

Dispersed Waterbirds Survey

Title

Dispersed Waterbird Survey 2002/03

Description and Summary of Results

The main wetland sites are counted by the Wetland Bird Survey (WeBS) Core Counts -- monthly counts from most of the main sites both inland and along the coast -- and periodic WeBS surveys, eg the Non-estuarine Coastal Waterbird Survey (NeWS). These in turn provide the principal source of data for population estimates of the UK's non-breeding waterbirds, for assessing the international importance of UK wetland sites and the monitoring of long-term trends and waterbird distributions.

The wider countryside is sampled to some extent by WeBS Core Counts, but the sample has not been randomly selected and any resulting biases need to be investigated. Such biases are likely to be large because the selection of count sites has traditionally been made by volunteers who have offered to count specific locations that have generally been chosen because they are 'good for waterbirds'. Furthermore, it is not clear what proportion of the species recorded occurs on such other habitats because the proportional coverage of these habitats within the UK has not been quantified.

There are also a number of systematic biases to WeBS data that affect the accuracy of national population estimates for individual species. These relate, in particular, to incomplete coverage (missing counts; not all sites are covered) and the distribution patterns of individual species. In particular, the coverage of widely dispersed species (such as Little Grebe *Tachybaptus ruficollis*, Mute Swan *Cygnus olor*, Mallard *Anas platyrhynchos* and Tufted Duck *Aythya fuligula*) is likely to be under-represented in the Core Counts given the concentration of efforts towards estuarine habitats and large, standing waterbodies. For several such species, low numbers occur at many smaller sites and, indeed, the combined total numbers at such may exceed those on sites that individually contain larger numbers of individuals. Hence a substantial proportion of national totals could be excluded from WeBS Core Counts and from the resultant national population estimates.

The Dispersed Waterbirds Survey (DWS) was set up to provide estimates of the numbers and to improve overall population estimates of waterbirds across the wider countryside away from the main sites. The DWS was particularly aimed at the species listed above and such as Grey Heron *Ardea cinerea*, Moorhen *Gallinula chloropus*, Teal *Anas crecca*, Lapwing *Vanellus vanellus*, Golden Plover *Pluvialis apricaria* and perhaps Snipe *Gallinago gallinago* which are often found dispersed across habitats such as ditches, ponds and flooded fields, none of which are well monitored by WeBS surveys.

During December 2000 and January 2001 a pilot survey was conducted to test the chosen quadrat (1-km square) sampling methodology and, if possible, to assess for which species reliable and useful results might be expected. The winter of 2000/2001 was exceptionally wet and the associated widespread flooding may have had consequences for the distributions of some of the species and caused problems of access to some areas -- a potential problem with any single-year survey.

The main survey ran in 2002/03 but sampled only a small proportion of the area it targeted --there are approximately 250000 1-km Ordnance Survey grid squares in Britain. Out of 1230 possible quadrats allocated to counters, completed survey forms were received from only 663 (54%). Nonetheless, collectively, 108 different waterbird species across 59 different habitat categories were reported at least once, in a total area of 132068ha. For 12 of the 16 species for which comparison was possible (no published estimates were available for Grey Heron, Golden Plover, Lapwing and Snipe), the published estimates for the overall British wintering populations were lower than the DWS population estimates, and for eight of these species, the DWS population estimates exceeded the published national estimates by at least 50%. (See below under Specific Issues for Analysis for the calculation of the DWS population estimates.) By contrast, for Great Crested Grebe *Podiceps cristatus*, Pochard *Aythya ferina*, Goldeneye *Bucephala clangula* and Moorhen the DWS population estimates were lower than the published national estimates. Indeed, the published national estimate for Moorhen was almost double that of the DWS population estimate.

Methods of Data Capture

Individual survey squares were Ordnance Survey 1-km grid squares, and observers were asked to make a single visit of at least two hours' to their allocated square between 0900 and 1430 hours GMT during the winter of 2002/03, during which they recorded all waterbirds seen. The actual length of the visit was dictated by the time the observers considered sufficient to obtain a reasonable count of the waterbirds present. Only those birds within the bounds of the 1-km square were counted. Any birds flying over, with the exception of those clearly using the area, were excluded. For example, gulls circling over a rubbish tip or reservoir were included, whereas flocks of gulls commuting to or from roosts or feeding areas were excluded.

All species were counted by the DWS, but only those that are widely dispersed, often away from major waterbodies, and which regularly occur on habitats other than those counted by WeBS monthly counts were considered for analysis. Of these, 20 were recorded with sufficient frequency to allow detailed analysis. These species also usually occur away from coastal areas.

Within each 1-km square, observers defined distinct habitat 'patches' by marking them on a map. Each was identified by a unique letter and any birds recorded were assigned to the habitat patch in which they were seen. Irrespective of whether they were subsequently counted or not, observers provided a summary description of the overall habitat of each patch based on the presence (or absence) of each of a number of readily distinguished habitat types. Observers were also asked to record whether any waterbodies were frozen and whether any habitat patches were flooded.

Habitat patches that were not counted because, in the estimation of the observer, they contained no suitable habitat (eg mature conifer forest) were distinguished from habitat patches that were not counted because of accessibility problems but that did contain suitable habitat. Finally, the area of all habitat patches was manually estimated from the completed maps.

Purpose of Data Capture

To improve the estimation of national population sizes for species less well covered by the UK Wetland Bird Survey (WeBS) using a stratified random sampling approach.

Geographic Coverage

Great Britain. It was intended to cover all of the UK but in the event very few data were received from Northern Ireland and it was found impossible to extrapolate.

Temporal Coverage

The winter of 2002/03. One visit to each 1-km survey square was requested. There was a Pilot Survey in 2000/01, and normally the main survey would have followed in 2001/02 but this was prevented by the outbreak of Foot & Mouth Disease and the consequent restrictions on movements in and accessibility of the countryside.

Other Interested parties

The survey was funded by the Wetland Bird Survey (WeBS) partnership between the BTO, Wildfowl and Wetlands Trust, Royal Society for the Protection of Birds and Joint Nature Conservation Committee (the last on behalf of English Nature (now Natural England), Scottish Natural Heritage, the Countryside Council for Wales (now Natural Resources Wales) and the Environment and Heritage Service in Northern Ireland).

Organiser(s)

Mike Armitage and then Sarah Jackson.

Current Staff Contact

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Publications

The main report of the survey is:

Jackson, S.F., Austin, G.E. & Armitage, M.J.S. 2006. Surveying waterbirds away from major waterbodies: implications for waterbird population estimates in Great Britain. *Bird Study* 53: 105-111.

An earlier report on the Pilot Survey is:

Armitage, M.J.S., Austin, G.E., Holloway, S.J. & Rehfisch, M.M. 2002. The Pilot Dispersed Waterbirds Survey. *BTO Research Report* no. 271. 35pp.

The survey was noticed in *BTO News* numbers 238 and 253.

Available from NBN?

No.

Computer data -- location

The WeBS archive area on the BTO Windows network.

Computer data -- outline contents

The definitive data are held as a single ExCel spreadsheet.

Computer data -- description of contents

Each record in the spreadsheet relates to observations of a given species (or a null record) for a given habitat patch for a given 1-km grid square. Descriptions of the contents of each field are given in the first row as column headings.

Information held in BTO Archives

Paper records are held within the boxes containing data for the WeBS surveys.

Notes on Access and Use

Data can be made available via the WeBS data request system if required.

Other information needed**Notes on Survey Design**

Square selection was made using a random stratified sample. The stratification was based on the Centre for Ecology and Hydrology Landcover Map 2000 and Land Classification system. The LCM2000 data were used to assign each 1-km square to one of three levels of freshwater coverage (low: $<0.1 \text{ ha/km}^2$, medium: $0.1 \text{ to } 5 \text{ ha/km}^2$, high: $>5 \text{ ha/km}^2$) and one of two levels of urban coverage (low: $<0.1 \text{ ha/km}^2$, high: $\geq 0.1 \text{ ha/km}^2$). Each 1-km square was assigned its landscape type (arable, pastoral, marginal upland or upland) using the Land Classification system. The lowland stratum was defined as the arable and pastoral squares and the upland stratum encompassed the marginal upland and upland squares. The latter however were not used as there was only very sparse coverage achieved for upland areas. Additionally, because coastal areas are covered by the Non-estuarine Waterbirds Surveys (NeWS), such areas were not represented within the DWS. These attributes resulted in a 12-class stratification, which was used to derive the stratified random sample. The same stratification had previously been used for the Naturalized Goose Survey in 1999 and 2000 and the pilot survey of DWS conducted during the winter of 2000/01. Information gleaned from these surveys was used to apportion the random sample between strata so as to strike

a balance between the need to minimize the expected variance within strata and optimizing available observers.

Thirty-eight of the WeBS local organizers agreed to participate in this survey. Each was supplied with a randomly ordered list for each land-class stratum in their region, and requested to assign 1-km squares to counters from each stratum in the order they were printed. In view of possible access restrictions, each stratum list contained twice the number of 1-km squares required. This allowed local organizers to allocate alternative squares to counters until the necessary number had been assigned. The proviso was that squares should not be rejected for reasons other than problems of access.

Specific Issues for Analysis

Population sizes of each of the chosen species were estimated using boot-strap techniques. These estimates would only represent bird numbers countrywide if complete coverage of every 1-km square had been achieved. However, data were frequently unavailable from inaccessible parts of 1-km squares in which habitat was suitable for waterbirds. To address this problem, one further computation was included on each occasion that a 1-km square was selected during the random selection with replacement. Each time it was selected, the number of a given species in a 1-km square was re-estimated as the total actually counted by the observer added to an estimate of the number of that species that would have been expected on uncounted habitat patches. The latter estimates for each habitat patch type were derived as the number of the species in question, found on a random selection with replacement, on similar habitat patches from all other 1-km squares. These random patches were selected until their combined area was equal to the total area of the uncounted habitat patches. This process ensured that sample variance was not lost (as it would have been if an overall habitat patch type average density had been used to assess numbers on uncounted patches). Estimates for patches not counted because observers had deemed the habitat totally unsuitable were not made (ie were treated as true zero counts). To provide a new estimate of the numbers of each species wintering in Great Britain, the extrapolated numbers from the DWS were added to the January five-year mean (1996/97 to 2000/01) WeBS Core Count totals from coastal sites and the 1998 NeWS data. Core Count totals were calculated after imputing missing values using the Underhill index. This combined total is the DWS population estimate. Comparisons were then made with published national population estimates in order to identify those species of waterbirds for which a substantial proportion of individuals occurring inland do so on sites or habitats not currently monitored. These comparisons were not possible for Grey Heron, Golden Plover, Lapwing and Snipe as published winter estimates were not available. Wintering national population estimates for coastal wildfowl and wader species were derived using WeBS data for the period 1994/95 to 1998/99 (Core Counts) and 1997/98 (NeWS). Where necessary, these data were supplemented with the 1984/85 Winter Shorebird Counts.