

# A Bird Recorded is Worth Two, Three or Four in the Bush!

Statistical analyses provide vital tools in the science of ornithology - revealing patterns, causes of declines and often providing new ecological insight. Here we see how statistics can help us estimate what proportion of birds observers see.



Many of the BTO datasets contain bird counts which are used to investigate whether habitat, environmental effects or resources might be impacting birds. We were reminded earlier this year of the need to count people, for the UK census, but censusing birds can be a bit more of a challenge! The Common Birds Census (CBC) for example, which was phased out in 2000, estimated densities of birds by using territory mapping techniques. This method involved about 10 visits per season to record and map every bird, and the intensity of this fieldwork was rewarded by accurate estimates of breeding bird numbers in the area.

## CBC VERSUS BBS

In 1994 the Breeding Bird Survey (BBS) was introduced to succeed the CBC. Only two short field visits are required, and this encouraged many more people to take part. Compared to the CBC, the BBS provides less detailed information about a much greater number of sites. But how do we convert the number of birds seen on two short visits, to estimates of density? The secret is a technique

introduced by Kate Risely in the last issue of *BTO News*: distance sampling.

When conducting distance sampling, observers record not only how many birds they see, but also how far from the observer the birds are. These distances are often pooled into distance bands; for instance, was the bird less than 25m from the observer, 25-100m from the observer or more than 100m from the observer? Using this information, we can estimate the proportion of individuals of that species that were observed. We can therefore get a handle on the number of birds of that species we didn't see, simply because they were further away.

## DETECTIVE WORK

Clearly bird species differ in how easy they are to observe. The table lists the approximate proportion of birds within 100m of a line, which we estimate are detected by a BBS observer on an average visit. This percentage varies with the size, colour and behaviour of a bird, as well as the habitat within which it is seen. Woodcocks are very well-camouflaged and skulking, so only a fifth of birds which ➤

▲ Wheatears are obvious birds, often sitting out in the open in full-view but, even so, it is likely that for every four that are recorded during a BBS visit, another six will have been missed. Distance sampling takes this calculated detectability into account.



At the heart of distance sampling is the fact that some birds are more 'detectable' than others: a surveyor will record a larger proportion of the individuals actually present of large, colourful or noisy species within 100 metres, than small, quiet or skulking species. Because of this, the detectability of Mute Swan, for example, would be expected to be much higher than for a species such as Goldcrest.

DAVID TIPLING

◀ are within 100m of a BBS observer are seen or heard. Chiffchaffs are small but are easily detected by song, enabling 50% of the birds within 100m to be detected. Wildfowl are generally easily detectable, because they are large birds in an open habitat, and therefore a high proportion are observed.

These estimates (known as the 'detectability' of a bird) can be used to convert counts from BBS surveys to densities, making them more similar to the intensive CBC counts than it would seem at first. Of course, there are still situations in which more accurate intensive territory mapping data are required. However, using distance sampling allows us to get much more from the counts that surveyors make.

These estimates of detectability can be used to enhance many of the BTO's science projects. For example, they were used in a project looking at the degree of specialisation exhibited by bird communities and how climate change is affecting this level of specialisation.

### OTHER BENEFITS

Distance sampling has also informed some cutting-edge spatial modelling of BBS data, which examines the effect that climate change is having on the abundance and distribution of birds in the UK. This project used estimates of species detectability which take into account the habitat, the time of year, and even the weather on the day a BBS count was done. As birdwatchers, we expect to see and hear more birds on a sunny day, than on a wet, gale-force day. We know this is not because there are more birds present, just because their behaviour makes them more detectable. Distance sampling helps us quantify these differences in detectability caused by weather and make use of them.

It is clear that distance-sampling can be extremely useful for the BTO and help make

## AVERAGE DETECTABILITY

**Species**                      Approximate percentage of birds within 100m that are seen or heard by a BBS observer

Woodcock	20%
Kingfisher	30%
Wheatear	40%
Chiffchaff	50%
Dunlin	60%
Greylag Goose	70%
Shoveler	80%

the most of the data collected by volunteers. But this technique clearly ignores a lot of other variation in detection probability. As mentioned in last month's *BTO News*, we are currently running a small-scale trial to test extensions of the current BBS distance-sampling protocol, which would provide even more useful information to BTO researchers. And next time you see a Woodcock – just think about the four that you didn't see...

### FIND OUT MORE

#### Rise of the generalists: evidence for climate driven homogenization of avian communities.

*Global Ecology and Biogeography* (in press).  
CM Davey, DE Chamberlain, SE Newson, DG Noble & A Johnston.

#### Modelling changes in species' abundance in response to projected climate change.

*Diversity and Distributions* (in press). AR Renwick, D Massimino, SE Newson, DE Chamberlain, JW Pearce-Higgins & A Johnston.

### ABOUT THE AUTHOR



Ali Johnston has been working as Ecological Statistician at the BTO for 2 years, after completing a

PhD at Cambridge University on population modelling of Stone Curlew in the UK. For a long time Ali has been interested in applying statistical models to ecological data, and has landed on her feet at the BTO: "The data held by the BTO are second-to-none - I am staggered by the amazing volume and quality of data collected by BTO volunteers. This makes it a brilliant place to be a statistician, as there are so many opportunities to use interesting statistical methods to tackle important ecological problems."