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Protected Species

In this issue

Welcome

New Survey Methods in Ecology, Even the Cow-boys Will Have to Keep Up

I use a smartphone, which now has several identification guides and a bat recording application on it, as well as providing me with weather data, a camera, a GPS application that outputs straight into Google Earth – it even has a torch. Yes, I can also make and receive phone calls. I wouldn't have imagined that I would have all of that to take out in the field with me in a phone when I got my first brick-like device 15 years ago. Now I am quite excited about what I might be able to take out in the field in 15 years' time, or maybe fewer. The article in this issue by Andrew Baker asks whether bioacoustics is a survey technology that has come of age? For me the answer is, not yet. Bat technology has moved on in leaps and bounds in the last few years, I now have a detector, easily held in one hand, that records the bat, records its location and replays the sound and sonogram in my chosen format. That's great but it doesn't yet automatically tell me what bat it is, for that I have to rely on my experience of what the bat looks like and what it's doing and analysis of a significant amount of digital data. I will grant that the technology has come of age when I can take a detector out, point it in the right direction and have it tell me (within the bounds of statistical probability) what bat species it is, maybe even what sex, and what type of call, record the weather and plot it on the map, then send it automatically to the local records centre. While there aren't so many species of bats in the British Isles as to make this unduly difficult, other groups are simply a matter of number crunching, so imagine something that you can take on site that does all that for you? Are you worried that this will mean no jobs for us, as anybody will be able to do it? I don't think you should be. It isn't the recording of data that is our key skill, it is our interpretation and how we use the information that makes us professionals. I'm certainly not arguing for the abandonment of taxonomic and survey skills, I think these are vital but as the technology advances everyone should realise that it is increasingly difficult for guidance and standards to keep up. How far back does 1999 seem now and how much further will it seem in another five years in terms of our practice? If guidance can't keep up that is no excuse for us not to. GPS and GIS are increasingly available and useful to all of us; feed in species data and we could have a new type of report we could all do a lot more with. Keep up to date; it could soon be time to put away those famous coloured pencils for the last time!

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Information

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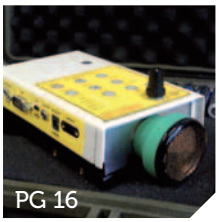

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Government Mid-Term Review

The Coalition Government's Mid-Term Review provides an update on the progress made in implementing the Programme for Government. The Defra section (see page 39) contains mostly farming and water updates, with woefully little on gains for biodiversity.

http://assets.cabinetoffice.gov.uk.s3-external-3.amazonaws.com/midtermreview/HMG_MidTermReview.pdf

Coalition Government Pledges Review

This document provides an update on the progress that has been made in implementing all of the commitments in the Programme for Government. It provides a snapshot of the work that has been done, up to the end of 2012, to accompany the Mid-Term Review.

http://assets.cabinetoffice.gov.uk.s3-external-3.amazonaws.com/midtermreview/Programme_for_Government_Update.pdf

New NBN Gateway

The first release of the new version of the NBN Gateway is now available. This release has involved a major rebuild of the site incorporating new technology to address current stability issues, implement new system of data access controls and provide enhanced functionality. Further details can be found on the NBN Forum.

http://data.nbn.org.uk/

New networking website for rural professionals

An experimental new networking website for rural professionals, Landbridge, has been launched. Landbridge provides a platform for inter-professional learning and debate and opportunities for knowledge exchange with the research community. The challenges facing farmers and land managers have been exacerbated by pressures such as climate change and food security and improving the skills and knowledge of the people who provide them with specialist advice, such as land agents, vets, ecologists and agronomists, has become a key imperative for the UK Government and for the industry. A panel from the rural professions has assisted with planning and implementing the initiative and continues to advise on its development. Landbridge is supported by the Economic and Social Research Council (ESRC), Rural Economy and Land Use Programme (RELU) and the Living With Environmental Change Partnership (LWEC).

http://www.relu.ac.uk/landbridge/

Action to protect iconic trees from disease

Tighter controls on the import of native species of trees have been announced by Environment Secretary Owen Paterson as the latest action to guard against tree pests and diseases. The new regulations to track the import of oak, ash, sweet chestnut and plane trees from countries within the EU came into force on 17 January 2013. This will allow plant health inspectors to target their inspections and to track saplings if there are any suspicions that they carry a pest or disease. Businesses that import tree plants, and the people who purchase the plants, will have additional confidence that any pests or diseases will be detected early on.

http://www.defra.gov.uk/news/2013/01/16/protect-trees-disease/

Natural England publishes updated guidance on EIA Agriculture Regulations

Following consultation with stakeholders and customers, Natural England has recently released updated guidance on the Environmental Impact Assessment (EIA) (Agriculture) Regulations 2006. The guidance is aimed at farmers, land managers and land agents and is available for immediate use. There are two documents: the public guidance which sets out what the regulations are and how they may affect farmers, and a set of Frequently Asked Questions. The guidance has been developed and tested with Natural England's customers.

http://www.naturalengland.org.uk/ourwork/regulation/eia/default.aspx

New environmental stewardship handbooks from Natural England

- Entry Level Stewardship: Environmental Stewardship Handbook, Fourth Edition – January 2013 (NE349)
  http://publications.naturalengland.org.uk/publication/2798159
- Higher Level Stewardship: Environmental Stewardship Handbook, Fourth Edition – January 2013 (NE350)
  http://publications.naturalengland.org.uk/publication/2827091
- Organic Entry Level Stewardship: Environmental Stewardship Handbook, Fourth Edition – January 2013 (NE351)
  http://publications.naturalengland.org.uk/publication/2810267
- A guide to using Natural England resources in agriculture courses (NE369)
  http://publications.naturalengland.org.uk/publication/3537519

New natural environment and health evidence from Natural England

Data is now available from Natural England to support Indicator 1.16 'utilisation of green space for exercise/health reasons' under the 'Wider determinant of health' domain of the Public Health Outcomes Framework (PHOF). A full list of the indicator scores for England as well as supporting information can be found at: http://www.naturalengland.org.uk/ourwork/research/mene.aspx#phof or as part of a new interactive online tool www.phoutcomes.info launched recently by the Department of Health to share the first set of baseline data for 39 of the 66 PHOF indicators. Data from MENE is complemented by other evidence on the benefits of the natural environment for health, drawn together by Natural England, which can help support the production of Joint Strategic Needs Assessments and Health and Wellbeing Strategies.

http://www.naturalengland.org.uk/ourwork/enjoying/health/default.aspx

Strategic Environmental Assessment - A Review of its Effectiveness in Ireland

A review of Strategic Environmental Assessment in Ireland has found:

- Strategic Environmental Assessment (SEA) is providing a vital tool for environmental protection in Ireland.
- SEA has ensured that environmental considerations are being taken into account in national, regional and local policy development across a broad range of sectors.
- There are challenges and barriers to effective, consistent implementation across all sectors, similar to those experienced in other EU Member States.

An Action Plan has been drawn up by the five SEA statutory environmental authorities to address the priority challenges identified in the Review.

http://www.epa.ie/news/pr/2012/name,34313,en.html

Wales' commitment to eradicating bovine TB recognised by Europe

Welsh Environment Minister, John Griffiths, has welcomed European approval of the Wales TB Eradication Plan 2013. The Minister's comments followed the European Commission endorsing the UK Bovine TB Eradication Programme for 2013, which includes Wales' own plans to tackle the disease. This is the fourth year running that the Commission has endorsed the Programme to eradicate bovine TB in Wales. The 2013 Plan sets out TB eradication policies that will be implemented during the year and builds on the measures contained in the Strategic Framework for Bovine TB Eradication in Wales. It also includes data on the epidemiology of bovine TB in Wales over the last five years and targets for TB testing and plans for badger vaccination in 2013. The Plan acts as an application for European Union funding for certain measures in the Programme, including contributions toward compensation for animals slaughtered and testing costs.

http://wales.gov.uk/newsroom/environmentandcountryside/2012/121228btb/?lang=en

Marine Protected Areas advice published

A Scottish Government report on progress in developing a network of Marine Protected Areas (MPAs) has been presented to Scottish Parliament. The report is based on advice from Scottish Natural Heritage (SNH) and the Joint Nature Conservation Committee (JNCC) on the identification of a suite of Nature Conservation Marine Protected Areas (MPAs) in Scottish waters. Designed to protect marine wildlife, habitats and geology from the coast to 200 nautical miles offshore, the proposed sites will help meet international commitments to create networks of MPAs in Scotland, the UK and across the North East Atlantic. Thirty-three sites have been put forward to Scottish Ministers for consideration, with further work proposed for another four areas where there is currently not enough evidence to make firm proposals. These include a number of sites initially proposed by community groups and other organisations.

http://www.snh.gov.uk/news-and-events/press-releases/press-release-details/?id=809

EEB's priorities for the EU for 2013

In this background paper, the European Environmental Bureau presents its views on those issues that are expected to dominate the environmental policy agenda in 2013. The paper gives a broad indication of the environmental and environment-related issues that they consider should be on the political agenda in 2013 and how they believe they should be addressed. The EEB's priorities for 2013 are:

1. Sustainable development as the overarching framework
2. Environmental governance
3. Financial Perspective 2014-2018/20 for sustainable development
4. 7th Environmental Action Programme
5. Reform of the Common Agriculture Policy
6. Reform of the Common Fisheries Policy
7. Fighting Climate Change, domestically and globally
8. Halting decline of Biodiversity and restoring ecosystems
9. Year of Air
10. Chemicals and nano-technology
11. Resources, products and waste
12. A global treaty on mercury phase out
13. Noise

http://www.eeb.org/EEB/?LinkServID=52B92102-5056-B741-DB8D4B259BC7D470&showMeta=0

Landowners encouraged to report beaver issues

The Tayside Beaver Study Group is encouraging landowners to contact them if they have any issues with beavers on their land, after a Scottish Natural Heritage (SNH) study confirmed that approximately 146 beavers are presently living in the wild in rivers in Tayside. Surveys from May and July 2012, along with long-term observations, found that there are about 40 groups of beavers and seven dams in the Tay catchment. The beavers were found in the Tayside rivers and lochs stretching from Kinloch Rannoch, Kenmore and beyond Crieff in the west, to Forfar, Perth and Bridge of Earn in the East.

http://www.snh.gov.uk/news-and-events/press-releases/press-release-details/index.jsp?id=811

Giant Hogweed

EEA report highlights impacts of invasive alien species in Europe

The European Environment Agency (EEA) has published a report on the impacts of invasive alien species (IAS) in Europe, aiming to raise awareness and inform all stakeholders, including the general public about the environmental and socioeconomic impacts of IAS. Circulated as EEA Technical report no. 16/2012 and produced jointly with the IUCN Invasive Species Specialist Group, the report focuses on the multifaceted impact of IAS. It provides 28 dedicated species accounts to highlight the various effects of IAS, without neglecting the benefits of these species. The report suggests that the best way to deal with IAS is through a combination of preventive measures, early detection and rapid response to new incursions, with permanent management only as a last resort.

http://www.eea.europa.eu/publications/impacts-of-invasive-alien-species/at_download/file

EC to fund INTERPOL's efforts against wildlife crime

The European Commission (EC) has announced that it will contribute €1.73 million to INTERPOL in support of its Project Combat Wildlife Crime, which operates under the International Consortium on Combating Wildlife Crime (ICCWC) and includes the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the UN Office on Drugs and Crime, the World Bank, and the World Customs Organisation. In addition, the EC will be providing €2 million to the MIKE programme, which monitors elephant poaching across Africa.

https://secure.interpol.int/Public/ICPO/PressReleases/PR2012/PR102.asp

Bioacoustics – A Survey Technology That Has Come of Age?

Andrew Baker MIEEM
Managing Director, Baker Consultants Ltd and Baker Consultants Marine

Introduction

Like many practising ecologists working in the UK consultancy environment, my introduction to bioacoustics was through working with bats. Over the years, ultrasonic recording devices, in their many guises, have become an essential aid for the identification of these frequently cryptic species. Recording and processing the calls of bats is essential – as their vocalisations are beyond the normal hearing frequencies of humans. However, there are many other species that generate audible signals that can also be recorded. Until recently few biologists have explored the potential for using bioacoustics for surveying and monitoring. In this article I will look at the basic concepts of bioacoustics and the potential applications as an everyday tool for ecologists.

Basic Concepts

At its very basic level, sound is the transmission of energy through a medium, normally through air or water, generating areas of low and high pressure. The frequency of the oscillation is measured in hertz (Hz) and we can only hear a small portion of the range of frequencies. The early pioneers of bioacoustics categorised sounds into three main sources: the geophony (sound generated by the physical environment; wind, rain, movement of the oceans, etc.), the biophony (sound generated by living organisms) and the anthrophony (sound generated by humans, which strictly speaking is a subset of the biophony). Together these three aspects make up the Soundscape[1]. It is the latter two categories that are of interest to bioacousticians.

Many organisms have evolved highly complex structures, firstly for generating outgoing signals (signal is defined as sound that conveys information), then receiving incoming sounds, and finally being able to separate the signal from noise (noise being the unwanted random addition to a signal). It is the signal produced by organisms that can be used by biologists to identify species and, in some cases, even individuals. Bioacoustics does not only provide a measure of the abundance and diversity of a species but also conveys information such as territorial boundaries, activity (feeding, roosting, passage), breeding status, and disturbance events. Most importantly, responses of animals to interactions with humans can also be monitored and measured. Different types of animals hear and produce sounds in a

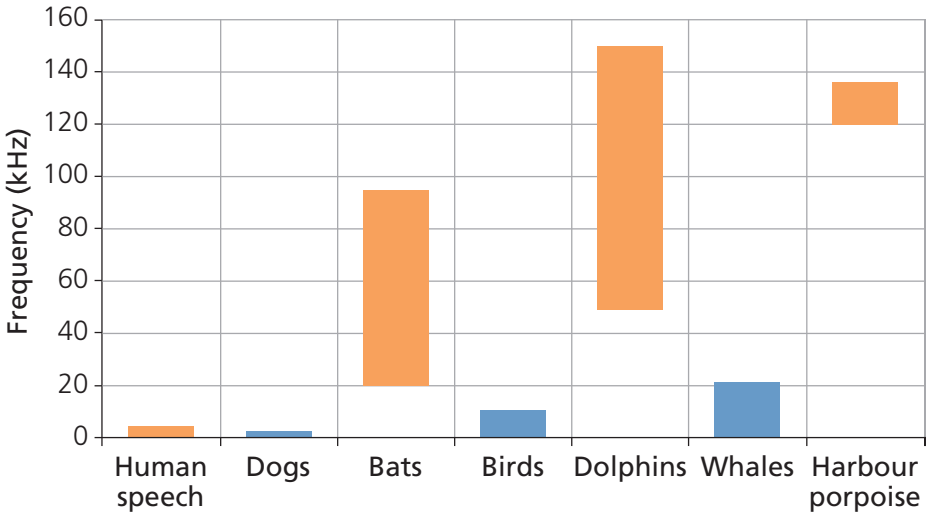

Figure 1. Diagram showing the frequency range of sounds produced by common animal species. Note that the hearing of most of these species extends beyond the frequencies at which they produce sounds.

specific range of frequencies, and this range is generally based on how and why they use sound. One example relevant to humans is the 'silent' dog whistle, which produces sounds that are above the human hearing range but still within that of dogs (Figure 1).

In addition to other more subtle characteristics, frequency range is a key feature in distinguishing the sounds of one species from another.

Because we can only hear a proportion of the sounds emitted by other species, generally up to 20kHz, techniques have been employed to be able to modify or visualise the sounds emitted outside our hearing range. Typically, high frequency sounds can be slowed down by as many times as needed to bring them into our frequency range, and sounds are recorded and later processed using computer software that allows us to visualise the amount of energy contained in the sound at specific frequency bands. The type of plot obtained from this kind of signal transformation is known as a spectrogram (Figure 2).

Technology

In order to interpret bioacoustics, it is first necessary to capture the data through recording devices, and then process the signal so it can be understood. Historically, high-quality recording devices were prohibitively expensive, one reason why bioacoustics has, until recently, been the preserve of researchers. In recent years however, the price of recording equipment has dropped considerably and cost effective devices are available that can record up to 200kHz and above, in both the marine and terrestrial environments. Not only are recording devices now cheaper but they are also better designed, more reliable and can be deployed for extended periods of time in the field. The data, which is invariably in a digital format, requires considerable computing power and memory for processing and storage, but likewise computing costs have also decreased dramatically. Finally, there is more software available to aid in signal processing, which can significantly speed up the rate of data analysis and aid interpretation. This combination of low cost technology and bespoke software means that bioacoustics can now be used by most field ecologists.

Applications

Since starting work in bioacousticss hardly a day goes by that I don't think of a new application for this approach. Bioacoustics offers the opportunity for reliable, objective measurement of biodiversity whether it be single species, species groups or as an indication of the overall health of a habitat. Because devices can be deployed for long periods of time, there is the potential for bioacoustics to be used for long-term monitoring applications over large areas at relatively low cost compared to conventional survey methods.

In the next section I explore some of the current and potential applications of bioacoustic survey and monitoring. Many of these applications are already adopted while others are in early development.

Birds

Although ornithologists have long used bird calls as a key part of species identification, recordings are rarely used for formal surveys in the same way that we do for bats. Bioacoustic surveys of birds have the potential to provide considerable amounts of data that can be collected over a long period of time. Cryptic or nocturnal species such as bittern or nightjar have calls that can be easily recorded by placing devices in the field at the appropriate time of year. Because of the long deployment times, collection of large amounts of data that otherwise would take considerable effort from surveyors on the ground is possible. If coupled with precise temporal and spatial references, these data can be processed not only to provide information on the number of calls but also information on distributions within the survey area. Furthermore there is now evidence that the signals of some species can provide information on breeding status, and work is currently underway in Nottinghamshire to determine whether the calls of paired and unpaired nightjar can be characterised (Andrew Lowe pers. comm.).

In the spring of 2012 I was able to secure funding for a proof of concept study, with the aim of comparing bioacoustic surveys of birds against conventional methods. The work is being led by Dr Mark Whittingham of Newcastle University under a research grant provided by Wildlife Acoustics Inc., the outcomes of which will be presented in peer-reviewed journals in the near future. Initial results of surveys for nightjar *Camrimulgus europeaus* show bioacoustic surveys to be more effective and less labour intensive than conventional survey methods.

Invertebrates

Signal generation in the acoustic frequencies is not confined to vertebrates. The soundscape also includes many invertebrates such as grasshoppers, crickets and cicadas. There are rapidly increasing bodies of literature and libraries of recordings for taxonomy, systematics and biodiversity research on these groups of animals. Like birds, there is the potential for bioacoustics to

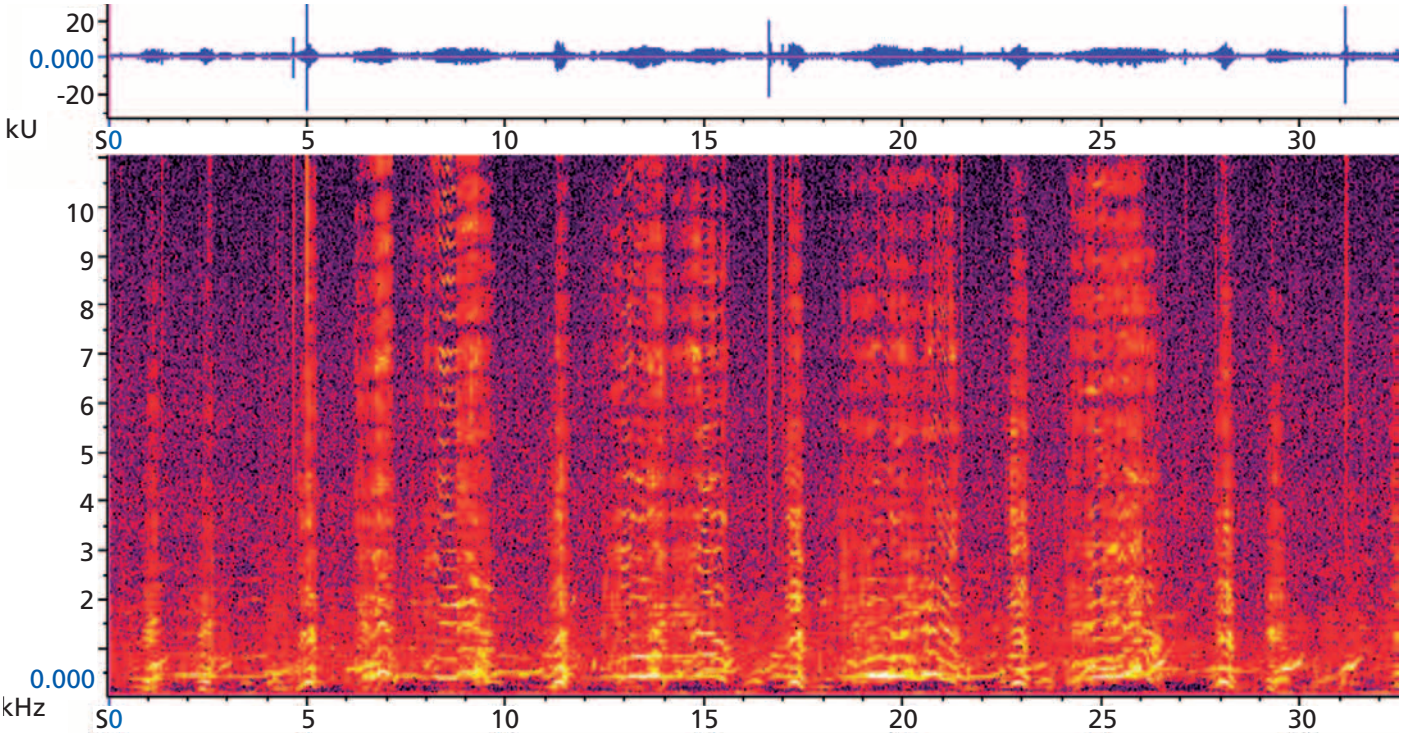

Figure 2. Spectrogram of a song produced by a humpback whale (*Megaptera novaeangliae*) in Madagascar (Federica Pace)

provide a means of monitoring populations in a manner that is objective, repeatable and subject to greatly reduced surveyor bias. Particularly because many invertebrates are small and difficult to locate in the field, using bioacoustics allows animals to be located regardless of their size.

Marine

Using bioacoustics for detecting the presence of animals and tracking their movements at sea has become a necessity because conducting surveys in the marine environment is much more challenging and costly than on land. For instance, marine mammals, which are protected by European law and raise great interest amongst the general public, spend most of their time underwater, making visual surveys from boats rarely adequate for assessing the status of their populations. Instead, sound can be used to survey in the same way that marine mammals use it (i.e. to detect individuals over distance). Because water is much denser than air, sound travels more quickly (about five times as fast) and farther through this medium. Coupled with the limited range of light, sound is a much better way of sensing and exploring the marine environment than light.

Indeed, the importance of sound in the underwater environment is demonstrated by how much marine mammals rely on this sense. Dolphins and other toothed whales have evolved extremely sophisticated sonar systems that allow them to navigate, detect prey, and distinguish the shape and material of objects. Even those marine mammals that are not capable of sonar-type sounds, such as seals and baleen whales, rely on sound to communicate, allowing parents to recognise their offspring, group members to remain close to each other and distant individuals to locate others of the same species.

In the past, the high cost of recording devices and the volume of data collected, severely constrained the use of bioacoustics in surveying whales and dolphins. Recording devices fall into two broad categories based on differences in how they store detected signals. The more basic method was to count sound waves and then average them to determine their frequency and until recently, most surveys were confined to this 'zero crossing' method. While having the advantage of producing more compact data, this method gives limited detail of the signals recorded. As the cost of equipment has fallen and its capabilities have increased, recording entire signals at their true frequency as they are detected is possible for long periods of time. This method, known as 'full spectrum' recording, and allows us as ecologists to build a complete picture of the marine fauna in a particular locality as well as how that picture changes over time.

Whilst most readers may be familiar with the capability of marine mammals to produce a variety of sounds, few people are aware that there are numerous other species that generate sound underwater, including fish, crustaceans and molluscs. Although these sounds are less well-studied at the moment, recording and characterising them will likely allow similar advances in detecting and monitoring their populations in the future.

While much focus has been given to the biophony of the marine environment, attention and concern about the anthrophony is becoming more prevalent. Sounds from anthropogenic sources can be recorded with the same devices used to survey for marine animals. Developing methodologies that combine recording biological sounds and anthropogenic ones has the potential to provide valuable information on the distribution, abundance and behaviour of commercial and other species simultaneous to data on how human activities are having an impact on the marine soundscape.

The soundscape of the marine environment has an added level of complexity in comparison to that of the terrestrial world because sound can travel much further and faster in water than in air. Because sound is affected by interactions with the surface and the substrate, as well as salinity, depth and temperature and can continue over extensive distance, the range at which effects are possible is very hard to predict. In some areas the marine soundscape is dominated by the anthropogenic components including noises generated by shipping, piling operations or seismic surveys. We are only just beginning to understand the potential interaction between the anthrophony and the biophony.

Regulation

The interaction between the biophony and the anthrophony has been the subject of concern for some time. In the terrestrial environment the main concern has been the impact of noise upon human populations. However, I am increasingly interested in the impact of anthropogenic noise upon the natural environment, particularly in the ocean. The potential negative impacts of high amplitude noise upon a wide range of species is well documented, but we are far from having a full understanding of the effects of noise pollution upon species such as cetaceans or migratory fish that may have to pass through noisy environments during migrations. The Marine Strategy Framework Directive (Directive 2008/56/EC) sets out eleven high-level descriptors of 'Good Environmental Status', of which Descriptor No. 11 reads: *"Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment."*

Although it is early days, the acoustic environment is clearly coming under closer scrutiny from regulators. The UK Government is currently consulting on how best to define and control marine noise pollution. In countries like New Zealand[2] and Germany[3] guidance or noise limits for operations such as seismic surveys and pile driving have already been put in place. In European waters, all cetaceans are European Protected Species and therefore protected against (amongst other things) disturbance including impacts from noise.

Biodiversity Monitoring

Given that many species use sound for a wide variety of purposes, there is the potential to use full-spectrum recorders to provide significant amounts of data to measure biodiversity and monitor changes in the biophony over the long term. A great example of how acoustics can be implemented for research in the wild is the Amphibian Monitoring and Research Initiative in the United States. This program has been using bioacoustic recorders since 2005 to monitor populations of frogs, examining factors such as the spread of invasive species and population responses to climate change (http://armi.usgs.gov/story/story.php?contentid=1626). In Europe, the AmiBio project (www.amibio-project.eu), funded by Natura 2000 and Life, has set up a network of bioacoustic monitoring stations to provide a systematic seasonal and longitudinal long-term monitoring of biodiversity in the Hymettus region near Athens (www.amibio-project.eu). Whether involving birds, amphibians, bats, invertebrates, mammals or fish, bioacoustics offers the potential to monitor biodiversity using systematic, replicable methods with greatly reduced surveyor bias with indices being devised to provide baseline measurements (e.g. Depraetere 2012[4]).

In Conclusion

The peer-reviewed literature on the use of bioacoustics for ecological survey and collaborative sound databases are expanding rapidly and bioacoustics clearly offers ecologists a powerful tool for recording and monitoring biodiversity as well as conservation of individual species and habitats. Technological advances and the falling cost of equipment means that the tools necessary to capture and process data are now within reach of both professional and amateur biologists. While there are still challenges ahead, in particular those related to data storage and analysis, there is little doubt that bioacoustics has indeed come of age and is now entering mainstream practice within the profession.

Acknowledgments

My thanks go to Dr Anna McGregor and Federica Pace for their contributions to the drafting of this article.

Notes

1 The concept of the Soundscape is attributed to Dr Bernard L. Krause, a musician turned biologist whose book *The Great Animal Orchestra* is an excellent and highly accessible introduction to bioacoustics.

2 New Zealand Department of Conservation. 2012. Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations July 2012.

3 Bundesamt für Seeschifffahrt und Hydrographie (BSH). 2007. Investigation of the impacts of offshore wind turbines on the marine environment (StUK 3).

4 Depraetere, M., *et al.* (2012). Monitoring animal diversity using acoustic indices: Implementation in a temperate woodland. *Ecological Indicators* **13:** 46–54.

About the Author

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Photo by Paul Kennedy

Noctule Bats and Wind Turbines

Larry Burrows MIEEM
Somerset County Council

Introduction

Noctule bats *Nyctalus noctula* are regarded as being at 'high risk' from collision with wind turbines – as are effects on their populations – by Natural England. To reduce the risks to bats from wind installations the Natural England guidance (Matthews *et al*. 2009) advises that turbines are placed at a minimum distance of 50m from the rotor tip to habitat features, such as hedgerows and woodlands that are used by many British species for commuting and feeding f y-ways. However, I consider that this 'rule' does not apply to noctule bats, which are a free f ying species.

The noctule bat is afforded protection under the Habitats and Species Regulations 2010 (the 'Habitats Regulations') making it illegal to cause disturbance that is likely to impair a species' ability to survive, rear or nurture their young, and to affect significantly the local distribution or abundance of a species. Furthermore, Regulation 9 obligates local authorities to have regard for the Habitats Directive 1992 which under Article 1 includes the 'Favourable Conservation Status' (FCS) of an Annex IV species, on which schedule noctule bats are included. FCS requires that a species' population is maintained. A planning officer's report to committee on an application must demonstrate this requirement apart from any subsequent licensing requirements.

Noctule bats are also a UK Biodiversity Action Plan priority species and are listed on Section 41 of the Natural Environment and Rural Communities Act 2006 as being of conservation importance to English biodiversity. A decline in the UK population of 21% was reported by JNCC between 1998 and 2004[1]. The National Bat Monitoring Programme shows no significant trend in the national population up to 2010[2].

Vulnerability

In Germany, noctule bats form 48% of all bat casualties at wind turbine sites (Dürr and Bach 2004). At Sachsen it was found that most casualties (48 out of 51) were juveniles (Rydell *et al*. 2010a).

Population models (VORTEX[3]) reveal that relatively small additives of 0.1% added to annual mortality rates may cause significant decreases in bat populations (Hötker *et al*. 2006). Hedenström and Rydell (2011) produced a model which could not exclude

the risk to noctule bat populations from additional mortality caused by wind turbine development.

Noctule bat maternity colonies generally consist of between 20 and 60 individuals (Dietz *et al*. 2009). However, in Somerset one observed roost supported >160 individuals in a churchyard tree and there is another large colony in a farm building. There is no overlap between neighbouring maternity colonies and home range may be defined by proximity (Mackie and Racey 2007). It is likely that any casualties caused by wind turbines would be inf icted on the same colony although if these are juveniles this could include dispersing males. Young female noctule bats are faithful to the place of their birth (Dietz *et al*. 2009).

Noctule bats are relatively short lived, compared to other species of bat, with an average lifespan of 2.2 years after reaching the first year in central Europe. The required birth rate to maintain a population is 1.5 to 1.6 births per year with an observed birth rate for the species of 1.4 to 1.5 births per year (Dietz *et al*. 2009). Two pups are typically born to a female in central Europe whereas one is normal in England indicating on average a longer lifespan if population levels are maintained. A maximum age of 8 years was recorded in the Netherlands (Mackie and Racey 2008). However, lifespan estimates are difficult to determine. Nonetheless, lacking evidence to the contrary, it is considered that even small increases in mortality rates can have significant effects on noctule bat populations.

In most cases when assessing proposed wind turbine sites the roost location and the size of the local population will not be known. Likewise the trend in that population will not be known. Therefore the additional loss of one noctule bat could be potentially significant, especially if (considering the typical size of most maternity colonies) incidents continue to occur over a period of time.

Multiple turbine sites in the same area could also have a cumulative effect on a population. Therefore the relative locations of noctule maternity roosts, existing and other proposed turbine installations need to be taken into account in making an assessment.

Roosts

Noctule bats prefer to roost near woodland edges. It seems that they are very selective about their tree hole roosts, preferring large uncluttered woodpecker holes, indicating dependence on woodpeckers, high up in trees in less dense areas of woodland. The rotten middles of ageing pollard willows are also used (Boonman 2000). The reliance on woodpecker holes is further suggested by a Czech study of over 40 years where over 95% of noctule roosts were found to occur in cavities excavated by greater spotted woodpecker *Dendrocopos major* (Lučan and Hanák, unknown date). It appears that the same preference is exhibited in Britain (Mackie and Racey 2008)

The most frequently used trees were willow *Salix fragilis*, oak *Quercus robur*, lime *Tilia cordata*, alder *Alnus glutinosa* and Scots pine *Pinus sylvestris* (Lučan and Hanák, unknown date). In another study, oak trees were the preferred roosting trees, and hornbeam *Carpinus betulus* and alder were avoided (Ruczynski and Bogdanowicz 2008). Kaňuch (2005) found that in park woodland, noctule bats were found to prefer the tallest and largest trees in the park, in this case ash *Fraxinus excelsior* and white poplar *Populus alba*.

Roosts were also only occupied for a number of years before new sites are found. The Czech study found that more than half of the cavities were occupied for ≤4 summers, and 35% were re-used for 5-10 years. The longest period a cavity was used by noctule bats was 16 years. The overgrowth of old voids by calluses is prevented by the continuous excavation of these cavities by woodpeckers, thereby keeping them accessible to bats (Lučan *et al*. 2009).

Within the summer period studies suggest that noctule bats shift roosts frequently so that the number of parasites that build up is kept to a minimum, especially in juveniles. This occurs within an area of 200 hectares (Boonman 2000; Dietz *et al*. 2009).

Therefore in accessing records from biological records centres for noctule bats in connection with wind turbine schemes it is also suggested that, when determining the 'zone of inf uence'[4] of the scheme, records for greater spotted woodpeckers should also be requested given the apparent reliance of noctule bats on the species for roost sites. Consideration should be given to woodland potentially supporting woodpeckers in the area of the proposed wind turbine development even if there are no records of noctule bat roosts. An assessment needs to be made of the location of the proposed site at a landscape level.

Flight

The foraging range of the noctule bat can be as much as 26km from its roost site. A radio tracking study of noctule bats roosting at Horner Wood in Somerset found that bats foraged a maximum of 6.3km away from the roost, although one bat f ew in a straight line for 23.5km, the mean distance travelled was 4.23km (Mackie and Racey 2007). It is considered reasonable that records within 5km of a proposed site need to be requested from the local biological records centre. This should then encompass areas of higher activity near roost sites.

The noctule bat's f ight to its foraging areas from its roost site is fast and in straight lines at 10-50m above ground level, up to hundreds of metres high. It will make steep dives in pursuit of prey (Dietz *et al*. 2009). This behaviour makes it vulnerable to collision with wind turbines if placed along commuting f ight paths or in feeding areas. Therefore, in making assessments, account needs to be taken of the relative locations of roost sites and foraging areas at a landscape level.

In one study in Germany no mortality occurred when the rotor axle was lower than 50m high (Dürr and Bach 2004) and Hötker *et al*. (2006) stated that Dürr reported similarly for turbines of less than 500kW (usually between 30m and 50m high). This was considered due to smaller tower and blade sizes (Jones *et al*. 2010). However, I have not seen any other studies supporting this and Jones *et al*. (2010) also cite data from German research that shows noctule bat casualties occur mostly at turbines where the rotor height is between 31m and 50m high although casualties occurred at heights between 20m and 80m at sites included in the survey. It is not known if casualties occur below 20m (i.e. for those classed as small or micro turbines).

Although air pressure differences on micro turbines may be less than on large turbines, making incidents of barotrauma less likely, acoustic research indicates that micro turbines still present a risk. Micro turbine blades turning at a constant 4-5m/s produce echoes analogous with approaching foraging bats at distance of 0.5m to 1m giving little time to avoid collision. This is, particularly so when

approaching laterally, towards the blades tips (Long *et al*. 2009). Research carried out by the University of Stirling showed that bat activity decreased with increasing wind speed when the turbines are running, but not when braked and those areas in the immediate vicinity of small wind turbines are selectively avoided by bats, especially when operating and at higher wind speeds (Minderman *et al*. 2012). However, no species specific behaviour was analysed for noctule bats and no study was made of mortality (Kirsty Park, University of Stirling, pers. comm.). Therefore, it is considered that turbines below 20m high should be assessed in the same way as larger turbines until there is evidence to the contrary.

Vulnerability of Juveniles

The young of the year first appear in August although some do not f y until September and October (The Earl of Cranbrook *et al*. 1965). Given that from the Sachsen study most casualties are juveniles and that most of these occur between August and September, there appears to be a coincidence with the period when noctule bat casualties are at their highest (Rydell *et al*. 2010a). This may explain observations made in Germany of noctule bats avoiding a wind farm of nine turbines at 100m distance and that they eventually avoided the area altogether despite favourable habitat being present (Bach and Rahmel 2004). Could they learn from experience? Nonetheless there are still records of adults becoming casualties and a group of noctule bats has been observed feeding on insects around rotor blades in afternoon sunlight in Austria (Rydell *et al*. 2010a).

Weaned juveniles are most likely to make use of foraging habitat closer to the nursery roosting area than adult bats. The importance of this zone close to the roost has been highlighted for horseshoe bats (Ransome 1996; Bontadina *et al*. 2002; Motte and Libois 2002). As they grow however, foraging ranges are likely to equal those of the adults (Elmore *et al*. 2005; Almenar *et al*. 2011). It is suggested that when considering locations for turbine development, sites closer than 2km to areas of maternity roosts should be avoided in the first instance, which is the area in which most activity occurs (Schmidt 1988: in Boye and Dietz 2005). These areas are likely to have a higher feeding density and numbers of commuting juvenile bats, and therefore the risk would be proportionally higher. The buffer would also allow for

an element of roost switching behaviour. Alternatively, a night-time shut down period, starting an hour before dusk, could be agreed between August and October, the period of highest risk.

Wind Speed

Bats are significantly more active when wind speeds are low. Nonetheless noctule bats are more tolerant of high wind speeds than other species (Rydell *et al*. 2010a). Jones *et al*. (2009) quote studies showing that noctule bats have been recorded f ying at wind speeds of up to 8m/s (from Grunwald and Schäfer 2007) and that 95% of noctule bats stopped f ying above 8m/s (from Bach and Bach 2008 and Behr and von Helversen 2006). At feeding sites noctule bats f y at 6m/s ± 2.1m/s (Jones 1995). From observation there is some evidence that noctule bats may f y at lower heights in windy conditions (Lynn Jenkins, Kestrel Wildlife Consultants, pers. comm.).

Studies of the benefits of cut-in speed at windfarms with high mortality have shown that increasing the cut-in speed of when a wind turbine operates from 3.5m/s to 5.5m/s can significantly reduce mortality (Baerwald *et al*. 2009). The findings of the Arnett *et al*. (2009) study suggest that there is no significant difference between a cut-in speed of 5m/s and 6.5m/s albeit with low statistical power to detect such a difference. The use of a 5m/s reduction was predicted to reduce casualties by approximately 50%. At the Rosskopf site Behr and von Helversen (2006)[5] observed that 95.7% of all bat activity was when the wind speed was below 6m/s. By 6.5m/s there were almost no bats near the nacelle. Noctule bat casualties have been recorded at average wind speeds between 5.8m/s and 6.4m/s (Bach *et al*. 2011).

A planning condition at a wind turbine site in Devon stipulated a minimum cut-in speed of 6m/s where there was a risk to bats.

It is suggested that 6.5m/s may be more appropriate where noctule bats are present. However, not all turbines, especially smaller and micro turbines, have the facility to enable a cut-in speed to be set.

Foraging Habitat and Behaviour

Noctule bats are found over water in early evening, in urban areas around streetlights and along woodland edges. They hunt above meadows, lakes, refuse tips and above treetops and activity is highest near lakes and over improved cattle pasture. Villages do not support high levels of activity. Mackie and Racey (2007) found that noctule bats at Horner Woods on Exmoor in Somerset preferred foraging above woodland, then pasture, followed by other habitats, arable and finally moorland. Broadleaved woodlands with surrounding pasture are key foraging areas.

Driven transects, carried out as part of the Somerset Biodiversity Monitoring Programme in 2009, indicated that the Somerset Levels and Moors had relatively higher levels of activity of noctule and 'big bat' activity when compared to other areas of Somerset. The locations of these areas of high activity were noticeable over wider watercourses, such as the Huntspill and Brue Rivers. Noctule bats are likely to favour these features, especially where woodland is uncommon, with high levels of foraging activity being observed where water bodies occur elsewhere (Mackie and Racey 2007; Boye and Dietz 2005; Dietz *et al*. 2009).

The maximum distance away from woodland at which noctule bat casualties have been found from wind turbines is 600m with a mean of 200m (Dürr and Bach 2004). It is suggested that a minimum of a 200m buffer from woodland, areas with a high density of hedgerows and larger water bodies 'rule' be adopted where noctule bats are present rather than the current Natural England guidance of a blanket buffer of 50m. Two hundred metres is the distance recommended by the EUROBAT Guidance on bats and wind turbines (Rodrigues *et al*. 2008).

Noctule bats regularly visit areas with high insect density but often there are no well defined hunting grounds, and they seem to roam freely hunting opportunistically (Dietz *et al*. 2009). Group feeding has been observed at preferred feeding sites (Kronwitter 1988; Mackie and Racey 2007).

Due to the seasonal variation in noctule bat prey, surveys for prospective wind turbine sites should take place over the active season. With consideration of the flight heights of this species also note that use of ground level detectors only when surveying can be misleading in determining presence (Collins and Jones 2009).

There is some evidence to suggest that insects are attracted to the colour of wind turbines, white or light grey, and that the highest bat mortality occurs at the time of insect migration in August and September (Long *et al*. 2011; Rydell *et al*. 2010b). Insects attracted to turbines include flies, moths, beetles and craneflies (Long *et al*. 2011). The noctule bat has a wide diet with equal proportions of flies, beetles and moths with variation reflecting seasonal abundance (Jones 1995; Mackie and Racey 2008).

From experience, the post-construction effects of wind turbines are often ignored in ecological impact assessments accompanying planning applications where bat foraging density at a site could change over that originally indicated from surveys. Habitat manipulation to reduce the attractiveness of a site may be required in some circumstances.

Mating Behaviour

As already noted, most noctule bat fatalities at turbines have, to date, been recorded occurring during late summer and autumn (Rydell *et al*. 2010a). Male noctule bats establish a mating roost within individual territories in August to September where females visit (Mackie and Racey 2008). Cryan (2008) hypothesises that tree bats collide with turbines while engaging in mating behaviour that centres on the tallest trees in a landscape. Bats use vision to move across landscapes and might react to the visual stimulus of turbines as they do to tall trees. If mating bats are drawn to turbines, wind farms may act as population sinks, which would be a risk that is hard to assess prior to the turbines being installed. In late summer and autumn male noctule bats occupy special mating roosts and behave territorially. Here they use mating calls to attract passing females (Boye and Dietz 2005). The Earl of Cranbrook *et al*. (1965) found that there was a considerable movement of adult male noctule bats in the late summer. In this case it is possible that fatalities to male bats are more likely. However, if there is an effect it is likely to be minimal depending on the location of the turbine in relation to roosting sites, given that juveniles are the main victims and that there is no significant difference between male and female casualties as has been indicated by studies in Germany.

Conclusion

The installation of a wind turbine development, either singly or cumulatively, must not affect the Favourable Conservation Status of the local noctule bat population. To reduce the risk of wind turbine development to noctule bat populations it is suggested that a desk study of occurrence at a landscape level should be undertaken and alternative sites recommended if within 2km of a known maternity roost. Consideration should be given to the mitigation methods outlined above.

Due to the increasing number of planning applications for wind installations there is an urgent need for research into the interaction of noctule bats and wind turbines, including small and micro turbines, in the UK if ecologists are going to make evidence-based assessments and give sound advice to their clients. This generally needs to be complemented by further survey work of woodland sites to identify noctule roosting areas. Priority should be given to a consideration of ecology in the initial site selection process including consultation with local authority ecologists.

I would be interested in hearing from anybody who has experience of post-construction interaction of noctule bats with wind turbines, either from monitoring or observation. Information on micro turbines would also be welcome.

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Notes

1 http://www.jncc.gov.uk/_speciespages/2459.pdf

2 http://www.bats.org.uk/publications_download.php/1060/State_of_the_UKs_bats_2011_web.pdf

3 http://www.vortex9.org/vortex.html

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'Bat Passes' – Redundant or Still Useful?

An Alternative Approach to the Analysis & Interpretation of Large Amounts of Data

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The collection of vast amounts of acoustic data by automated detectors during the process of bat surveys, along with the development of advances in analysis software may have made the use of the 'bat pass' redundant. The authors discuss the alternatives and the need for a standardised measure of bat activity across the industry.

AnaBat SD2 Bat Detector

For many ecological consultancies within the UK, the undertaking of ecological impact assessments for bats at proposed and existing wind energy facilities have become, quite rightly, an area that is requiring considerably more field effort for site assessments relative to their potential impact upon bat populations within a geographical region. During 2011 the Bat Conservation Trust issued guidance relating to survey methodologies and effort for such sites, and this guidance evolved into a finalised, revised approach as documented within the *Bat Surveys Good Practice Guidelines* (Bat Conservation Trust 2012).

With increased field effort in the form of active season surveys comes a correspondingly increased time load for analysis of collected data (i.e. the identification of bat echolocation encounters, and the sorting of the gathered data into information that can be understood by the key stakeholders involved in the decision-making process). Recent years have seen the development of automated bat detector systems (e.g. Titley AnaBat, Wildlife Acoustics SM2) that can gather vast amounts of data continuously over long periods of time, without the presence of a bat surveyor (other than to install and collect the devices). However, bat acoustic data analysis can be considerable, with the consequent impact on the ecological consultancy's resource management (often at a time when resources are being stretched to the limit), and on a client's budget. There is therefore good reason to consider ways in which the processing and analysis of data can be achieved more efficiently (and less expensively) and without adversely affecting the quality and rigor of the assessment.

With all of this in mind, a question worthy of consideration is: What is a significant amount of bat activity across a site? How can a planning authority decide if European Protected Species have been adequately taken into consideration if there is no universally agreed standard measure against which activity within a geographic region or habitat type or a species group can be assessed? For such a 'yard stick' to be developed, a standard bat activity unit of measure (representing an encounter with a bat) needs to be developed and agreed. If this were achieved it would mean that there could be more efficient options open to ecologists when making assessments, involving mountains of acoustic data.

The term 'bat pass' was developed in the days when manned heterodyne detectors were the only acoustic tools used for bat activity surveys and the 'bat pass' was defined as a burst of echolocation from a passing bat. With the advent of unmanned remote recording detectors, and their ability to continuously and endlessly record bat activity, the term 'bat pass' may now be redundant, as it is sometimes difficult and always time consuming/costly to confidently extract the equivalent of a bat pass easily from files recorded from remote detectors. More efficient options for evaluating bat activity have, in recent years, become available. With the use of software like Analook, the old 'bat pass' is frequently replaced by the number of sound files (usually from Anabat recordings)

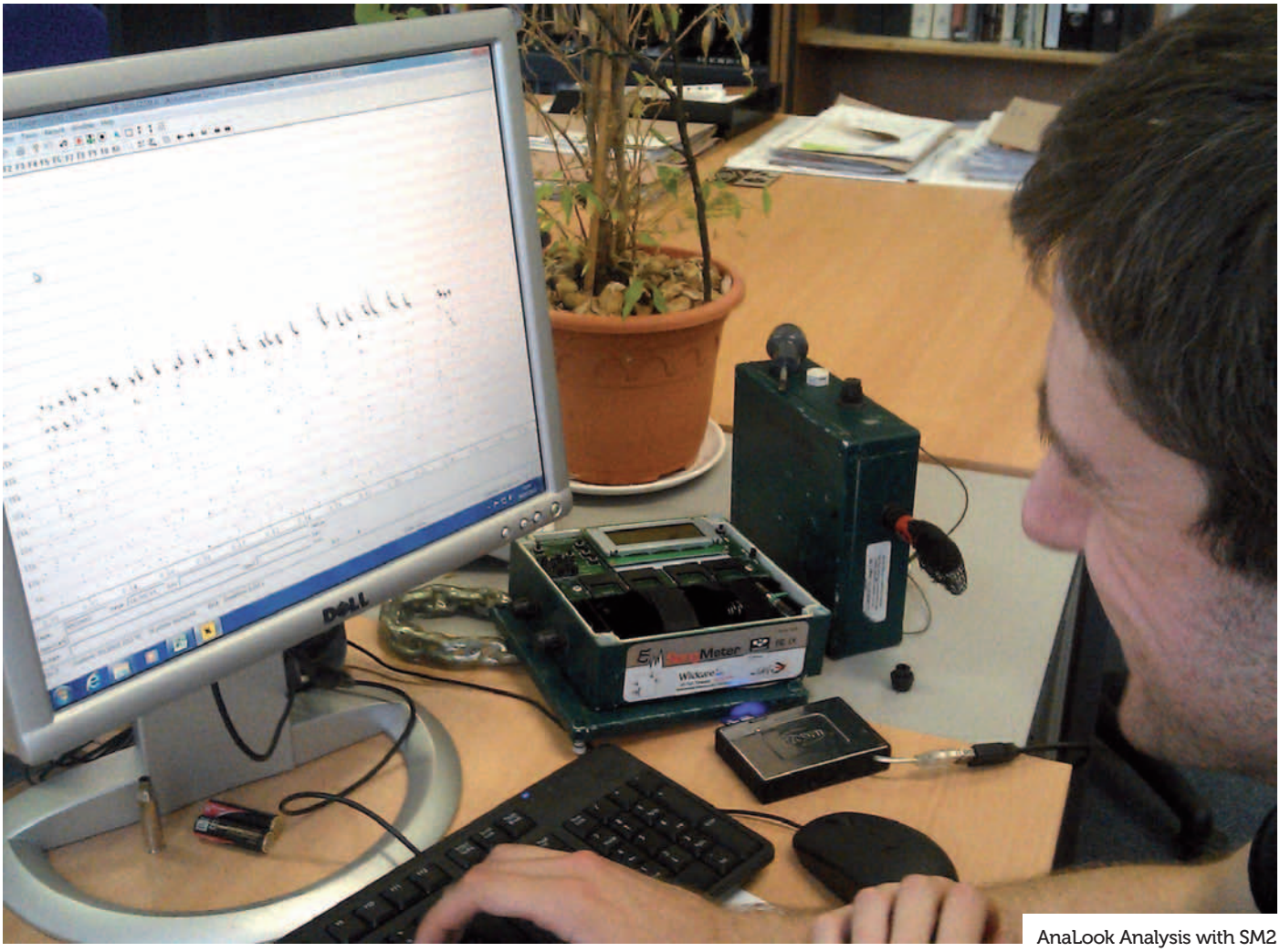
per night, per species or species group, as a measure of activity, and when this is the case it should be explained and defined as such within the text of the methodology.

The problem with 'bat passes' (as defined by the 2012 BCT Bat Survey Guidelines[1]) and sound generated files (containing pulses of a given species), is that both methods can be variable in duration and therefore not provide comparable units of activity. A bat pass can be two pulses or many pulses. A sound generated file can contain up to 15 seconds of continuous bat activity or one millisecond of bat activity. Ecological consultancies, individuals or teams within an organisation may not be following the same approach when determining what constitutes a 'bat pass', resulting in inconsistencies and analysis open to challenge at a public inquiry. With the need to analyse vast amounts of data, especially from wind farm sites, Analook scans were developed which use the basic activity measure of a bat pulse (instead of 'bat passes' or 'sound files'). This unit, a bat pulse, is unequivocal and is the smallest unit possible. Analook scans, based on filters (developed from parameters set for each bat species or group of bat species), list and/or measure pulses and provide for objective, repeatable and consistent results of bat activity or species composition; repeatable across a consultancy or across an industry, when all are using the same set of scans.

Ecological consultants in other countries have raised the question of bat activity units which are comparable 'across the board', from site to site, rather than simply provide *relative* levels of activity within a single location. One suggestion is that a bat activity unit could be a 10 second sound file, to be adopted as a possible standard. However, a 10 second sound file could have, for example, two pulses from one bat species or many pulses of more than one bat and more than one species, but if used as a standard activity measure, both could carry the same weight. This clearly would not be scientifically acceptable. Those that are using Analook are stuck with 15 second files (instead of any other unit of time) and would have great difficulty complying with this. Scans were set up for handling large data sets in a consistent, repeatable, objective way, and their application results in an efficient and reliable way of measuring many things including bat activity, without inconsistencies, misinterpretation or time consuming analysis.

Therefore, given what is available to us today, measuring the number of bat pulses for each species, through use of scans rather than using 'bat passes' or a defined duration of sound files, to determine activity, would appear to make commercial and scientific sense, and as such worthy of debate and development.

Leading on from this detectability, repetition rate and call intensity are variable between species, and inter-specific comparisons would



AnaLook Analysis with SM2

Table 1. Example of Comparison between Nyctalus, Pipistrellus and Myotis activity within a Proposed Wind Farm Site within the UK

Species Group	Bat Pulses Encountered	Typical Number of Pulses Expected per Unit of Time (10 seconds)*	Bat Encounters Occurring at Site
Nyctalus	1,500	40	37.5 (14.7%)
Pipistrellus	15,000	80	187.5 (73.3%)
Myotis	4,000	130	30.8 (12.0%)
Total	**5500**	**Total**	**255.8 (100%)**

**Note: The 'Pulses Expected per Unit of Time' data is not intended to be totally accurate or refined at this stage. The figures shown are purely there to demonstrate the approach discussed.*

be biased. For example, you would not expect a single pulse from a *Nyctalus*, to equate to the same level of activity as a single pulse from a *Myotis*, when all of the pulses for a site have been accumulated. However, depending upon the objective of the survey, a set of representative species 'pulse groupings' could be used as a comparable activity indicator across a region, thus providing a starting place for the development of that elusive, but much needed bat activity unit. For example, if during a survey period it was determined that 1,500 Noctule pulses were encountered, and during the same study 15,000 *Pipistrellus* and 4,000 *Myotis* pulses obtained there would be a need to show how they would, on average, compare against each other. Table 1 gives an example of such an approach. This is intended to offer a starting point to be modified and refined across all the species or species groups for a region.

In conclusion, 'bat passes' are considered by the authors of this article to have probably outlived their usefulness when it comes to the analysis of vast amounts of data from automated remote systems. We consider that it is time that we as an industry debate the development of a new bat activity unit, based on the ability of the new generation of detectors and their software, to count and measure bat pulses, leading to a consistent, repeatable and scientifically robust measure of bat activity worthy of a young, rapidly evolving industry.

Notes

1 The 2012 Bat Survey Guidelines (page 82) define a 'bat pass' as *"two or more bat calls in a continuous sequence, each sequence or pass separated by 1 second or more in which no calls are recorded"*.

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Automatic Recognition Systems for Bat Call Identification

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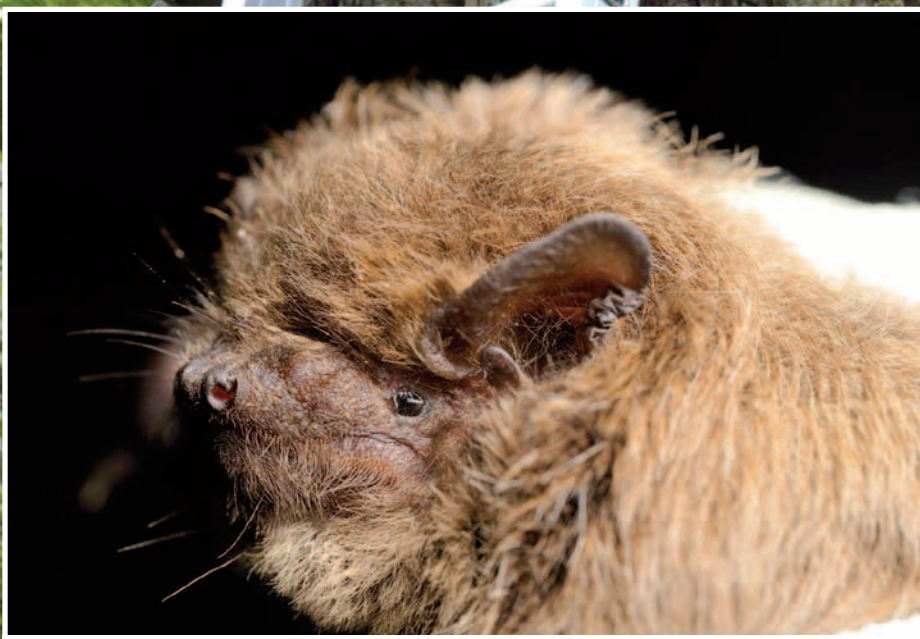
The current trend for large-scale or long-term bat surveys is to use remote monitoring equipment to capture the echolocation calls of passing bats. A number of hardware and software solutions are being developed commercially to allow these data to be automatically captured and processed, with bat calls subsequently extracted and identified to species level. In this article we review the current state of this technology and advise caution in interpreting the results.

Introduction

Bats are by their very nature not the easiest of animals to survey. They are nocturnal, highly mobile and often thinly spread. The improved portability and sophistication of bat detectors over the last few decades has meant that surveying for bats has become less of a specialist art, and the advent of remote logging devices has decreased the man-hours needed to survey locations while increasing the amount of data collected.

In the recent past, many Heath-Robinson style devices were assembled to undertake remote logging, but specifically engineered robust products have now become commercially available. The Anabat SD2system stores zero crossing data on a CF card which can be left unattended in a suitably weather-proof housing for remote recordings, as can the full bandwidth Elekon Batlogger. The Pettersson D500x stores full bandwidth calls onto memory cards, as does the Wildlife Acoustics SM2Bat+. The EcoObs Batcorder records full bandwidth data streamed onto an SDHC card while the Binary Acoustics AR125/AR180 ultrasound units store data onto the dedicated FR125 field recorder. What all these devices offer is the versatility of setting the threshold levels to start recording only when a bat passes by, timed recordings with time and date stamping of the recorded files and robust hardware that can be left unattended

A Pettersson D500x in a homemade enclosure deployed in old parkland. A three week deployment recorded 8,885 files, which when manually processed, yielded 1,025 files containing recognizable bat passes. Photo by Dean Waters.



Nathusius' pipistrelle – the greater quantity of data collected from automatic loggers may help to find this potentially under-recorded species. Photo by Dean Waters.

in the field for as long as the battery, memory cards and weather proofing hold out.

Following on from the generation of large quantities of time and location stamped echolocation data from such devices comes the possibility of automatic call recognition – software that will automatically and reliably process the large volume of calls recorded from remote survey stations, extract the calls and assign each call to a particular species.

Data Acquisition and Processing

The automatic capture and analysis of remotely logged bat calls is a three stage process. Firstly, for devices which can be programmed to capture calls from a trigger, the most commonly used method by remote bat detectors, the call has to reach the microphone of the device at sufficient amplitude to trigger it. If the trigger is set too high, then weak bat passes from quiet or more distant bats will be missed; if it is set too low, other sounds such as rain, wind or calling insects will rapidly fill up the memory cards with useless data which will prove time consuming to analyse. Secondly, the echolocation calls within a recording sequence must be of sufficient quality to be located and extracted by an automated system scanning each file. Again, weak or poor quality calls may not be picked out of the noise and will be overlooked. The identification of the presence or absence of a call will obviously affect the quantitative measure of bat abundance and is a serious issue to consider in comparing studies between sites or recording stations using different equipment settings. Once a call sequence has been identified in a recording and the calls extracted, the third and final stage is the assignment of that call to a genus or species of bat.

Call Identification in Theory and Practice

There are a number of different statistical techniques available that can be used to make species identifications. Broadly, they start with a set of echolocation call data from known bat species, usually termed the 'training set'. From this set, a series of measured parameters are extracted from the calls, either manually or automatically. These can be as simple as the maximum frequency of the call, the duration or inter-pulse interval, or more complex parameters such as the function describing the frequency sweep.

Whiskered bat – not only difficult to identify in the hand, but also a real challenge to identify from its echolocation calls. Photo by Dean Waters.

These parameters are then analysed by a statistical process or function. Finally, a call from a bat of an unknown species is then compared with this set of data, and based on its extracted parameters, assigned to one of the species from the training set.

A number of conditions have to be satisfied for this process to work. The first of these is that there must be a genuine set of parameters that can be extracted from the calls that are different between each species to be discriminated. Such a principle can easily be applied to the horseshoe bats in the UK for example. A species with a constant frequency echolocation call with a peak frequency between 100-120kHz will be a lesser horseshoe bat *Rhinolophus hipposideros*, whilst one between 80-85kHz will be a greater horseshoe bat *R. ferrumequinum*.

For most bats however, separating species is not that simple. The majority of bats use frequency modulated echolocation calls that sweep down from a high frequency to a low one, most use similar, overlapping frequency ranges and most have similar call durations. This makes discrimination between species on a single character more or less impossible. However, it may be possible to make the discriminations based on combinations of two or more characters, which is the principle behind Discriminant Function Analysis (DFA). In practice, linear combinations of variables (such as maximum, minimum and peak frequency, and duration and inter-pulse interval) are used to maximise the differences between the echolocation calls of two species. A range of parameters are measured from the echolocation calls of a set of species. These are analysed statistically to find out which combinations of these parameters are capable of discriminating the species, and their relative importance. A call from an unknown species will then be entered into the function and be assigned to one of the species or species groups. Such an approach was first used by Vaughan *et al*. (1997) to test the possibility of classifying the calls of British bats.

An alternative approach is that of the Artificial Neural Network (ANN), where a software network is trained to recognise species based on the input parameters. A call from an unknown species will then be entered and again assigned to species. Parsons and Jones (2000) used this approach and found an improved level of classification for British bats compared with a DFA approach. An extension of DFA, the Support Vector Machine (SVM) has gained ground since the mid 1990s in that it optimises the discrimination of new or unseen calls based on a relatively small training set. Whilst Armitage and Ober (2010) found that SVM outperformed DFA in discriminating bat echolocation calls from US species, it was no better than the ANN approach, and Redgwell *et al*. (2009) found it performed less well than ANNs, although it did still outperform DFA.

Not only does a set of unique call characters have to exist for each species, it has to also be observable, and there is a range of

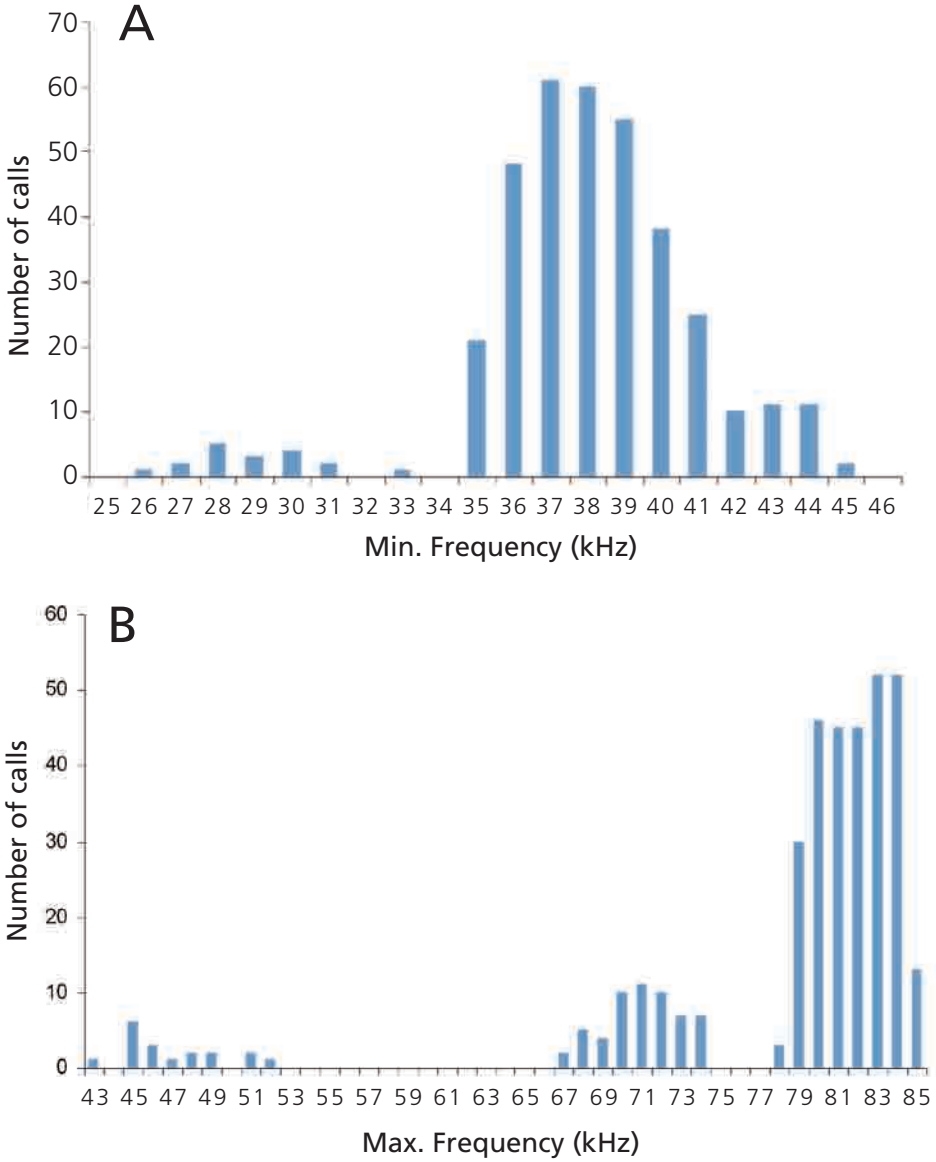


Figure 1. A. Distribution of the minimum frequency of a set of echolocations calls from *M. daubentonii*. While the minimum call frequency of the majority of calls falls between 36 and 40 kHz, the range extends from 26 to 45 kHz.
B. Distribution of the maximum frequency of the same set of echolocation calls which extends from 43 to 85 kHz.

sources of variation which hinder that. Firstly there is intra-bat variability. This is variation in the calls from a single individual due to habitat or feeding stage. Superimposed upon this is inter-bat variability, the variation in calls between individual bats of the same species. Finally, there is recording variability and this is probably the single largest issue. This is variation caused by specific technical features of the recording device, angle of the microphone to the bat, recording distance and processing technique. All of these sources of variation combine to blur any differences between species. The underlying nature of variation in recorded echolocation calls is illustrated in Figure 1 where the distribution of the minimum and maximum frequency of a set of calls from a number of individual Daubenton's bats *Myotis daubentonii* feeding over water are shown. As can be seen, the range of recorded frequencies is quite large.

The development of the statistical classification techniques requires a set of recordings from individuals of a known species. The only reliable way of obtaining these is to record individuals identified morphologically (i.e. in the hand). These can be recordings made on hand release, from bats exiting positively identified roosts or from bats tagged with radio transmitters. If recordings are made from bats which are not positively identified and used in the training set, then the statistics may be trained to recognise the wrong species. The downside, apart from the difficulty of obtaining sufficient volumes of such data, is that bats may be echolocating in a non-standard way in these situations compared with when they are actively foraging. The training set also tends to be made up from the best recordings, ones that have good bandwidth and high signal to noise ratio, something that may not be true of typical field recordings.

Once the statistical process is developed, it then needs testing. What should happen is that a new and unused set of recordings made from known species is passed through the statistical process and the number of calls correctly classified is noted. This then provides the correct classification and misclassification rates for each species. However, since the gathering of data from known species is so problematic and time consuming, it is often the original training data or a subset of it that is used to test the statistics as well as to develop them. This is a process known as 'bootstrapping'. While there are some advantages to bootstrapping, it is essentially using the same data to test the model as that used to build it which may lead to overconfidence in the ability to make c orrect discriminations.

Once developed and tested to satisfaction the statistical process can then be deployed and used on unknown bat calls. However, there is still no effective way of testing whether it is working or not. Any bat classified by the system is long gone by the time the data are processed, so there is never any method by which the system can actually be verified in the field. This is perhaps the greatest issue, and to be fair, one that also plagues bat consultants using other manual methods of species identification: how do you know that the bat you just identified was the species you think it is?

Commercially Available and Freeware Systems

There are already a number of systems available that advertise the facility to automatically assign calls to species using the methods described, or at least to highlight calls that have a certain set of characteristics.

The Song Scope package from Wildlife Acoustics allows the user to build up their

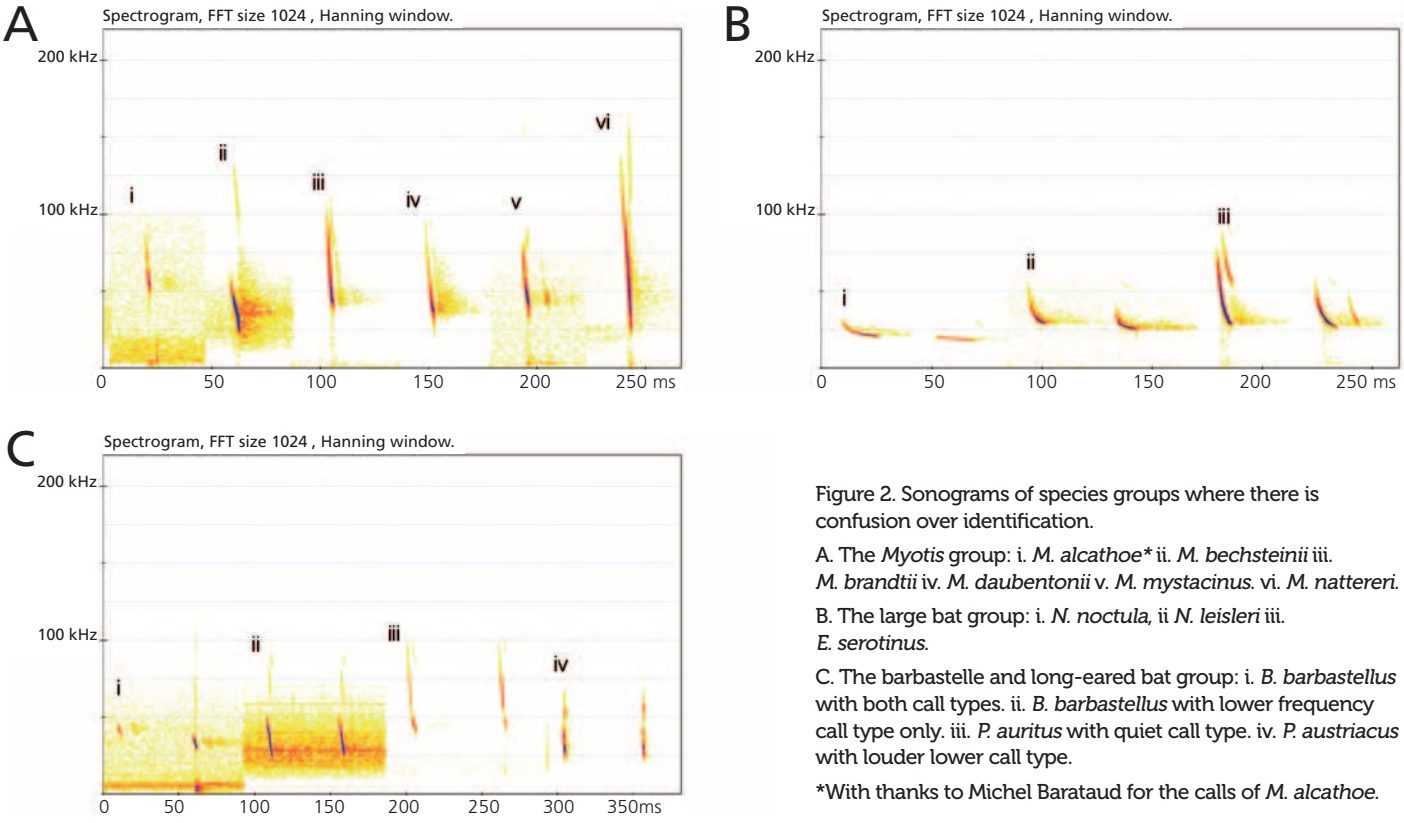


Figure 2. Sonograms of species groups where there is confusion over identification.

A. The *Myotis* group: i. *M. alcathoe** ii. *M. bechsteinii* iii. *M. brandtii* iv. *M. daubentonii* v. *M. mystacinus*. vi. *M. nattereri.*

B. The large bat group: i. *N. noctula,* ii *N. leisleri* iii. *E. serotinus.*

C. The barbastelle and long-eared bat group: i. *B. barbastellus* with both call types. ii. *B. barbastellus* with lower frequency call type only. iii. *P. auritus* with quiet call type. iv. *P. austriacus* with louder lower call type.

*With thanks to Michel Barataud for the calls of *M. alcathoe.*

own set of 'recognisers' based on previously identified calls and the software will then scan long recordings for similar calls for further analysis. While not an automated call analyser as such, it does save time in searching for specific species. Also under development by Wildlife Acoustics is an ID package as an add-on to their Kaleidoscope file conversion software. This is currently being developed for North American bats, but may be extended to European species later. The process uses a variety of techniques, including Hidden Markov Models (HMM) applied to both full spectrum and zero-crossing files.

With Anabat, the user can generate a set of filters to scan large numbers of files and pull out signals which fit. This can be very useful for sorting files containing *Myotis* from *Pipistrellus* for example. A software tool for Anabat, termed 'Anascheme' has been developed for Australian bat species. This system analyses various parameters of the frequency divided signals recorded by the Anabat, including the frequency sweep pattern. It also incorporates an 'unknown' classification category where the echolocation call sequence is not of sufficient quality to attribute to species. Testing of this system on Australian bats shows a correct classification rate of 56-75%, and up to 91-99% for some species when the unknowns (i.e. calls that could not be assigned to species) were removed from the dataset (Adams *et al*. 2010).

Sonobat 3 has a built-in automatic bat call identification option, currently only available for North American bat species. It has a fairly sophisticated interface at the classification stage allowing fine tuning of the acceptable levels of probability of correct identification, and will also not classify species if the recordings are of poor quality. It will also indicate if it doesn't know what the species is. The advantage of this system is that the data for the training sets have already been collected, so the user simply needs to input their own recordings. Sonobat can also be used to find calls in recording sequences and extract parameters from the calls, which can then be used in further analysis for species identification.

The ecoObs batcorder system uses an open source SVM and 'Random Forest' algorithm to identify European bats based on their echolocation call characteristics. After capture by the recorder, files can be scanned using a package called bcAdmin which will find calls and extract various parameters from them. These can then be passed to the batIdent package which will perform the classification by running scripts written within the 'R' statistical language. The software only runs on the Macintosh platform (OSX 10.5 and above). The identification algorithms check to see if the call parameters are outside the ranges that it might expect (outliers) before continuing to attempt to classify the call. While there are data missing for some European species, all of those occurring in the UK are covered. However, there are currently no data available on the reliability of the algorithms in attributing calls to the correct species, and according to the instructions, recordings must be made at a sampling rate of 350kHz or higher and at a resolution of 16 bits which excludes commonly used time expansion bat detectors such as the Pettersson D-240x.

While most software is developed by hardware manufacturers, a number of other independent software packages are becoming available, including SoundID which partly uses Linear Predictive Coding (LPC), a well-established sound analysis technique

to compare recordings with the users own reference library. The iBats project has a web upload interface (iBatsID) into which can be pasted call parameters extracted by Sonobat and which will then use Ensemble Artificial Neural Networks (eANNs) to classify European species (Walters *et al*. 2012). Other open-source applications to extract calls from recordings log their parameters and classify them are also becoming available.

Automatic Identification in Practice

Are any of these systems likely to be of help in automatically identifying bats from their echolocation calls in the UK? The most tricky group is certainly the genus *Myotis*, particularly troublesome since calls from all species are very similar and it is also the most specious group (Figure 2). There is also some difficulty in distinguishing Leisler's bat *Nyctalus leisleri* from serotine *Eptesicus serotinus* and some call types of barbastelle *Barbastellus barbastella* from *Plecotus* (Table 1.) In the scientific literature, Obrist *et al*. (2004) found the average correct classification rate of *Myotis* to species to be 59%, with the highest success being for correctly classifying Natterers's bats *Myotis nattereri* at 82%. For serotine, 69% were correctly assigned to species, while for Leisler's bat only 27% were, the bulk of the calls being misclassified as serotines.

Papadatou *et al*. (2008) obtained an overall 82% correct classification success rate for bats in Greece, with 84% correct classification for *Myotis* species, with similar results obtained for Italian bats by Russo and Jones (2002), although there was considerable variation in which species of *Myotis* could be correctly classified.

Redgwell *et al*. (2009) compared SVM and ANN approaches. The best SVM result correctly classified 87% of calls to species, while an Ensemble Neural Network (ENN) approach using 21 neural networks did achieve up to 100% correct classification within some genus groups, although the number of calls per species were limited (between 25 and 100 depending on the species) and all of high signal to noise ratio which is unlikely to ref ect real field data.

Perhaps the most relevant study to bat consultants is that of Jennings *et al*. (2008) which compared the ability of neural networks to identify calls with that of experienced bat consultants. In this study, unlabelled calls were sent to bat consultants across Europe and they were asked to attribute the call to a species. The same calls were then run through an ANN and the results compared. There were no significant differences between the abilities of the humans and the artificial neural networks to discriminate calls with 56% and 62% correct classifications to species respectively.

The most recent study is that associated with the iBats project and provides identification models for all European bat species based on an extensive dataset of bat calls (Walters *et al*. 2012). This has a sliding threshold level where increasing the threshold increases the percentage of correct classifications to species but also increases the number of calls that can't be classified. The overall correct classification rate was 84% for all species, but *Myotis* proved more challenging. There are particular issues with distinguishing within the species group comprising *M. bechsteinii/daubentonii/brandtii/mystacinus* with only 50% of calls being correctly assigned to each species. This compares with *Pipistrellus pipistrellus* and *P. pygmaeus* which had 98% and 94% correct classifications respectively. The authors conclude that species-level identification within *Myotis* is currently not possible with existing methods.

Conclusions

It would appear that the best that can be hoped for in Britain using current techniques is an 85% overall correct classification rate. This sounds encouraging, but given that 15% of bats are likely to be misclassified, and that an additional unknown number of calls will be missed by the scanning software or be of too poor quality to analyse means that such techniques must be approached with caution. The genus *Myotis* remains especially difficult. There are as yet no 100% reliable expert systems for the identification of UK bats from their echolocation calls, and nor may there ever be. These systems are undoubtedly useful for batch-scanning large numbers of files, f agging calls of interest, and suggesting possible species. There is however still a requirement for manual checking. Whilst they can greatly increase the quantity of data collected and processed they are not a replacement for expert knowledge. Until such systems have been rigorously tested and verified in real field situations they should be used with caution.

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Evaluation of the Survey Method to Determine Population Size Class for Great Crested Newts in England and Wales

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Summary

Great crested newt survey results were collated from 101 ponds across England and Wales to determine, for this sample, how often the results from the fifth and sixth survey visits resulted in a change in the population class size and when the maximum counts were recorded. Analysis of the results indicated that the population class size changed in only 1% of the ponds used in this study. This, and the analysis of when peak counts were recorded, suggests that a review of the great crested newt guidelines would be useful.

Great Crested Newt. Photo by Barry Kemp

Background

English Nature published guidance in 2001 to inform the need for great crested newt mitigation as part of development projects and other works that could affect great crested newts and their habitat (English Nature 2001). The guidelines address the required survey effort to determine the presence/absence of great crested newts in a pond and, if present, their population size class. The guidelines give minimum standards of survey effort and methods. The survey effort to determine presence/absence is four survey visits between mid-March and mid-June, with at least two visits between mid-April and mid-May. To determine the population size class, a further two visits are required, giving a total of six visits, with at least three visits between mid-April and mid-May.

Method

This paper presents the results of the collation and analysis of great crested newt survey results from 101 ponds from 27 sites throughout England and Wales in order to answer the following questions:

- How often do the fifth and sixth visits result in a change to the population size class estimate?
- When were the maximum counts recorded?

All surveys were undertaken in accordance with the guidelines in terms of survey methods and weather (particularly air temperature). Exceptions to the recommended survey dates occurred for 15 ponds, where the sixth visit was undertaken between the 15th and the 21st June. This study has made use of data collected over the period 2006 to 2011. The ponds were distributed across England and Wales: North East (1), North West (17), Midlands (36), South East (35) and South West and South Wales (12).

The following data were collated for each of the 101 ponds: location, peak count, visit number and date of the maximum count, air temperature, survey methods and dates of the survey period. The data were analysed by sorting the data in the columns

and comparing the other values across the spreadsheet visually for consistent patterns. No statistical tests have been undertaken.

Sixty-four of the ponds supported a small population of great crested newts (maximum counts up to 10), 34 supported a medium population (maximum count between 11 and 100), and three ponds supported a large population (maximum count over 100).

Analysis of Results

Out of the 101 ponds surveyed to determine the population size class, the peak count was recorded during either the fifth or sixth visit in only 13 ponds. These additional visits did not change the size class in 12 of these ponds. The additional visits only changed the size class at one pond. This was in a quarry site in the North West where the peak count increased from 6 on the third visit on 4th May to 11 on the fifth visit on 24th May, changing the class from small to medium.

The dates of the fifth and sixth visits to these 13 ponds ranged from 4th May to 9th June. There was no correlation between the geographical location, the year of survey, or the population size class of these 13 ponds.

The maximum counts in the 101 ponds occurred during the following time periods, as shown in Figure 1:

- 58% between mid April and mid May;
- 30% in the last two weeks of May;
- 7% in the first two weeks of April;
- 5% in the first two weeks of June.

Discussion

The guidelines propose two additional survey visits beyond the four required to establish the presence/absence of great crested newts in order to estimate the population size class. The population size class allows the predicted impacts of a development on the newt population to be assessed and appropriate mitigation measures to be developed.

These results indicate that in 99% of the ponds included in this study (and 96% of the projects), the fifth and sixth visits did not provide information that affected the need for and scope of mitigation for development works. This reassessment of the data from 101 ponds suggests that a review of the current great crested newt survey methodology set out in the 2001 guidelines should be undertaken. Given the relatively small sample size, further analysis could be undertaken to corroborate these findings. For example, the data from Natural England's database of licence applications could be used to determine whether the 101 ponds included in this current study are indeed representative.

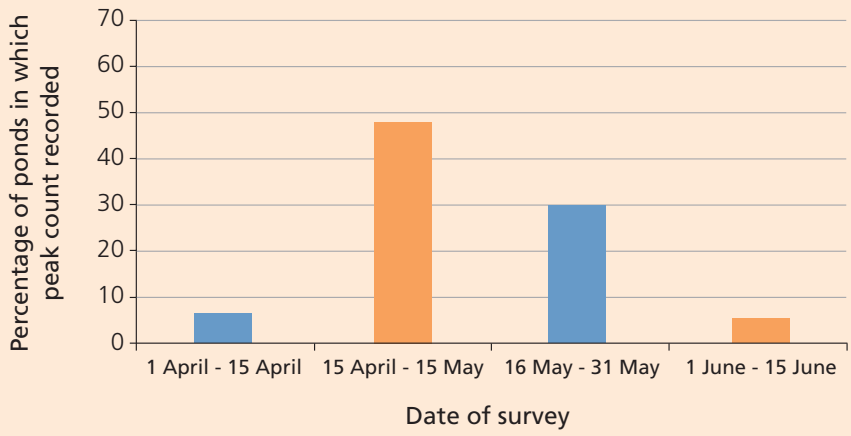

Figure 1. The percentage of ponds in which peak counts were recorded in each time period

In addition to the questions posed by this paper, the review could also determine how often small numbers (i.e. less than five) of great crested newts are recorded during a fourth survey visit that is outside of the guideline period, thus requiring a further two survey visits which, by definition, are outside of the optimum survey period.

Edgar, Griffiths and Foster (2005) reported that in 2000 there were over 80 projects that were covered by a great crested newt development licence, at a cost, for the mitigation works, of approximately £1.5 million per year. There could be substantial cost savings to be made from a revision of the current methodology for great crested newt surveys for development projects.

The timings of the maximum counts show that, for the ponds used in this study, 88% of the peak counts were recorded between mid-April and the end of May. This accords with the peak survey period of mid-April to mid-May set out in the 2001 guidelines.

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Using Field Signs to Identify Water Voles – Are We Still Getting it Wrong?

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Water vole. Photo by Mike Dean

The River Colne in north Essex is the location of one of the largest water vole *Arvicola amphibius* translocations ever attempted in the Eastern Region. Over 600 water voles have been re-introduced along 10km of river corridor during a 5-year project to enhance and expand the existing Essex Water Vole Recovery Project. Of prime importance was ensuring that receptor habitat was not already occupied by water voles from a previous year's translocation, which could result in territorial conf icts between existing populations and new colonisers.

While undertaking surveys of the final release site in May 2012, I discovered a series of feeding stations at the top of the river bank, along the edge of a wheat crop. The way the stems were cut was indistinguishable from the widely accepted appearance of water vole feeding activity (Strachan, Moorhouse and Gelling 2011). However, the cropping pattern was repeated along field margins up to 0.5km from the river and the ground was littered with distinctive droppings indicating that this was the grazing activity of brown hares.

At the time of the survey, the similarity of these field signs to those produced by water voles was nothing more than a curiosity. However upon reviewing the photos, prior to hosting a water vole survey training course, I became more concerned. Could less experienced surveyors or volunteers take these signs out of context and present them as evidence of water voles, or could similar field signs occur in more ambiguous locations than an arable field margin?

Previous authors have expressed concerns regarding the similarity in the appearance of feeding signs of other vole species to water voles (Ryland and Kemp 2009). This has always formed part of the training for potential water vole surveyors in Essex and Suffolk. Field voles, in particular, regularly feed on grasses, rushes and sedges along streams, rivers and grazing marsh ditches but can tackle plants as large as yellow f ag iris *Iris pseudacorus*.

The feeding signs of lagomorphs do not appear to have been highlighted in the same way even though my observations are by no means unique. Jon Bramley, an experienced mammal ecologist, reports seeing similar feeding remains left by rabbits on field margins near Sandwich, Kent in 2012 while undertaking water vole surveys. And in Hertfordshire there was an even more relevant example. Tim Hill, Conservation Manager at Herts and Middlesex Wildlife Trust, has been working on wetland restoration of Stanborough Reedmarsh, an HMWT Reserve, for the past eight years. Water voles were rediscovered in 2008, but while undertaking a repeat survey in 2011 he found what appeared to be high level feeding stations, 30m into an area where they had previously carried out 'bed lowering'. He describes the following:

"The feeding stations were about 18 inches above the water on dense vegetation, comprised of reed sweet grass, sedges and common reed. There were piles of stems with the characteristic 45 degree cuts suggesting water voles. However, as I searched further, I found rabbit droppings close by and subsequently saw rabbits in the same area – the vegetation was dense enough to support their weight."

Surveying is both an art and a science and we must ensure that field signs are placed into context when trying to ascertain the presence or absence of a species. It would seem unlikely that an experienced surveyor could mistake the cropping pattern of hare or rabbit activity along a field margin as being that of water vole. However we need to be aware of the potential for these field signs to look identical and, more importantly, realise that they may occur in areas where we may be surveying to confirm the continued presence of known water vole colonies.

Feeding remains – when found alongside latrines, droppings, tracks or other field signs – are still an important field sign when searching for evidence of water voles. As long as care is taken to interpret the overall context of the remains there should be no reason to discount this evidence in most cases.

1. Field vole flag iris feeding station, St Osyth Priory lake, Essex (Field vole latrines and small incisor marks in the cut leaves were evident.)
2. Water vole feeding signs, Tenpenny Brook, Elmstead Market, Essex
3. Brown hare feeding signs in wheat, River Colne, Halstead, Essex
4. Water vole feeding station, grazing marsh ditch, Vange Marshes, Essex
5. Brown hare feeding station, River Colne, Halstead, Essex
6. Series of brown hare feeding stations along field margin, River Colne, Halstead, Essex
7. Cropping pattern of field margin, River Colne, Halstead, Essex
8. Rabbit (left) and brown hare (right) droppings comparison photo

Photos 1-8 by Darren Tansley

Brown Hare. Photo by www.wildstock.co.uk

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About the Author

Darren Tansley is the co-ordinator of the Essex Water Vole Recovery Project and an Associate Tutor in Riparian Mammal Ecology and Survey Techniques for the Field Studies Council, Flatford Mill, Suffolk.

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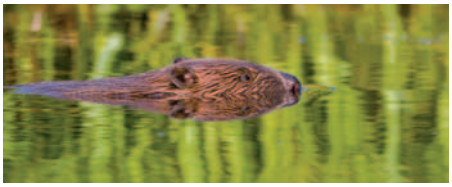
A Potential English Beaver Trial

Derek Gow MIEEM
Derek Gow Consultancy Ltd



Photos by Richard Stafford

Archaeological evidence, place name association and folklore all provide evidence that the Eurasian beaver *Castor fiber* was once widely distributed throughout mainland Britain. This species was hunted to extinction by humans for its valuable fur, meat and castoreum (a presumed agent of pain relief). In medieval Europe a single castor gland was worth the equivalent of a year's wage to a labourer. Bounty records suggest that the last beavers may have survived in England until 1780. However, over-exploitation across their Eurasian range meant that by the beginning of the 20th century this once common species had been reduced to around 1,200 individuals, in eight isolated populations. From this low point beavers have re-colonised or been proactively reintroduced throughout much of their former range. It is well established that with tolerance and pragmatic management beavers can co-exist in modern cultural landscapes alongside people. Public support for beaver reintroduction has been strong with popular media coverage being largely sympathetic.

Beavers are totally herbivorous. About 90% of their summer diet consists of green vegetation such as grasses, sedges and aquatic plants. Tree bark, twigs and leaves are more commonly consumed in the autumn and winter. Beavers almost always feed within 100m of the water's edge, although most activity is generally confined to a 30m zone from fresh water bodies. On average, adults weigh ~22kg, although individuals of up to 30kg have been recorded. Beavers have large, orange, curved incisors and are well adapted to a semi-aquatic lifestyle with webbed hind feet, a flattened rudder-like scaled tail and waterproof fur. The species is monogamous, and adult pairs typically produce two or three young, or 'kits', each year.

Although beavers are famous for their dam building, the construction of these structures is very dependent on habitat type and dams are not constructed on larger water bodies, such as rivers and lakes. Dams are generally found in the upper reaches of river systems where water courses are too shallow to afford suitable living habitat. The landscapes which result from this activity contain significant densities of submerged, standing and fallen dead-wood, which provide valuable invertebrate habitat. The wetland environments created by beavers have other exploitable features such as foraging canals, wet grasslands, raised groundwater levels and extensive silt or gravel beds. Beaver activity results in a myriad of vital habitats for a wide range of mammal, insect, reptile, amphibian, fish, bird and plant species.

The idea of reintroducing beavers to Britain is not new and has been recommended by various individuals and organisations dating back over the last 100 years. Currently the only licenced beaver reintroduction is underway at a study site in mid-Argyll, Scotland. This 5-year trial – the Scottish Beaver Trial (SBT) – is due to conclude in 2014, with the Scottish Government expected to make a decision on the future of beaver reintroduction to Scotland in 2015. Much of the foundation work for this trial was undertaken by Scottish Natural Heritage (SNH), with the licence finally granted to project partners, the Royal Zoological Society of Scotland (RZSS) and the Scottish Wildlife Trust (SWT) in 2008. In England and Wales, feasibility studies commissioned by Natural England (NE) and the Countryside Council for Wales (CCW) have both recommended trial releases into closed catchments. NE has indicated that they will confine their role to licencing any such trial as opposed to actively seeking to develop an active project. Beaver reintroduction in England will therefore only progress through the action and support of the wider conservation community.

Currently, an independent beaver reintroduction trial is being proposed within the Mevagissey Valley in southeast Cornwall. It is the only one of its type in England and has been developed by the Lost Gardens of Heligan/Eden Project, the Cornwall Wildlife Trust and the Royal Zoological Society of Scotland. A provisional licence application which will shortly be finalised has been prepared for consideration by NE. The project has been designed and advised by a range of national land-use organisations. Monitoring work is designed to complement the scientific work of the SBT and offers a unique opportunity to assess the impact of a beaver-generated environment on water retention, purification, flood dissipation and indigenous wildlife.

This project is now seeking funding partners to enable it to proceed with the first principal aim being the employment of a project officer to coordinate all the required monitoring, fund raising, community liaison and animal management issues. Any members requiring further information should contact Roisin Campbell-Palmer (rcampbellpalmer@rzss.org.uk).

About the Author

Derek Gow is a member of the Eurasian Beaver Working group. He project managed the import of beavers for Kent Wildlife Trust, the Cotswold Water Park and the Wildfowl and Wetlands Trust. With the assistance of a grant from the Esmée Fairbairn Foundation and the Ecology Trust, Derek has worked since 2009 on the identification of potential trial release sites for Eurasian Beavers in England. He advised aspects of the Natural England and Countryside Council for Wales beaver feasibility studies and is currently a member of the advisory board for the Welsh Beaver Project.

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Biodiversity and the Big Society: A Case Study of London's Biodiversity Action Plans

Maria Crastus GradIEEM

Figure 1 (Source: http://commons.wikimedia.org)

Introduction

The Big Society was launched by Prime Minister David Cameron on 16th July 2010. One of its most prominent features is to allow charities and community groups to take over public services (Cabinet Office 2010). The Big Society was the subject of a 15,000-word dissertation that I wrote as part of my MSc in Conservation in 2011. My project investigated the opportunities and challenges presented by delivering biodiversity outcomes from a third sector- and community-led perspective. The new national political focus on a Big Society raises the question of whether a definitive shift towards delivery by non-state actors will produce better, and more cost-effective, outcomes for nature conservation in the UK than a more strongly state-directed approach. This is especially significant given that nature conservation is now facing its most serious funding challenge in many years as a result of the difficult economic climate and the outcomes of the Comprehensive Spending Review. Figure 2 shows the six stages between Big Government and Big Society.

This article introduces a number of the findings of my MSc thesis. They include:

i) participants' views on the value that local expertise has for the Biodiversity Action Plan (BAP) framework, and the limits of this expertise;

ii) the implications of the public spending cuts for local authorities' future roles in the BAP process, and for third sector involvement in the BAPs; and

iii) some potential problems, other than the funding issue, that are posed by giving voluntary groups more power over conservation issues.

Study Area and Method

The focus of the study was the London Biodiversity Partnership (LBP) BAP (a pan-city BAP) and London's individual borough Local BAPs (LBAPs). The research consisted of in-depth interviews with a total of 20 public and third sector members of the LBP BAP and 13 different London borough LBAPs. The participants included several local authority biodiversity officers and representatives from statutory environmental organisations, environmental charities, and a local community group. Figure 4 shows all the member organisations of the LBP BAP, and Figure 5 shows some sample interview questions that were posed to the 20 participants during the project research.

Figure 2. The six stages between Big Government and Big Society. The bold arrow shows the current balance, between stages 2 and 3.
Source: Department for Communities and Local Government (DCLG 2010).

Charitable trusts and foundations will come under ever greater pressure as they are subjected to an increase in demand for funding from larger numbers of environmental organisations.

The author volunteering with The Conservation Volunteers (TCV). Photo taken by Wenxin Liu.

Figure 3. London boroughs.
Source: London Councils (no date).

Value of Local Expertise

There was unanimous agreement among the interviewees that third sector and community group involvement in the BAPs is and always will be a crucial component of the BAPs' success. A major reason for this is that local communities can bring expertise on habitats and species to the BAPs in numbers and to a level that a single local authority could never possess. In fact, volunteer species recorders are responsible for a large proportion of the species data that environmental records centres hold. Long-term residents of an area can also bring the kind of continuity to a local knowledge base that council biodiversity officers, many of whom are only on fixed-term contracts, cannot always bring.

Local people can therefore fill the gaps in a local authority's knowledge. Even if a council ecologist is highly skilled and has a specialism in a particular species group, they might not understand all of the data relating to other plant or animal species groups. Indeed, a number of local authorities do not even have any trained ecologists on their staff. Therefore, particularly in a climate where there may be even fewer biodiversity posts available in local authorities, this local knowledge is felt to be increasingly important.

Public bodies and statutory organisations:

- British Waterways Ltd.
- Environment Agency (EA) – leads the Rivers & Streams HAP
- Forestry Commission (FC)
- Greater London Authority (GLA)
- Lee Valley Regional Park Authority (LVRPA)
- London Boroughs
- London Councils
- Natural England (NE)
- Royal Botanic Gardens, Kew
- The Royal Parks – leads the Acid Grassland and Heathland HAPs
- Transport for London (TfL)
- University College London (UCL)

Charities:

- Amphibian and Reptile Conservation
- The Conservation Volunteers (TCV)
- Buglife
- Froglife – leads the Standing Water HAP
- London Bat Group – leads the Bats SAP
- Groundwork London
- London Natural History Society (LNHS)
- London Orchard Project – leads the Woodland HAP
- London Wildlife Trust – leads the Chalk Grassland, Private Gardens, and Wasteland HAPs, and the Stag Beetle and Water Vole SAPs
- Natural History Museum – leads the Black Poplar SAP
- Peabody Trust
- Royal Society for the Protection of Birds (RSPB) – leads the House Sparrow and Sand Martin SAPs
- Trees for Cities
- Wildfowl and Wetlands Trust (WWT) – leads the Reedbeds HAP
- Woodland Trust
- Zoological Society of London (ZSL)

Private companies:

- Thames Water Utilities Ltd.

Other organisations:

- Greenspace Information for Greater London (GiGL)
- Thames Estuary Partnership (TEP)
- Thames Landscape Strategies

Figure 4. Member organisations of the London Biodiversity Partnership BAP. The list also shows which organisations lead which Habitat Action Plans (HAPs) and Species Action Plans (SAPs). The list gives an idea of the great variety of public and third sector organisations that collaborate in a BAP. Source: London Biodiversity Partnership (LBP 2011).

Q1) What skills and expertise do you think third sector organisations can bring to the BAPs?

Q2) In light of the public spending cuts, what do you think the future role of local authorities will be in delivering BAP conservation objectives?

Q3) What implications do you think the spending cuts could have for third sector involvement in the BAPs?

Q4) In the context of the BAPs, do you think the Big Society will signal a move away from the state?

Q5) On the whole, do you think the Big Society agenda would be a worthwhile undertaking for the nature conservation sector?

Q6) What do you think the balance should be between public sector and third sector delivery of the BAPs in a Big Society approach?

Figure 5. Sample interview questions posed to participants during project research.

Limits of Local Expertise

However, while all local authority officers encourage biological recording by members of the public, they also recognise that it does not always have a professional basis. They therefore warn that there needs to be a clear separation of volunteer recorders and their expertise, which has a role to play, and the guidance that is needed from professional ecologists. Some officers feel that volunteer species surveys sometimes have quite a limited utility beyond being good awareness raising tools, because they do not always generate very much useful data.

What the public can generate useful data on, though, are those species that are well known, easily identifiable, and often found in private gardens. Hedgehogs are one of these species, and volunteer recorders are particularly useful for monitoring species such as these, because local authorities could never send paid staff around their entire boroughs to monitor all of them.

Some council officers therefore believe that whilst local people can generate some useful records, most of them can still only have a role to play in surveying for a relatively limited number of species, because most people would not be able to identify many of the less well known species. Neither do biological records generated by local people always cover an entire borough, so environmental records centres do inevitably end up with spatial data biases. Community wildlife surveys therefore cannot be entirely relied upon to provide a local authority with complete data on which to base BAP actions, and they are not a replacement for professional surveys. These findings would suggest that the professional ecologist's role in verifying species survey data is not one that can simply be replaced by the Big Society.

Effects of Public Spending Cuts on Environmental Organisations in the Public and Third Sectors

Effects on Defra and Local Authorities

The Comprehensive Spending Review was published in October 2010 (HM Treasury 2010). Figure 6 shows a breakdown of selected government departmental budgets in 2014-15, and it also shows the percentage changes in real terms from 2011-12. As can be seen, the Department for Environment, Food and Rural Affairs (Defra) ('Environment') is among the worst affected departments of all, with a settlement which includes overall resource savings of 29.96% in real terms by 2014-15. Greenspace (2011) estimates that 82% of local authorities in the UK will have their funding from central government cut over this period, of which 30% could face losing more than 20% of their budgets. The National Council for Voluntary Organisations (NCVO 2011) estimates that, cumulatively, the UK's voluntary sector stands to lose in the region of £2.8 billion over the spending review period 2011-2016, largely as a result of the public spending cuts.

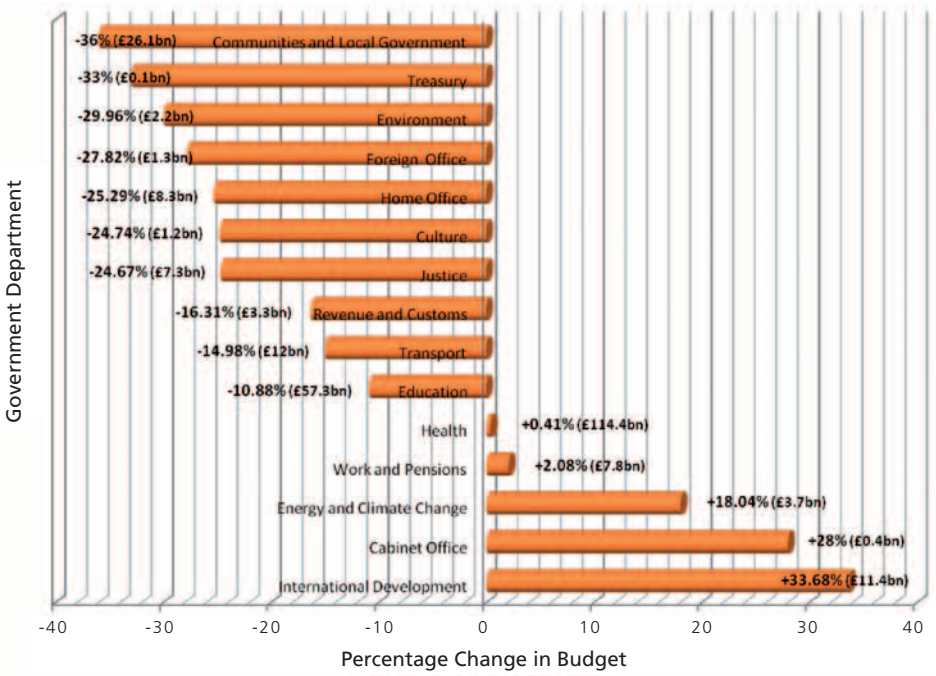

Figure 6. Percentage changes in real terms in selected government departmental budgets between 2011-12 and 2014-15. The total departmental budgets that result are shown in brackets. Source: The Telegraph (2010).

The budgetary pressures that have resulted from the Spending Review lead most participants to believe that the role of local authorities in the BAPs is going to diminish over the coming years. Indeed, biodiversity officer posts have already been cut from a number of local councils, and more are likely to follow. Unfortunately, biodiversity's already low position on the political agenda is made even worse by the fact that local authorities do not have a statutory duty to have dedicated biodiversity officers, nor to enhance biodiversity in their boroughs. These adversities mean that local authority core funding for the third sector groups that manage sites throughout their boroughs are coming under huge pressure.

If further rounds of spending cuts are demanded of councils, many could eventually be forced to concentrate only on their statutory duties. This is already the case with several biodiversity officers, who can now only afford to do the tasks that they absolutely must do by law, such as maintaining sites around their boroughs to a minimum standard. Any extra actions such as habitat creation and enhancement work, however, have since ceased.

Many local authority officers believe it is a myth that a reliance on voluntary groups would be any less resource-intensive than employing paid staff in the public sector. Whether it is a council or a charity that tries to encourage more volunteer involvement, it is still a time-consuming and costly exercise either way. One reason for this is that a council or charity needs to attract skilled people who can lead the volunteers and teach them how to carry out tasks correctly, and how to use tools safely. Another reason is that the council or charity needs to devise a volunteer programme that is not only fun, but which also covers all of the different skills and physical abilities of the individual volunteers in order to make sure that the volunteers keep coming back. All of these elements cost time and money and, without the funds to

cover these, a volunteer programme will be unsustainable. Several council officers said that a cost saving could be made if councils could have paid, in-house volunteer leaders who could work across several departments. The officers also said, however, that many councils do not see such posts as a priority in the present climate.

Now that councils are going to have to implement spending cuts across the board, a number of London borough councils have come together to run joint green space services at a lower cost than if they were to have individual services. Unfortunately, though, this kind of collaboration is not a foolproof strategy either, and its viability can still be put at risk by spending cuts. For example, if a number of boroughs collectively employ a project officer to manage a particular service, funding for this position will be reliant on all of those boroughs. This means that if further spending cuts were demanded of the departments in any of the participating councils which fund that position, then they might decide to withdraw their funding for it, and this could lead to the entire service being disbanded. Cross-borough models of governance could therefore be equally vulnerable over the next few years.

Effects on Environmental Charities and Community Groups

With public sector funding being cut sharply, many voluntary groups will need to look to alternative sources of funding, such as charitable trusts and foundations like the SITA Trust or the Heritage Lottery Fund (HLF). The issue with many alternative funding sources, however, is that they are both short-term and project-specific. Many will provide any single voluntary organisation with funding for a maximum of three years, and the funding is quite restricted in terms of what it can and cannot be used for. For example, these funds are not designed to cover the day-to-day running costs of third sector organisations, because this is what core funding from local authorities is mainly intended for.

Most interviewees reinforced the already substantial doubt that alternative funding sources will be able to make up for the core funding that voluntary organisations could lose from local authorities. They explained that doing just one grant application can be a complicated and time-consuming process, particularly if it is for a large amount of money. For example, for a community group to put in a HLF bid for £100,000 would be an enormous undertaking that could easily take the best part of a year to do. An application such as this also needs considerable skills, and community groups have historically been very dependent on local authorities not only for funding, but also for assistance with these kinds of grant applications, because many groups do not hold the necessary expertise within their ranks to be able to do the applications on their own.

This leads many people to believe that the Big Society idea of local groups surviving on

Image 1: Community tree planting project. Source: http://commons.wikimedia.org

Image 2 shows community scrub clearance, and Image 3 shows community path building. Both are from http://commons.wikimedia.org

their own would not work, because they depend on local authorities for advice on so many aspects of their work. There remains the possibility that community groups will still be capable of applying for smaller amounts of money without the support of local authorities. Even with these, though, many more groups will be bidding for an ever diminishing resource, and inevitably not all groups can succeed in securing this funding.

The large environmental NGOs that have bigger staff bodies with the time to devote to fundraising efforts will be in a better position than small community groups, but even for them it will be a challenge to maintain the present scope of their projects. A major stumbling block is a problem associated with their landfill and community tax funding streams. The Landfill Communities Fund (LCF) is a tax credit scheme that enables operators of landfill sites to contribute money to enrolled environmental bodies to carry out projects that meet certain environmental objectives. Landfill operators can contribute up to 6.2% of their landfill tax liability, and reclaim 90% of this contribution as a tax credit. A complication with landfill tax revenue, however, is that the landfill operators often require a third party to make up the 10% net loss that still remains after they have reclaimed 90% of their contribution as a tax credit. Only then can they send a voluntary organisation their full contribution. Typically, these third parties are local authorities, and they need to have these funds in place before a contribution can be granted.

Some projects that charities are currently involved in are stalling because local authorities cannot be the third party contributors to their landfill tax funding streams. Many charities are therefore afraid that this will mean they have to discontinue a number of the projects that they are currently building up. These findings show that alternative funding streams will certainly not enable the voluntary sector to become the core provider of biodiversity services as a serious alternative to the state.

Ameliorating the Effects of Spending Cuts

There is evidence to suggest that those borough councils whose LBAPs have been successfully integrated into other council functions such as housing, health, and education, have a better chance of retaining their biodiversity officers than those councils that have more stand-alone LBAPs. This is because it gives LBAP coordinators a greater cross-cutting role, and makes them less expendable. It is also very important from a funding perspective, because if nature conservationists can demonstrate, for example, that they are working to create new habitats around housing estates, encouraging more active lifestyles, or engaging young people, then their LBAPs have a greater chance of receiving funding from the council departments whose remits include these things. This in turn will increase their chances of being able to continue funding at least some of the voluntary groups in their boroughs. This finding suggests that nature conservation needs to have widely understood objectives if it is to avoid dropping off the agenda when hard times strike.

Other Potential Problems with a Big Society Approach

Apart from the funding issue, there are still other reasons why an over-reliance on the voluntary sector to deliver biodiversity outcomes would be a risky strategy. One of these reasons is that the setup of many community groups is problematic because they are very dependent on single, key individuals. Often, a community group comes down to one or, at most, two people who are organising it and holding it all together, and then there are many more people, on a mailing list, who are either just a little involved with the group, or who do not contribute to it at all. Therefore, if the people who are organising the group leave, fall ill, or cannot continue for any other reason, then the group could easily fall apart.

Added to the high dependence that community groups have on a few key individuals is the problem of waning enthusiasm on the part of their volunteers. There is often a lot of enthusiasm for a green space at the beginning, for example after it has been saved from a development. But after the reality of week-in-week-out management of a public open space sets in, which is not just for the use of the few people who are managing it, and which gets misused and vandalised from time to time, what often happens is that volunteer enthusiasm for giving up time to look after it gets lost. This is an example of a general problem that exists in the voluntary sector, and in this respect, managing volunteers is actually more challenging than managing permanent paid staff.

Concluding Comments

Third sector involvement in the BAP framework will always be integral to its success. A problem exists however in that some community groups are too dependent on local authorities for funding and for expertise in fundraising to be able to function without their support. Several large conservation organisations will also have their capacity significantly reduced over the coming years.

Alternative funding sources will come under ever greater pressure as they are subjected to an increase in demand from larger numbers of organisations, and in any case, these sources will certainly not make up for the shortfall in government funding for biodiversity. To mitigate the effects of the public spending cuts, local authority biodiversity officers should endeavour to make their activities relevant to a more diverse range of other policy agendas such as health and education.

An over-reliance on the voluntary sector could also give rise to continuity problems in terms of community group leadership and volunteer enthusiasm. Local authorities would therefore need to think carefully about how they would manage problems such as these, before they could consider giving the voluntary sector greater responsibility for sites of biodiversity interest.

If the aim of the Big Society is that the state should off oad its costs and responsibilities in terms of biodiversity onto the third sector, then it is clearly misguided. The role of professional expertise in setting up and coordinating the Big Society through volunteer leadership, advice on fundraising, the verification of environmental records, and a host of other skills, will need to remain an indispensable part of delivering biodiversity through the Big Society.

Figure 7 gives some sample interview quotes from participants on the themes covered in this article.

Acknowledgements

Thanks are due to the 20 interviewees, without whose participation the project would not have been possible. I also want to thank Judith Hanna and Nick White from Natural England, and Amanda MacLean from the Environment Agency, for providing many helpful suggestions for the methodology, and for giving advice throughout the project.

Views on the Big Society's usefulness.

"Biodiversity is such a broad, specialist field with all these little niches and sub-disciplines, that there will never be one person in a local authority who knows absolutely everything."

"I'm the only biodiversity officer here, and I only have a certain amount of time, so I feel very lucky to have groups that are incredibly knowledgeable and helpful."

"Most people probably know very little about biodiversity, so they won't necessarily bring many skills."

"Many local authorities don't have trained ecologists on their staff, so they've got to get that expertise from the Big Society. I don't necessarily think that situation is desirable, but it could increasingly be the case."

Views on the viability of a Big Society approach amidst the public spending cuts.

"There is a strong argument that the Big Society has been launched at entirely the wrong time, when there's no money left. If you want to demonstrate that it works, you don't do it at a time when everyone's scrabbling around for far less money."

"People can quite clearly see money's being cut, and I don't think people are going to be fooled into saying, that's great, now I'll get involved. They'll go, why should we? Because it's not going to be matched by the local authorities."

"It's a paradox really – the government says it wants a Big Society, but then it stops the councils' ability to fund the voluntary groups in their jurisdictions."

"Even the most keen proponent of the Big Society would never propose that public expenditure should be reduced to zero."

Views on other problems posed by a Big Society approach.

"You will always get a few committed individuals who will do great things, but there are also many hangers-on who will only do it if there is something in it for them."

"You'll always need a professional to direct the Big Society, you can't just hand everything over to untrained people and hope for the best."

"I think for many people who volunteer, they don't want stress, don't want to be in charge, they just want to turn up and do something for a few hours and then go home."

Figure 7. Sample quotes from interviewees, illustrating views on the Big Society's usefulness, the impact of the public spending cuts, and other problems with a Big Society approach.

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About the Author

Maria Crastus is a recent graduate who specialises in environmental communications, and currently volunteers for Wildlife and Countryside Link and Women's Environmental Network. She completed her MSc in Conservation at University College London in 2011, for which she wrote her dissertation on which this article is based. In 2012 she gave a talk at IEEM's South East England Section AGM on her dissertation findings.

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Institute News

Royal Charter

Following the exciting news that our petition for a Royal Charter has been granted there have been lots of preparations underway to make the necessary arrangements. Easter Monday (1st April) is 'C' day when we become the Chartered Institute of Ecology and Environmental Management. Further information about what this means is given on page 46.

Country Life Article

Members may be aware of an article entitled *The Bats are in charge of the belfry* published in *Country Life* magazine (and subsequently in *The Telegraph* as *Holy bat protection! That's cost me £10,000*) in January 2013 regarding bats and a barn conversion. The IEEM response to these articles can be found on the website.

Degree Accreditation Scheme

We have had a fantastic response to our call for assessors for the new degree accreditation scheme, which was launched earlier this year. The first tranche of applicant degree course programmes is now being processed and we hope to announce the first accredited degrees at the end of June. Interestingly, the first enquiry for accreditation has come from an institution in British Columbia, Canada!

Accredited degrees will be those that meet the criteria set by the Governing Board as being sufficient to be able to equip graduates with the knowledge and skills that employers in our profession need. This does not mean that unaccredited degree courses are not good courses – they may well be. But accreditation by IEEM is an opportunity for those that cover core knowledge and skills in sufficient depth, including practical skills, to achieve the desired learning outcomes.

More information on the scheme can be found at www.ieem.net.

2013 Professional Development Programme

The 2013 programme of workshops and training courses is now available online. We have tried to respond to ideas and suggestions for new courses as well as delivering those that are popular each year and increasing the geographical spread. We will be adding to the programme throughout the year so if you have further suggestions for suitable courses that you would like to see included in the programme please do get in touch with IEEM's Training and Professional Development Officer, Helen Boulden, on 01962 868626 or at helenboulden@ieem.net.

Awards Event 2013

For the first time, IEEM will in 2013 be holding a single awards event. This will involve bringing together the awarding of the Institute Medal, the Best Practice Awards, the People Awards, and fellowships. The single awards event will be a lunch, taking place in June 2013 in Birmingham. For more information on the awards, or to book a place or table at the event, please visit www.ieem.net/awards.

Spring Conference 2013

IEEM's Spring 2013 Conference will take place on 20th March 2013 in Birmingham and will be on the theme of *Ecosystem Services I: Practical Methods for Demonstrating the Value of Nature To Decision-Makers*. This is the first in a series of three events in 2013 looking at different aspects of ecosystem services. Bookings Are Open!

www.ieem.net/events

Staff Changes

In January we welcomed **Sarah Hayward** who joined us as our Membership Administrative Assistant. Sarah has previously worked for the Hampshire and Isle of Wight Wildlife Trust and for an environmental consultancy.

We said goodbye to Membership Officer **Zacyntha Dunhill-Rice** at the end of February. Zacyntha had worked for the Institute for over three years but has now decided that it is time for fresh challenges and we wish her well. We hope to replace Zacyntha shortly.

New Fellows

Congratulations to four members who have recently been admitted to fellowship of the Institute.

Mike Barker is an environmental consultant engaged in the strategic planning and delivery of utilities and their interaction with the natural environment. He has worked on projects of all sizes including major infrastructure projects and is adept at forming partnerships and encouraging professional networks to increase inter-disciplinary understanding. Mike was chair of the Institute's External Affairs Committee from 2002 until 2007, and was the IEEM Company Secretary from 2006 until 2012. He has recently formed the first of IEEM's Special Interest Groups (on Overseas Territories). Mike has been very active in promoting European-wide networking and represents IEEM at the European Network of Environmental Professionals's (ENEP) General Assemblies and also chairs the Network's Biodiversity Working Group.

Alastair Driver is the National Conservation Manager for the Environment Agency (England and Wales). In this role he oversees a team of national advisers responsible for all conservation strategies, policies and procedures of the EA. He is recognised nationally and internationally as having an impressive technical knowledge of effective river catchment management to support biodiversity outcomes.

Will Manley has been a member of IEEM since its early days and is a former Vice President of the Institute (2002-2005). He is currently a director at the Royal Agricultural College. His application for fellowship is based on his research outputs which are mainly related to ecological interest and land use for commercial agriculture. His research has informed policy and policy-makers within the land management sectors in England and Scotland, for example, inf uencing agri-environment payment structures, the use of set-aside, and novel approaches to Higher Level Stewardship.

Pam Nolan is currently the National Technical Manager (Conservation and Biodiversity) for the Environment Agency (England and Wales), leading a team of 19 national advisers and team leaders who are advising and supporting thousands of staff across the EA. She is described by her lead sponsor as *"the single most inf uential promoter of professional standards for ecologists within the EA since its formation in 1996"*. Pam has pioneered professional training and development plans for conservation and ecology within the Agency, initiated a training and accreditation programme for aquatic biologists which was a winner of an IEEM Best Practice Award and is described as having personally driven and overseen the implementation of a wide range of initiatives that have ensured that hundreds of ecology and biodiversity staff within Europe's largest environmental agency have access to better training , support and professional guidance.

Scottish Section News

Nicola Tyrrell MIEEM
Convenor, Scottish Geographic Section Committee
nicola.m.tyrrell@gmail.com

Section Committee 2012-2013

In 2012 we said a fond farewell to Karen Dick and Graham Rankin who stepped down from the Scottish Section Committee. We wish to thank them for their valued contribution and for giving up their spare time for the benefit of IEEM members in Scotland. Several Committee members renewed their commitment and we were pleased to welcome Erin Grieve, Phil Baarda and Claire Lacey. This year we will be joined by Brian Minshull, Sarah Bassett and Jessica Tainsh. We wish to introduce ourselves.

Nicola Tyrrell is Convener and has served on the Committee since 2009. As an ecologist and environmental advisor since 2005 she has worked with several consultancies to promote a positive approach to wildlife conservation within development and land management. Within the Scottish Committee, Nicola particularly enjoys facilitating collaboration between IEEM and other environmental organisations, seeking ways to fill ecological skills gaps in our sector, promoting continual improvement of professional standards and supporting students to realise their career potential.

Elaine Anderson is Vice Convener and has served on the Committee since 2010. She graduated from Edinburgh University with a BSc Hons in Conservation and Ecological Management in 2010 and is the Ecology Services Manager for Highland Birchwoods near Inverness. Her main interests cover the conservation and sustainable management of woodland and riparian environments. She joined the Committee as a graduate and brought a student and graduate perspective. Elaine has since worked with several universities to encourage students to think about a career in the environmental sector and to join IEEM.

Claire Lacey is the Committee's Secretary and joined in 2011. She qualified in Marine and Environmental Biology in 2002 and has worked ever since in the field of marine mammal ecology. She has previously worked in the charity sector and is now an environmental consultant. As well as all marine aspects, she also has a keen interest in bats and looks forward to bringing her experience in these areas to the Committee.

Erin Grieve is Treasurer and joined the Committee in 2011. She is a mature student currently in her third year of a BSc in Ecological Science (Environmental Science) at the University of Edinburgh. As a student she understands the importance of guiding and improving standards in ecology and environmental management and recognises the value of employability of graduates. She hopes that her new role with the committee will contribute to these factors.

Dr Marcus Cross has served on the Committee since 2009. He works for ScottishPower Renewables as an Environmental Manager providing ecological advice to their UK and international offshore business. In 2002, Marcus was awarded his doctorate in Environmental Parasitology and has worked in various positions in large and small ecological consultancies before starting his present position in 2010.

Phil Baarda was co-opted on to the Committee in 2011. He is a Woodland and Land Use Adviser based at Inverness and has been with Scottish Natural Heritage for the last five years. Prior to this, Phil has done a variety of things in a variety of places – an EU project manager with the NGO Highland Birchwoods in the Highlands, a nature reserve manager in East Dorset, a field officer with BTCV in Dorset and a Biodiversity and Livelihoods adviser with VSO in the Philippines. Phil has been a Full member of IEEM since 1997 and sits on the Professional Standards Committee.

Brian Minshull joined the Committee in 2012. He has operated BCM Environmental Services Ltd since 1990. His career includes two seasons of Upland Bird Survey work for NCC, three years as an Assistant Wildlife Warden in Wigan, 16 months as a consultant for ERL, (pre-ERM!) and 13 years as an environmental specialist on numerous pipeline projects in the UK and abroad. More recently he has provided ecological expertise on development projects closer to home; inevitably this has included ornithological input on wind energy projects. He wants to contribute as he benefitted greatly from his mentors and wants to give something back.

Sarah Bassett joined the Committee in 2012. She is a consultant with eight years of experience and is currently based at Land Use Consultants having previously worked for a large consultancy. Sarah is a generalist ecologist with a passion for mammals, particularly otters, having assisted with an IEEM otter training course and written an article for *In Practice* on the species and disturbance impacts. She has worked on a wide variety of projects, including road and rail schemes, wind farms and utility projects and hopes that her impact assessment knowledge and understanding of the planning process will prove useful on the Committee.

Jessica Tainsh is a Graduate member. She graduated from the University of Glasgow with an MSc in Coastal System Management and a BSc (Hons) in Zoology. She currently volunteers with the RSPB in Lochwinnoch as a family events helper and is sub-contracted with a couple of energy companies, carrying out ecology surveys.

Jessica has also been a volunteer with the Cats Protection League, Buglife and at Kelvingrove Museum. Her interests are in ecology and conservation and she is looking forward to becoming part of the IEEM Committee group.

Your new Committee will hold meetings to make arrangements for an exciting programme of events. Look out for full details in forthcoming emails, *In Practice* and on the new Scottish Section LinkedIn page (www.linkedin.com/groups?gid=4306517). Please get in touch with your ideas of how we can extend the presence of IEEM in Scottish society and add value to being a member of the Institute.

Each year there are 10 positions leaving one position to be filled on the Committee. Please contact IEEM HQ or any of our Committee members should you be interested or wish to know more. For your interest, the new Governance relating to Geographic Section Committees is detailed in the box.

The Role of the Geographic Section Committee

1. To promote the Institute and its work at a regional/national level;
2. To promote membership of the Institute to eligible individuals and organisations;
3. To arrange a programme of events, meetings and activities for the benefit of members;
4. To organise, with appropriate Secretariat support, regional and national conferences;
5. To bring the needs of the members to the Secretariat's attention, especially in relation to matters of professional standards, continuing professional development and external policy;
6. To promote careers in ecology and environmental management to local schools and higher education institutions;
7. To contribute to the Institute's response to relevant national policy consultations;
8. To support the Institute's President and Vice Presidents in representing the Institute at formal events, meetings and workshops;
9. To elect a representative (normally the Convenor) to the Institute's Advisory Forum;
10. To consult the Section's members and to represent their views at the Institute's Advisory Forum;
11. To liaise with regional or national groups of other relevant professional bodies with a view to increasing understanding between the professions;
12. To nominate potential candidates for fellowship to the Fellowship Review Group;
13. To operate within the operational, financial and strategic framework approved by the Governing Board and in accordance with the Geographic Section Regulations;
14. To provide regular reports on Section activities for *In Practice* and the Institute's annual review;
15. To hold an annual general meeting in accordance with the Geographic Section Regulations.

Composition of the Geographic Section Committee

The Geographic Section Committee will be composed of the following:

- Section Convenor (who will also be the Chair of the Committee)
- Section Vice-Convenor
- Treasurer
- Secretary
- No less than two and no more than six from any of the following: Fellow, Full, Associate, Graduate or Student members

All Committee members' home or principal work address must be within the geographic area represented by the Geographic Section.

Yorkshire and Humber Shadow Section News

Gordon Haycock CEnv MIEEM
Convenor, Yorkshire and Humber Geographic Section Committee

In 2012 the Shadow Section continued to be active with varied activities and events starting in March with a decidedly aquatic theme.

Ecus Ltd in Sheffield have excellent new premises with labs equipped for aquatic ecology. Sarah Clarke (Senior Aquatic Ecologist) ran two introductory events on standing and flowing water ecosystems. Each event was a great introduction to ecologists not familiar with these habitat types introducing key interest features indicating when additional, more detailed survey might be required. The workshops provided an introduction to quick assessment of habitat potential and quality of standing waters (ponds, lakes, canals) and flowing waters (ditches, streams, canals) likely to be encountered on site during a Phase 1/general site assessment survey. Concentrating on ponds and ornamental lakes of the types that may frequently be encountered, participants explored the variety of habitats provided by such water bodies for different species/groups and how an initial assessment of the potential quality of such habitats should be made. Use of macrophyte and macro-invertebrate communities as indicators of habitat and water quality was discussed, with some basic ID information and guidance, including a chance to look at specimens from a range of water bodies in the Ecus Lab.

Subsequently in May a field session led by Dr Alex Ramsay MIEEM at Otley Wetlands Nature Reserve allowed participants to practice aquatic invertebrate survey techniques, complementing the lab sessions held earlier in the year.

Our autumn programme included a lively debate led by Prof. David Hill CEnv FIEEM at King's Head, Masham. David led the discussion with a presentation describing the types of markets that are beginning to interest corporate bodies, concentrating on the role of biodiversity offsetting in bringing significant new investment into the natural environment. David's presentation was a frank analysis of our current predicament where nature and natural resources underpin the economy as well as being intrinsically valuable to our way of life. He stated that continued loss of biodiversity and ecosystem services are going to increasingly impact on business and the costs of restoration measures by 2050 are likely to be prohibitive such that the only realistic prediction is for a substantial decline in business activity and quality of life. His thesis is that to avoid this situation society needs to act now to get nature onto the balance sheet through biodiversity offsetting. The Environment Bank is working both within and outwith the Defra offsetting pilot schemes and David described the Environmental Markets Exchange which is a platform for trading in commoditised assets in the natural environment with the aim being to attract corporate investors to buy into nature. Subsequent discussion explored the practicalities of implementing offsetting schemes and the potential for unintended consequences of this approach.

Our final event was led by Dr Tim Thom of Yorkshire Peat Partnership on Oxenhope Moor in November. This well attended field visit showcased an ongoing restoration project using novel techniques in a harsh environment. The Moor is a badly degraded peatland, largely devoid of *Sphagnum* moss with a lot of bare liquid peat exposed to the atmosphere. Evidence from Yorkshire Water monitoring shows that this peat is being washed off the moor. Objectives for the site are to make it wetter through grip and gully blocking, re-profile the worst areas of erosion and then inoculate with *Sphagnum*-rich brash to re-establish a functioning blanket bog. This site represents an extremely difficult restoration challenge and Tim demonstrated methods that are partially experimental and close to the limits of what is possible in peatland restoration. Discussion on site (enhanced by the presence of Penny Anderson CEnv FIEEM) elucidated the problems, explored the causes, and assessed the restoration methods being used. Future restoration plans were also discussed rounding off a fascinating and informative morning.

As I write this we are making plans to formalise the Yorkshire and Humber Section with an inaugural AGM in March 2013.

Any members who are able to offer events, activities or venues in our region should please contact Gordon Haycock at gordon.haycock@haycockandjay.co.uk or on 01943 850276.

1. Alex Ramsay event at Otley Wetlands Nature Reserve. Photo by Alex Ramsay
2. Searching for *Sphagnum* at the Yorkshire Peat Partnership Event in November

3-4. Yorkshire Peat Partnership meeting. Photos by Tabatha Boniface

South East England Section News

Gemma Russell MIEEM
Secretary, South East England Geographic Section Committee

21st Anniversary Event – Habitat Translocation

Members celebrated IEEM's 21st anniversary at an event organised by the South East England Section on 21st November 2012. John Box CEnv FIEEM and Peter Buckley MIEEM gave thought-provoking presentations on the topic of habitat translocation, with the latter focusing on the controversial issue of woodland translocation. The event was kindly hosted by the University of Greenwich. This article explores the main conclusions of these talks, with reference to relevant literature and research. It establishes the premise for habitat translocation and outlines guidance on its implementation and targets for the future.

The speakers drew on a wealth of experience in the fields of habitat creation, restoration and translocation. John is an ecologist with over 25 years of experience and was elected as the President of IEEM in November 2012. He was a member of the Steering Group for the Highways Agency project, providing national advice on habitat translocation, which was published as the CIRIA guide (C600) *Habitat Translocation – A Best Practice Guide*[1]. Peter was also a member of the Steering Group and is an applied ecologist and botanist, specialising in ecological restoration and its relevance to policies affecting biodiversity and wildlife conservation. He began as a researcher attempting to solve the problems of establishing trees on derelict land but became interested in the ecology of habitat translocation in the 1980s during his involvement in experimental regeneration projects surrounding the development of the Channel Tunnel in Kent.

Historically, habitat translocation has not been considered as a favourable option to mitigate or compensate for the loss of habitats associated with development. The Joint Nature Conservation Committee (JNCC) publication *A Habitats Translocation Policy for Britain*[2], states that *"… it is not possible to move assemblages of species together without substantial changes taking place in the structure of the habitat and in its species composition thus rendering the translocation unsuccessful with respect to sustaining the original* f *ora and fauna."* However, John pointed out that current planning policies seek 'net gains in biodiversity' during the course of development. This policy is outlined in the National Planning Policy Framework[3] and filtered down through regional and local policies. While habitat creation, restoration and enhancements can contribute towards achieving this aim, John suggested that working to this policy, alongside others, such as 'establishing ecologically coherent networks', will require habitat translocation as well. Newly planted habitats cannot fully compensate for habitat loss, as these take time to mature. The risks of failure associated with translocation are also considered to be no greater. These factors make habitat translocation a valid alternative to habitat creation.

John gave practical advice on the translocation of small-scale features, such as hedges, species-rich grassland and wetland vegetation, with reference to case studies. This included a hedgerow at Lightmoor Urban Village in Shropshire, which was translocated successfully in 2007 (see images). The receptor site needs to be similar to the donor site; factors such as the slope, aspect, soils and hydrology should be matched as closely as possible to ensure that the translocated habitats deliver adequate compensation. Translocation should ideally be undertaken in the autumn, when the soils are warm and moist and new root growth is possible before the winter[4]. The translocated material should also be established at the receptor site on the same day, to avoid damage to the root systems. Monitoring and management are also vital to ensuring the long-term success of translocation projects. With respect to the translocation of features such as species-rich grassland, the topsoil can be translocated in sections or 'turves', which best maintains the soil profile and minimises damage to perennating organs. The alternative method is termed 'loose-tipping', whereby the topsoil is stripped and laid randomly, which destroys the soil profile, but is less costly.

Translocation of a hedgerow at Lightmoor Urban Village, Shropshire:
1. The trench was dug;
2. The hedgerow was removed in sections, with some cutting with a chainsaw;
3. The hedgerow was placed in the trench section by section; and
4. The trench was back-filled with soil.

The factors identified above also apply to woodland translocation. However, Peter identified a number of problems inherent in woodland translocation that make the results less satisfactory. It is not possible to translocate mature trees, although tree stumps, coppice stools, saplings and shrubs can be transplanted using excavator buckets or tree spades. It is also not possible to avoid damage and disturbance to the soil profile during felling and the translocation of topsoil. The loss of the canopy following translocation leads to an increase in open ground, colonisation by non-target opportunistic species and the loss of the internal woodland conditions. In conjunction with the translocation of woody features, Peter recommended that fast-growing 'nurse' trees are planted at a high density, about one metre apart, to create rapid shade and allow the transplanted shade-tolerant species to flourish. Thinning, coppicing and/or felling must then be carried out at an early stage to maintain light levels that will allow the ground flora to continue to recover. Peter presented the results of the analysis of the vegetation cover at a case study, Brickhouse Wood in Kent, following its translocation in 1998. The species composition was still significantly different to the donor site after 10 years, although there were indications that the original woodland ground flora was returning, with the recovery of bluebell *Hyacinthoides non-scripta* populations. He concluded that, although it is possible to translocate many woodland features, translocated woodlands will not wholly replicate the donor sites and cannot be considered to fully compensate for the loss of ancient woodland. Natural England's Standing Advice for Ancient Woodland[5], states that ancient woodland *"... as a system cannot be moved"* and that *"... some elements of the system... can possibly be moved but the long-term benefits from this for biodiversity are largely unproven."* This view is also shared by the Woodland Trust[6,7] and JNCC. Over time, the translocated habitats may come to resemble semi-natural woodlands, but insufficient monitoring has been undertaken over a long enough time period to accurately assess their value.

John's presentation illustrated that small-scale habitat translocation can be the best option to ensure that developments provide 'net gains in biodiversity' and can be undertaken successfully. However, he also recognised that habitat translocation could be employed inappropriately and exploited by developers to facilitate planning applications, through the proposition that valuable habitats can simply be translocated and are therefore not material constraints to development. As such, it is crucial that consultants provide appropriate advice to developers, by identifying habitats that must be retained and the suitability of habitat translocation as a means to compensate for the loss of habitats as a result of development. The first option should always be to retain and protect valuable habitats. Translocation should only be employed as a last resort, to rescue ecological features that would otherwise be lost to development. To ensure that the potential benefits of habitat translocation are realised, John suggested that the JNCC guidelines should be revised in light of the current planning policy context and that future planning policies should refer to habitat translocation as a means to conserve ecological resources during the course of development, alongside creation, restoration and enhancement measures. Both talks highlighted a need for further long-term monitoring and research, particularly with respect to woodland translocation, to ascertain the reasons for the success or failure of translocation programmes and therefore establish best practice guidelines.

Notes

1 Anderson, P. and Groutage, P. (2003). *Habitat Translocation - A Best Practice Guide*. C600. CIRIA, London.

2 Joint Nature Conservation Committee on behalf of The Countryside Council for Wales, English Nature and Scottish Natural Heritage (2003). *A Habitats Translocation Policy for Britain*. Peterborough. Available at: http://jncc.defra.gov.uk/pdf/habitats_policy.pdf

3 Department for Communities and Local Government (2012). National Planning Policy Framework. Available at: https://www.gov.uk/government/uploads/system/ uploads/attachment_data/file/6077/2116950.pdf

4 Box, J. and Stanhope, K. (2010). Translocating Wildlife Habitats: A Guide for Civil Engineers. *Proceedings of the Institution of Civil Engineers - Civil Engineering* **163:** 123-130.

5 Natural England (2012). Standing Advice for Ancient Woodland.

6 Woodland Trust (2010). Position Statement: Species Translocation.

7 Woodland Trust (2001). Position Statement: Ancient Woods and Translocation.

Further Reading

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Tunstall S.J. (2004). An Appraisal of Woodland Habitat Translocation: Biggins Wood, Kent. MSc Thesis, Department of Environmental Science and Technology, Imperial College London.

West Midlands Section News

Veronica Lawrie CEnv MIEEM
West Midlands Geographic Section Committee Member

In the West Midlands, further to our successful event in July 2012, the Section held a second Bat Discussion Workshop in the north of our region. The event was held at the Acton Trussell Community Centre, just south of Stafford, on 14th November 2012 and over 25 participants contributed to the discussions. The event provided an opportunity for everyone to discuss their experiences with the updated *Bat Survey Guidelines* published by the Bat Conservation Trust (BCT) in April 2012. There were lively discussions about the changes to the BCT guidelines and how they affect the quality of bat work undertaken in the region. How ecological consultants apply the guidelines was discussed, as were the reactions of clients to the changes. Several ecologists from local authorities were able to contribute their perspective, and described how they had defined their own local trigger criteria for bat surveys based on analysis of local bat roosts. In urban areas, such trigger criteria had to be applied very critically with reference to the wider landscape to avoid unnecessary surveys.

The Section Committee is currently busy putting together plans for a variety of events we will be offering in 2013, including discussion workshops on green infrastructure/ biodiversity offsetting, reptiles and bats – and outdoor events on invertebrates on brown field sites and orchards/conservation grazing. Please keep an eye out for the emails advertising the events and we look forward to seeing you there.

Welsh Section News

The Welsh Geographic Section held an event in celebration of the Institute's 21st anniversary in conjunction with the Autumn 2012 Conference, which was held in Cardiff in November 2012. Around 40 members and invited guests gathered to hear, then President, Penny Anderson CEnv FIEEM speak about how far the Institute has come and the challenges that we face in the future.

Penny Anderson


Mike Willis, Welsh Section Convenor, cutting the cake

21st anniversary cake

Partnership News

Society for the Environment

Renowned environmental campaigner Tony Juniper has been appointed as the first President of the Society for the Environment. Juniper joins the Society for the Environment to help the organisation in its mission to champion the role of environmental professionals and the Chartered Environmentalist qualification. Juniper is an established face on the environmental circuit having been the director of Friends of the Earth in England, Wales and Northern Ireland between 2003 and 2008 and the vice chair of Friends of the Earth International from 2001 to 2008. He has also written a series of books covering various ecological issues (see page 49), holds a number of positions with diverse institutions as well as being a regular media commentator on environmental matters.

Upon his appointment Juniper said: *"As the number of people working in the environmental sector grows, it is vital that Chartered Environmentalists are recognised as professionals in their own right, whatever their role. It is very pleasing to be working with the Society for the Environment to champion professionalism in the environmental sector. The Society fulfils a vitally important role by setting the standards for professionals working across a range of sectors. It has shown how professional bodies from widely different fields can work together on a common agenda. I look forward immensely to working with the Society."*

Society for the Environment chief executive Alex Galloway said: *"To have somebody of Tony's calibre as our President will help us take the status of Chartered Environmentalists to a new level of recognition and reach into new areas."*

www.socenv.org.uk

Europarc and Eurosite

Europarc and Eurosite have issued a joint communication relating to their merger. The coming year (2013) is to be transitional and the plan is to develop proposals in good time to be presented to the General Assemblies of both organisations in autumn 2013. Subject to that and decisions reached, the aim is to create a new network organisation by January 2014.

This year also marks the 40th anniversary of the Europarc Federation. Over this time the Federation has reached out to bring eastern and western European nature conservationists together, even under the difficulties of the Iron Curtain. Today, 'conservation without frontiers', the key message at times of the organisation, has become reality with Europarc having 400 members in 35 European countries.

www.europarc.org | www.eurosite.org

IUCN-UK

One of the outcomes of the recent meeting of European IUCN National Committees in Copenhagen was the formation of a working group to take forward the issues of the role and development of National Committees in Europe. Chris Mahon, IUCN-UK Chair, has agreed to chair this task and finish group over the next 6 months.

A European Policy Advisory Group was also formed and Jonathan Hughes from Scottish Wildlife Trust/Scottish Environment Link has agreed to sit on this. Jonathan has also recently been appointed as a Regional Councillor for West Europe.

www.iucn-uk.org

Applicants and Admissions

If any existing Member has any good reason to object to someone being admitted to the Institute, especially if this relates to compliance with the Code of Professional Conduct, they must inform the Chief Executive Officer by telephone or letter before 1st April 2013. Any communications will be handled discreetly. The decision on admission is usually taken by the Membership Admissions Committee under delegated authority from the Governing Board but may be taken directly by the Board itself. IEEM is pleased to welcome applications for membership from the following:

APPLICANTS

Applications For Full Membership
Miss Victoria Alexander, Mr Sion Brackenbury, Mr James Campbell, Miss Claire Collings, Miss Marianne Curtis, Mr Scott Dodd, Mr David Dowse, Mr Jonathan Elmer, Ms Paula Kearney, Dr Stephanie Murphy, Mr Stephen Ray, Dr Sarah Taylor, Miss Siân Williams

Applications For For Associate Membership
Mr Conrad Barrowclough, Miss Laura Belfield, Miss Kate Bennett, Mr Christopher Bingham, Miss Andrea Hudspeth, Mr Callum McNeill-Ritchie, Miss Sophie Milburn, Mr Benjamen Nelumbu, Mrs Catherine Oakley, Ms Ivi Szaboova, Mr Andrew Zealand

Applications to Upgrade to Associate Membership
Mr Liam Atherton, Mr Mark Bates, Mr James Bird, Miss Rebecca Brown, Mr Richard Chilcott, Miss Katie Jackson, Miss Holly Lewis, Mr Christopher Shaw, Miss Hannah Stebbings, Miss Hannah Stephenson

ADMISSIONS

Full Members
Mr Thomas Appleby, Dr Helen Armstrong, Dr Kate Bayley, Mr Thomas Beasley-Suffolk, Ms Donna Bigsby, Dr William Bodles, Dr Maria Callanan, Dr Caroline Chapman, Mr Barry Clarkson, Mr Allan Conlin, Mr Philip Davey, Mr Kevin Donovan, Miss Helen Emberson, Mr Andrew Godfrey, Ms Suzanne Goodfellow, Mr Philip Gould, Ms Karen Healy, Mr Nathaniel Healy, Mr Brian Hicks, Mr David Hodd, Mr Christopher Hodsman, Mr Dermot Hughes, Mr Paul James, Ms Rebecca Johnson, Mr Gus Keys, Mr Matthew Lambert, Mr Alexander Macdonald, Dr Ross McGregor, Dr Bethan Morgan, Mrs Katy Ann Morris, Dr Roisin Nash, Miss Trudy Seagon, Dr Janet Simkin, Mr Jonathan Tye, Mr Matthew Vernon, Mr Kevin Young, Mr Nick Young

Associate Members
Dr Charlotte Bell, Mr Grant Berky, Mr Alexander Foy, Mr Joseph Lane, Mr Stephen Lockwood, Miss Elizabeth Ludlow, Mr Andrew Pankhurst, Mr Justin Slowey

Upgrades to Full Membership
Ms Crystal Acquaviva, Miss Charlotte Bell, Miss Hayley Bishop, Mr Timothy Buckland, Mr Jonathan Byrd, Miss Sally Chadwick, Miss Gail Cobbold, Miss Carolyn Cowan, Miss Lynsey Crellin, Mr Francis Flanagan, Miss Rosamund Hall, Miss Jana Kahl, Mr Andrew Leese, Miss Lisbeth Nash, Miss Clare Parker, Mr Nicholas Pincombe, Mr Nicholas Pond, Mr Rory Sandison, Miss Natasha Seaward, Mr James Segar, Miss Victoria Shearman, Dr Polly Spencer-Vellacott, Mr Roger Spring, Mr Chris Sutton, Mrs Kelly Thomas, Mr Kevin Wright

Upgrades to Associate Membership
Miss Aislinn Blackmore, Mrs Kirsten Bywater, Miss Stephanie Cooling, Miss Julia Coulson, Miss Michelle Fielden, Mr Richard Flight, Mr Chris Jackson, Ms Carole Lowther, Mr Tony Marshall, Mr Joseph McMinn, Mr Bruce Milne, Miss Lorna Potts, Mr Steven Roe, Ms Natalie Stokes, Miss Hannah Williams, Mr Benjamin Wright, Mr Mark Zammit

Recent Graduate Members
Mr John Allsopp, Mr Jason Ashworth, Miss Lisa J. Barlow, Miss Victoria Bate, Mr Phil Bowater, Miss Tamsyn H. Bridger, Miss Alannah M. Bruce, Mr Gareth D. Buchanan, Miss Nicola Bunch, Miss Alice Clarke, Mr Duncan Colquhoun, Ms Larissa Cooper, Miss Rhiannon Cowan, Miss Andrea Coyne, Mr James A. Cross, Miss Chantal Dave, Miss Verity Dickie, Mrs Helen Dickinson, Miss Caitriona Donohoe, Miss Emily C Drinkwater, Mr Walter Etug-Ejong, Miss Rachel Eyre, Mr Jack E. Fenwick, Miss Aoibhin Flanagan, Ms Claire L. Ford, Miss Michelle A. Furber, Mr Thomas F.M. Gardner, Mr Benjamin J. Goodall, Miss Leonie Gough, Mr Jeffrey Grant, Ms Eva Greene, Ms Erica C. Halliday, Mr Joe Hamer, Miss Flora Haynes, Mr Matthew Hazleton, Mr Jacob Hepworth-Bell, Mr Soeren Hoejlund, Miss Penelope J. Holgate, Mrs Laura J. Holmes, Mr Christopher G. Horley, Miss Alice Horsell, Miss Gabrielle Horup, Mr Robert Hutchinson, Mrs Marielle C. James, Ms Jane Kwasnicki, Miss Heather J. Lafferty, Mr Benjamin J. Leonard, Miss Rachel Lingard, Miss Nadine Little, Miss Amy Martin, Ms Rachel J. Masters, Miss Eilidh McNab, Mr David McNicholas, Miss Clare H. Morgans, Miss Kirsty Myron, Mr Harry J.F. Owen, Miss Federica Pace, Mr James D. Parsons, Miss Lynnette K. Pearce, Miss Emma T. Polak, Mr Daniel Reed, Ms Juliet M. Reid, Mr Daniel Robertson, Mr Rowan Rumball, Miss Harriet Safe, Mr Kieran L. Shaw, Miss Alana Shoosmith, Miss Lynn Spencer, Ms Cheryl Stansbury, Miss Emma Taylor, Mr Jackson P.C. Thirgood, Dr Anatoli Togridou, Mrs Donna Tubridy, Mr John White, Miss Carla S. Williams, Mr Joel Wright, Miss Frances Yates, Mr Ross Ziegelmeier

Recent Student to Graduate Upgraded Members
Mr Christopher Arthur, Ms Claire Bailly, Miss Katherine E. Biggs, Ms Abigail Brewer, Miss Georgia Brill, Mr Paul Diamond, Mr Alasdair J. Grant, Mr Richard Heath, Mrs Vera Hugues Salas, Miss Susanne R. Lane, Miss Joanne Lucas, Miss Rose Revera, Mr Ben Walsh, Miss Sarah White

Recent Student Members
Miss Leah Barnes, Mr Christopher Batey, Mr Michael J. Brandon, Miss Jessica Breeze, Mr Jamie L. Chaplin, Mr Richard Claxton, Miss Stephanie Clayton-Green, Mr Christopher Cooper, Miss Tristanna Cornwell, Miss Makrina Diakaki, Miss Grace Dickins, Mr Theodore J. Dominian, Mr Christopher W. Dosser, Miss Emily Eaton, Mr Alasdair Fagan, Miss Madara Gaile, Mr Gregory Gibson, Miss Claire Giles, Mr Samuel J. Gray, Miss Louise Green, Miss Holly Gregory, Ms Jeneen Hadj-Hammal, Ms Laura Harrison, Miss Emily Huntingford, Mrs Amanda J. Jackson, Mrs Marian Kemp, Kora Kunzmann, Miss Jacqueline Machin, Mrs Lisa Malter, Miss Johanne McGrath, Miss Stacey Melia, Mr Martin Noble, MD Zaman Nuruzzaman, Mr Nurudeen O. Olanipekun, Mr Dominic Ranson, Miss Lucy Ryan, Mr Andrew N. Scott, Mr Jim Silverstone, Miss Jodie Southgate, Mr Joshua D Sowden, Miss Natasha Stevenson, Miss Joanne Surgey, Mr Craig W. Tallentire, Miss Samantha Ward, Miss Rebecca C. Weaving, Miss Lindsay A. Webster, Mr Robert A. West, Ms Sophie K. Wheeler, Mr Gregory Wood, Miss Adele Wratten, Miss Leah Wright

Recent Affiliate Members
Mrs Janet E. Brogan, Miss Maureen Davis, Mr Thomas C. Kemp, Mr Stephen R. Roberts, Mr Liam Robson, Mr David Taylor, Mr Stephen P. Wadley

IEEM Spring Conference 2013

Ecosystem Services 1:
Practical Methods for Demonstrating the Value of Nature to Decision-Makers

20th March 2013, Birmingham

There is growing interest in how the many benefits that nature provides, through ecosystem services, can be more fully and effectively incorporated into a very wide range of decision-making processes. How can society ensure that we place meaningful value on aspects of the natural environment that we have, in the past, taken for granted?

This year's Spring Conference will explore practical methods to integrate ecosystem services into key decisions made at the national, regional and local scales. These methods will be shown to apply to a variety of very different situations and environments.

This will be explored through a series of presentations, panel discussions, case studies and examination of emerging tools and techniques.

Topics to be covered include:

- Examples of the benefits of cost-effective investment in ecosystem services.
- Practical methods and tools to help us place a value (both monetary and non-monetary) on natural capital.
- Alternatives to traditional economic valuation of these services.
- Development of tools to enable land managers to understand which interventions lead to which changes in ecosystems.
- Mapping tools and techniques (e.g. using GIS) to identify ecosystem services at the landscape and catchment scale.
- Embedding ecosystem services into land-use planning.
- How an understanding of stocks and flows in an ecosystem context can contribute to a better consideration of their use by decision-makers.
- Identifying conflicting demands on ecosystem services, e.g. recreation vs biodiversity.
- Tools to improve strategic economic planning using an ecosystem services framework.
- Case studies showing how society already provides financial support for the continued protection and management of biodiversity-related ecosystem services.

Booking is Open!
www.ieem.net

Update on the Royal Charter

Sally Hayns MIEEM
Chief Executive Officer, IEEM

Following approval of our Petition for a Royal Charter in November last year there has been much work behind the scenes to make the necessary arrangements to transfer the Institute from a limited liability company to a chartered body. Hopefully the mechanical changes will have little impact on individual members but you will certainly notice some differences.

The date for enacting the new Charter will be the 1st April 2013. From that date we will be the Chartered Institute of Ecology and Environmental Management (CIEEM – pronounced '*sy-eem*'). We will have a new logo but our vision and mission will remain the same (see box).

Our governing instrument will be come the Charter, which will have received the 'Great Seal' and By-laws. Copies will be available on our website.

A New Register

Included within the Charter is the power to establish a new Register of Chartered Ecologists. Since December a 'shadow' Registration Authority has been debating issues such as the eligibility criteria, application and assessment procedures for Chartered Ecologist (CEcol) registration, conditions for de-registration and for re-assessment. The shadow Registration Authority is required to make recommendations to the Governing Board for decision.

We do not yet know when the new Register will be launched but further information and updates will be provided on our website as soon as it is available and there will be further news in the next issue of *In Practice*.

Some Frequently Asked Questions

What difference does IEEM becoming CIEEM mean to me?

You will become a member of the Chartered Institute. At the appropriate time (but not yet!) you would be required to update your post nominals-such that:

FIEEM	becomes FCIEEM
MIEEM	becomes MCIEEM
AIEEM	becomes ACIEEM
GradIEEM	becomes GradCIEEM

On or shortly after the 1st April you will receive an email from us (if relevant) telling you what your new post-nominals are.

What about changing my business card and website to show the new post-nominals?

There is no requirement to immediately change your printed materials or website or incur any extra costs. However we would ask you to update such materials as soon as practicably possible – e.g. the next time you do a print run or make other changes. Certainly you should update your email signature and make sure that, from the 1st April, you sign off pieces of work, etc. with your new post-nominals.

What will CIEEM's new contact details be?

Our new website will be www.cieem.net and our emails will be @cieem.net. We will be keeping ieem.net so any web searches or emails sent to @ieem.net will still reach us. In time we hope that you will get used to the new e-address. Our telephone number and postal address will remain the same.

Can I still become a Chartered Environmentalist?

IEEM currently holds a licence to award CEnv accreditation and this licence would be transferred to the Chartered Institute. CEnv is an increasingly recognised standard of good environmental practice and the competence requirements are appropriate for many of our members. The Chartered Institute will remain fully committed to working with other members of the Society for the Environment to continue to promote recognition of Chartered Environmentalist status.

When will the new Chartered Ecologist Register be open?

There is still a considerable amount of work to be done to define and approve the eligibility criteria, the application and assessment process, put all the necessary forms together, recruit and train assessors and establish the necessary 'back office' systems. This cannot happen overnight but will clearly be a high priority which is dependent on the goodwill and effort of a very significant number of volunteers. We anticipate being able to open the Register for applications before the end of the year and we will keep you informed.

Can I just transfer across from CEnv to CEcol?

No. The Chartered Ecologist award recognises a different assemblage of competences to that of Chartered Environmentalist so you cannot just transfer across. You may have been assessed as meeting the CEnv competence requirements but that does not necessarily mean that you will meet the CEcol assessment competency requirements. Similarly, future CEcols will not necessarily meet the CEnv competencies. They are not interchangeable, although of course some members may be able to demonstrate competence in both sets of criteria and may decide to have both awards.

Our Vision

A society which values the natural environment and recognises the contribution of professional ecologists and environmental managers to its conservation

Our Mission

To promote the highest standards of professional practice, and to raise the profile of professional ecological and environmental management, for the benefit of nature and society

About the Author
Sally Hayns has been CEO of IEEM since June 2010. Prior to joining the Institute she was Head of People and Wildlife at the Hampshire and Isle of Wight Wildlife Trust.

Contact Sally at:
sallyhayns@ieem.net

PROFESSIONAL DEVELOPMENT COURSES

Water Environment: The Legal Framework

14 March 2013, Sheffield

This one-day seminar focuses on key aspects of European and national Water Law, including the Water Framework Directive, permits and consents, and the Water White Paper.

Level: Beginner – Intermediate

Cost: IEEM members £195
Non-members £225

Introduction to Ecological Impact Assessment (EcIA)

18 March 2013, Leeds

A one-day introductory course covering each stage of EcIA for complete beginners and those practitioners who require an overview of the process. Teaching will be delivered through presentations and discussion using case study examples.

Level: Beginner

Cost: IEEM members £195
Non-members £245

Developing Practical Skills in Ecological Impact Assessment (EcIA)

19-20 March 2013, Leeds

A two-day practical course for practitioners with existing experience of undertaking EcIAs delivered through a combination of presentations, workshops and case study examples. This course includes all aspects of EcIA, including a session on how to present the outcomes of EcIAs in a report.

Level: Intermediate

Cost: IEEM members £375
Non-members £425

Lunch and refreshments are included but overnight accommodation is not.

Making the most of BREEAM and the Code for Sustainable Homes

18 April 2013, London

1 May 2013, St Ives, Cambridgeshire

An introduction to the ecological component of BREEAM and how to get the most from it covering all types of BREEAM/Code for Sustainable Homes. Each of the ecology credits will be discussed individually, including the use of BRE's ecology calculator. The aim of the workshop is for ecologists to be able to achieve maximum ecological benefit from BREEAM and the Code.

Level: Beginner

Cost: IEEM members £90
Non-members £180

Introduction to Ecosystem Services Valuation

23 April 2013, Chester

This course will give an introduction to the valuation of ecosystem services drawing on best practice guidance. It will give a general introduction, covering the definition of ecosystem services and the context. The course will look at how we identify the link between ecological features and the benefits that they provide to people, and how it is applied as part of ecological and wider environmental assessments. Participants will gain an overview of the valuation process and a summary of key economic tools. The limitations of ecosystem service valuations will be considered along with their pitfalls, caveats and key assumptions, and efforts to address them.

Level: Beginner

Cost: IEEM members £90
Non-members £180

Soils – Design and Management for Habitat Creation and Biodiversity

9 May 2013, Neston, Cheshire

This course will include an introduction to soil types and soil profiles, such as urban and brownfield soils, soil structure and soil ecosystem function and biodiversity. Soil amelioration will be discussed, including soil creation and manufacture, with emphasis on brownfield land and development sites. The course will look at soils for specific end-uses in new landscapes and specific habitat creation. Also covered is aftercare and management of new habitats and the monitoring of soil development.

Level: Beginner – Intermediate

Cost: IEEM members £90
(£80 if booked before 10 March 2013)
Non-members £180
(£160 if booked before 10 March 2013)

For more information and to book visit www.ieem.net/events

Fraudulent Claims of Membership (Trading Standards)

Linda Yost CEnv MIEEM
Deputy Chief Executive Officer, IEEM

IEEM receives a number of notifications of claims of membership which, upon investigation, are found to be fraudulent. A meeting with Trading Standards was held on 1st November 2012 to discuss this issue.

Introduction

False claims of membership have so far come to the attention of IEEM in the following ways:

1. Individual CVs – e.g. having applied for a job with an IEEM member's company
2. Planning inquiry reports
3. Ecological survey reports submitted as part/ requirement of planning applications

The following was provided as an explanation of the potential effects of false claims of membership on the parties involved (these are a summary and not exhaustive):

- Client – A report may invalidate a planning application where the individual submitting the report is not an ecologist/ environmental manager as claimed, the planning application is therefore rejected, and monies in payment for the planning application and ecological report are lost. There is no recourse to IEEM, the development window is lost, and there is potentially a case of fraud against the report author.
- Planning Department – A waste of public resources in assessing invalid reports and planning applications where the individual submitting the report is not a competent ecologist/environmental manager. There is a possible breach of the local authority biodiversity duty if planning permission is given and inadequate scrutiny is given by the planning authority (only approx. 30% of local authorities have an ecologist).
- IEEM and the profession – Bringing the profession into disrepute, and wasting resources spent on dealing with false claims of membership.
- Statutory Nature Conservation Organisations, Competent Authorities – Time is wasted (and hence public resources) due to assessing invalid reports and planning applications where the individual submitting the report is not a competent ecologist/environmental manager. Where claims include holding a licence, this brings the species licensing system into disrepute.
- Society – Could lead to loss of biodiversity.

Outcome of the Meeting

Trading Standards now has a clearer understanding of the Institute, its role and the possible repercussions of false claims. They have provided the below statement:

"Falsely claiming to be a member of a professional institute is a banned practice under the Consumer Protection from Unfair Trading Regulations 2008, which are enforced by the Trading Standards Service. It may also constitute an offence of fraud by false representation, contrary to Section 2 of the Fraud Act 2006."

IEEM will continue to protect the reputation of the profession and the Institute, by ensuring that all false claims are made publically known. Through the formalised relationship with Trading Standards (Hampshire) as the 'Home Authority', IEEM is able to reach Trading Standards across Britain and Northern Ireland. In such cases, IEEM will also notify the relevant Local Authority CEO, Head of Planning Authority, National Wildlife Crime Unit, Local Police Wildlife Crime Officer, the relevant SNCO, and Trading Standards.

Following on from this meeting and coincident with a false claim of membership from the Republic of Ireland, contact has been made with the National Consumer Agency who have informed us that the appropriate legislation is the Consumer Protection Act 2007, Number 19 of 2007.

It should be noted that fraud and misrepresentation could apply equally to members in the following situations:

- Those who do not renew their membership within the specified time period and continue to assert that they are members. This includes Chartered status.
- Claiming a grade of membership that has not been approved.
- Claiming to be a 'professional member' and not stating the approved grade.

About the Author
Linda Yost has been Deputy CEO at the Institute since 2005, and is Secretary to the Professional Standards Committee and Disciplinary Boards.

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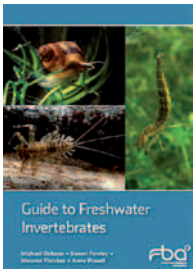
New Publications



Guide to Freshwater Invertebrates

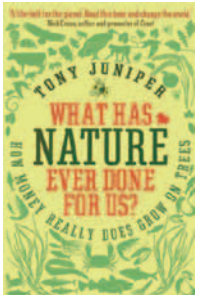
Authors: Michael Dobson, Simon Pawley, Melanie Fletcher and Anne Powell

ISBN-13: 978-0-900386-80-0

Available from: www.fba.org.uk

Price: Price £33.00 plus postage

Most enthusiasts of freshwater biology will have come across the works of T.T. Macan. He wrote six of the FBA's Scientific Publications, including the very first in 1939, and in 1951 co-authored a volume in the New Naturalist series, *Life in Lakes and Rivers*. It is, however, for *A Guide to Freshwater Invertebrate Animals* (1959) that he is best known. This little book, with its distinctive blue cover, was written out of his strong desire to educate and help those interested in fresh waters. This new guide, a successor to 'the little blue book', is intended as a tribute to Macan and his legacy, and will hopefully inspire a new generation of freshwater biologists. A series of easy-to-follow keys, along with notes on ecology and distribution, allow identification of the more commonly encountered freshwater invertebrates occurring in Britain and Ireland, while 460 line drawings illustrate whole animals and the features of importance in distinguishing different groups. Identification is typically to family level, and beyond where this is straightforward to do so, with a bibliography of other keys and guides for those who want to pursue identification further. With introductory notes on the classification of animals and the collection and preservation of specimens, as well as a detailed glossary, this guide is aimed at anyone interested in identifying freshwater invertebrate animals, from established naturalists and biologists to those new to the field.



What Has Nature Ever Done For Us?

Author: Tony Juniper

ISBN-13: 9781846685606

Available from: www.profilebooks.com

Price: £9.99

From Indian vultures to Chinese bees, nature provides the natural services that keep the economy going. From the recycling miracles in the soil; an army of predators ridding us of unwanted pests; an abundance of life creating a genetic codebook that underpins our food, pharmaceutical industries and much more, it has been estimated that these and other services are each year worth about double global GDP. Yet we take most of nature's services for granted, imagining them to be free and limitless. This is a book full of immediate, impactful stories, containing both warnings (such as in the tale of India's vultures, killed off by drugs given to cattle, leading to an epidemic of rabies) but also the positive (how birds protect fruit harvests, coral reefs protect coasts from storms and how the rainforests absorb billions of tonnes of carbon released from cars and power stations).

LIFE managing habitats for birds

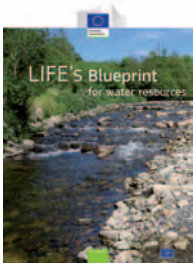
Author: European Commission

ISBN-13: 978-92-79-27587-6

Available from: http://bit.ly/UPHyHo

Price: free download

This LIFE Focus publication from LIFE Nature highlights the crucial link between habitat management and the conservation of Europe's threatened bird species. *LIFE managing habitats for birds* offers a host of examples from projects that have introduced management programmes for wetlands, grasslands, forests and other habitats favoured by endangered birds. Human interventions, such as regular cutting of reed beds or grazing cattle on wet meadows, are necessary to provide the right conditions for many species, including migratory birds. LIFE co-funding has played an important role in kick-starting habitat management through the drafting of management plans, the provision of education and training for farmers, land managers and other stakeholders and by enabling the purchase of machinery and livestock to maintain in a favourable status habitats that are important to species listed in the annexes of the Birds and Habitats directives. With more than 120 featured projects, there are numerous practical examples and lessons that can be drawn from the LIFE programme's work in this area and taken forward into the 2014-2020 funding period.



LIFE's Blueprint for water resources

Author: European Commission

ISBN-13: 978-92-79-27206-6

Available from: http://bit.ly/ZDQZ1n

Price: free download

This LIFE Focus publication highlights the relevance of LIFE Environment project actions in helping to implement EU water policy. As its title suggests, *LIFE's Blueprint for water resources* is a practical companion piece to the recent European Commission Communication, *The Blueprint to Safeguard Europe's Water Resources*.

As well as an introduction to the policy agenda and an overview of LIFE's role with regard to Europe's water resources, this LIFE Focus publication takes an in-depth look at projects targeting five key areas, each of which ties in with the recommendations of the 'Water Blueprint', namely: water quality and quantity; water-related green infrastructure; increasing water efficiency; water re-use; and management tools for effective water use. Featuring more than 100 projects in total, there are a host of practical examples of ways in which water-related policy can be implemented, not only to achieve the desired environmental goals, but also to provide added social and economic value across the EU.

A decision framework for considering climate change adaptation in biodiversity conservation planning

T.H. Oliver *et al.*

Journal of Applied Ecology 2012, 49: 1247–1255

This study proposes a decision framework that identifies and prioritises actions to increase the adaptive capacity of species. The framework classifies species according to their current distribution and projected future climate space, as a basis for selecting appropriate decision trees. Decisions rely primarily on expert opinion, with additional information from quantitative models, where data are available. The framework considers *in situ* management, followed by interventions at the landscape scale and finally translocation or *ex situ* conservation. From eight case studies, the key interventions identified for integrating climate change adaptation into conservation planning were local management and expansion of sites.

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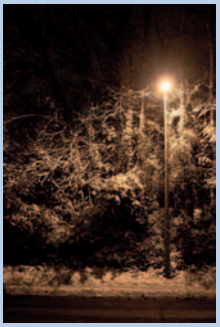
Reducing the ecological consequences of night-time light pollution: options and developments



K.J. Gaston *et al.*

Journal of Applied Ecology 2012, 49: 1256–1266

The authors examine the potential consequences for organisms of five management options to reduce night-time light pollution. These are to (i) prevent areas from being artificially lit; (ii) limit the duration of lighting; (iii) reduce the 'trespass' of lighting into areas that are not intended to be lit (including the night sky); (iv) change the intensity of lighting; and (v) change the spectral composition of lighting. Maintaining and increasing natural unlit areas is likely to be the most effective option for reducing the ecological effects of lighting. However, this will often conf ict with other social and economic objectives. Decreasing the duration of lighting will reduce energy costs and carbon emissions, but is unlikely to alleviate many impacts on nocturnal and crepuscular animals, as peak times of demand for lighting frequently coincide with those in the activities of these species. Reducing the trespass of lighting will maintain heterogeneity even in otherwise well-lit areas, providing dark refuges that mobile animals can exploit. Decreasing the intensity of lighting will reduce energy consumption and limit both skyglow and the area impacted by high-intensity direct light. Shifts towards 'whiter' light are likely to increase the potential range of environmental impacts as light is emitted across a broader range of wavelengths. As both lighting technology and understanding of its ecological effects develop, there is potential to identify adaptive solutions that resolve these conf icts.

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The effectiveness of classical biological control of invasive plants

G.D. Clewley *et al.*

Journal of Applied Ecology 2012, 49: 1287–1295

This study involved carrying out meta-analyses combining the results of 61 published studies (2000–2011) that quantified the impact of classical bio-control at the level of individual target plants, target populations or non-target vegetation. Factors associated with the control programmes (invasive region, native region, plant growth form, target longevity, control agent guild, taxonomy and study duration) were analysed to identify patterns in control success. On average, bio-control agents significantly reduced plant size (28 ± 4%), plant mass (37 ± 4%), f ower and seed production (35 ± 13% and 42 ± 9%, respectively) and target plant density (56 ± 7%). Beetles in the Chrysomelidae and Curculionidae families were more effective at reducing plant size than other groups. Non-target plant diversity significantly increased by 88 ± 31% at sites where bio-control agents were released, but it was largely unclear whether the replacement plant species were native or invasive. This study demonstrates the positive impacts of classical bio-control and the re-establishment of native plants in a broad range of systems and establishes the value of classical bio-control for the control of invasive alien plants. The Chrysomelidae and Curculionidae families were the most effective agents and the authors recommend these be prioritised in cases where potential agents of different taxa have also been identified. In addition, data on the recovery of native plant species and the invertebrate community remain sparse and it is recommended that future studies report the identity of plant species that replace target species as well as invertebrate community responses.

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Species-rich dung beetle communities buffer ecosystem services in perturbed agro-ecosystems

S.A. Beynon *et al.*

Journal of Applied Ecology 2012, 49: 1365–1372

The authors used a mesocosm experiment to investigate the functional importance of dung beetle species richness in a system perturbed by the anthelmintic, ivermectin. They varied dung beetle species richness within three functional groups in factorial combination with ivermectin treatment. In the short term, multi-species dung beetle assemblages achieved higher decomposition rates than monocultures, but only in ivermectin-treated dung. Varying species-specific sensitivities to ivermectin meant that species-rich assemblages sustained ecosystem functioning in the context of this anthropogenic perturbation. Over the longer term, there was a significant, positive effect of species richness on dung decomposition in both ivermectin-treated and untreated dung, underlining the functional importance of maintaining a species-rich dung processing community even in the absence of perturbations to the system. The authors suggest that apparent functional redundancy of species in agro-ecosystems should be interpreted cautiously. Furthermore, different farm management practices (e.g. pesticide use and fragmentation of habitats) may have consequences for ecosystem functions and services that exceed the effects of each when considered in isolation.

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Competition response of European beech *Fagus sylvatica* L. varies with tree size and abiotic stress: minimizing anthropogenic disturbances in forests

A. Fichtner *et al.*

Journal of Applied Ecology 2012, 49: 1306–1315

The authors assessed growth dynamics of European beech *Fagus sylvatica* in oligo- to eutrophic lowland beech forests by quantifying variation in the importance and intensity of competitive interactions among adult trees along a productivity gradient defined by nutrient availability and hydrological characteristics. They further predicted changes in competition indices with various levels of crowding for different forest types. Basal area growth of 1,819 canopy trees was analysed using forest inventory data. Competition response of adult trees was inconsistent among forest types. For small timber trees, the intensity and importance of competition decreased with increasing abiotic stress. Growth responses of medium and large timber trees, however, revealed an opposite trend. Thus, in tree communities, competition effects did not follow a general pattern, because tree maturation altered the responsiveness of trees to environmental stress. Resource dependency of competition effects was most pronounced for large timber trees, with lowest sensitivity to changes in crowding conditions occurring on fertile sites. For small and medium timber trees, however, competition effects were strongest in dense stands, with lowest sensitivity to changes in crowding conditions on resource-limited sites. The findings indicate that management practices could facilitate both timber production and nature conservation demands by adapting thinning approaches to age- and resource-related tree growth patterns. The authors propose a distinct reduction in thinning intensity, particularly for larger beech trees growing on sites with optimum below-ground resources. This would increase the permanent stand volumes and promote natural stand dynamics, which in turn would benefit biodiversity typical of old-growth beech forest ecosystems.

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Identification of 100 fundamental ecological questions

W.J. Sutherland *et al.*Journal of Ecology 2013, 101: 58–67

The authors identified 100 important questions of fundamental importance in pure ecology. They elicited questions from ecologists working across a wide range of systems and disciplines. The 754 questions submitted (listed in the online appendix) from 388 participants were narrowed down to the final 100 through a process of discussion, rewording and repeated rounds of voting. These 100 questions ref ect the state of ecology today. Using them as an agenda for further research would lead to a substantial enhancement in understanding of the discipline, with practical relevance for the conservation of biodiversity and ecosystem function.

See the full list: http://bit.ly/TV1ysY

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Hedgerow trees and extended-width field margins enhance macro-moth diversity: implications for management

T. Merckx *et al.*

Journal of Applied Ecology 2012, 49: 1396–1404

The authors used data on abundance and species richness of farmland macro-moths, many of which are declining, and trait-based analyses on their feeding guild, mobility and conservation status, to explore local- and landscape-scale effects of two farmland features (extended-width field margins and hedgerow trees) and surrounding farmland intensification. Macro-moths were light trapped at 48 fixed sites on 16 farms, over 4 years, within a 1,200km^2 area of lowland UK farmland. Sites belonged to one of four experimental groups that differed in their combinations of hedgerow tree presence and field margin width. Hedgerow trees and extended-width field margins locally increased species richness, but not abundance, of macro-moths, irrespective of each other's presence. Overall, species richness and abundance were not affected by agricultural intensification, as measured by the amount of arable land in the surrounding landscape. Sedentary moths showed double the species richness, but were half as abundant as mobile moths. Both groups responded positively to extended-width margin and hedgerow tree presence. The effect of hedgerow trees was particularly strong for shrub- and/or tree-feeding species. Analyses based on the conservation status of moths demonstrated that agricultural intensification lowered the species richness of nationally severely declining UK Biodiversity Action Plan priority species and the abundance of both nationally moderately declining and priority species. These effects were most pronounced at the 0.8km radius scale. The results suggest that the presence of extended-width field margins and hedgerow trees, possibly promoted by agri-environment schemes targeting their implementation at relatively small spatial scales (0.8km), may help mitigate negative effects of agricultural intensification on macro-moths.

Correspondence: th.merckx@gmail.com

Biological Flora of the British Isles: *Gunnera tinctoria*

M. Gioria and B.A. Osborne

Journal of Ecology 2013, 101: 243–264

This account presents information on all aspects of the biology of *Gunnera tinctoria* that are relevant to understanding its ecological characteristics and behaviour. The main topics are presented within the standard framework of the *Biological Flora of the British Isles*: distribution, habitat, communities, responses to biotic factors, responses to environment, structure and physiology, phenology, f oral and seed characters, herbivores and disease, history and conservation. *Gunnera tinctoria* is native to South America but is naturalised in parts of Britain, becoming invasive in parts of Ireland and, more recently, Scotland. Typical habitats in Britain and Ireland include stream and river banks, lake and pond margins, coastal cliffs, as well as disturbed areas, such as roadsides, quarries and ditches.

Correspondence: margheritagioria1@gmail.com

Riparian field margins: can they enhance the functional structure of ground beetle (Coleoptera: Carabidae) assemblages in intensively managed grassland landscapes?

L.J. Cole *et al.*

Journal of Applied Ecology 2012, 49: 1384–1395.

A range of riparian margins and their adjacent grassland fields were investigated to determine the effects of riparian management on the diversity and functional structure of carabid assemblages. Carabid assemblages of fields and open margins (i.e. unfenced watercourses) were more diverse and species rich than those of fenced margins. The functional structure of carabid assemblages in fenced margins differed from grassland fields and open margins. This disparity was greater in wide margins (fences erected over 5.4m from watercourses) than narrow margins (fences erected within 2.6m of watercourses). Wide margins had the highest relative proportions of carabids which had pushing body forms, were f ightless, very small in size and Collembola specialists. During early summer, wide margins also had the highest proportion of carabids that overwinter as adults. The taxonomic and functional structure of carabid assemblages was more sensitive for detecting impacts of agricultural management than measurements of diversity. It is likely that this also applies to other taxa, thus emphasising the need to consider a wide range of assemblage attributes when investigating agricultural impacts on biodiversity.

Correspondence: Lorna.Cole@sac.ac.uk

Using functional traits to quantify the value of plant communities to invertebrate ecosystem service providers in arable landscapes

J. Storkey *et al.*

Journal of Ecology 2013, 101: 38–46

Two data sets of plant and invertebrate communities from a range of annual crops and uncropped land habitats were analysed. The community-weighted means of plant functional traits were calculated for the vegetation samples and used as the explanatory variables in a multivariate analysis of plant species composition across habitats. The constrained axes scores were used in statistical models to explain the variance in associated total invertebrate abundance, phytophagous invertebrates and invertebrate numbers weighted by importance in the diet of farmland bird chicks. The multivariate analysis discriminated between plant communities characterised by ruderal traits (high specific leaf area and early f owering) and those with more competitive traits. More ruderal communities also supported proportionally more invertebrates. The suite of traits included in the analysis explained a greater proportion of the variance in invertebrate abundance between uncropped habitats, as opposed to between annual crops. The overlap between the plant traits that respond to disturbance (functional response traits) and those that affect the abundance of phytophagous invertebrates (functional effect traits) and the diet of farmland birds demonstrates the potential for using common functional metrics to integrate the assessment of an ecosystem service across different habitats particularly on uncropped land where intensity of disturbance is the main environmental driver.

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Does managed coastal realignment create saltmarshes with 'equivalent biological characteristics' to natural reference sites?

H.L. Mossman, A.J. Davy and A. Grant

Journal of Applied Ecology 2012, 49: 1446–1456

This study compared plant communities and environmental characteristics of 18 deliberately realigned (managed realignment, MR - between 1 and 14 years old), 17 accidentally realigned (AR, 25–131 years old) sites with those on 34 natural reference saltmarshes in the UK. Halophytic species colonised individual realignment sites rapidly, attaining species richness similar to nearby reference marshes after 1 year. Nevertheless, the community composition of MR sites was significantly different from reference sites, with early-successional species remaining dominant, even on the high marsh. The dominance of pioneer species on the low and mid-marsh may be because, at the same elevation, sediments were less oxygenated than on reference sites. Sediments were well oxygenated on the high marsh, but were often drier than on natural marshes. Overall community composition of AR marshes was not significantly different to reference marshes, but the characteristic perennials *Limonium vulgare, Triglochin maritima, Plantago maritima* and *Armeria maritima* remained relatively rare. In contrast, the shrub *Atriplex portulacoides* was more abundant, and its growth form may inhibit or delay colonisation by other species. Marshes created by managed realignment do not satisfy the requirements of the EU Habitats Directive. Adherence to the Directive might be improved by additional management interventions, such as manipulation of topographic heterogeneity or planting of mid- and upper-marsh species. However, given the inherent variation in natural saltmarshes and projected environmental change, policies that require exact equivalence at individual sites may be unachievable. More realistic goals might require minimum levels of a range of ecosystem functions on a broader scale, across catchments or regions.

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Common and Conflicting Interests in the Engagements between Conservation Organizations and Corporations

J.G. Robinson

Conservation Biology 2012, 26: 967–977

The conservation community increasingly views the corporate sector as a positive force for conservation. Collaborations between corporations and conservation NGOs seek to mitigate the negative effects of corporate activities and augment positive conservation outcomes. The author reviewed the establishment of corporate social responsibility (CSR) policies by corporations; the emerging focus on environmental practices and sustainability; and the history of engagement between corporations and NGOs. The author considered the ethical and reputation vulnerabilities of these collaborations, which depend especially on the financial nature of the relationship and reviewed how CSR approaches have inf uenced corporate practices. The review concluded that whereas CSR practices can act to mitigate negative environmental impact, to date they have had limited positive effect on biodiversity conservation.

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Ecological effects on gut bacterial communities in wild bumblebee colonies

H. Koch, G. Cisarovsky and P. Schmid-Hempel

Journal of Animal Ecology 2012, 81: 1202–1210

Bumblebees have recently been shown to possess simple and highly specific microbiota. The authors examined the dynamics of these microbiota in field colonies of the bumblebee *Bombus terrestris* over one season. The gut bacteria were assessed with culture-independent methods, that is, with terminal restriction fragment length profiles of the 16S rRNA gene. To further understand the factors that affect the microbiota, they experimentally manipulated field-placed colonies in a fully factorial experiment by providing additional food or by priming the workers' immune system by injecting heat-killed bacteria. They furthermore looked at possible correlates of diversity and composition of the microbiota for (i) natural infections with the microbial parasites *Crithidia bombi* and *Nosema bombi*, (ii) bumblebee worker size, (iii) colony identity, and (iv) colony age. The authors found an increase in diversity of the microbiota in individuals naturally infected with either *C. bombi* or *N. bombi*. *Crithidia bombi* infections, however, appear to be only indirectly linked with higher microbial diversity when comparing colonies. The treatments of priming the immune system with heat-killed bacteria and additional food supply, as well as host body size, had no effect on the diversity or composition of the microbiota. Host colony identity had only a weak effect on the composition of the microbiota at the level of resolution of this method. The authors found both significant increases and decreases in the relative abundance of selected bacterial taxa over the season. The study identifies parasite infections, colony identity and colony age as important factors inf uencing the diversity and composition of the bacterial communities.

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Testing the stress-gradient hypothesis with aquatic detritivorous invertebrates: insights for biodiversity-ecosystem functioning research

V. Fugère *et al.*

Journal of Animal Ecology 2012, 81: 1259–1267

To explore whether the stress-gradient hypothesis (SGH) could be applied to animal communities, the authors conducted a litter decomposition experiment with aquatic detritivorous invertebrates in which we manipulated litter quality and measured species interactions along this resource quality gradient. Litter quality was manipulated by presenting detritivores with leaves of plant species varying in specific leaf area and decomposition rate in streams. The authors found a switch from negative to neutral interactions with increasing resource quality stress, in line with the SGH. However, by re-examining other published results with aquatic detritivores from the perspective of the SGH, they found that a diversity of patterns seem to characterise detritivore interactions along s tress gradients.

Although the basic pattern proposed by the SGH may not apply to animal systems in general, this study shows that aquatic detritivore interactions do change along stress gradients, which underlines the importance of incorporating environmental stressors more explicitly in biodiversity-ecosystem function research.

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Biogeographic comparisons of herbivore attack, growth and impact of Japanese knotweed between Japan and France

N. Maurel *et al.*

Journal of Ecology 2013, 101: 118–127

The authors' intent was to measure differences in herbivory, plant growth and the impact on other species in *Fallopia japonica* in its native and non-native ranges. They performed a cross-range full descriptive, field study in Japan (native range) and France (non-native range), and assessed DNA ploidy levels, the presence of phytophagous enemies, the amount of leaf damage, several growth parameters and the co-occurrence of *F. japonica* with other plant species of herbaceous communities. Invasive *F. japonica* plants were all octoploid, a ploidy level not encountered in the native range, where plants were all tetraploid. Octoploids in France harboured far less phytophagous enemies, suffered much lower levels of herbivory, grew larger and had a much stronger impact on plant communities than tetraploid conspecifics in the native range in Japan. The results confirm that *F. japonica* performs better in its non-native than its native range.

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Forthcoming Events

For information on these events please see *www.ieem.net.*

Conferences		
Date	Title	Location
20 March 2013	Spring Conference - Ecosystem Services 1: Practical Methods for Demonstrating the Value of Nature to Decision-makers	Birmingham
November 2013	Autumn Conference - Ecosystem Services 3: River Catchment Restoration and Management	TBC

Training Courses		
14 March 2013	Water Environment: The Legal Framework	Sheffield
18 March 2013	Introduction to Ecological Impact Assessment (EcIA)	Leeds
19 March 2013	Developing Practical Skills in Ecological Impact Assessment (EcIA)	Leeds
26 March 2013	Water Vole Ecology	Devon
27 March 2013	Water Vole mitigation options for development	Devon
8 April 2013	Reptile Ecology, Survey and Handling	Essex
17 April 2013	Surveying and Report Writing for Protected Bird Species - Barn Owl	Tamworth
18 April 2013	Making the most of BREEAM and the Code for Sustainable Homes	London
19 April 2013	Intro to Bird Identification Techniques	Henfield, W. Sussex
20-21 April 2013	Intro to Bryophyte identification for habitat survey	Co. Fermanagh
23 April 2013	Intro to Ecosystem services valuation	Chester
24-25 April 2013	Intro to Badgers and Badger Survey Techniques	Axminster
26 April 2013	Great Crested Newt: Ecology, Survey Techniques and Conservation	Stockend, Glos.
29-30 April 2013	Reptile Mitigation	Essex
30 April 2013	Upland Farming for Ecologists and Environmental Managers	Derbyshire
1 May 2013	Making the most of BREEAM and the Code for Sustainable Homes	St Ives, Cambs.
9 May 2013	Soils - Design and Management for Habitat Creation and Biodiversity	Cheshire
9-10 May 2013	Introduction to Phase 1 Habitat Mapping and Plant Identification	Newark
9-10 May 2013	Intro to Ecological Mapping with Open Source GIS	Athlone, Co. Westmeath
13 May 2013	Field ID of common birds and breeding bird song	Totnes
15 May 2013	Native Woodland Creation	Carmarthen
15 May 2013	Introduction to bat survey	Dunblane
15-16 May 2013	Intro to biological indicators of river water quality	Axminster
16 May 2013	Bat impacts and mitigation	Dunblane
17 May 2013	Early season grass and sedge identification	Salisbury
20 May 2013	Retaining Landscape Features for Biodiversity	Farndon, Cheshire
22-23 May 2013	Intro to Grass Identification	Settle
23 May 2013	Introduction to Adult Dragonf ies and Damself ies	Somerset
1 June 2013	Bat Handling and Identification	Herne Bay, Kent
4 June 2013	Reptile identification, surveys and handling	Clyst St Mary, Devon
5 June 2013	Grass and Sedge Identification - Neutral and Calcareous Grassland	Salisbury
6 June 2013	Grass, Sedge and Rush Identification - Heathland, Acid Grassland and Bogs	New Forest
11 June 2013	Invasive non-native species - Identification and site assessment	South East England
14 June 2013	Wildf ower Identification for beginners	Wirksworth, Derbyshire
15 June 2013	Hazel Dormouse: Ecology, Conservation and Survey Techniques	Stockend, Glos.
20-21 June 2013	Introduction to Marine Benthic Ecology	Ireland
25-26 June 2013	Getting to Grips With Grasses	Axminster

Geographic Section Events		
14 March 2013	Yorkshire and The Humber Section Inaugural AGM	Leeds
22 March 2013	South East England Section AGM 2013	Wakehurst Place