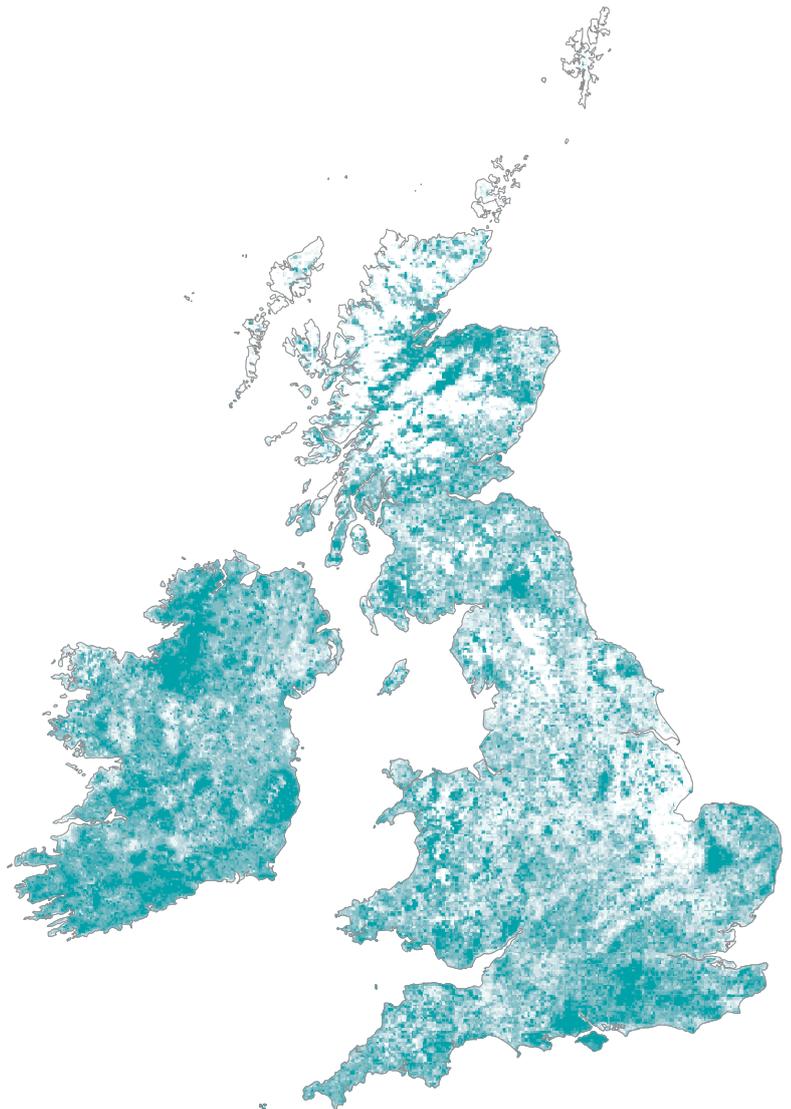


ATLAS 2007–11
Goldcrests...



Fig 1a. This provisional map, based on the first three winters of Atlas TTVs, shows the winter abundance of Goldcrests. Darker blues indicate higher numbers, and reveal that the species is more abundant in Ireland than Britain. NB: Atlas coverage includes Republic of Ireland, BBS doesn't.



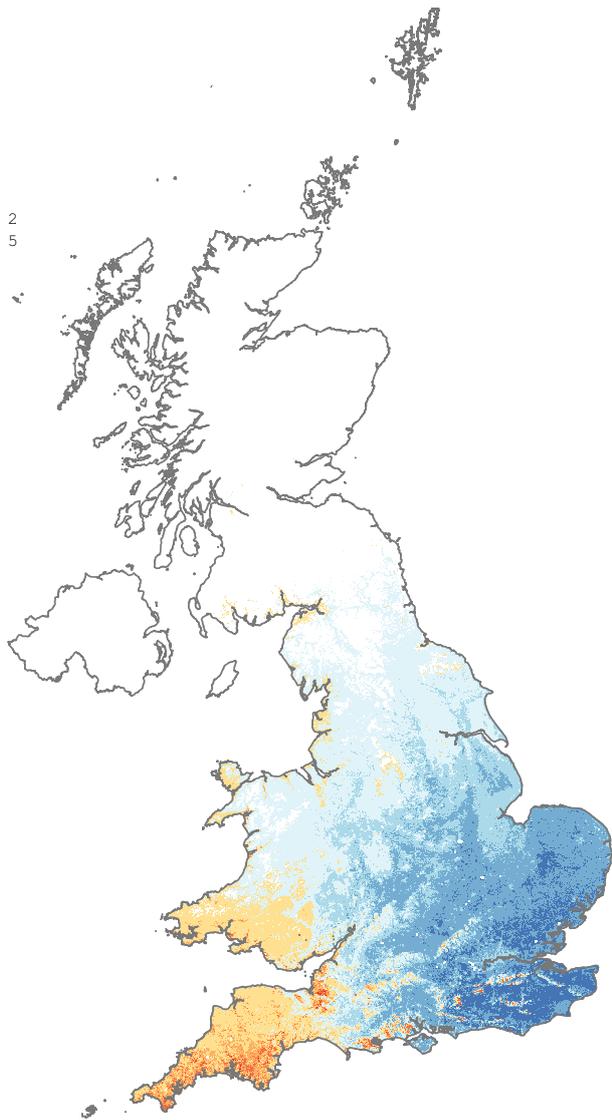
From Monitoring to Maps

Maps are great for outlining where particular species may or may not be found, how distributions have changed through time, and where particular species may be most common, increasing or decreasing. Here Simon Gillings, James Pearce-Higgins, Stephen Baillie and Rob Fuller describe how both Atlas and BBS surveys can be used to produce maps which together provide a complete picture of recent bird population changes.

Any job requires the right tools, and monitoring bird populations is no different. BTO volunteers contribute to an array of surveys that fit together into a toolbox for conservationists and researchers. Some of these are very specific: the Heronries Census, for example, primarily tells us about changes in the number of herons. Others, such as the *Bird Atlas 2007–11* and Breeding Bird Survey, potentially have overlapping uses but subtle differences in field methods can make big differences to how they are used.

ATLAS AND BBS

Atlases are essentially about distribution patterns, or 'where birds live'. They have become increasingly sophisticated and now incorporate measures of abundance, rather than mere presence/absence. This makes it possible to map geographical patterns of abundance for many species and, when an Atlas is repeated, to determine in which areas each species is going up or down. In contrast, the main purpose of the BBS is to measure how bird populations vary through time. However, by using state-of-the-art statistical techniques, we can convert BBS counts



BREEDING BIRD SURVEY (BBS)

Green Woodpeckers...



Fig 1b. One of the latest maps from BBS, showing how the density of Green Woodpeckers has changed across the UK since BBS began in 1994. Reds show local declines in density, blues show local increases. It tells us that the 47% increase at the UK level does not mean good news everywhere.

into maps showing how the abundance of certain species varies across the UK. This approach can be extended to assess how the spatial pattern of abundance changes through time. These recent developments in mapping capability for the Atlas and BBS beg the obvious question, 'why do we need to go through all the effort of doing an Atlas when we can get seemingly the same information from 'just' 3,200 BBS 1-km squares?' The key to this question is in the scale and completeness of the data which, in turn, stem from their differing field methods.

SCOPE VERSUS SCALE

The big plus-point for the Atlas is its scope – every 10-km square is visited and Atlas volunteers search for every breeding or wintering species. For many large-scale questions, these data can't be bettered and maps showing where species were recorded, and how those patterns have changed, are incredibly powerful resources. The Atlas is, in effect, a massive stocktaking exercise for the whole avifauna – the forthcoming Atlas will contain maps for 295 species. Unlike BBS, it also provides data for the winter, and for the Republic

of Ireland. The downside is that we can't do this every year, and with a planned 20-year rolling programme, Atlases potentially suffer from a lack of immediacy. This is where BBS scores points. Although BBS cannot cover every square or every species, it does cover every year, and thus provides an ongoing alerting system of changes in breeding bird populations. Importantly, BBS tells us exactly when these changes occur. The strength of BBS lies mainly in what it tells us about the commoner and more widespread species – 107 species are currently recorded on enough squares to produce UK trends. For the highly localised and thinly distributed scarce species, the random sample of 3,200 1-km squares just doesn't 'hit' enough of them to provide a meaningful picture. In summary, the two approaches are complementary, with each having been designed with a particular task in mind.

EXTRAPOLATION AND SPATIAL MODELLING

Volunteers cannot regularly visit every location and record every bird so instead the Atlas and BBS employ sampling – the Atlas with ➤

'Atlases have become increasingly sophisticated and they now incorporate measures of abundance, rather than mere presence/absence.'

HOW IT'S DONE: ATLAS & BREEDING BIRD SURVEY (BBS) IN FOCUS

Atlas Timed Tetrad Visits...



Fig 2a. Thanks to the structured way in which the BTO/BirdWatch Ireland/SOC Bird Atlas TTVs were organised, all parts of Britain and Ireland received a minimum level of coverage. Notice the solid areas where local atlases aimed to survey every tetrad in their region.

BBS 1-km squares...



Fig 2b. In 2011, c.3,200 BTO/JNCC/RSPB BBS squares were surveyed in the UK. Most squares are surveyed every year providing an invaluable record of how numbers change locally and nationally. NB: BBS only covers Northern Ireland.

◀ its Timed Tetrad Visits and BBS with its random selection of 1-km squares. There is a growing list of spatial modelling techniques, with baffling names or acronyms – GLMs, GAMs, GARP, BIOCLIM and Random Forests to name a few – that enable us to combine data on bird counts and environment (*e.g.* habitat, altitude and climate) in surveyed squares, to make predictions of likely bird counts in unsurveyed squares throughout Britain, the UK, Britain and Ireland, or even Europe. Such models are the basis of many of the maps you'll see in the Atlas and soon on the BBS web pages.

Here again the Atlas and BBS have their strengths and weaknesses. The high intensity of Atlas fieldwork means that, for every tetrad surveyed, we have to extrapolate on average to only two neighbouring unsurveyed tetrads. BBS employs only a 1–2% sample, so for every surveyed square, counts for a further 70 must be estimated. You might think that Atlas data are clearly the way to go, but that may not always be the case. The smaller BBS squares and the certainty over which parts were surveyed enables us to more closely match the environmental data to describe where the birds actually were, which could result in better models and

predictions. Also, because BBS observers record birds in distance bands, their data can be used to estimate the number of birds missed (often referred to as detectability) because they were too far away (*BTO News* 295), resulting in maps approximating to population density which is a more biologically meaningful metric than what the Atlas TTVs provide in numbers seen per hour. Of course, regardless of the field method, some species are recorded on too few squares to enable us to produce robust modelled maps.

FUTURE INTEGRATION

Since BBS only started in 1994, just after the last Atlas, this is our first opportunity to directly compare Atlas and BBS results. Whilst we have some initial expectations about which survey is best for which job, there are many comparisons that we can make between these two independent datasets. Consistent results that emerge from both projects will give us great confidence that the patterns are real. We also plan to develop new analytical techniques to make the best of both – to combine the 'big' and the 'everything' of the Atlas with the 'fine' and the 'annual' of BBS. You can follow these developments, new maps, and news of the Atlas book on the BBS and Atlas web-pages.

'Since BBS started only in 1994, just after the last Atlas, this is our first opportunity to directly compare Atlas and BBS results.'