Breeding Skylark 1997

Title
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Description and Summary of Results
(Note: a survey of wintering Skylarks was carried out in the winter following this breeding survey; the two surveys are closely related.)
The number of Skylarks *Alauda arvensis* in Britain declined sharply (55%) between about 1975 and 1994, particularly in agricultural habitats. Within farmland alone this meant a loss of approximately three million breeding birds. Most evidence indicated that the decline was caused by widespread changes in agricultural practices in Britain, with the simplification of crop rotations, the increased use of pesticides, more intensive grassland management and a shift from spring- to autumn-sown cereals all being suggested specifically. Similar declines were recorded for a range of other farmland birds at the same time and several species also underwent marked range contractions (eg Grey Partridge *Perdix perdix*, Tree Sparrow *Passer montanus* and Corn Bunting *Emberiza calandra*).
In contrast to these latter, the decline in Skylark numbers was accompanied only by a relatively small (<5%) reduction in range, and the species remained widespread in most open country habitats throughout Britain and Ireland. Most initial research focused on farmland populations, and comparatively little was known about habitat selection or trends in numbers elsewhere in Britain, particularly the large upland populations.
The first national survey of breeding Skylarks in Britain was therefore undertaken in the breeding season of 1997, aiming to produce a population estimate and to investigate regional and habitat related patterns in distribution and abundance. For this, a random selection of 1-km squares was used with the selection stratified by landscape category.
In the event 608 1-km squares were surveyed representing a wide geographic spread across Britain. Within these squares, 47% were visited four times in the breeding season and 64% at least three times. A small number of arable (17%) and pastoral (13%) squares were only visited once, but quite a large proportion of marginal upland (37%) and upland (49%) squares only received single visits.
Overall, there was a significant difference between the proportion of different habitat types selected and those actually covered, with marginal upland habitats over-represented and upland habitats under-represented in the sample as a whole. Estimating the national population size was therefore done by adding estimates from individual landscape types to avoid any biases.
The majority of the Skylark population was associated with arable landscapes, accounting for around 40% of the squares surveyed but 45% of the mean and 49% of the maximum estimated national population -- equated to a mean density of 4.55 pairs per 1-km square and a maximum of 5.97 pairs per 1-km square. Lowest densities were recorded in the uplands: a mean and maximum of 2.46 and 2.69 pairs per 1-km square. As a large number of upland and marginal upland squares were only visited once the upland density and therefore population size may have been underestimated -- mean density on upland and marginal upland squares visited once (2.92) was less than on squares visited more than

once (3.13). Summing the population estimates for the four landscape types resulted in a mean national Skylark population of 800541 pairs (95% confidence limits 737783 - 861321) and a maximum of 1002651 (95% cl 925130 - 1077675).
Mean density was determined for 27 habitat types. The lowest densities occurred in suburban land, woodland, all types of grazed pasture and winter cereals, and the highest included set-aside, chalk downland, coastal and moorland habitats. Set-aside and chalk downland had the highest preference indices, with legumes and spring cereals the highest of the crop types considered. Winter cereals, one of the more common nesting habitats for Skylarks, was neither preferred nor avoided, although it held the largest proportion of the population in England and Wales. Improved grassland held the second largest population, despite occupying by far the largest area, indicating the relative unsuitability of this habitat. Set-aside covered only 3% of farmland area, but held almost 10% of the population.

Methods of Data Capture

The sampling units used for the survey were 1-km Ordnance Survey grid squares, and a total of 1000 squares was selected and assigned to volunteer fieldworkers who undertook to survey one or more in the summer of 1997. (See Notes on Survey Design for the rationale for selecting squares.)
Observers were asked to visit their square four times, evenly spread between mid-April and mid-June. The locations of all singing Skylarks were mapped onto the recording form. Observers were not required to walk across areas of suitable habitat in order to flush birds, but were asked to use access roads and tracks (or tractor tramlines if no access routes were available) to ensure that the entire square was surveyed. Only singing birds were recorded. Volunteers were requested to carry out the surveys early in the morning, where possible within two hours of sunrise. Volunteers were also advised to take approximately two hours to survey a square and to vary the starting point of the route between visits to avoid bias due to time of day, and to avoid surveying in poor weather.
Detailed habitat information was collected for each square. Squares were divided into distinct habitat patches, defined as areas greater than 20m square within which the habitat or land-use was relatively uniform. These patches were allocated a code to describe the vegetation and land-use, using the standardized (Crick) habitat coding system used for a range of BTO surveys, but which was modified slightly to include more detail on farmland habitats. In addition grazing pressure, whether by rabbits, deer or livestock, was also recorded in all open habitats as either light (producing an even sward with an average height of greater than 10cm) or heavy (producing a much shorter sward with an average height of less than 10cm).

Purpose of Data Capture

The aims of the survey were to produce a reliable population estimate against which future estimates could be compared, and to investigate regional and habitat related patterns in distribution and abundance.

Geographic Coverage
All of Britain. Just over 600 randomly-selected 1-km squares were covered from an original selection of 1000. The 1000 were selected randomly but stratified as to landscape type.

Temporal Coverage
The breeding season of 1997 with a pilot survey in 1996. Four visits were requested, evenly spaced between mid-April and mid-June.

Other Interested parties
The survey was funded primarily by the BTO's Save Our Skylarks Appeal to which many people contributed. Some other funding came from Tesco and the Royal Society for the Protection of Birds.

Organiser(s)
Stephen Browne

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Publications
The main report of the survey is:
Browne S., Vickery J. & Chamberlain D. 2000. Densities and population estimates of breeding Skylarks *Alauda arvensis* in Britain in 1997. *Bird Study* 47: 52-65.
The survey was noticed in *BTO News* numbers 207 and 218.

Available from NBN?
No.

Computer data -- location
BTO Windows network central area.

Computer data -- outline contents
An MSAccess database and Excel spreadsheet containing the data. One line per patch with visit dates and counts.

Computer data -- description of contents

The spreadsheet has 2 sheets with the format:

Grid Reference (1-km square); patch number; visit date A; visit date B; visit date C; visit date D; count on A; count on B; count on C; count on D; grazing pressure (0-9); habitat code (Crick system); patch area.

Contains 6420 lines for the 608 squares surveyed.

The other sheet simply lists the 1-km squares surveyed (608).

Information held in BTO Archives

1 Transfer Case containing reports and papers. The data sheets and cards were destroyed after they had been input as there was no extra information.

Notes on Access and Use

Other information needed

Notes on Survey Design

Until the time of this survey, many recent single species surveys in the UK had used random site selection throughout Britain (eg Rook *Corvus frugilegus* in 1996), semi-random site selection throughout England and Wales (eg Lapwing *Vanellus vanellus* in 1987), or semi-random site selection in the species range (eg Corn Bunting *Emberiza calandra* 1993). This Skylark survey was the first single species survey where survey sites were randomly selected throughout Britain but stratified by landscape type.

Skylarks are found in most open habitats throughout the UK. The practicalities and costs of surveying a tetrad in every 10-km square (approximately 2700 in Britain) would have been impossible -- the 1987 Lapwing survey covered only England and Wales, a total of 1713 10-km squares and many were clearly unsuitable and did not actually need to be surveyed. Similarly, because the species is so widespread, limiting the chosen squares to those in the species range as documented in the 1988-1991 Breeding Atlas would not have reduced the number much. A total of 1000 1-km grid squares was considered a reasonable number for volunteers to cover and these were selected using randomized stratified sampling from the National Grid.

Although Skylarks are present throughout Britain, the distribution as documented in the atlas suggested densities varied markedly with landscape type. For this reason, squares selected were stratified using the Institute of Terrestrial Ecology's (ITE) Landscape Classification such that each of four broad landscape types (arable, pastoral, marginal upland and upland) was represented in the final sample in the same proportion as they are found at the national level. Landscape types are defined by a number of factors, including predominant vegetation types, geology, topography, soil type and climate.

The most important advantage of this approach is that it avoided over- or underestimating the population of a species by sampling a disproportionately high number of squares from one particular habitat type. It also overcame difficulties of a common bias in coverage by volunteers towards the more densely inhabited regions of the south and east of Britain.

Thus fieldwork effort was targeted more effectively and national population sizes could be estimated more accurately.
To check the efficacy of this new stratification method a national population estimate was also derived from summing population estimates for the different Nomenclature of Terrestrial Units for Statistics (NUTS) regions but it was not significantly different. The estimate was also compared with national estimates derived from the 1988-1991 Breeding Atlas and the Breeding Bird Survey, both of which use different sample site selection processes and field methodologies. The BBS estimate of 1 million pairs was the same as the maximum estimated by the Skylark Survey, but the figure was about half that from the 1988-1991 Breeding Atlas. However, the scale of this discrepancy was likely to reflect primarily a bias in Atlas field methodology and site selection since there had been a real decline of approximately 9% since 1990.

Specific Issues for Analysis

Population estimates were calculated assuming that a singing Skylark represented a Skylark territory and that the birds are not polygynous. National population estimates derived from single species surveys are usually based on the mean number for a survey unit. However, for species that establish territories and breed late in the season (eg Corn Bunting), maximum counts have been shown to be more appropriate. Skylarks have multiple broods and breed from mid-April to mid-July, but the survey methodology, based upon observations of territorial activity (usually male song flights), may have resulted in marked variation in detectability through the season. Since territoriality varies with the stage of breeding, both mean and maximum population estimates were calculated.