Corn Bunting 1993

Title
Corn Bunting 1993
(Note: the survey was also variously known as the Farmland Buntings Survey but although Yellowhammer and Reed Bunting were recorded by fieldworkers no reports on the results from these species were ever produced.)

Description and Summary of Results
The Corn Bunting *Emberiza calandra* is one of a number of farmland birds which showed a marked decline in numbers and contraction in range in the British Isles after the mid-1970s. The decline was most severe in western and northern parts of Britain and in Ireland, and it also declined across much of its range in central and western Europe. By the early 1990s the species was virtually extinct in western Scotland, Wales, Ireland and southwestern counties of England, areas where it had been common or abundant at the start of the 20th Century.
More specifically by 1991 the BTO's Common Birds Census (CBC) index stood at less than a third of what it had been in 1970, although this might have underestimated the decline because of the southeasterly bias in the distribution of CBC plots. There was also a 35% decline in the number of occupied 10-km squares in Britain and Ireland between the two breeding atlases of 1968-1972 and 1988-1991.
Possible factors causing this decline included changes in the times of sowing and harvesting of both cereal and pasture crops, declines in the cultivated area of barley (particularly spring-sown varieties), increased pesticide usage and increasing regional specialization of farming leading to the loss of traditional rotations. However, little was known of the species' habitat requirements across Britain as a whole, and a number of intensive studies on local populations provided conflicting evidence. Hence the first national survey of breeding Corn Buntings in Britain was organized for the breeding season of 1993, aiming to produce a reliable population estimate, to collect information on the species' habitat requirements and to test some of the various hypotheses for the decline. The survey complemented a similar one of wintering Corn Buntings carried out during winter 1992/93.
In the 1993 survey 1305 completed cards were received, the majority of which were from randomly selected tetrads. Coverage was fairly even throughout the range of the Corn Bunting in Britain, although rather low in West Scotland, Wales and East Anglia. During a pilot survey in 1992, 360 tetrads in 11 counties were surveyed. Some of these were repeated in 1993 but those that were not (53) were included in the calculations of population estimates although not habitat selection.
Using the higher count of males where there was more than one count in a tetrad gave an estimated population of 19786 Corn Bunting territories in Britain with 95% confidence limits of about 20% either side. Corn Buntings were not recorded in any of the tetrads selected in 10-km squares in which birds had not been recorded in either Breeding Atlas. Regional populations were positively correlated with the overall areas of cereals and total tilled land in those regions, but not with the total area of farmland nor with the proportion of total tilled land made up by cereals. These suggested that the total area of tilled land is a more

important factor in determining population size than the total area of farmland or of cereals alone. It seems there is an optimal proportion of arable land to grassland. Furthermore tetrads in 10-km squares which had been abandoned by breeding Corn Buntings between the two Breeding Atlas periods were at higher altitudes and contained significantly more moorland, heathland and grassland and less farmland, particularly tilled land, than 10-km squares which retained Corn Buntings. Abandoned ones also held more walls and fewer hedges.
Although records of both Reed Bunting *Emberiza schoeniclus* and Yellowhammer *E. citrinella* were collected during the fieldwork no analyses or reports on these were ever produced.

Methods of Data Capture
The fieldwork unit was the tetrad (2 x 2-km square). These were selected in the same way as for the winter survey -- one was selected at random from each 10-km square in which Corn Buntings were recorded breeding in one or both of the Breeding Atlases (n=1466). In addition, local organizers were asked to select the tetrad which in their opinion was 'best' for Corn Buntings in each of the 921 10-km squares in which breeding birds were recorded during fieldwork for the 1988-91 Breeding Atlas. Results from this group of tetrads were not included in any analyses which might be biased by observer choice. A further 150 tetrads were selected at random from 10-km squares in which Corn Buntings were not recorded breeding during either Breeding Atlas fieldwork period.
Two visits to chosen tetrads were undertaken, one during May and one during June 1993. On each visit, observers were asked to note the numbers of male and female Corn Buntings, as well as birds which could not be sexed, and to mark the position of all birds on a map. Twenty evenly spaced habitat recording points were marked on the map, and at each point the habitat was recorded using a set of descriptive codes adapted from those used by many BTO surveys. (The codes differed from the standard by compressing non-farmland habitats into fewer classes, and expanding farmland codes to include categories for different cereal and grassland types, stubble and rotational setaside.) Observers also noted the presence and type of field boundaries which lay within 100m of each of the 20 habitat sampling points.
Observers were asked to record Reed Buntings and Yellowhammers in the same way (partly as it was thought that Corn Buntings might be only rarely recorded). The data are stored but were never analysed.

Purpose of Data Capture
The survey aimed: 1) to produce a reliable population estimate, 2) to collect information on the species' habitat requirements and 3) to test some of the various hypotheses for decline.

Geographic Coverage
All of Britain and the survey covered randomly selected tetrads across the range recorded by the two breeding atlases, with a stratification based on whether the bird was recorded in both atlases, in one and not the other or not at all (some of these last were included to confirm absence).

Temporal Coverage
The breeding season of 1993 with one visit requested in May and a second in June to each selected tetrad. Some data from the 1992 pilot survey were also used in the calculation of population estimates.

Other Interested parties
The survey was funded jointly by the BTO and the Joint Nature Conservation Committee (JNCC) on behalf of English Nature (now Natural England), Scottish Natural Heritage and the Countryside Council for Wales (now Natural Resources Wales).

Organiser(s)
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Publications
The main report of the survey is:
Donald, P.F. & Evans, A.D. 1995. Habitat selection and population size of Corn Buntings *Miliaria calandra* breeding in Britain in 1993. *Bird Study* 42: 190-204.
A report on the other bunting species was promised (in *BTO News* 192) but it was never completed.
The survey was noticed in *BTO News* numbers 185 and 192.

Available from NBN?
No.

Computer data -- location
BTO Windows network central area.

Computer data -- outline contents
The raw count data and habitat data are stored in an ASCII file.

Computer data -- description of contents
Data files from both the 1992 pilot and the full 1993 breeding survey of Corn Buntings. Yellowhammers and Reed Buntings are included.

1993 Bunting Survey data.txt is the raw data set of the full survey. Each tetrad record has 7 lines.
Line 1: cols 1-2 county (2 letter code), 3-7 10-km grid square and tetrad letter (eg SE23H), 8-10 altitude of highest point in tetrad (m), 11-12 (13) tetrad codes (first letter R=randomly-selected, B=a selected 'best' tetrad, blank=?; second letter B=present in both breeding atlases, O=present only in first, N=present only in second, .=?; P in col 13 refers to tetrads surveyed outside the atlas range of the Corn Bunting. Note: it must be remembered at all times that data for the other two species have been collected only within the range of the Corn Bunting except in the ca. 200 cards marked P.
Lines 2-5: habitat data from 5 points in each of the constituent 1-km squares. Five habitat codes (as 3 cols and a space) (as on the back of the recording cards) and five field boundary codes (as single col code and a space) (also as on the cards) are given in each.
Lines 6-7: dates of each count (as DDMMYY), numbers of male, female and unsexed corn buntings, male, female and unsexed reed buntings and male, female and unsexed yellowhammers, each as 2 columns.
1992 Pilot Survey data.txt is data from the 1992 pilot survey, with the same format as FULL.DAT but only has information on Corn Buntings.
OUTPUT and OUTPUT.PILOT are copies of the raw data files such that all data for each tetrad are on one line.
CBSURVEY is a list of all 10-km squares included in the survey together with counties (BTO regions) and patterns of occupancy in the breeding atlases.
CBBOOTS.SAS is a program to bootstrap 95% limits for the population estimates.

Information held in BTO Archives

2 Transfer Cases contain the data cards and information from the 1993 survey; another 2 Transfer Cases contain data and letters from the 1992 Pilot Survey. All have been scanned.

Notes on Access and Use

Other information needed

Notes on Survey Design

Randomly selected tetrads were selected from 10-km squares. The squares were assigned to one of four categories of occupancy by breeding Corn Buntings from the two Breeding Atlases -- Corn Buntings recorded in both atlases, first only, second only or neither.
Local organizers were asked to give priority to surveying randomly selected tetrads rather than the chosen 'best' tetrads, and if a shortage of observers precluded coverage of all the randomly selected tetrads in their regions, they were asked to ensure that those which were surveyed were selected without bias.

Specific Issues for Analysis

Of all land-based randomly selected tetrads 65.4% were surveyed in one or both years (61.1% in 1993 alone), in 93% of which both visits were completed.
Several possible measures of population size were available. The higher of the two counts of males was considered likely to yield the most accurate. An analysis of all randomly selected tetrads which were visited once in May and once in June and recorded Corn Buntings on at least one visit showed that June counts of males were significantly higher than May counts, reflecting the very late breeding season of this species.

A slightly lower estimate of 16716 territories (with 95% confidence limits of 13306-20621) was calculated using the mean count of males recorded over the 2 visits (cf the 19786 from the higher count).

Population estimates were calculated for each of 11 regions separately in order to reduce any bias caused by geographical differences in abundance when extrapolating from tetrads which were covered. These regions followed the MAFF/DAFS standard statistical regions although, to avoid small sample sizes, Scotland had to be divided into two rather than four regions. Populations of birds in coastal (with at least some sea) and inland (with no sea) 10-km squares were calculated separately to take account of differences in Corn Bunting population density between coastal and inland sites. In many parts of Britain the species is confined to, or breeds at higher densities in, coastal areas.

Several assumptions had to be made during the calculation of regional population estimates:

1) that randomly selected tetrads were covered with no bias towards those perceived to be more likely to hold Corn Buntings. This assumption is likely to hold because, with tetrads being widely spaced, observers were likely to cover those near their own homes irrespective of the likelihood of finding Corn Buntings. Regional organizers were warned about the possibilities of systematic bias and asked to ensure that these tetrads were covered without.

2) that within a region there were no systematic differences in population densities between 10-km squares. The use of a relatively large number of regions and the calculation of separate estimates for coastal and inland squares and for different tetrad classes will have greatly reduced this potential bias.

3) that there was no systematic bias in observer ability or the detectability of birds between regions. The males' habit of delivering a far-carrying and easily recognized song from exposed songposts for prolonged periods combined with the requirement of two visits during the breeding season make it likely that most territorial males were recorded in most tetrads. A further assumption was that the same individual birds were not recorded in different tetrads. The probability of this occurring was very low as Corn Buntings are very sedentary during the breeding season and surveyed tetrads were usually widely separated.

Confidence limits for the national population estimate were derived using a random resampling method (bootstrapping). Within each of the 33 region/class categories, the original data set was resampled randomly with replacement, thereby allowing some observations to be included more than once and some, consequently, not at all. The simulated dataset had the same number of observations in each region/class category as the original data set. The national population suggested by this randomly reselected data set was calculated in exactly the same way as the true national population estimate. This process was repeated a total of 999 times and the twenty-fifth highest and lowest simulated national populations (ie the 2.5 percentiles) were taken as the upper and lower 95% confidence limits. This process was repeated for regional population estimates.

Data collected during the 1992 pilot survey were used to test the methods used during the main survey in 1993. They could not be included in analyses of habitat selection because of significant land-use changes between the 2 years resulting from the proliferation of rotational set-aside after the 1992 harvest. However, population data from those randomly selected tetrads covered in 1992 but not during the main survey (n=53) were used in the calculation of population estimates. This was considered justified because tetrads covered

in both years showed no significant population change and because the Common Birds Census index indicated no significant national population change between 1992 and 1993. Thirty-seven different land-use types and 8 field boundary types were considered. These were not mutually exclusive because, for example, a record of winter barley also contributed towards the farmland, tilled land, cereal, winter cereal and overall barley categories. If fewer than 20 habitat records were entered on a card, the numbers of completed records of each land-use type were scaled up in proportion, although over 90% of cards were completed fully. Cards with fewer than 10 completed habitat records were excluded from the analyses. The altitude of the highest point in each tetrad was extracted from maps.

Changes in distribution between 1968-1972 and 1988-1991 Breeding Atlas data and MAFF and DAFS agricultural statistics (converted to 10-km grid squares by the Edinburgh University Data Library) were used to analyse changes between 1969 and 1988 in the extent of a number of land-use types in all 10-km squares in which Corn Buntings were recorded breeding in one or both Breeding Atlas periods.