

Beyond birds: working across other taxa

An update on recent BTO research, monitoring and partnership working



THE BTO

The British Trust for Ornithology (BTO) is the UK's leading independent research organisation studying birds and their habitats, with considerable expertise in the design and implementation of monitoring and research projects, from intensive studies to extensive surveys. The BTO also collects, analyses and shares information on other taxa, both through its core monitoring schemes and through the other projects with which it is involved, often working in partnership.

One of the great strengths of the BTO is its volunteer networks, and the organisation's expertise in working with and supporting volunteers delivers valuable monitoring outputs across a broad range of taxa, from deer and butterflies through to bats and bush-crickets. Many of those interested in birds and birdwatching are also interested in other wildlife, and the BTO recognises the contribution that its volunteers can make to our knowledge of habitats and wildlife.

A CORE CONTRIBUTION

The BTO's core monitoring schemes contribute a significant amount of information on the changing fortunes, abundance and

distribution of species other than birds. Participants in the **BTO/JNCC/RSPB Breeding Bird Survey (BBS)** have the option to record information on mammals and butterflies, the latter through the **Wider Countryside Butterfly Survey** (run jointly by the BTO with Butterfly Conservation and the Centre for Ecology and Hydrology).

Some 86% of BBS participants have submitted mammal records, with sufficient annual coverage to allow the monitoring of population trends for nine species (Wright et al. 2014), including two whose populations have increased significantly in the UK as a whole since 1995 – Roe Deer (53%) and Reeves's Muntjac (95%) – and two that have declined significantly – Rabbit (-59%) and Red Fox (-34%). These, and other data, feed into the Tracking Mammals Partnership.

Information on the mammals using our gardens comes from the weekly submissions made by participants in the **BTO Garden BirdWatch** (Toms & Newson 2006), whose observations of Hedgehogs provide sufficient sampling power to pick up a 10% decline in Hedgehog populations over a ten-year period (Roos et al. 2012). This makes the BTO

Garden BirdWatch a particularly valuable tool for monitoring widespread mammal species. Garden BirdWatch participants also record reptiles, amphibians, butterflies, dragonflies, bumblebees and several species from other taxa (e.g. Stag Beetle and Hornet).

In addition, through the contributions that many Garden BirdWatch participants make to the **Garden Wildlife Health** project, we are helping to collect core information on disease in garden wildlife, including ranavirus in Common Frogs, trichomonosis in birds and lungworm in Hedgehogs. This joint project with the Institute of Zoology, Froglife and RSPB, uses both systematic and opportunistic records of wildlife disease alongside post-mortem examination and tissue archiving to identify and report on a wide range of diseases. These results feed into the Great Britain Wildlife Disease Surveillance Partnership, reporting to Defra and the World Organisation for Animal Health.

Elsewhere, birders are using the BTO's **BirdTrack** mobile apps and website to record the dragonflies they encounter when out birdwatching. Birders seem increasingly interested in these and other taxa.

MONITORING BUTTERFLY POPULATIONS AT A LANDSCAPE SCALE

The Wider Countryside Butterfly Survey covers in excess of 800 survey squares annually, with roughly 40% of these contributed by BBS participants making additional visits to their sites to record butterflies.

Twenty-three species occur frequently enough to allow robust monitoring of trends in abundance, with 19 or so of these recorded from at least 100 squares annually.

The survey complements transect monitoring of butterfly populations on semi-natural sites and forms part of an integrated approach to monitoring butterflies through the UK Butterfly Monitoring Scheme (UKBMS).

Data from the survey have also been used to examine how large-scale patterns in habitat and other factors influence community structure across different taxa (Eglington et al. 2015).



CROSS-TAXA MONITORING THROUGH CORE BTO SCHEMES

The willingness of BTO volunteers to collect information on taxa other than birds can be seen from the contributions made to core monitoring schemes, like the BTO/JNCC/RSPB Breeding Bird Survey, BTO Garden BirdWatch, the Waterways Breeding Bird Survey and BirdTrack, which collectively generate c.4.6 million other taxa records per year.



BTO/JNCC/RSPB BREEDING BIRD SURVEY (BBS)

BBS was launched in 1994, and involves thousands of volunteer birdwatchers carrying out standardised annual bird counts on randomly-located 1-km sites. Comparing these annual counts enables us to monitor the population changes of over 100 bird species. Mammal recording was introduced to the BBS in 1995. Compared with birds, the population trends of mammals are relatively poorly known. Even though mammal recording has always been a voluntary addition to the scheme, 90% of BBS observers now actively look for them during their BBS visits. Roughly one in ten of our BBS observers also contributes to the Wider Countryside Butterfly Survey, returning to make additional summer visits to their BBS square. www.bto.org/bbs



Muntjac, by Paul Newton

BTO GARDEN BIRDWATCH

BTO Garden BirdWatch monitors the changing fortunes of birds and other garden wildlife through its network of 12,000 'citizen scientists', who submit records of the wildlife using their gardens each week throughout the year. Launched in 1995, the survey has provided a great deal of information on garden wildlife, supporting research and the peer-reviewed publication of scientific papers. After an initial trial, other wildlife recording was formerly introduced to the survey in 2007 and these data have since contributed to the national dragonfly atlas, to the **Reptiles and Amphibians in Gardens Survey**, to a PhD on bumblebees and to local record centres. www.bto.org/gbw



Common Toad, by Mike Toms



WATERWAYS BREEDING BIRD SURVEY (WBBS)

WBBS is an annual survey of breeding birds along rivers and canals. It uses transect methods akin to those of the Breeding Bird Survey but with minor adaptations to a linear habitat. Volunteers walk along up to 5-km of waterway, making a note of all of the birds and mammals that they see and hear.

Data from WBBS is particularly valuable for monitoring the population trends of birds and mammals that are specifically associated with linear waters, such as Water Vole, Otter and American Mink. www.bto.org/wbbs



Water Vole, by John Harding

BIRDTRACK

BirdTrack is an exciting project, through a partnership between the BTO, the RSPB, Birdwatch Ireland, the Scottish Ornithologists' Club and the Welsh Ornithological Society, that initially looked at migration movements and distributions of birds throughout Britain and Ireland, but is now available for data entry globally. BirdTrack provides facilities for observers to store and manage their own personal records as well as using these to support species conservation at local, regional, national and international scales. Dragonflies are a popular order of insects among birdwatchers. They occur at many birding sites, are relatively conspicuous, and can usually be identified fairly easily. BirdTrack allows life-stage recording for dragonflies. www.birdtrack.net



Broad-bodied Chaser, by Moss Taylor

ENGAGING A NEW GENERATION IN OTHER WILDLIFE



Our *What's under your feet?* project is a joint initiative with EDF Energy, established to collect information on the abundance of soil-dwelling invertebrates from school playing fields. This will help identify potential causes of declines in bird populations. The survey has involved hundreds of schools, inspiring a new generation in invertebrates and citizen science.



MAKING THE MOST OF DATA

The BTO's amazing volunteers generate a lot of other taxa data, which we then put to good use in many different ways. Often though, one of the best things we can do is pass the records on to others who can extract maximum benefit from them.

One channel for this is via the National Biodiversity Network (NBN). The BTO is by far the biggest contributor of data to the NBN, having provided over 170 million records for the purposes of sharing them with a diverse range of users. Clearly, most of these relate to birds, but we have also made available large volumes of data on other taxa (especially mammals). BTO staff are also active in contributing to discussions around the future development of the NBN and its positioning within the complex landscape of UK biological recording.

Moreover, BTO also provides substantial datasets directly to other organisations for their own purposes. For example, we've provided 50,000 records to the British Dragonfly Society for their national atlas project, made up of records provided by participants in Garden BirdWatch and BirdTrack. In a similar vein, we received a request from the Mammal Society for records that might contribute to their

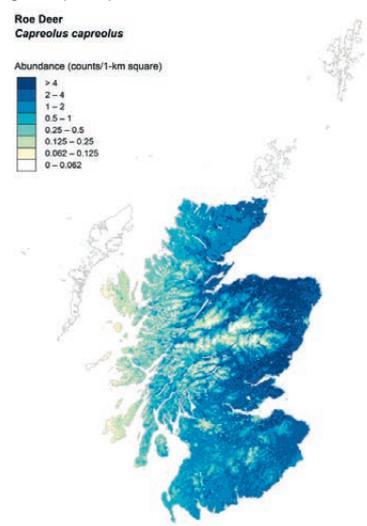
forthcoming atlas and were able to provide them a dataset of over two million BTO mammal records. Indeed, BTO records alone provide reasonably good broad-scale distribution maps for a range of species, from larger diurnal mammals to butterflies and amphibians. Through **Wild Walks** and **Wild Surveys**, and working with the Wildlife Trusts, we've also supported wider recording across many other taxa.

TACKLING CHALLENGES

Not all taxa are as straightforward to detect and identify as birds, dragonflies and large mammals. We recognise this and are active in discussions with partner organisations about both increasing the skill-levels of some of our volunteers, and in considering the best ways to make use of the data that we have even where identification is more of an issue. For example, BTO is excited to be part of the new UK Pollinator Monitoring and Research Partnership.

Despite our Garden BirdWatch volunteers submitting 50,000 bumblebee records every year, we are very aware that identification of many of these species can be difficult. We've been working with Professor Dave Goulson at the University of Sussex, and his PhD student Leanne Casey, to examine opportunities for using citizen science to monitor bumblebee

populations. Even allowing for the difficulties associated with this group of species, the BTO's volunteers are more than capable of recording the broad pattern spread of a distinctive and newly colonising species like Tree Bumblebee. Indeed, for relatively distinctive invasive non-native species, a large network of alert and skilled observers such as the BTO's are surely a resource we should be making full use of. Perhaps they should be put on alert to look out for the surely imminent arrival of the Emerald Ash Borer *Agrius planipennis?*



BTO expertise in statistical modelling has enabled our ecologists to produce maps showing the broad-scale abundance patterns for a range of species; including deer and other mammals (Massimino & Calladine 2017).

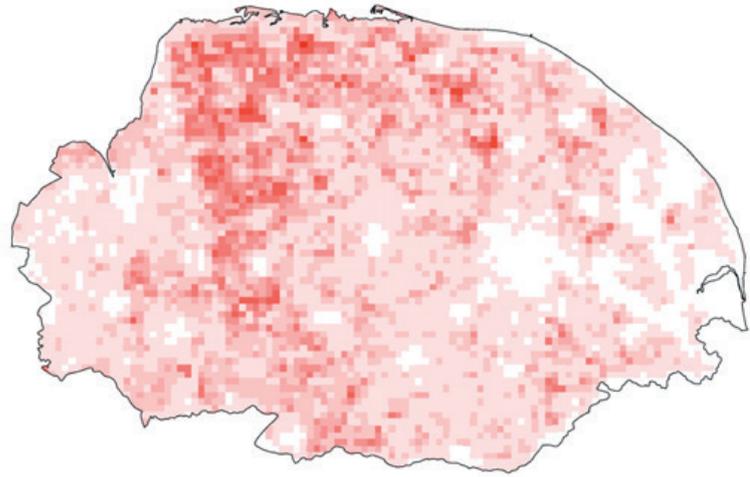
USING INNOVATION

Technological innovation, paired with citizen science networks, provides new opportunities for the monitoring of our wildlife and habitats. Bats provide a particularly good example of the difference that a new approach can make to our understanding.

Bat monitoring has traditionally been challenging, because most species are nocturnal, wide-ranging and difficult to identify. Whilst the National Bat Monitoring Programme run by the Bat Conservation Trust (BCT) produces national trends for 11 of the UK's 17 breeding species, it relies heavily on trained volunteers, limiting the data which can be collected, and it cannot be used to monitor all species effectively. Developments in passive bat detectors, which automatically trigger and record passing bats, along with software for semi-automating the analysis of resulting sound files, have allowed BTO scientists to overcome these obstacles, transforming our understanding.

The **Norfolk Bat Survey** was started in 2013 by BTO ecologist Stuart Newson. Stuart and his colleagues have taken advantage of advances in technology to map bat distributions, and activity on a scale never before seen. The survey relies on a network of 'Bat Monitoring Centres' situated throughout the county, from which members of the public borrow passive bat detectors and set them up locally for three days at a time. Since its launch in 2013, the project has analysed over a million bat recordings from across the county, making it one of the most extensive high-quality data sets for bats from anywhere in the world and engaging volunteers with citizen science in the process.

The project has improved our understanding of spatial patterns of bat distribution and activity of all species, from the near-ubiquitous Common Pipistrelle to the locally scarce Leisler's Bat, increasing the number of records of this rare bat from Norfolk from 10 to almost 200. The study also reveals how bat activity varies through the night. For example, Common and Soprano Pipistrelles are most active shortly after sunset, when airborne small insect prey availability is at its peak, while Brown Long-eared Bats, which take prey from foliage, are active throughout the night. These data have also identified some novel seasonal movements, particularly evident in certain species in the east of the county.



The Norfolk Bat Project, with its database of over 1.4 million recordings from 6,246 nights of surveying, has revolutionised our understanding of the distribution of rare bats, like Barbastelle. This map shows the modelled distribution for Barbastelle, using data from the survey and knowledge of habitat associations.

Such information has important conservation implications. Surveys of many species of bat are required before land is developed. The techniques used by the Norfolk Bat Survey present a better way of carrying out such work, with more informative results. As more years' data are collected, the technique will also allow changes in bat populations to be monitored in a way that has not previously been possible (Newson et al. 2015).

The Norfolk Bat Survey has been expanded into neighbouring parts of East Anglia by popular demand. In 2016, a new survey was launched in southern Scotland using the Norfolk Bat Survey model, and BTO and BCT have been discussing how this approach may inform bat monitoring more widely.

The Norfolk Barbastelle Study Group (NBSG) provides a great example of the wider effects of the BTO's bat work on smaller charities. NBSG is using the extensive dataset collected through the Norfolk Bat Survey to home in on potential roost locations, thus supporting

radio-tracking work that seeks to understand the habitat use and requirements of this rare bat. The results of this work will then provide evidence-based targeted conservation advice to central and local government, to planners and land managers.

BEYOND BATS

The devices used for the Norfolk Bat Survey also log sounds produced by other species. Working in partnership with Natural England, and with researchers at the Muséum National d'Histoire Naturelle and the Centre d'Ecologie Fonctionnelle et Evolutive UMR in France, BTO staff have developed algorithms that can classify bush-cricket calls. It should be possible to automatically scan recordings for three species in particular: Speckled Bush-cricket, Dark Bush-cricket and Roesel's Bush-cricket, but additional work is needed to refine the approach for acoustically-similar species, such as Short-winged Conehead and Long-winged Conehead. The approach has potential for other taxa too, including some other invertebrates, mammals and birds.



MULTI-TAXA RESEARCH

The BTO's avian datasets, and our expertise in statistical modelling, have led to an increasing number of multi-taxa collaborations, many of which seek to address significant ecological and conservation questions.

For example, understanding how climate change and changes in land-use patterns affect our wildlife and habitats is central to much of the conservation work that will be needed over the coming decades. Thanks to a long history of monitoring bird populations, and with growing datasets on certain other taxa, it is now possible to examine such landscape-scale impacts and to make predictions about what will happen to species and communities under different scenarios.

Recent BTO work, carried out in collaboration with colleagues at the University of Reading, the Centre for Ecology and Hydrology,

Butterfly Conservation and Natural England, seeks to understand how climate change and habitat interact to affect bird and butterfly populations (Oliver et al. 2017). Other work, this time carried out with the Centre for Ecology and Hydrology, BioSS, Butterfly Conservation and Rothamsted Research, provides new insights into when butterfly and moth species are most sensitive to change, revealing that seasonal as well as annual temperatures must be considered when predicting species' vulnerability to climate change. This is particularly important given that recent BTO-led analysis as part of the DEFRA-funded **BICCO-Net** project has identified a climate change component underlying some of the recently observed national moth declines (Martay et al. 2016).

ECOSYSTEM SERVICES

Recognition of the broader benefits that species and habitats provide for our health

and well-being has prompted new cross-taxa research examining the nature and scale of ecosystems services. Working with a range of partners across several projects within the Natural Environment Research Council (NERC) Biodiversity and Ecosystem Services Sustainability project, has again underlined the huge potential of a partnership approach and shared expertise. One of these projects, the Urban BESS project, has been investigating urban green space and the species communities it contains. Elsewhere within the built environment, BTO researchers have been working with colleagues from the University of Birmingham to unravel the impacts of street-lighting on moth populations. The results of this work provide valuable evidence in support of decisions about the types of street lighting used in urban areas (Plummer et al. 2016).

TAPPING INTO ENTHUSIASM

That BTO volunteers are willing to take on additional survey work, often alongside their core work on birds, means that valuable information on other species can be collected with little additional cost. In addition, these volunteer networks can often be asked to take on something completely new, particularly if there are pressing questions to be addressed.

Interestingly, volunteers have often asked about opportunities to record other species during the course of their bird-related activities. The introduction of other wildlife recording to GBW, for example, was driven by requests from BTO Garden BirdWatchers to adapt our forms so that they could tell us about their Badgers, Common Frogs and butterflies. Now they monitor a whole suite of species and have generated in excess of four million other wildlife records.

Many of the volunteers who contribute to the BTO's surveys, also contribute to other monitoring schemes or send other taxa records to record centres, county recorders and other national organisations. There is an expectation that the information they submit will get to the right place, and that the various national and local organisations all talk to one another. If we work together then we can build on this enthusiasm.

MEETING A WIDER NEED

Recognising the enthusiasm of BTO volunteers, and the BTO's expertise for running large-scale surveys and analysing



BTO volunteers, by Mike Toms

complex datasets, it is easy to see why the BTO is able to contribute to work across a broad range of other taxa. Our impartial, evidence-based approach means that our data, together with our analyses of these and other datasets, is highly valued. Of particular value is the way in which the BTO has been able to get the most out of its core datasets, often by working with partners to collect additional information on other taxa alongside that being collected on birds.

Recognising the willingness, interests and expertise of BTO volunteer networks means that the organisation is well-placed to support other taxa monitoring more broadly. In addition, our expertise in managing volunteer networks, in collecting, curating and analysing large datasets, and in sharing our expertise with partners, means that the BTO is well-placed to help develop monitoring and surveillance programmes that deliver the other taxa information needed by government, its agencies and by others working across industry, land management and conservation.

That the BTO currently holds in excess of 4.6 million records of species other than birds, underlines the potential to build on what has been achieved already, and to work with new and existing partners to drive forward work in this area as we enter a period of significant change in our environment.

RESOURCE FOR THE FUTURE

The BTO's cloud-based ORACLE database holds significant numbers of other-taxa records, collected through core recording schemes and other surveys. The figures shown here represent data submitted up until the end of December 2016.



Mammals
2,579,179



Butterflies & Moths
1,148,650



Bees & Wasps
458,709



Reptiles & Amphibians
348,041



Dragonflies
86,630

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Beyond birds: working across other taxa in partnership

Partnership working continues to be at the heart of the BTO's multi-taxa work, and we are very grateful to those individuals and organisations with whom we have been able to collaborate. The most important contributors are the tens of thousands of BTO volunteers who give so generously of their time.

These partnerships include, among others: Amphibian and Reptile Conservation Trust, ARG UK, Bat Conservation Trust, BioSS, Birmingham University, British Dragonfly Society, BSBI, Butterfly Conservation, Cardiff University, Centre for Ecology and Hydrology, Cranfield University, Department of Agriculture, Environment and Rural Affairs, Northern Ireland, ENSIS – ERC, Exeter University, Froglife, Game & Wildlife Conservation Trust, Institute of Zoology, JNCC, The Mammal Society, Natural England, Natural Resources Wales, Plantlife, Reading University, Rothamsted Research, RSPB, Scottish Natural Heritage, Tracking Mammals Partnership, University of Sheffield, University of Sussex, The Wildlife Trusts, The Woodland Trust and WWT.

Images: Cover image, by Paul Sterry. Back cover: Bog Bush-cricket, by Paul Sterry (www.naturephotographers.co.uk); Black-tailed Skimmer, by John Flowerday; Common Lizard, by Amy Lewis.