack of guidance on worthwhile projects. Provision of better guidance (as suggested in many of the papers in the current workshop) might help to reduce such 'wastage'.

2 Increasing the flow of conservation-relevant information from ringing (points 7 & 8 in Fig 1). Note that Peach *et al.* (this volume) consider the same problem from the perspective of breeding season ringing

There are huge differences in the availability of ringing data across passerine species (Table 1). In general, these differences do not reflect conservation priorities; they reflect the continued ringing of large numbers of species whose conservation status is currently secure at the expense of some species which are in rapid decline. We recognise the imperative of long-term monitoring and thus the need to ring adequate samples of as many species as possible annually. However, some redistribution of ringing effort between species and habitats is clearly desirable in order to increase the extent to which ringing data collection can address bird conservation issues in the UK. For example, Peach *et al.* (this volume) consider 30 ringing recoveries annually to be the minimum necessary for adequate monitoring of annual variation in survival rates. Table 1 shows that this is achieved for only two (Song Thrush *Turdus philomelos* and Reed Bunting *Emberiza schoeniclus*) of the eight red-listed farmland bird species that remain widespread in the UK and are amenable to study by ringing, whilst there is an abundance of data for secure species, such as Blue Tit *Parus caeruleus*, Great Tit *Parus major* and Chaffinch *Fringilla coelebs*. Species listed as secure in 1996, but which are now showing evidence of rapid population decline (eg Yellow Wagtail *Motacilla flava*, House Sparrow and Yellowhammer - Siriwardena *et al* 1998b) are also currently being ringed in insufficient numbers to allow survival rate monitoring with a desirable level of precision.

The flow of conservation-relevant information might also be increased by making more use of existing data. Encouraging and supporting volunteer ringers to analyse and publish more of their own data could contribute here, particularly at a local level.

Although it is important to consider the distribution of ringing effort in relation to conservation need, and to ensure central computerisation of data, it is equally important to ensure that the most important data are collected by ringers. Here we consider three conservation purposes towards which ringing data collected outside the breeding season can contribute: i) estimation of survival rates, ii) improving understanding of movements and habitat use, and iii) improving understanding of seasonal patterns of physical condition and diet.

Survival Rate Estimation

Currently, survival rates are estimated from the recovery of dead birds ringed during a defined breeding season period (Peach *et al.* this volume). This allows survival rates to be estimated between the mid-points of successive breeding seasons, carrying the additional advantages that most birds can be aged reliably at the time of ringing (ie breeding adult or hatched during the current breeding season), and that the population for which survival is being estimated is a well-defined breeding population. However, recovery sample sizes are often small for passerines (typically less than 1% of birds ringed for species smaller than thrushes or Starlings *Sturnus vulgaris* - Baillie 1993), thus limiting the power to detect temporal trends. This is particularly so where data on the numbers of birds initially ringed are unavailable (Aebischer 1987, Anderson & Burnham 1987); this weakness applies to the majority of data within the British and Irish Ringing Scheme because of the historical impracticality of computerising them. Methods are being developed, however, which permit determination of survival rates from combined data sets of recoveries of dead birds and recaptures of live ringed birds (Mardekian & McDonald 1981, Baillie & McCulloch 1993). Since most passerine ringers obtain high recapture rates of locally ringed birds, the potential for increase in the data available for survival rate estimation is huge. Given that future computerisation of ringing, recovery and recapture data by the BTO will make more powerful analyses of all these data possible, the ability to make use of recapture data for survival rate estimation will become the single largest increase in the conservation value of ringing data in the near future. Recapture data from both within and outside the breeding season will contribute to this.

It is equally possible to consider monitoring the annual survival rates of birds between defined *non*-breeding season periods. In many cases, the population for which survival is being monitored may be less well defined than during the breeding season, consisting of an unknown mix of locally resident birds, winter immigrants and transients. This might make it difficult to judge the appropriate nature and location of research or conservation actions in response to a decline in the observed survival rate. For example, the ringing of Song Thrushes or Starlings outside the breeding season might encounter this problem. Examples of the monitoring of survival rates based on a 'winter' ringing period for site faithful wintering populations of wildfowl do exist however (eg for Pink-footed Goose *Anser brachyrhynhcus* and Teal *Anas crecca* - Gitay *et al.* 1990a, Gitay *et al.* 1990b), and this approach might be extended to winter populations of more sedentary passerines such as Yellowhammer, Corn Bunting and House Sparrow.

An alternative approach to the estimation of survival rates depends solely upon ring-recapture and/or ring-resighting data (eg of colour-ringed birds) and involves the application of open population models parameterised in terms of survival and recapture rates (Pollock *et al.* 1990, Lebreton *et al.* 1992). These techniques are used with CES data, collected during the breeding season, to estimate annual *adult* survival rates (Peach *et al.* this volume). However, as permanent emigration cannot be distinguished from mortality using these methods, the resultant survival rates will tend to be minimum estimates of true survival, and are likely to be most accurate for those passerines that show strong site-fidelity between breeding seasons. The high rates of natal dispersal of first-year birds (Greenwood & Harvey 1982) make such methods inappropriate for this age class, and, generally, the survival rates of these birds must be estimated using recoveries of dead birds (as outlined above). The estimation of survival rates of passerine birds, either within or between non-breeding season periods, presents similar difficulties because of the dispersive behaviour shown by many species. Nonetheless, for localised or isolated populations that are predictably associated with particular habitats or locations, it may be possible for ring-recapture or colour-ring-resighting studies to produce good estimates of survival rates using these methods. Suitable species include Reed Buntings or Corn Buntings using a particular set of reed-bed roost locations (eg Fennell & Stone 1976), a House Sparrow population associated with an individual farm, or a Dipper (*Cinclus cinclus*) population associated with an isolated river catchment. Such techniques were used recently to measure survival rates in isolated House

Sparrow populations inhabiting islands off the Norwegian coast (Ringsby *et al.* 1998).

Movements and Habitat Use

Even for non-migratory passerines, flocking and nomadism are characteristic of the non-breeding season, when many species exhibit reduced territorial behaviour and roam widely in search of food. Certainly many of the declining, granivorous passerines of agricultural habitats exhibit this behaviour, but seasonal patterns of movement and habitat use of most species remain very poorly understood. Although the long-term accumulation of ring-recovery data can give insights into directions, distances and seasonal patterns of movement of these species at large spatial scales (eg Skylark - Dougall 1996), the rapid collection of data through intensive ring-recapture or ring-resighting studies has the potential to offer much more detailed insights into the seasonal variation in movements and habitat use of individuals within local populations. Such data would never be as detailed as those amassed by radio telemetry studies but would be cheaper to collect, would involve much larger samples of individuals and, for those species accessible to many ringers, could be replicated at many sites around the country. For any given species, the establishment of ringing in a number of sites representative of the main habitat types used would be important. For example, a study of Chaffinches might focus on farmyards, gardens, and deciduous woodland, whilst a study of Corn Buntings might focus on a variety of farmland seed sources (eg grain stores, stubble fields) and local reed-bed roost sites. Secondly, representative sites of all these habitats would need to be established wherever possible within a standard unit of area, at the smallest a 1km square, and at the largest a 10km square. This constraint arises simply because all the objectives outlined above make use of local recapture data, thus making local clusters of ringing sites essential. 'Ringing squares' of this nature could be established around the country for particular species of interest, wherever individual ringers or groups are able to establish suitable sites. Ringing at these sites could not easily be undertaken using standard CES methods, since different capture techniques may be necessary in different habitats. Nonetheless, seasonal trends in capture rates within habitats, coupled with data from recaptures of ringed birds, would be sufficient to improve our understanding of seasonal changes in the use of particular sites or habitats and patterns of movement between them.

Physical Condition and Diet

Fat and muscle scores (eg Gosler 1991), and measures of physical condition derived from standard biometrics (eg Gosler *et al.* 1995) may be important correlates of survival probabilities, varying seasonally and in relation to habitat and weather; they should be collected by all ringers of passerines outside the breeding season. Some assistance from the BTO may be necessary to provide documentation to assist in standardising muscle and fat scoring across the ringing community. Weather data will also be needed in order to standardise condition indices (eg Gosler *et al.* 1995). While the most appropriate data would come from the capture sites themselves, it may be unrealistic to expect this and Meteorological Office data may need to be used. Currently, many of the passerines ringed in winter are caught at feeder sites, and it is likely that this would also be the case if there was a shift in emphasis towards ringing in habitats such as farmland and woodland. The use of artificial food for baiting might bias data collected in pursuit of the objectives outlined above. Consequently, the development of standardised baiting regimes, as far as possible, and of methods for ringers to submit quantitative information on any baiting used will be important.

Many individual birds excrete a faecal sample during capture and handling for ringing. Whether the predominant foods are invertebrates or plant material, microscopic examination of the contents of faeces usually makes it possible to obtain at least a qualitative description of the diet composition of the bird (Moreby 1987, Eybert & Constant 1992, Poulsen & Aebischer 1995). For most species, a knowledge of the diet, particularly the extent to which it varies seasonally, geographically and between individuals, is scanty (Wilson *et al.* 1996), despite the increasing evidence that environmental change may often cause

population declines via effects on avian food supply (Campbell *et al.* 1997). The collection and storage of faecal samples by ringers could provide a cost-effective means of improving our understanding of the range and variation in the diets of species of conservation concern; this would require collaboration with a professional institution with the laboratory facilities needed to carry out analysis of large numbers of such samples.

Addressing needs - the establishment of habitat-based study groups

Several routes to increasing the contribution to conservation objectives of ringing outside the breeding season are explored above. It is amongst farmland birds that these data are currently most needed. Since the start of monitoring schemes, such as the Common Birds Census, population declines have been more prevalent amongst farmland birds than amongst species characteristic of other habitats (Fuller *et al.* 1995, Siriwardena *et al.* 1998b), and bird population declines are more widespread in farmland habitats than any other, at a European scale (Tucker & Heath 1994, Tucker & Evans 1997). As a consequence, many declining species are now the subject of intensive field research and survey (eg Potts 1986, Evans *et al.* 1997, Donald & Aebischer 1997, Wilson *et al.* 1997). Overall, these studies suggest that the majority of the declines we are witnessing in farmland passerine populations are the direct result of changes in agricultural practices. Such knowledge can be used to develop advisory measures that may benefit individual species if adopted by farmers (Dodds *et al.* 1995). However, for these to form the core of a successful species recovery programme, it is essential that they are based on an understanding of the demographic factors causing the decline. For example, recent analyses of trends in survival for farmland bird species using ring-recovery data suggest that for some species (eg Goldfinch *Carduelis carduelis*, House Sparrow and Yellowhammer), changes in survival rate are likely to be driving population trends, whereas for others (eg Linnet, Bullfinch *Pyrrhula pyrrhula*) measures to increase survival are unlikely to result in population increase since breeding numbers may be limited elsewhere in the life cycle (Siriwardena *et al.* 1998a, 1999). Some of the measures discussed above can be used to improve the availability of monitoring data to refine such analyses. However, this shift in the balance of ringing activity will also require that certain problems are discussed and solved if it is to be achieved; these include the low capture rates in farmland habitats, difficulties in capturing certain species (eg Skylark), and the need to disseminate information to ringers about developments in methodology for ringing on farmland.

A Farmland Bird Study Group (FBSG), composed of representatives from the volunteer ringing community, the BTO, the RSPB, statutory conservation agencies, university research groups, agricultural research groups, such as the agricultural colleges, and the Farming and Wildlife Advisory Group (FWAG), would provide an ideal forum for the development of projects to provide the necessary demographic data on farmland passerine populations. Such a group could also help to disseminate expertise in catching passerines in farmland habitats, and access problems might be reduced by working under the auspices of a recognised study group. The idea of specialised study groups is certainly not a new one, but the evident success of existing examples such as the Wader Study Group and Raptor Study Groups suggest that this may be an excellent approach to the farmland bird problem. The most important aspects of a Farmland Bird Study Group are listed below.

1 Combining the experience, views and aspirations of both conservation bodies and ringers at the earliest stages of gestation of such a group will be essential so that each can understand the aims, needs and limitations of the others.
2 The participation of non-ringing volunteer birdwatchers is highly desirable. Some projects may make use of colour-marks that enable individual birds to be identified in the field without recapture. The generation of data then depends on time spent searching for colour-marked birds. Clearly, such projects would benefit if, where possible, non-ringers could conduct these searches, leaving ringers more time to make the most of their skills. Such collaborations would have the added benefit of advertising the value of ringing both to

birdwatchers in general and to a wider pool of potential new ringers.

3 The co-ordination of such a Group would best be achieved by a full-time Ringing Projects Officer, employed at the BTO, who would be responsible for the implementation and analysis of data from the pilot schemes and finalised projects devised by the Group, along with other projects within the Ringing Scheme.

4 Effective feedback to all participating groups from their representatives in the FBSG will be essential if the Group is to succeed. It will also be important to ensure that ringers are kept aware of the focus of the projects within the group (as these evolve over time). The recent restructuring of ring pricing by the BTO in order to subsidise the ringing of species of high conservation priority (Clark *et al.* 1998) provides one example of a flexible means of achieving this aim.

USE OF BRITAIN AND IRELAND BY PASSERINES FROM ABROAD

The proposals discussed above are all designed to provide important information, which is currently lacking, about the ecology of passerines outside the breeding season, but within Britain and Ireland. Of course, the ringing of migrant birds as they enter or leave the country has been a key element of ringing activity in Britain, notably at coastal Observatories but also at many inland sites. Such ringing will continue to have utility in improving our understanding of the migration routes of birds, and the impact of weather conditions on migratory behaviour and orientation. In particular, publication of the BTO *Migration Atlas* will, in due course, provide guidance in identifying those species and stages of the life cycle for which knowledge of movements is currently poor, and to which ringing effort should be directed. In addition, for species where the British Isles harbour large numbers of wintering birds from other European states (eg thrushes *Turdus* species, Meadow Pipit *Anthus pratensis*), the collection of ringing and biometric data from inbound migrants can help greatly in allowing us to understand their subsequent movements, wintering locations and habitat use. For species where resident and immigrant populations occur together in the British Isles in winter (eg Chaffinch), ringing and biometric studies have already helped us to understand differences in the habitat use of populations with different origins (eg Newton 1967, Swann 1988). The detailed discussion of the future of ringing studies on migrating birds in the British Isles is deserving of a full paper in its own right and is beyond the scope of this discussion. Here, we focus on the many species breeding in Britain which winter elsewhere (eg Ireland, southern Europe and Africa) and whose ecology is little known in their wintering quarters.

DEVELOPMENT OF STUDIES OF THE ECOLOGY OF UK PASSERINES ABROAD

Improving our understanding of the ecology of species using such wintering grounds may be necessary in order to understand their population dynamics fully. Perhaps the best-known case is that of the Sedge Warbler (*Acrocephalus schoenobaenus*), in which annual variation in the size of the breeding population in the UK is best explained by the effect of variation in winter rainfall in the Sahel of West Africa on overwinter survival (Peach *et al.* 1991). Despite the clear imperative that we understand the winter ecology of such birds, even the wintering quarters of most populations of trans-Saharan migrants are not known precisely. Clearly there is great scope to advance our knowledge in this area and recent developments, such as the ringing expeditions to Senegambia (eg Stoate & Moreby 1995), the development of migration network stations in Africa (Bairlein 1994), and census expeditions to the Nigerian Sahel (Jones *et al.* 1996), are most encouraging. Whilst we recognise that funding for project organisation direct from the BTO might not be possible, we would urge strongly that every assistance is given to help British and Irish ringers to collaborate with local research communities to study Palearctic migrants in their wintering quarters. Again, extension of the principles of applying standardised ringing methods in several habitats at nearby sites, recording biometrics on size, condition and moult, and reporting recaptures could yield much valuable information on winter habitat-use, movements and the geographical origins of wintering populations.

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