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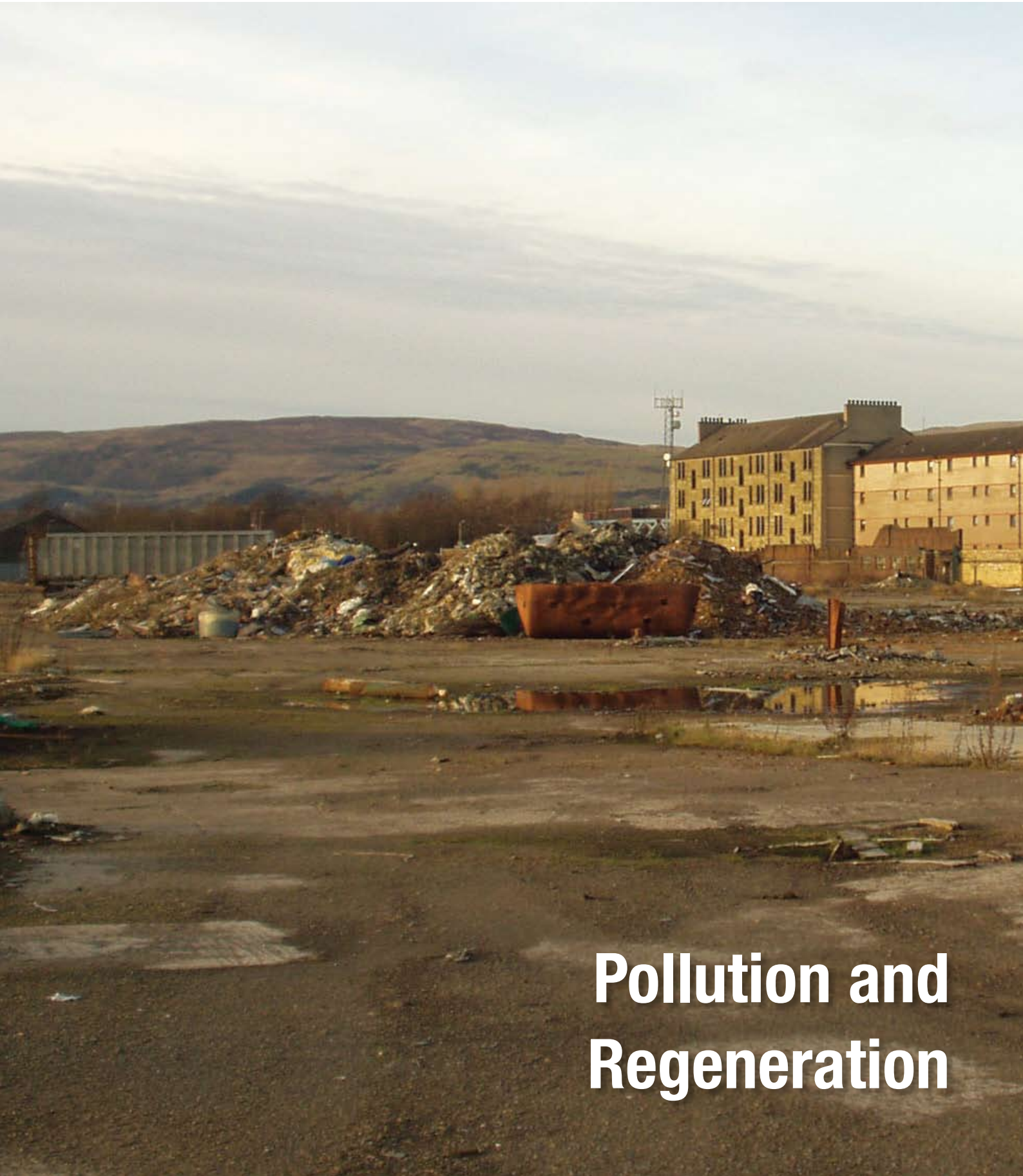

Pollution and Regeneration

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IEEM aims to raise the profile of the profession of ecology and environmental management, to establish, maintain and enhance professional standards, and to promote an ethic of environmental care within the profession and to clients and employers of the members.

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McParland Finn
British Ecological Society

Editorial

IYB, Copenhagen and all that jazz...

Just a few short weeks after 'seal the deal' at Copenhagen, the International Year for Biodiversity (IYB) started. What, if anything, do these events mean for practitioners in IEEM?

The results from Copenhagen mark a new departure in International Environmental Governance – it was either a success or a failure, depending on who you talk to. Yet the problem is you can claim either, depending on your baseline – yes, over 130 important people (along with 44, 870 unimportant ones) gathered in Copenhagen – but actually only five of them really did anything (see page 30). Yes, progress was made on the REDD (Reducing Emissions from Deforestation and Forest Degradation) deal, finally bringing at least some biodiversity elements into the climate change political debates. But overall the Deal was not sealed, and the world's climate change governance system is adrift still in an uncertain future. Maybe it will mean a change for the better, but it certainly means a change in the way environmental issues are debated and resolved internationally.

But how does this link to IYB? Well, just as 2009 should have been the year for climate change (of direction) now 2010 is the year biodiversity comes into its own. Looking back after a decade of the Conventions' existence, by 2002 a new direction was sought, to be realised through implementation of the 2010 target to reduce the rate of loss of biodiversity. (In Europe of course, after maybe a too lavish lunch event, the EU Heads of State in 2001 agreed to a target to *halt* the rate of loss.) In the end, neither the global community nor the EU have had traction, although the view that we now have more protected areas in the world is trumpeted as a sign of success. The real problem was lack of baseline against which to measure the success or otherwise of the target and its subsidiary goals.

It is clear that far from the rate of loss being reduced, it is actually accelerating – and if we needed quantification the Millennium Ecosystem Assessment provided it. Yet unlike climate change, biodiversity has not only a global convention, it has a number of other specific theme conventions dealing with various issues (Ramsar wetlands, CITES, Migratory Species, World Heritage natural sites and Plant Genetic Resources). Yet even with this phalanx of legal *apparti*, let alone all the regional legal instruments such as European Directives, Berne Convention, Barcelona Convention, *etc*., it seems we have failed.

But maybe there are signs of hope. We have nearly a whole year to try and plan for a better biodiversity future. Just recently the UK and Brazilian governments held a consultation in London on the next steps to have a successful CBD COP10 in October in Nagoya, Japan. And in September the UN General Assembly (at Head of State level) will debate biodiversity from the viewpoint of three key themes; poverty reduction, climate change, and establishing new and measurable targets. This decoupling of the Convention's COP and Heads of State events can perhaps achieve more (or, cynically, fail less) than climate change did. But in the end the real issue is getting what these ethereal conferences discuss and decide into the hearts and minds of the world's population – for it is you, me and the rest of the seven billion members of the ill-named *Homo sapiens* who can actually make a difference, help achieve targets, *etc*. It is not conventions, governments or corporations – it is the people in them that will succeed or fail.

So, as a member of IEEM there is a role that we can all play; to articulate these ideas in our daily work, and through communicating the concepts more widely. Even something as simple as using the IYB logo in your e-mail signature or as a hotlink on your web page spreads the message. We have, in 2010, a chance to make Nagoya more successful than Copenhagen, and with that finally giving biodiversity more prominence in the public's hearts and minds. Hey, here's a thought; why don't we use a different term, something like 'natural history' for example?!

Happy IYB to all!

Peter Bridgewater CEnv FIEEM
Director, Global Garden Consulting

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Cover image: Industrial brownfield site in Glasgow

Photography: Jim Thompson HonFSE CEnv MIEEM

Artwork on the cover will normally illustrate an article in, or the theme of, the current issue. The Editor would be pleased to consider any such material from authors.

Biomonitoring of Air Pollution with Plants – A Regulatory Tool of the Future?

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*** Director of OPAL, Imperial College London*

Biomonitoring air pollution with plants is a simple and cheap technique which can complement sophisticated physico-chemical monitoring. It can be used for bioaccumulation or monitoring via injury or changes in species composition. Its strong evidence-based approach is leading to European standardisation and its likely use in regulation in the UK and elsewhere in Europe.

Historical Air Pollution Monitoring

Monitoring of air pollution in the UK dates from the mid-nineteenth century when Robert Angus Smith, the first inspector of the Alkali Inspectorate (a forerunner of today's Environment Agency) carried out extensive studies into the acidity and other chemical aspects of rain around industrial locations in northwest England. Subsequently, in the same century, early measurements were made of SO_2 concentrations, and particulate and sulphate deposition in a range of urban locations. However, most air pollution monitoring was conducted on an *ad hoc* and limited basis until the National Survey of Smoke and Sulphur Dioxide was established in 1958, primarily to monitor the effect of the Clean Air Act of 1956, brought about by the appalling death toll from the Great London Smog in December 1952. Since then air pollution monitoring has expanded beyond all recognition with numerous pollutants involved, in both rural and urban areas, using a wide range of techniques from sophisticated continuous monitors to integrating diffusion tubes, mainly under the control of Defra and the local authorities. The data generated by these surveys are employed for regulatory purposes and as evidence in litigation and planning enquiries.

Biomonitoring Definitions

In view of these developments it may at first sight seem strange that currently there is growing interest in developing the use of plants as biomonitors of air pollution in this country. However, changes in legislation at EU level are raising the profile of these techniques and in the UK the Environment Agency of England and Wales has commissioned relevant research and is inputting into international developments. It should be noted that the relatively low profile of biomonitoring of air pollution in the UK contrasts markedly with aquatic biomonitoring where its use in assessing water quality on the basis of invertebrate fauna has been long established as a standard regulatory tool.

Biomonitoring can be defined as the use of an organism or assemblage of organisms at all levels of their organisation, ranging from molecular/biochemical to morphological and ecological, to predict or reveal a modification of the environment and follow the time course over which this takes place. There are two main types of biomonitors:

1. Plants which show a measureable response to air pollution, often in the form of visible injury or else respond in terms

Photo 1. Fluorine sensitive gladiolus varieties, showing injury near a fluorine chemical works in Rotherham, 1983

Photo 2. Ozone damage on Bel-W3 tobacco at Ascot, Summer 1972

of changes in community composition, depending on the sensitivity of different species.

2. Plants which are classed as bioaccumulators and accumulate pollutants such as heavy metals or fluorides.

Biomonitors can further be classified as passive or active, with the former being plants already growing in the field and the latter being highly standardised cultures designed to minimise effects of potentially confounding variables.

Advantages of Biomonitors

Clearly biomonitors can never replace physico-chemical monitors which measure real time concentrations of pollutants. Rather, they complement them by providing extra information. In particular, biomonitors provide a response measurement which reflects actual deposition onto vegetation, which is in itself influenced by factors such as wind-speed, rainfall, relative humidity and exposure, as well as the physiological state of the plants concerned. Thus it is a good predictor of risk of damage to vegetation or toxic effects on biota (including humans) via the food chain. Biomonitors provide evidence that pollution has changed the natural state of the environment. They also have the advantage of invariably being cheap and inconspicuous, thereby not detracting from the landscape, minimising vandalism problems and permitting large numbers to be exposed in the field in order to map pollutants on both a spatial and temporal basis. They also do not require an electricity supply and can utilise relatively unskilled personnel. All these attributes make them particularly suitable for use in developing countries, where air pollution monitoring is usually very limited.

Biomonitoring 100 Years Ago

One of the earliest UK studies involving the use of plants as biomonitors is described by Ruston (1921) in an ambitious programme investigating impacts of air pollution in Leeds around the time of World War I. This included many measurements of sulphur and soot deposition, but also exposure of standard cultures of crop plants (active biomonitors) along a gradient of air pollution from a rural area to the industrial location of Hunslet. The decline in growth towards the most polluted site was spectacular, with yields reduced to a fraction of those in a clean rural area, reflecting very recent similar studies in Chinese and Indian cities. The authors also made observations on vegetation growing *in situ* at the same locations (passive biomonitors): of particular interest was privet, which as pollutant concentrations increased initially ceased flowering and then became progressively deciduous until all leaves were shed by November. In the same study bioaccumulator monitoring was employed with measurements of leaf sulphur content.

Bioaccumulation

There are many examples of bioaccumulation being used on scales from the very local around individual point sources to regional to continental. In the case of industrial sources, exposure of standard cultures on a grid pattern is carried out before operation in order to obtain baseline data, followed by similar monitoring for a period when the emission source is active. This has been employed in many countries, including Canada and Germany, but with relatively little use in the UK. An interesting example of bioaccumulation being used to determine the distribution of SO_2 and the success of subsequent abatement measures is the use of birch leaf sulphur content around the Kvarntorp oil shale works in Sweden in the 1950s. Emissions from the works, which was established in World War II, had caused massive damage to conifers over a wide area and the spatial distribution of SO_2 was determined by passive biomonitoring of leaves collected on a grid at the end of the growing season when maximum uptake of atmospheric sulphur had taken place. When the data were mapped it became apparent that the works was resulting in elevated sulphur levels in birch leaves up to 30 km away. Another survey was conducted after introduction of abatement measures (probably

Photo 3. Biomonitoring station in Baden-Würtemberg, Germany, 1986

Photo 4. Lichens on oak tree at Hesworth Common, rural Sussex

an increase in stack height), which indicated a massive fall in sulphur levels, especially over the first few kilometres from the source. A similar study was conducted some 30 years ago in this country, by Rothamsted Experimental Station, in response to concerns over air pollution damage to vegetation around brickworks near Woburn. In this case hawthorn leaves were used as a passive bioaccumulator, being collected at the end of the growing season and analysed for fluoride. Subsequent mapping showed that elevated fluorine levels were associated with the (now closed) Ridgmont and Lidlington brickworks along the line of the prevailing wind.

Both mosses and lichens are particularly suitable for bioaccumulation studies, in both active and passive modes, due to their propensity to accumulate large amounts of chemicals from the air through their non-cuticular surfaces as their means of mineral nutrition. In this country extensive monitoring of heavy metals was conducted using mosses around the Swansea area in the early 1970s. At the time there were serious concerns about residual air pollution arising from the numerous highly toxic old smelter waste tips in the Lower Swansea Valley, as well as a currently operating lead/zinc smelter. There was controversy as to which of these sources was responsible for the death of local horses from heavy metal poisoning. The issue was resolved by Roberts (1972), who employed a form of active biomonitoring, using dead *Sphagnum* moss, which had been rinsed with acid and sewn into nylon mesh bags *i.e.* 'moss bags', which have been employed widely since. Exposure of the moss bags for one month over the area, followed by analysis of metal content, showed the former and current smelter operational area to have massively elevated lead levels. The source of the problem was identified by a second survey after closure of the smelter, which showed around 100-fold reduction in lead levels with the appearance of 'hot spots' associated with old smelter waste, whose signal was previously obscured by the current emissions. On a much larger scale passive biomonitoring is now being employed across Europe as a whole, under the auspices of the UNECE Convention on Transboundary Air Pollution, arising out of an earlier programme restricted to Scandinavia and Finland. This is conducted at five year intervals and involves analysis of a wide range of heavy metals in selected epiphytic moss species. It has enabled a detailed picture to be built up of heavy metal deposition over Europe, with the identification of both hotspots and temporal trends.

Biomonitoring by Foliar Injury

There are a number of higher plant species which are particularly suitable for active biomonitoring of individual pollutants. These include gladioli and other narrow leaved ornamental monocotyledons, which accumulate fluorine (which can also be assessed in the bioaccumulation mode) in the leaf tips, with the area of leaf damaged being the basis of aerial fluoride monitoring. A somewhat different approach has utilised measuring the degree of epinasty (bending of leaf's petiole downwards) for monitoring ethylene in the atmosphere, although there are doubts as to the specificity of this response. However, the most familiar example of this type of biomonitoring is the

Photo 5. Lichens on oak tree at Epsom Common, London urban fringe

use of tobacco for tropospheric O_3. In the 1950s a mysterious form of injury rendered cigar wrapper tobacco crops valueless in the eastern USA. This was initially known as 'weather fleck' due to its association with high temperatures and irradiance, but later shown to be due to O_3 which is generated under these conditions. In the course of a breeding programme to develop resistant varieties, a supersensitive individual was identified which shows injury above the maximum natural O_3 level of 40 ppb and was bred as the biomonitor variety Bel-W3, which has subsequently been used extensively across the developed (and now to some extent the developing) world. Our group at Imperial College demonstrated as early as 1972 that Bel-W3 was an excellent biomonitor of O_3 under UK conditions. Subsequently we carried out summertime surveys in 1977 and 1978 of O_3 distribution across the British Isles, employing a standard protocol used by volunteers at around 50 sites. At that time there was only a handful of physico-chemical monitors operating in the UK, with these effectively being restricted to southeast England. The results of the Bel-W3 survey generated the first O_3 map of the British Isles (Ashmore *et al.* 1978), which demonstrated the widespread distribution of this pollutant at phytotoxic levels across most rural areas monitored, thus providing early evidence of the now internationally recognised threat to crops, trees and native vegetation in Europe.

Lichen Monitoring

Many people automatically associate biomonitoring of air pollution with plants with the use of lichens for this purpose, although these symbiotic algal/fungal associations are not nowadays strictly classified as plants. The disappearance of lichens due to SO_2 since the Industrial Revolution, has been remarkably well documented in the UK, leaving large areas as 'lichen deserts' and even rural areas in most of England losing the more pollution sensitive species. This has led to the development both in the UK and elsewhere of a range of protocols for estimating air quality on the basis of lichen species. In this country the best known is that of Hawksworth and Rose (1970), who developed a 10 point zone scale based on lichen communities on trees, utilising the differential sensitivity to SO_2 of different species, in order to predict ambient levels of the pollutant. This was used to produce a map which highlighted the impoverishment of the lichen flora over much of England and Wales. A few years later a much simpler scale was used by one thousand school children to produce a remarkably similar map. Since 1970, SO_2 levels have declined by around 100 times across the UK and interest has become directed towards reinvasion of the 'lichen deserts'. However, it has become apparent that this has been accompanied by a rise in levels of other pollutants, particularly nitrogen oxides, ammonia and their derivatives. Consequently the lichen flora of urban areas show marked improvement, such as London now supporting 73 species on ash alone, compared with only nine epiphytes on all trees in 1968-9 (Davies *et al.* 2007). Thus the old SO_2 scales have completely broken down under ameliorating pollutant conditions. However, the inner city areas still show a depletion in lichen flora compared with the suburbs and most species present are nitrophytic, reflecting the increased levels of nitrogen deposition. One interesting observation is that the most SO_2 tolerant lichen, *Lecanora conizaeoides*, which was formerly abundant in all but the most polluted sites in the central areas, has more or less completely disappeared. Currently new zone scales are being developed for lichen biomonitoring and the present low SO_2, high nitrogen regimes.

Eurobionet

The importance of biomonitoring air pollution with plants has been recognised by the European Commission which funded Eurobionet, an ambitious programme commencing in 1999

Photo 6. Absence of lichens on oak tree in Kensington Gardens, central London

(Klumpp *et al.* 2004). This was based on the premise that understanding harmful effects of pollution can only take place via effects on living organisms, as opposed to physico-chemical monitoring. Nine cities (including Edinburgh and Sheffield) in seven countries took part, using a highly standardised protocol with four plant species as the monitors. Italian ryegrass *Lolium multiflorum* was employed as a bioaccumulator of sulphur and heavy metals, curly kale as an accumulator of polycyclic aromatic hydrocarbons on its waxy leaf surfaces, Bel-W3 tobacco for O_3 and *Tradescantia* (spiderwort) to demonstrate the level of mutagens in the atmosphere by micronuclei formation in its pollen mother cells. The programme had a very high public profile, designed to raise awareness of air pollution issues of the public in the cities concerned. At this it was highly successful and at the final workshop a local authority representative stated that 'it made the invisible visible'. This is an aspect of biomonitoring that cannot be understated. Most people, including politicians and the public, have little or no understanding of data on concentration, deposition rates, *etc.*, but visible damage really brings home the significance of pollution.

Biomonitoring Standardisation

The country which has made the greatest advances in Europe in biomonitoring air pollution is Germany, where standardised

Photo 7. Standard Italian ryegrass culture employed for biomonitoring in accumulation mode, Essen, North Rhine-Westphalia, 1972

grass cultures were developed as bioaccumulators in the late 1960s, subsequently becoming standardised in the form of a VDI (Verein Deutscher Ingenieure) guideline in 1978, with subsequent refinements for use with fluorine and lead. At the present time there are two European Standards Association (CEN) working groups developing standardised protocols for Europe as a whole, so that biomonitoring can be standardised throughout the continent. WG30 is developing a protocol for maintaining fluorine and heavy metals using Italian ryegrass, based on German and French standards, followed by O_3 monitoring with tobacco. WG31 is developing standardised lichen and moss biomonitoring, working in parallel. It is noteworthy that there are a number of British representatives on these working groups, including scientists from academia and the Environment Agency. In the 1970s, the UK authorities actively discouraged participation in European biomonitoring and it is clear that matters have changed considerably since then.

OPAL

In 2007, biomonitoring in the UK took a new turn with the award of around £12 million from the Big Lottery Fund for the OPAL (Open Air Laboratories) project, involving 15 partners and a total of 31 projects, led by Imperial College London. The authors of this article are the Director and Chair of OPAL's biomonitoring committee, the latter oversees five programmes (in chronological order of being set up): soil quality (using earthworms as an indicator), air quality, water quality, biodiversity, and a climate survey. The air quality survey is led by Imperial College and consists of two parts. Firstly, there is a lichen survey, involving recording of three nitrogen-loving, three nitrogen sensitive and three intermediate species on free-standing tree trunks and their twigs, the latter being useful for understanding recent colonisation without any long term 'memory' effect. Secondly, there is a survey of tar spot disease of sycamore, caused by the fungus *Rhytisma acerinum*. This disease has been shown to be sensitive to SO_2 in the manner of the more familiar black spot of roses and has now reinvaded many of the urban sites from which it was previously excluded, but there is strong evidence that it cannot survive under the current high NO_2 central London air pollution regime. Results from these and the other surveys are entered by the participants into a web-site which is continuously updated and can be interrogated by the public to determine current distribution of records. The data are being analysed in depth statistically, seeking relationships between lichen and tar spot populations and pollution levels, together with rigorous quality assurance procedures sufficiently robust for publication of results in international journals. The OPAL project is an excellent example of how biomonitoring can reach out to a very wide audience, including disadvantaged social groups, while at the same time reviving interest in the science of taxonomy and producing high quality scientific information which will make major advances in this field – a true win-win-win situation! www.opalexplorenature.org.uk

The Future

A recent review of European legislation identified a number of Directives where biomonitoring appears relevant, including Integrated Pollution Prevention and Control (IPPC), Habitats Directive, and Air Quality Framework Directive. The Reference Document on General Principles of Monitoring (MON REF) associated with IPPC is due for review this year and efforts will be made to promote the use of biomonitoring as an evidence-based approach to support the physico-chemical monitoring currently required.

References

Ashmore M R, Bell J N B and Reily C L (1978) A survey of ozone levels in the British Isles using indicator plants. *Nature* **276**: 813-815.

Davies L, Bates J W, Bell J N B, James P W, Purvis O W (2007) Diversity and sensitivity of epiphytes to oxides of nitrogen in London. *Environmental Pollution* **146**: 249-310.

Hawksworth D L and Rose F (1970) Qualitative scale for estimating sulphur dioxide pollution in England and Wales using epiphytic lichens. *Nature* **227**: 145-148.

Klumpp A, Ansel W and Klumpp G (2004) *Urban air pollution, bioindication and environmental awareness*. Cuvillier Verlag, Göttingen.

Roberts T M (1972) Plants as monitors of heavy metal pollution. *Journal of Environmental Planning and Pollution Control* **1**: 43-54.

Ruston A G (1921) The plant as an index of smoke pollution. *Annals of Applied Biology* **7**: 390-402.

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ECOSYSTEM SERVICES

IEEM Spring Conference 2010

24 March 2010, London

Humans benefit from a plethora of processes and resources that are supplied by natural ecosystems. Collectively, these are known as ecosystem services and include products like clean drinking water and processes such as the decomposition of wastes.

These services were popularised and their definitions formalised by the Millennium Ecosystem Assessment. This grouped ecosystem services into four broad categories: provisioning, such as the production of food and water; regulating, such as the control of climate and disease; supporting, such as nutrient cycles and crop pollination; and cultural, such as spiritual and recreational benefits.

The impacts of the use and abuse of these ecosystem services are becoming evermore apparent – air and water quality are increasingly compromised, oceans are being over-fished, pests and diseases are extending beyond their historical boundaries, and deforestation is eliminating flood control around human settlements. Consequently, society is coming to realise that ecosystem services are not only threatened and limited, but that the pressure to compromise between immediate and long-term human needs is urgent.

To help inform decision-makers, economic value is increasingly associated with many ecosystem services. The on-going challenge of prescribing economic value to nature is prompting shifts in how we recognise and manage the environment.

Speakers will present the application of ecosystem services evaluation into mainstream ecological practice. Examples of recent case studies from the terrestrial, marine and freshwater environments will be covered.

For more information and to book online please visit: www.ieem.net/conferences.asp

The Recall of the Wild – What EU Legislation Means for UK Water Standards

Pam Gilder
Head of Land and Natural Environment, Environment Agency

The continued improvement in water quality throughout England and Wales has led to otters, salmon and eels returning to our rivers. However, the introduction of the European Union's Water Framework Directive sets new standards for water throughout the UK.

Water is society's most important and basic resource: it supports diverse ecosystems in wetlands, lakes, rivers, estuaries and the sea; it is vital in our homes, for health, recreation and tourism; it is used to generate power, run industries and grow food.

Increased pressure is being placed on our water resources. An additional 20 million people are expected to be living and working in England and Wales by the 2050s, leading to an inevitable rise in demand for water. Hotter, drier summers and warmer, wetter winters are predicted as a result of climate change. By 2050, natural river flows in summer could be up to 80 per cent lower than they are today. Polluted water run-off from farms and towns and cities is also affecting the quality of our surface and ground waters. Valuing water is vital.

We live in a crowded island and there are very few really pristine environments. Many water features have been modified by years of exploitation and indeed some artificial water bodies, such as the Norfolk Broads, have become special and protected environments in their own right.

Many rivers, lakes and estuaries have had their physical conditions altered substantially since the industrial revolution. Our industrialised society has straightened rivers for navigation, lined our estuaries with concrete banks and we have constructed thousands of weirs to manage river flow. These all have an impact on the water quality and the life it supports.

Our job is to target future investment in the right place so that we can continue to improve wildlife habitats whilst making best use of scarce resources, including money. Success will depend on good partnership. The ability of organisations to work together and to a common goal will be crucial.

Setting New Standards for Water

The Environment Agency has been monitoring the quality of water in rivers, lakes and reservoirs in England and Wales since 1990. These tests show a continuous improvement in water quality over the last two decades with 70 per cent of rivers in England and 90 per cent of rivers in Wales achieving the highest quality as determined by the general quality assessment (GQA).

So why are we seeing an improvement in water quality? Investment by water companies, tougher action on polluters, changing farming practices and thousands of local education and restoration projects have all played their part. The Environment Agency has been involved at all levels of improvement, from delivering the regulations which ensure business investment, to prosecuting polluters and funding local habitat improvement projects.

Otter ***Photo: Debbie Cousins***

River Avon ***Photo: Anne Taylor***

These continued enhancements to the quality of our waters are not only benefiting people. An increasing number of rivers are becoming home to species that were once thought to be in terminal decline. Fifty years ago there were no salmon in the River Tyne, but in 2009 more than 10,000 salmon were recorded migrating up the river. Otters have also been recorded in both Greater Manchester and the lower Thames for the first time in 40 years and can now be found in every English county. In the River Hamble in Hampshire a new fish pass has helped sea trout, lamprey and eels to swim upstream for the first time in hundreds of years.

Careful management, strict regulation and substantial investment are all paying dividends. For example, a £1 billion investment to reduce levels of industrial discharge into the River Mersey has contributed to salmon and sea trout returning to the river. Fish populations in the River Wensum in Norfolk are also expected to increase as a result of river restoration and habitat creation projects and a £4 million investment in phosphate removal programmes at two local sewage works.

The Water Framework Directive – Ensuring Continued Improvements

The past improvements are encouraging, but there is still more that needs be done to protect and improve the health of our waters. A more extensive range of quality standards has now been introduced under the European Union's (EU) Water Framework Directive (WFD), which aims to improve the ecological (biological and chemical) health of our waters. The WFD is the most substantial piece of European water legislation to date. These additional standards aim to raise the quality of all groundwater, surface waters, estuaries and coastal waters across all member states of the EU.

Actions to achieve these new standards are set out in River Basin Management Plans. In England and Wales, these plans have been developed by the Environment Agency in consultation with many organisations and individuals including those who have an interest in, or impact on, the quality of our waterways. They lay out ambitious proposals to improve more than 9,000 miles of waterways in England and Wales over the next five years.

The WFD establishes a strategic river basin management approach to the land and water environment in 11 River Basin Districts. It includes a common approach to setting environmental objectives for all groundwater, surface waters, estuaries and coastal waters within the European Community, and requires member states to draw up plans for meeting those objectives in each river basin district.

Monitoring Water Quality

As the WFD requires us to assess and take action on a far greater range of pressures than ever before, we have extended the geographic range and types of environmental parameters measured very significantly. The monitoring data collected for the WFD will drive all stages of the river basin planning cycle. We have reviewed our current chemical and biological monitoring so that we can get better information about the ecological status of water bodies and the impact of environmental pressures.

Monitoring of lakes, estuaries and coastal waters has increased and now covers a wider range of environmental pressures. There has also been a significant increase in the amount of data collected from groundwaters, allowing classification of chemical and quantitative status.

The monitoring programme is set out in the WFD for all member states to follow. In England and Wales there is a network of 534 surveillance sites in water bodies which are being monitored to provide an overview of status and identify long-term trends across England and Wales. These sites represent the full range of water body types and pressures on the water environment. A sub set of surveillance sites are being screened for specific polluting chemicals designated in the WFD.

Other organisations and government agencies also collect a wide range of information. We are looking at opportunities for sharing information and collaborating on monitoring.

Each component of a river ecosystem can tell us something different about the pressure we exert on the environment. If the plants are showing signs of damage this can indicate that low water levels are a problem, or that there are too many nutrients in the water. Interpretation of the results of the analysis of our chemical sampling lets us differentiate between the two. The story is the same for fish. Poor results from monitoring fish populations might indicate that there are toxic substances being released into the environment in harmful quantities or that fish passage is being impeded. Our monitoring can help us identify the likely causes. In some cases we design specific investigations, including monitoring to confirm the problem, trace the source and take the right remedial action.

Dipper ***Photo: Frank Hardwick***

Pond skater ***Photo: www.wildstock.co.uk***

Achieving Ambitious Plans

Much hard work still lies ahead. Under the WFD, the Environment Agency will continue to work at a national and local level with water companies, industry, agriculture, voluntary organisations, government and members of the public to tackle issues such as discharges from sewage treatment works and the over-abstraction of water from rivers. We are also working to prevent polluted water from farmland and urban areas entering rivers, lakes, groundwater and coastal areas.

Significant improvements are underway on some of England and Wales' most notoriously polluted rivers and lakes. For example, years of abstraction, pollution, runoff from agriculture and industrialisation meant that the River Lee – a major tributary of the River Thames – was almost written off as irreversibly polluted 20 years ago. Today, the Environment Agency is working on over 20 projects in the River Lee catchment. All of these aim to bring the river back to life. As a result, despite parts of the river still being classified as 'bad' under the WFD, the future of the River Lee is now far brighter.

This year the Environment Agency has removed over 30,000 tonnes of

urban sediment from 3.2 km of the Lower Lee. This sediment included three tonnes of tyres, three cars, 40 motorbikes and 120 shopping trolleys. Elsewhere along the River Lee, river banks have been restored to encourage biodiversity, support local birdlife and provide fish with good spawning habitats.

The construction of the 2012 Olympic site and its associated legacy developments provide an unparalleled opportunity to improve the lower reaches of the River Lee and its backwaters. The Environment Agency is working with the Olympic Development Authority to make the most of these opportunities, bringing about further significant changes along the Lee.

Elsewhere, as part of work to deliver the WFD, the Environment Agency is supporting local projects and initiatives to promote soil and nutrient management plans with local farmers; restore sustainable abstraction; and tackle the causes of urban diffuse pollution.

Planning for the Future

Higher environmental standards and the inevitable higher cost of improving the water environment call for careful management and regulation, particularly if the requirements of the WFD are to be met. The Environment Agency deals with all aspects of water – including abstraction, flood risk and water quality – and plays a vital role in safeguarding the future of water environments, ensuring the most effective and efficient solutions are supported.

We cannot be sure how climate change will alter the quality of our waters. Lower river flows and higher water temperatures could magnify the effects of pollution, putting the environment and wildlife at an increased risk from poor water quality. Fish, plants and insects all need a good flow of water to thrive. In times of less flow, oxygen supplies can be greatly reduced and damage to the plant and animal community is more likely. We also rely on river flows to dilute treated sewage effluent. In times of low water levels there will be less clean water to dilute the treated effluent.

The Environment Agency has a duty to protect the most valued habitats and species that rely on water. But we cannot do this alone. The solutions in the River Basin Management Plans will require investment and engagement with many interests and organisations including farmers, water companies and NGOs such as the RSPB. Planning now and making the necessary changes will mean that our waterways are a richer and more diverse natural resource to be enjoyed by people and wildlife for generations to come. We will play our part, will you join us?

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River Roding ***Photo: Colin Carron***

IEEM Tony Bradshaw Best Practice Awards 2010

The Institute of Ecology and Environmental Management is pleased to announce the call for entries for the 2010 IEEM Tony Bradshaw Best Practice Awards.

Entries that demonstrate best practice whilst contributing to the five objectives of IEEM are welcomed from all ecological professionals including from the public, voluntary and consultancy sectors. Projects of any size will be considered.
At least one IEEM member must have been involved in the project.

The five objectives of IEEM are:

1. to advance the science and practice of ecology and environmental management for the public benefit in the United Kingdom and internationally;
2. to further the conservation and enhancement of biodiversity and maintenance of ecological processes and life support systems essential to a fully functional biosphere;
3. to further environmentally sustainable management and development;
4. to promote and encourage education, training, study and research in the science and practice of ecology, environmental management and sustainable development; and
5. to establish, uphold and advance the standards of education, qualification, competence and conduct of those who practise ecology and environmental management as a profession and for the benefit of the public.

Entrants will be expected to submit an entry form and then, if short-listed, to produce a poster for the IEEM Conference in November 2010.

The short-list will be announced in September 2010. A representative for each short-listed entry must be available for the IEEM conference in November 2010. The awards will be presented at the conference dinner.

The deadline for entries is 2 July 2010.

For more information and an application form please visit: www.ieem.net/awards.asp

Tidal Energy Barrages – What Can Geomorphological Analogues Tell Us About Their Likely Impact?

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Introduction

Proponents of tidal power argue that it offers large quantities of reliable and predictable energy. The case in favour of the Severn barrage in particular has been supported by assertions that there will also be wildlife benefits arising from improvements in water clarity as a result of reduced sediment mobilisation (Kirby and Shaw 2005). Others such as the RSPB argue that there will be significant detrimental impacts on wildlife.

Who is right, or is anyone right? There are several examples of tidal energy barrages and a variety of other structures that together help to show how this form of coastal manipulation will affect people and wildlife; some of which is seemingly counter-intuitive. To make best use of these analogues we need to think about what the coast does and how it has evolved? The key is to look at the coast as a giant energy management system. Its form reflects the levels of energy imparted on it and the means at its disposal to absorb that energy.

Where energy levels are high, only the most resistant materials remain. Erosion will correspond to the resilience of the local geology and where the geology is weak it will happen relatively quickly. Where energy levels are lower and sediment is available (transported from areas of higher energy activity) then deposition or 'accretion' will take place. Two critical energy sources are involved: tidal currents and wind-driven waves. The former are relatively constant but will change over time as sediment is re-distributed and inputs of freshwater from rivers change, whilst the latter vary in intensity and orientation on an hourly basis.

These forces influence geomorphological evolution over several timescales: short-term responses (days, weeks or perhaps months), longer-term trends (years or decades) and changes over geological timescales (hundreds/thousands of years). Understanding the factors that affect these processes is the key to explaining what can be expected as a result of particular interventions. It is a form of conceptual modelling where analogues can be used to give first order indications of what will happen. In other words, the type of response can be predicted and the pathways that lead to that response can be identified. Absolute impacts require more complex modelling using physical or mathematical models, but even these have their limitations.

This article draws on the principles of geomorphological modelling (Pethick *et al.* 2009) and the application of experience from analogues to explain how coastlines respond to barrages and causeways that have been used both for tidal energy generation and for coastal defence.

What Does a Barrage Do?

A barrage is simply a constriction that allows tides to pass up and down an estuary or embayment in such a manner that energy can be generated by the movement of water. Various models exist, with power generation occurring on either the flood or ebb tides or, more usually, on the ebb tide alone.

Ebb generation involves retention of water behind the barrage until a sufficient 'head' develops – this is the fall that converts gravitational energy into electrical energy: the water body upstream becomes a temporary reservoir. Generation on the flood tide involves waiting until a sufficient head has developed on the upstream side before turbines let water pass upstream: this type of generation uses the open sea as the reservoir. Detailed information is available on Wikipedia (http://en.wikipedia.org/wiki/Severn_Barrage).

These basic principles can be used to develop an understanding of how a barrage will affect estuarine geomorphology, drawing upon relevant analogues. They include other tidal energy barrages, storm surge barrages, tidal sills and freshwater reservoirs, all of which provide partial indications of how an estuary or embayment will respond to barrage construction.

Immediate Geomorphological Responses

If water is allowed to travel unimpeded into an estuary or embayment it will reach a particular height that is dependent upon the shape of the estuary, its orientation in relation to the prevailing winds and the extent of the Continental shelf. The combination of funnelling effects from the seabed and coastal features mean that tides can vary enormously. Tides in bigger estuaries on the west coast of Britain, which faces the deep Atlantic Ocean, are generally much greater than those on the east coast where the North Sea is relatively shallow.

Impeding the progress of the tides means that water has a narrower cross-section through which to enter and this in turn means that there is greater friction, which reduces the ability of water to move as far as it might otherwise do or in as large volumes. Consequently, barrages and other constrictions cause a reduction in upstream water levels: a response that might be expected to bring flood defence benefits. Studies of the Severn Estuary in the 1980s suggested that the proposed Cardiff-Weston Barrage would lead to significant reductions in tide heights – 0.5 metres lower immediately upstream, 1 metre lower at Avonmouth and 1.5 metres lower at Sharpeness (Black and Veatch 2007).

This reduction in tide heights is also accompanied by reduced sediment mobilisation on flood tides. Creating a temporary reservoir also creates the environment for sub-tidal sediment deposition. The combination of these two responses is a reduction in the sediment available for inter-tidal deposition. In

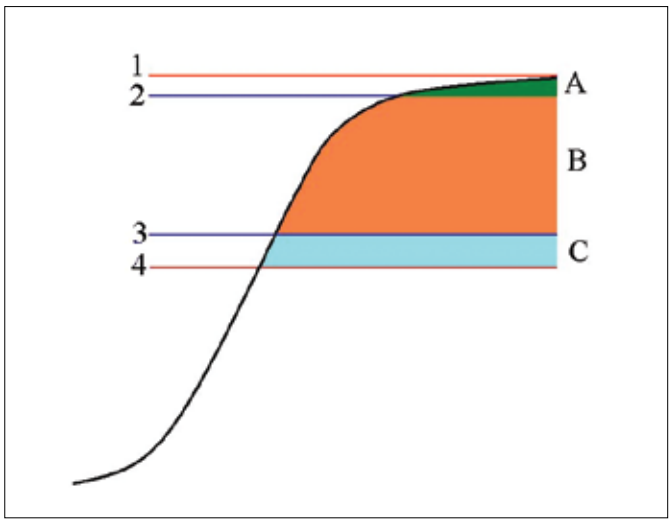

Figure 1. Changes to tidal propagation arising from imposition of a tidal barrage. Red lines 1 and 4 represent the original extreme high and low water levels. Blue lines 2 and 3 represent post-barrage extreme high and low water levels (without pumping). Section A (green) comprises saltmarsh and mudflat that is no longer inundated at high tide. Section B (orange) is the new tidal range and Section C (light blue) is former inter-tidal that is no longer exposed on any tide.

addition, the extent of inter-tidal exposed at low tide will also be reduced (Figure 1).

This response is crucial to the subsequent evolution of any estuary or embayment because it shifts the relationship between building and erosive processes, with the building processes focussed on the sub-tidal environment. The response of the inter-tidal is more complex and involves a mixture of erosion and accretion.

From a wildlife perspective these first responses mean that the upper inter-tidal ceases to be inundated. Saltmarshes will change from saline influenced communities to rainwater-fed communities, whilst some lower inter-tidal will cease to be exposed and available to support migratory waterfowl. The absolute proportions will vary according to the design, but in essence a one-off loss of habitat can be expected.

In addition, fine sediment will be deposited in sub-tidal environments, smothering some sub-tidal habitats such as exposed rock and reef communities. Mobile habitats such as sandbanks will become less mobile as the currents that form and drive them will be reduced. Sub-tidal responses involve change rather than complete loss, although the nature of the communities may differ greatly from existing communities.

Long-Term Geomorphological Evolution

A combination of tidal and wave energy influences affect sediment generation and distribution on the coast. Imposing large structures that influence both energy inputs will affect coastal evolution, especially in embayments and estuaries.

Reducing tidal range means that the form of the banks of the water body, which is shaped to accommodate the former wave regime, will have to change to reflect the new conditions. If a head pond or reservoir is created, then the wave regime will also be more dominant over certain parts of the tidal profile and consequently this energy will be instrumental in the development of a new form. This sort of evolution is a well-established process that is evident along the shores of many reservoirs (Photograph 1). Reservoirs therefore form one analogue that can be used to explain post-barrage responses (Morris 2009).

In addition to the absolute form of the shoreline, the nature of the sediments can be expected to change. This is because the relative rates of erosion and deposition will have been disrupted. Less sediment mobilisation through reduced flood tide energy means less sediment will be available for deposition during periods of foreshore building (mainly during the summer when diatom growth contributes to sediment binding and stabilisation).

The need to develop a new foreshore profile means that erosion will dominate in many places. This erosion is closely linked to big energy events such as winter storms, but even the lightest wave action can cause sediment mobilisation (Photograph 2). The extent of erosion depends upon the strength of the material that forms the original foreshore. If it is non-cohesive sands and gravels then the lightest fraction will be mobilised and drawn offshore, leaving heavier fractions - winnowing that is illustrated by the distinct distribution of mud, sand and shingle on beaches.

Cohesive materials such as clays will respond by block failures after under-cutting, which can be seen on many of the East Coast estuaries where coastal squeeze is eroding saltmarshes. Examples of this response are particularly evident within the Eastern Schelde where a storm surge barrage operates in a similar manner to a tidal energy barrage. Similar responses have also been noted in smaller estuaries such as the Wansbeck (Photograph 3).

These responses will take many decades to stabilise and in this period changes in sediment type will dictate the nature of the wildlife response. Erosion exposes more consolidated sediments, whilst winnowing means that foreshores will change from sloppy muds to harder substrates with a covering of coarser materials. Together they can be expected to reduce feeding habitat for the migratory waterfowl that inhabit the site. In the case of the Severn, loss of fine clays and silts will be most detrimental to species such as dunlin and redshank.

How Can We Be Sure About These Responses?

There are very few tidal energy barrages. The French example at La Rance is the most frequently quoted case study but it is not a good analogue because the estuary involved was a Ria with a largely rocky shore. Its response will differ in many ways to estuaries and embayments whose shoreline is predominantly sandy or muddy. Russian and Chinese examples are poorly described in the literature which offers no insights.

The turbine in the Canadian example at Annapolis Royal was retrofitted into an existing tidal causeway but it does provide a valuable insight into the processes involved. There is a well-documented history of foreshore erosion in consultants' reports but it has not been reported in published literature. The processes of foreshore evolution exhibited are however critical to our understanding of the overall processes involved (Morris *in prep.*). We know that the creation of a headpond led to the development of a new foreshore profile, which when modified by the reintroduction of tidal range underwent further evolution and erosion.

Most of the published evidence comes from the Eastern Schelde storm surge barrage in the Netherlands (Mulder and Louters 1994, Louters *et al.* 1998). Here, erosion was predicted and has been monitored. Erosion within the estuary has been confirmed together with unexpected erosion of offshore sandbanks. Concern about the implications of this

Photograph 1. Foreshore erosion on the Grassholme Reservoir (NW Yorks). Note that the erosion cliff comprises material of varying diameter, primarily fine grains. The foreshore below the erosion cliff is, however, predominantly coarser material.

erosion, which is predicted to lead to around 90% loss of inter-tidal by the 2070s, has led to the preparation of an Action Plan (Van Zanten and Adriaanse 2008). The costs involved are considerable.

A relatively simple mathematical model has been employed to provide a basic indication of how the Severn Estuary might respond to a barrage at the Cardiff-Weston line (Pethick *et al*. 2009). It used the principles of estuarine energy regimes to predict possible evolutionary processes and showed that the estuary would need to fill with sediment to acquire a more stable form. This has been predicted to take up to 1,500 years. Not all of this time would involve erosion, but the timescales can be indicated from what we know about other responses.

The Eastern Schelde is approximately two orders of magnitude smaller than the Severn Estuary and erosion is expected to take place for upwards of 90 years before a stable foreshore profile is reached. We know that the foreshore profile of Annapolis Royal headpond took at least 20 years to reach a more stable form and that, in the 25 years since tidal influences were re-introduced, the erosion has progressed further and is only now starting to show signs of slowing. This latter estuary is several orders of magnitude smaller than the Eastern Schelde. Consequently, proposals for a large estuary such as the Severn, Mersey or Solway could involve adjustment times of many decades or possibly several centuries.

Applying Principles to the Severn Estuary

This article is intended to highlight the impacts that can be expected as a result of barrage construction in any of the estuaries where such structures have been proposed. However, most interest has focussed on the Severn Estuary and especially on the largest of the barrage proposals. Some thought therefore needs to be given to specific implications for this estuary.

The Severn Estuary is unusual for a variety of reasons linked to its extreme tidal range (third highest in the world behind the Bay of Fundy and Ungava Bay in Canada). The high levels of tidal energy mean that sediment, which would not be mobilised in smaller estuaries, is remobilised during spring tides and is made available for deposition on the foreshore. Relatively little new sediment enters the estuary each year: most arises from foreshore erosion.

The process of erosion and accretion is particularly noticeable because the sediment has a high sand content and is therefore

less capable of forming more resilient cohesive shorelines. These factors, together with the extreme tidal range, mean that slumping and reconstitution of foreshores is a common occurrence (as is also apparent in parts of the Bay of Fundy where the tidal range and sediment types are similar).

Thus, the Severn shows an established predilection for the sort of erosion demonstrated by analogue responses to wave erosion. This erosion can be expected to change the estuary from a deep profile with well-defined sandbanks and steep foreshores to a flat basin with poorly defined sandbanks and shallow foreshore profiles better suited to absorbing wave energy. The finest sediment will migrate towards the deepest and slowest moving water and consequently the margins of the estuary will become more sandy rather than less sandy, whilst sub-tidal environments will become muddier.

This type of foreshore evolution has important wildlife consequences but the implications for strategic structures such as flood defences, railways, roads and perhaps even ports have received far less attention. If existing defence lines are to be retained, remedial action will be necessary, and as sea levels rise the security of these defences will be greatly reduced because protective saltmarshes that absorb wave energy will have been lost. Thus, rather than reducing flood risk and the cost of flood defence, the long-term prognosis should be that the costs of defences will escalate and will be compounded by a barrage.

The Implications for Waterfowl?

We know from existing analogues that the nature of the habitat will change. Quite how much viable habitat will remain within any given estuary is dependent upon its shape, prevailing winds, underlying geology and of course sediment supplies. Predictions that the remaining habitat in the Severn would be more suitable for migratory waterfowl (Kirby and Shaw 2005) seem rather optimistic, given that much of the foreshore can be expected to erode and to be formed of harder substrates that are less favourable to feeding birds. It is therefore logical to consider what the impact of a barrage might be in terms of part of the population of the East Atlantic Flyway.

Impacts on overall bird populations are very difficult to predict, but it is worth raising the plight of waterfowl on the Australasian Flyway that have been severely impacted by the extensive creation of barrages and tidal exclusion along the South Korean coast. Here, several species such as spoonbilled sandpiper are threatened with extinction.

Photograph 2. Tollesbury managed realignment site. Here former sea walls on the inside of the realignment are eroding through wind-driven wave activity. Evidence of sediment mobilisation is clear through the band of muddy water adjacent to the shoreline. This mobilised sediment will be drawn offshore as the tide ebbs, after which it will be dispersed and may settle sub-tidally.

Photograph 3. Wansbeck estuary (Northumberland) upstream of the tidal sill. Here the water has been retained behind a barrier, effectively forming a partially tidal reservoir. Resulting foreshore erosion is exposing post-industrial waste. Finer fractions are entering the water column for sub-tidal deposition whilst coarser material is retained on the foreshore.

References

Black and Veatch (2007) Tidal power in the UK Contract 3 - Review of the Severn Barrage proposals. Report for the Sustainable Development Commission. 250pp.

Kirby R and Shaw TL (2005) Severn Barrage, UK – environmental reappraisal. *Engineering Sustainability* **158**, issue ESI: 31-39.

Louters T, van den Berg JH and Mulder JPM (1998) Geomorphological changes of the Oosterschelde tidal system during and after the implementation of the Delta Project. *Journal of Coastal Research* **14**: 1134-1151.

Morris RKA (2009) *The impact of tidal energy barrages on estuarine geomorphology*. In: Aranoff JB (2009) *Handbook of Nature Conservation: Global, Environmental and Economic Issues*. Nova Science Publishers.

Morris RKA (*in prep.*) Geomorphological analogues for large estuarine engineering projects: a case study of barrages, causeways and tidal energy projects.

Mulder JMP and Louters T (1994) Changes in basin geomorphology after implementation of the Oosterschelde estuary project. *Hydrobiologia* **282/283**: 29-39.

Pethick JS, Morris RKA and Evans D (2009) Nature conservation implications of a Severn tidal barrage – a preliminary assessment of geomorphological change. *Journal for Nature Conservation* **17**: 183-198.

Van Zanten E and Adriaanse L (2008) *Verminderd getij: Verkenning naar mogelijke maatregelen om het verlies van platen, slikken enshorren in de Oosterschelde te beperken. Hoofdrapport*. Rijkswaterstaat. 80pp.

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Lichens, Bryophytes and Developments - Some Guidelines for Ecological Assessments

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Introduction

Non-vascular plants are a major source of biodiversity. To put it into context, there are about 1,900 lichens and 1,100 bryophytes compared to 1,400 species of native flowering plants in the British Isles. In addition, Britain, despite its small size, has 60% of the European bryophyte flora, 45% of European fern flora, 35-40% of the European lichen flora, but only 15% of the native flowering plant flora (Rothero 2003). The British lichen and bryophyte floras include a large number of species that are rare or threatened in a national or international context. Certain key habitats (Table 1) in Britain can support good populations of lichen and bryophyte species that are rare or threatened in Europe and some of these have a very restricted global distribution.

The author removing a section of bark from a tree to be removed with the lichen* Arctomia delicatula *(IUCN Near Threatened, Nationally Rare) for transplant onto nearby trees, Esragan Hydro Scheme, Argyll. Transplants of lichen are often unsuccessful so it is important to confirm healthy populations of this lichen from elsewhere in the catchment and not just rely on translocation.
Photo: Kathy Dale

Good Practice

Relatively few lichen and bryophyte species are protected by the current legislation, but given the importance of the British lichen and bryophyte flora it should be a matter of good practice that all ecological assessments include an assessment of the lichen and bryophyte interest as well as the vascular plant flora, invertebrates, mammals, *etc*. This does not necessarily mean that detailed lichen and bryophyte surveys are always required. The assessment may simply be that the lichen and/or bryophyte flora is of low conservation value at all scales (local, regional, national, international) but, if so, this should be stated in the report so that it is clear that lichens and bryophytes have been given due consideration. The reasoning behind this assessment should also be explicit.

Preliminary Assessment

Desk study and Specialist Consultation

Unless a site has already been subject to detailed lichen and bryophyte surveys, great care must be taken when interpreting currently available lichen/bryophyte species data. For example:

- At present, lichen data for Scotland on the National Biodiversity Network (NBN) (http://data.nbn.org.uk) is fairly well up to date, but that for England and Wales is still in the process of being developed.
- Even when the latest datasets are available, lichens and bryophytes are under-recorded groups so absence of records does not mean rare or threatened species are absent.
- Lichen and bryophyte assemblages of regional, national and international conservation value are present on a number of designated sites (SSSIs, SACs, *etc*.) that do not specifically include lichens or bryophytes as a notified feature.
- Lichen and bryophyte assemblages of regional, national and international conservation value occur on sites that are not designated as SSSIs, SACs, *etc*.
- Species that are regionally scarce or threatened should also be taken into consideration. Lists of Local Biodiversity Action Plan (LBAP) species may exclude lichens/bryophytes that are of regional conservation value.

Therefore, desk studies should not rely solely on species data from NBN. Desk studies should also use any relevant background information (such as Ancient Woodland Inventory maps, Phase 1 Habitat and NVC surveys) to identify any *potential* lichen and bryophyte habitats at a site.

A desk study alone should not be used to conclude that the lichen or bryophyte interest is of low conservation value unless the assessor has a sound reason for the judgement. An experienced ecologist who is very familiar with a wide range of

Table 1 Key lichen and bryophyte habitats. Habitats in bold are particularly important habitats (and some are of international importance).

Lichen/ bryophyte habitat	Examples	Note
Trees and scrub	Old wayside trees, wood pasture and parkland, long-established semi-natural woodland and long-established scrubby woodland (including willow carr and long-established stands of birch). Especially **Atlantic Woodlands**, (including **Atlantic hazelwoods**), **Caledonian pinewoods**.	Ancient woodland inventories are useful to identify areas of ancient woodland but many small but important stands of ancient woodland have been overlooked on these inventories. For example narrow strips of riparian woodland, or remnant broadleaves within conifer Plantations on Ancient Woodland Sites (PAWs).
Atlantic heaths	Sub-montane to montane Atlantic heaths on steep or rocky NW through to E facing slopes that support the **Northern Atlantic hepatic mat (liverwort heath)**.	
Montane habitats	Montane grassland, montane heaths (including moss-heaths, rush-heaths), rock outcrops and boulders, screes, **snowbeds**, **flushes**. In particular **basic rock habitats associated with alpine calcareous grasslands, mountain ledges, stony flushes** (see below).	
Flushes	Important flushes for bryophytes occur at all altitudes.	Mainly important for bryophytes.
Bogs, valley mires		Mainly important for bryophytes.
Basic rock habitats	Including mildly calcareous sedimentary rocks (*e.g.* sandstones and mudstones), mildly calcareous igneous rocks (*e.g.* basalts and andesites), and mildly basic outcrops of schists (*e.g.* mica schist), limestone rocks. **Montane outcrops of sugar limestone and mica schist**.	
Dune habitats	Stable coastal shingle, semi-fixed dune grasslands, fixed dune grasslands (including **machair**), dune slacks and dune heaths. Also including rock outcrops in these habitats.	
Rivers and ravines	Rock outcrops, boulders (especially those with basic rocks, see above), riparian trees and woodland (see above).	
Upland lake margins	Rock habitats along upland lake margins.	
Seasonally dry lacustrine habitats	Silt and mud on reservoir and loch margins	Bryophytes only
Metal-rich (metalliferous) habitats	Mine spoil, serpentine rocks, other metal-rich rocks.	

lichen and bryophyte habitats may be able to do a preliminary assessment of whether the lichen/bryophyte interest is likely to be of low value. However, *unless they are very confident in this assessment and willing to state this clearly in the site report, with explicit reasons for the assessment*, the input of an experienced bryologist and lichenologist should be sought. At its simplest, this input may take the form of e-mails or phone calls to a lichenologist and bryologist. Consulting a specialist early in the planning process should be a matter of good practice.

Site Visits

Unless the conclusion of the desk study is that the lichen/bryophyte interest is of low conservation value, then a site visit by a competent lichenologist and bryologist is necessary to make a reliable preliminary assessment. An experienced ecologist who can identify a number of macro-lichens, common bryophytes and recognise good lichen and bryophyte habitats is unlikely to be able to say with certainty that the lichen interest of a key lichen/bryophyte habitat (Table 1) is of low conservation value unless he/she is also an experienced lichenologist/bryologist. It should be the responsibility of the client's main appointed ecological consultant to ensure that any sub-contracted lichenologist/bryologist is competent and suitably experienced.

A rapid preliminary visit by a lichenologist and bryologist could quickly determine the need for detailed lichen/bryophyte surveys. In certain key lichen and bryophyte habitats in some regions, this rapid preliminary survey might possibly be dispensed with, as a detailed survey would almost certainly be required (*e.g.* Atlantic woodlands in western Scotland). For small sites where the specialist must travel a considerable distance to make a preliminary assessment, it might be worth negotiating in advance that the preliminary visit could be extended into a full survey at the discretion of the lichenologist/bryologist.

Key Habitats

Key habitats, LBAPs and Important Plant Areas (IPAs)

A key lichen/bryophyte habitat (Table 1) is one that may support particularly well developed lichen/bryophyte assemblages

Construction work with minimal disturbance to trees and boulders supporting lichens and bryophyte assemblages, Esragan Burn, Argyll
Photo: Andy Acton

and these may include rare and threatened species. Important Plant Areas (IPAs) identify general areas that are internationally important for plants as opposed to focussing on specifically designated sites. Currently identified IPAs that are particularly important for lichens and bryophytes include:

- Breadalbane Mountains (including Ben Lawers) IPA, Scotland
- West Coast Scotland IPA, West Scotland
- Isles of Scilly IPA, Southwest England

Details of other IPAs should become available soon via the Plantlife website (http://www.plantlife.org.uk) or the Planta Europa website (http://www.plantaeuropa.org/pe-EPCS-hot_issues-IPA.htm).

Key lichen/bryophyte habitats, LBAPs and IPAs are useful tools that can be used in the preliminary assessment. For example, it is often very difficult for a non-specialist to distinguish a well developed lichen/bryophyte assemblage which includes rare species, from a well developed assemblage composed wholly of common and widespread species, but the presence of a key habitat should alert a non-specialist to the possibility that lichens or bryophytes of conservation importance might be present. LBAPs may also help identify habitats that are likely to be important for lichens/bryophytes. One useful rule of thumb would be that a site with a key lichen or bryophyte habitat in an IPA should always be subject to detailed surveys.

Construction of penstock and access track involved minimal removal of trees supporting the lichen* Arctomia delicatula *at Esragan Burn, Argyll
Photo: Andy Acton

Again, these tools must be used with care. For example many rare and threatened lichens and bryophytes are not UKBAP or LBAP species, and of course lichen/bryophyte habitats outside IPAs may still have lichens/bryophytes that may be of conservation value at a regional, national or international level.

Other Lichen and Bryophyte Habitats

Other lichen/bryophyte habitats may support rare or threatened species, but it is difficult to be prescriptive about which habitats should be surveyed and which are likely to be of low interest. For example, other lichen/bryophyte habitats that are regionally scarce or threatened may be of regional conservation value and this should be taken into consideration. If provided with details of the Phase 1 habitats/NVC types present within the study site, a lichenologist/bryologist will be able to advise on other likely lichen/bryophyte habitats that should be targeted during any lichen/bryophyte surveys. Other lichen habitats include:

- Lowland habitats: lowland heaths, lowland calcareous grassland, fens.
- Upland habitats: sub-montane heaths/moors, siliceous rocky outcrops, boulders and stable screes, streams.
- Maritime habitats: maritime rocks and cliffs, maritime grasslands and heaths.
- Other habitats: arable habitats, man-made structures (graveyards, standing stones, monuments, quarries).

Detailed Survey and Ecological Assessment

Detailed lichen and bryophyte surveys by a competent bryologist and lichenologist are the only way to be confident that a site that includes certain key lichen and bryophyte habitats has been correctly assessed. Standard tools used in ecological assessments of a site for lichens include Woods and Coppins (*in prep.*) and Coppins and Coppins (2002). These tools can only be used to accurately assess a site following detailed lichen survey. Standard tools used in ecological assessments of a site for bryophytes include data from the British Bryological Society (2008), Hill and Preston (1998) and Hill *et al.* (2007).

The person(s) doing the detailed survey(s) will be able to make the final ecological assessment of the lichen and/or bryophyte interest.

Impact Assessment, Avoidance and Mitigation

Impact assessment should follow standard guidelines (*e.g.* IEEM 2006). If the site includes lichen and/or bryophyte assemblages of conservation value, the relevant specialists should be able to recommend appropriate avoidance and mitigation measures. If developments impact on potential key lichen/bryophyte habitats an Ecological Clerk of Works (ECoW) may need to be appointed. The ECoW should be familiar with the potential impacts of construction works on the lichens/bryophytes and familiar with post construction issues. If the site is of high conservation value for lichens/bryophytes it is recommended that the ECoW should be a lichenologist/bryologist.

Post Project Appraisal and Monitoring

Where a project impacts on lichen/bryophyte assemblages, any post-project appraisal should be based on some form of monitoring. The minimum level of monitoring should be that which directly monitors the health/viability of selected species/assemblages at a site. Suitable methods and target species may have been recommended in the detailed lichen/bryophyte survey report.

Where it is felt that implementation of the recommended avoidance/mitigation measures is highly likely to be successful, some fairly simple site-specific monitoring of target species of conservation value may be appropriate. The results of simple monitoring may be used to help subjective assessment of the effectiveness of specific avoidance/mitigation measures. Where there is no evidence of decline it can be inferred that, as yet, there appears to be no significant negative impact from the development. This can provide valuable feedback to the specialist surveyors and inform post-project appraisal/review. However, it is unlikely that a decline in lichen/bryophyte assemblages can be attributable to a scheme with certainty in the absence of more detailed scientific monitoring.

Research and Scientific Monitoring

A scientific monitoring programme at a number of sites and including appropriate controls would be necessary to get any meaningful results that could inform the science base of

Pseudocyphellaria crocata *yellow speckle-belly lichen (British populations of this species are considered to be of international significance)*
Photo: Andy Acton

Lobaria virens *green satin lichen (British populations of this species are considered to be of international significance)*
Photo: Andy Acton

Ecological Impact Assessments. Unfortunately little research has been done to date on the long-term impact of developments on lichens/bryophytes. This would involve long-term monitoring/surveillance, and such a programme would need to be co-ordinated by government agencies/research establishments. Scottish Natural Heritage is currently commissioning research into the impact of hydro-electric power (HEP) schemes on lichens/bryophytes and it will be interesting to see how this goes.

References and Other Sources of Information

British Bryological Society (2008) *2008 bryophyte conservation designations*: Microsoft Excel spreadsheet available from http://rbg-web2.rbge.org.uk/bbs/Bryodiversity/conserv.htm

Coppins AM and Coppins BJ (2002) *Indices of Ecological Continuity for Woodland Epiphytic Lichen Habitats in the British Isles*. British Lichen Society, London.

Hill MO, Preston CD, Bosanquet SDS and Roy DB (2007) *BRYOATT: Attributes of British and Irish Mosses, Liverworts and Hornworts*. Centre for Ecology and Hydrology, Huntingdon.

Hill MO and Preston CD (1998) The geographical relationships of British and Irish bryophytes. *Journal of Bryology* **20**: 127-226.

IEEM (2006) *Guidelines for Ecological Impact Assessment in the United Kingdom*. Institute of Ecology and Environmental Management.

Rothero GP (2003) Bryophyte Conservation in Scotland. *Botanical Journal of Scotland* **55**: 17-26.

Woods RG and Coppins BJ (*in prep.*) *A Conservation Evaluation of British Lichens*. British Lichen Society, London.

Acknowledgements

Although the above article is a personal view, the draft was circulated to a number of professional ecologists for comment. Many thanks to Kathy Dale (EnviroCentre), Anna Griffith (ecological consultant), Ben Averis (bryologist), Gordon Rothero (bryologist) and Sandy Coppins (lichenologist) for their valuable input and comments on the draft.

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BIODIVERSITY BEYOND 2010: Missed Opportunities, New Targets

IEEM Autumn Conference 2010

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COUNTDOWN 2010 SAVE BIODIVERSITY

2010 International Year of Biodiversity

Photos: Alan Bell, P Edwards, Gordon Howe, Gavin Parsons, Gerard Stewart, Pascal Sweeny

A Review of Two Years Following the BCT Tree Survey Guidelines

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Introduction

Bat survey is an area fraught with difficulties, with tree and woodland surveys to locate roosts being perhaps the most problematic. The sites can be difficult to negotiate, recording locations is complicated (unless an arboricultural plan is available) and there may be a vast number of potential roost sites most of which will be tricky to access and survey. It is frequently labour intensive work, requiring data to be gathered over a long period.

For consultants working to tight budgets, foresters committed to felling plans or for any organisation with limited resources, it is important to be able to justify the level of survey effort and expense involved to those paying for the surveys. In most cases, it is sensible practice to prioritise surveys such that the maximum amount of information is gathered for minimum effort. However, how much survey is enough and how does one objectively determine this?

SLR developed a tree survey strategy in response to this conundrum. This methodology, a clarification of a common-sense approach often used informally by consultants, was published within the Bat Conservation Trust's (BCT) *Best Practice Guidelines* in 2007. The tree survey protocol involves increasing the amount of survey effort where roosting is most likely, and sets standards and options for additional surveys and the need for involvement of ecologists [pp65, BCT (2007) *Bat Survey Good Practice Guidelines*].

In the two years since the publication of this methodology, we have maintained records for all of the sites on which we have conducted such surveys, and are now at a point where it is possible to review the information we have gathered in order to present evidence of its effectiveness and further refine the process.

Tree Survey for Bats

A total of 3,272 trees across 26 sites have been subject to initial (Stage 1) surveys for the presence of roosts. These surveys were undertaken from ground level by experienced bat surveyors using binoculars and high powered torches. No roosts were identified from ground level in any trees, but 24 of the 26 sites contained potential roost features. Climb-and-inspect surveys were undertaken at nine sites where trees with potential roost features were proposed for felling. During these surveys, three sites, a total of nine trees, were confirmed to contain roosts. Night time survey (including dusk, dawn and AnaBat recording) was also undertaken at nine sites and confirmed roosting at three sites.

The above information is summarised in the table below.

Table 1. Bat Survey Summary Data

		No. of sites where roosts found
Total no. of sites subject to daytime inspection for roosts	26	0
Total no. of sites subject to climb-and-inspect surveys	9	3 (9 trees)
Total no. of sites subject to night survey (dusk, dawn and/or AnaBat)	9	3 (at least 3 trees)
Total no. of roosts identified	12	12

Woodland and large dead oak ***Photo: SLR Consulting Ltd***

The data above are very crude, as each site has not been subject to exactly the same level of survey, for instance, night time survey was conducted at some, climb-and-inspect at others. However, three sites were subject to every level of survey, and the results are summarised in the table below.

Table 2. Summary Results for Sites Subject to Stage 1-3 Survey

Site Description	No. of roosts found by daytime inspection	No. of roosts found by climb-and-inspect	No. of roosts found by night survey
Quarry	0	0	1
Brickworks	0	4	0
Quarry Access	0	4	1

Whilst the findings might not be groundbreaking, they do back up our initial supposition when designing this methodology:

- Daytime searches for roosts from the ground are very rarely successful.
- Night time survey can determine roosting, but is poor at discriminating between roost trees when they are close together.
- Climb-and-inspect survey can locate roost trees and individual roosting locations with good accuracy and the method is appropriate for use at any time of year.

Pipistrelle in wood crack ***Photo: SLR Consulting Ltd***

Assessing the Usefulness of the Tree Survey Protocol

Daytime Inspections for Roosts

From the ground, surveys are very poor at identifying actual roost trees, SLR did not confirm any roosts in trees from the ground during surveys from 2007-2009. However, the method is an excellent tool for prioritizing additional surveys and for providing an objective assessment of potential resource suitability for bats.

Daytime inspection can also be used to quantify the compensation needed where potential roosts are lost to development. For instance, if a survey identifies 10 trees with high potential (Category 2a) and 5 of these would be lost to development, replacement features on retained trees should be provided as a multiplier of the number lost.

The method is also suitable for identifying those trees that do not require further assessment before felling. It is therefore a useful tool for land managers and arborists to assess the likely risk of an offence. The approach may be appropriate for use by non-ecologists after training; SLR has trained non-ecological staff (arboriculturalists) to undertake these surveys and, after one day of training, typically the skilled arboriculturalist made the same judgement calls as an ecologist.

Climb-and-Inspect

Due to the labour and time involved in climb-and-inspect surveys, and because of sporadic roost use, these types of surveys were most usually undertaken immediately prior to felling. The benefit of this approach is that the tree felling contractor and a certified and licensed tree climbing batworker are on site together and can work as a team.

The downside to this approach is that if a roost is located, the tree cannot be felled and a European Protected Species (EPS) licence must be sought for work to proceed that would remove the roost. Surrounding woodland/hedgerows may also need to be retained in order not to disturb the roost. Provided this potential delay is highlighted and understood at the outset, it can usually be accommodated.

It is worth highlighting that this type of pre-felling survey is undertaken only after daytime inspection and night time work is complete – i.e. the batworker should already have some idea on the likelihood of roost presence and can advise about the risk of potential delays well in advance.

Night Time Survey Work

This remains the best and sometimes only way to determine what species of bat use the woodland/trees in question. We were also able to determine roost presence, but not specific roost location using this method. However, our own surveys indicate that it is not possible to confidently assess bat roost presence at individual trees using this method alone, unless a significant amount of survey resources are dedicated to the task.

Example Survey Strategy

Although we are lacking in data, daytime inspection combined with climb-and-inspect surveys would seem to be more effective (for the equivalent survey effort) at identifying roosts than dusk and dawn surveys alone. We would therefore put forward the following as a practicable way of addressing potential bat presence where tree felling/woodland removal is planned.

An initial inspection (Stage 1) survey is undertaken. At this stage, we often find that clients are yet to determine which trees may be affected by plans. Climb-and-inspect is therefore

costly to implement because many more trees will be surveyed than is necessary. This is followed by activity survey, to determine the types of bats using the woodland. If few bats of common species are encountered, the client may choose to delay climb-and-inspect surveys until immediately prior to felling (accepting that there is always a chance a roost may later be found). This may also prove to be an acceptable level of survey for planning purposes. However, if many bats or rarities are encountered, additional survey effort can then be programmed well in advance of planning requirements and felling operations. We would hesitate to suggest dusk and dawn survey as a method to locate roosts. It is best used to determine species and numbers after precise roost locations have been noted using other means. This method is summarised in the table below.

Table 3. Bat Survey Scheduling Where Planning Applications/Felling is Planned

	Pre-planning	Pre-felling	As soon as possible at known roosts
Initial inspection	X	X	-
Activity surveys	X	X	
Dusk and dawn survey (emergence re-entry)			X
Climb-and-inspect	X (but only where activity surveys indicate roosts are likely)	X	

Conclusions

We remain certain that due to the sporadic use of tree roosts, all of the above survey methods may fail to locate a little used roost. However, identifying roosts is only part of assessing impacts to bats where woodland or tree loss is likely. We would hope that all *potential* roosts would be found using the above methods and that all *important* roosts for commoner species would be identified. To date, our surveys have almost exclusively revealed pipistrelle roosts and so we have no indication of the usefulness of this approach for rarer species of bat, *i.e.* Bechstein and Barbastelle.

Ashridge Bluebell woods ***Photo: SLR Consulting Ltd***

We are aware that Natural England is conducting a large scale study in Sherwood, and other consultants must be undertaking surveys using a very similar approach to SLR. We would welcome the opportunity to pool this data in order to conduct a more thorough appraisal of bat survey techniques in woodlands and trees. The aim of this would be:

- to present evidence on the effectiveness of the survey method;
- to determine if there is a better way of focussing survey effort; and
- to work toward the most appropriate way of minimising risks to bats and roosts during arboricultural operations.

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Brown long-eared bat* Plecotus auritus *in hand close up ***Photo: SLR Consulting Ltd***

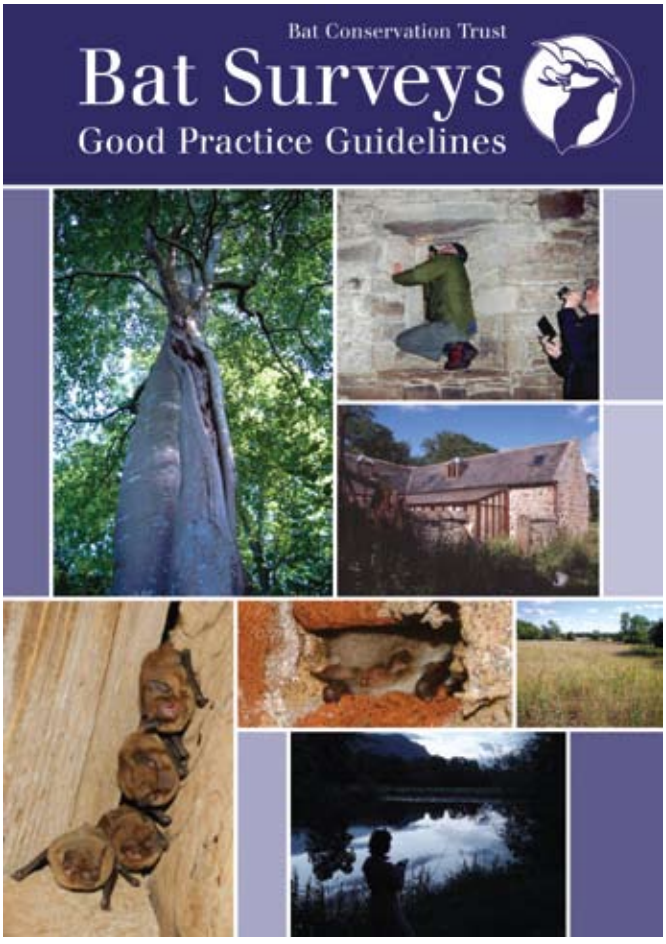
Planning and Protected Species – Letter of Concern

In 2005, a number of local authority countryside officers and ecologists from North East England established a working group with the specific aim of sharing information and best practice in relation to the growing issue of planning and protected species. The group meets on a regular basis and is supported by staff from Natural England's regional office.

Growing concern has been raised among our group as to the standard of some ecological survey reports submitted in support of planning applications. Whilst the majority considered by local planning authorities within our area are fit for purpose, a growing number could only be described as being less than satisfactory.

Of particular concern is the undertaking of bat activity surveys outwith the period recommended in the Bat Conservation Trust's *Bat Surveys Good Practice Guidelines* and concern has also been raised with respect to the frequency and spacing of survey visits, the number and experience of surveyors used to conduct activity surveys and the standard and presentation of information.

The submission of a sub-optimal ecological survey report has the potential to significantly delay the determination of a planning application, place those having to draw conclusions from such reports under considerable pressure and, in a particularly challenging economic climate, can have serious financial implications for the applicant.



The Bat Conservation Trust's* Bat Surveys Good Practice Guidelines *can be downloaded for free at www.bats.org.uk

Greater horseshoe bats ***Photo: Natural England***

Whilst we understand the challenges faced by many ecological consultants in coping with an increasing workload and in meeting the often tight deadlines set by their clients, it would appear that these issues and others may have compromised the standard of some ecological survey work and reporting.

We hope that in conducting surveys and producing reports, ecological consultants follow accepted guidelines (or at least the spirit of those guidelines in those cases where some amendments need to be made) and in some instances it would be prudent for consultant ecologists to first consult the local planning authority in order to determine the level of survey required.

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Terry Coult MIEEM	Ecologist	Durham County Council
Claire Dewson	Countryside Officer	Sunderland Council
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The New Marine Planning System

Information from the Defra document *Factsheet: The New System of Marine Planning*

The Marine and Coastal Access Act 2009 aims to deliver the UK Government's and Devolved Administrations' vision for the marine environment: 'clean, healthy, safe, productive and biologically diverse oceans and seas'. To help deliver this vision the Act introduces a new system of marine planning. This new system will enable more strategic management of marine activities and contribute to the sustainable development of our marine resources.

The marine planning process will, for the first time, consolidate and explain the policies relating to the marine area. More importantly, it will create the framework for consistent and evidence-based decision-making, through extensive public involvement. Anyone with an interest in our seas will have the chance to shape how our marine environment is managed.

What is the Marine Policy Statement?

The Marine Policy Statement is the first step in this new planning system and builds on the UK High Level Objectives published in April 2009. See: www.defra.gov.uk/environment/marine/documents/ourseas-2009update.pdf

It will be the framework under which Marine Plans will be developed and will set the direction for the new marine licensing system. The Marine Policy Statement is aimed at more strategic management of our marine resources. It will apply to the whole of the UK waters, from the inland tidal limit out to the furthest extent of the UK Continental Shelf or Renewable Energy Zone. The UK Government and Devolved Administrations are working together on the Marine Policy Statement and aim to adopt it jointly. A shared approach will ensure that the planning arrangements implemented throughout UK waters will be joined-up, but will be flexible enough to meet the needs of different Administrations, stakeholders and decision-makers.

The aim is to have a Marine Policy Statement in place by November 2011. However, given the importance of the Marine Policy Statement, Defra is hoping to have it finalised before then.

For the first time it will draw together existing policies of all UK Administrations relating to marine areas. It will provide a clear steer to decision-makers as to how difficult choices can be made and provide clarity to users and developers. It will be a practical and pragmatic document.

What are Marine Plans?

In England, the Marine Management Organisation (MMO) (on behalf of the Secretary of State for Environment, Food and Rural Affairs) will be developing a series of Marine Plans which will translate the policies in the Marine Policy Statement into more spatial detail at the local level. The Devolved Administrations are taking marine planning forward within their own marine regions.

The content of Marine Plans will vary according to the specific issues in each plan area. A Model Marine Plan for English inshore and offshore areas has been compiled, see: www.mfa.gov.uk/mmo/structure.htm.

Who will be responsible for marine planning?

The Act divides UK waters into marine regions with a region under each of the four Administrations (England, Northern Ireland, Scotland and Wales). The Act also refers to 'marine plan authorities' who are responsible for planning in each region with the exception of the Northern Ireland and Scottish inshore waters which will be covered by separate legislation.

Marine planning responsibilities:

Region	Inshore (0-12 nautical miles)	Offshore (12-200 nautical miles)
England	Secretary of State (delegated to MMO)	Secretary of State (delegated to MMO)
Northern Ireland	(separate legislation)	Department of the Environment in Northern Ireland (with agreement of Secretary of State)
Scotland	(separate legislation)	Scottish Ministers (with the agreement of Secretary of State)
Wales	Welsh Ministers (with the agreement of Secretary of State if the plan affects non-devolved matters)	Welsh Ministers (with agreement of Secretary of State)

How will stakeholders be involved in this planning process?

The first step in the preparation of both the Marine Policy Statement and Marine Plans will be to publish a Statement of Public Participation. For the Marine Policy Statement and each of the Marine Plans the Statement of Public Participation will set out how and when stakeholders can be involved in the development of the Policy Statement or planning process. The Statement of Public Participation will contain a timetable for the various stages of preparing the Policy Statement or plan and how and when representations about the content of the consultation draft of the policy statement and the plans should be made. For the Marine Plans, the Statement of Public Participation will also state the area which is to be planned for.

How will marine planning affect decision-making?

Under the Marine and Coastal Access Act 2009, the Marine Policy Statement and plans have a legal effect on decision-making. Any authorisation and enforcement decisions made by public authorities (apart from decisions by the Infrastructure Planning Commission), which might affect the UK marine area will need to be made in accordance with the Marine Policy Statement and Marine Plans, unless there are very good reasons why not. Other types of decisions that may affect the marine area must have regard to the Marine Policy Statement and Marine Plans.

Where can you find more information?

England:
www.defra.gov.uk/environment/marine/planning.htm
mps@defra.gsi.gov.uk
marine.planning@defra.gsi.gov.uk

Northern Ireland:
www.doeni.gov.uk/marine_and_coast
marineteam@doeni.gov.uk

Scotland:
www.scotland.gov.uk/marinescotland
anna.donald@scotland.gsi.gov.uk

Wales:
www.wales.gov.uk/topics/environmentcountryside/consmanagement/?lang+en
www.walescoastalpartnership.org.uk
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The Copenhagen Accord - Seeing REDD

The Copenhagen Accord was drawn up at the United Nations Climate Change Conference (COP15) in Copenhagen on 18 December 2009 by leaders from the United States, China, India, Brazil and South Africa and has been recognised by the Parties to the United Nations Framework Convention on Climate Change.

Many are disappointed with COP15's main output. However, the summit did not only introduce the Copenhagen Accord but also a new kind of dynamics in global climate policy. The text is still strongly debated, and it remains to be seen how many countries will sign up, however, members may be interested in the text of the accord (taken from the advance unedited version), which is reproduced below. Please note that Appendices I and II are not included. Further information can be found at: www.denmark.dk/en/menu/Climate-Energy/COP15-Copenhagen-2009/cop15.htm

The Copenhagen Accord

The Heads of State, Heads of Government, Ministers, and other heads of the following delegations present at the United Nations Climate Change Conference 2009 in Copenhagen: [List of Parties]

Have agreed on this Copenhagen Accord which is operational immediately.

1. We underline that climate change is one of the greatest challenges of our time. We emphasise our strong political will to urgently combat climate change in accordance with the principle of common but differentiated responsibilities and respective capabilities. To achieve the ultimate objective of the Convention to stabilize greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, we shall, recognizing the scientific view that the increase in global temperature should be below 2 degrees Celsius, on the basis of equity and in the context of sustainable development, enhance our long-term cooperative action to combat climate change. We recognize the critical impacts of climate change and the potential impacts of response measures on countries particularly vulnerable to its adverse effects and stress the need to establish a comprehensive adaptation programme including international support.

2. We agree that deep cuts in global emissions are required according to science, and as documented by the IPCC Fourth Assessment Report with a view to reduce global emissions so as to hold the increase in global temperature below 2 degrees Celsius, and take action to meet this objective consistent with science and on the basis of equity. We should cooperate in achieving the peaking of global and national emissions as soon as possible, recognizing that the time frame for peaking will be longer in developing countries and bearing in mind that social and economic development and poverty eradication are the first and overriding priorities of developing countries and that a low-emission development strategy is indispensable to sustainable development.

3. Adaptation to the adverse effects of climate change and the potential impacts of response measures is a challenge faced by all countries. Enhanced action and international cooperation on adaptation is urgently required to ensure the implementation of the Convention by enabling and supporting the implementation of adaptation actions aimed at reducing vulnerability and building resilience in developing countries, especially in those that are particularly vulnerable, especially least developed countries, small island developing States and Africa. We agree that developed countries shall provide adequate, predictable and sustainable financial resources, technology and capacity-building to support the implementation of adaptation action in developing countries.

4. Annex I Parties commit to implement individually or jointly the quantified economy-wide emissions targets for 2020, to be submitted in the format given in Appendix I by Annex I Parties to the secretariat by 31 January 2010 for compilation in an INF document. Annex I Parties that are Party to the Kyoto Protocol will thereby further strengthen the emissions reductions initiated by the Kyoto Protocol. Delivery of reductions and financing by developed countries will be measured, reported and verified in accordance with existing and any further guidelines adopted by the Conference of the Parties, and will ensure that accounting of such targets and finance is rigorous, robust and transparent.

5. Non-Annex I Parties to the Convention will implement mitigation actions, including those to be submitted to the secretariat by non-Annex I Parties in the format given in Appendix II by 31 January 2010, for compilation in an INF document, consistent with Article 4.1 and Article 4.7 and in the context of sustainable development. Least developed countries and small island developing States may undertake actions voluntarily and on the basis of support. Mitigation actions subsequently taken and envisaged by Non-Annex I Parties, including national inventory reports, shall be communicated through national communications consistent with Article 12.1(b) every two years on the basis of guidelines to be adopted by the Conference of the Parties. Those mitigation actions in national communications or otherwise communicated to the Secretariat will be added to the list in appendix II. Mitigation actions taken by Non-Annex I Parties will be subject to their domestic measurement, reporting and verification the result of which will be reported through their national communications every two years. Non-Annex I Parties will communicate information on the implementation of their actions through National Communications, with provisions for international consultations and analysis under clearly defined guidelines that will ensure that national sovereignty is respected. Nationally appropriate mitigation actions seeking international support will be recorded in a registry along with relevant technology, finance and capacity building support. Those actions supported will be added to the list in appendix II. These supported nationally appropriate mitigation actions will be subject to international measurement, reporting and verification in accordance with guidelines adopted by the Conference of the Parties.

6. We recognize the crucial role of reducing emission from deforestation and forest degradation and the need to enhance removals of greenhouse gas emission by forests and agree on the need to provide positive incentives to such actions through the immediate establishment of a mechanism including REDD-plus, to enable the mobilization of financial resources from developed countries.

7. We decide to pursue various approaches, including opportunities to use markets, to enhance the cost-effectiveness of, and to promote mitigation actions. Developing countries, especially those with low emitting economies should be provided incentives to continue to develop on a low emission pathway.

8. Scaled up, new and additional, predictable and adequate funding as well as improved access shall be provided to developing countries, in accordance with the relevant provisions of the Convention, to enable and support enhanced action on mitigation, including substantial finance to reduce emissions from deforestation and forest degradation (REDD-plus), adaptation, technology development and transfer and capacity-building, for enhanced implementation of the Convention. The collective commitment by developed countries is to provide new and additional resources, including forestry and investments through international institutions, approaching USD 30 billion for the period 2010-2012 with balanced allocation between adaptation and mitigation. Funding for adaptation will be prioritized for the most vulnerable developing countries, such as the least developed countries, small island developing States and Africa. In the context of meaningful mitigation actions and transparency on implementation, developed countries commit to a goal of mobilizing jointly USD 100 billion dollars a year by 2020 to address the needs of developing countries. This funding will come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance. New multilateral funding for adaptation will be delivered through effective and efficient fund arrangements, with a governance structure providing for equal representation of developed and developing countries. A significant portion of such funding should flow through the Copenhagen Green Climate Fund.

9. To this end, a High Level Panel will be established under the guidance of and accountable to the Conference of the Parties to study the contribution of the potential sources of revenue, including alternative sources of finance, towards meeting this goal.

10. We decide that the Copenhagen Green Climate Fund shall be established as an operating entity of the financial mechanism of the Convention to support projects, programme, policies and other activities in developing countries related to mitigation including REDD-plus, adaptation, capacity-building, technology development and transfer.

11. In order to enhance action on development and transfer of technology we decide to establish a Technology Mechanism to accelerate technology development and transfer in support of action on adaptation and mitigation that will be guided by a country-driven approach and be based on national circumstances and priorities.

12. We call for an assessment of the implementation of this Accord to be completed by 2015, including in light of the Convention's ultimate objective. This would include consideration of strengthening the long-term goal referencing various matters presented by the science, including in relation to temperature rises of 1.5 degrees Celsius.

IEEM and Natur Sign Memorandum of Understanding

On 15 December 2009, IEEM and Natur signed a Memorandum of Understanding (MoU).

Natur is the Welsh Institute of Countryside and Conservation Management (Sefydliad Rheolaeth Cefn Gwlad a Chadwraeth Cymru). Natur exists to stimulate and develop the skills and competencies with which we manage the living environment of land and sea among countryside and conservation professionals within a uniquely Welsh context.

Under the terms of the MoU, the two organisations agree to work together, wherever feasible, for the benefit of the environment as a whole, towards achieving environmentally sustainable development and for the conservation of biodiversity. We plan to do this by: publishing joint publications; exchanging publications; providing reciprocal website links; encouraging close working in the interest of best practice and professional standards; promoting knowledge transfer between our two organisations; and maintaining good communications and working relationships between our two organisations together with any regional and special interest groups.

We are also planning two joint events for later in 2010; the first at Bangor University for students wishing to enter the profession, and the second on European Protected Species licensing issues in Wales.

For more information please contact Linda Yost (lindayost@ieem.net) or visit www.ieem.net/partnerships.asp.

Signing of the IEEM-Natur Memorandum of Understanding [Standing, L-R: Charles Morgan (Natur Board and IEEM External Affairs Committee), Marie Madigan (Natur), Richard Dodd (IEEM Welsh Geographic Section Convenor), Linda Yost (IEEM Deputy Executive Director), Paul Sinnadurai (Natur Board). Sitting, L-R: Mike Alexander (Natur Executive Director), Steve Ormerod (IEEM President)]
Photo: Natur

InterAcademy Panel Conference on Biodiversity

Jason Reeves AIEEM
External Relations Officer, IEEM

On 13 and 14 January 2010, around 200 delegates from around the world attended the InterAcademy Panel (IAP) Conference on Biodiversity at the Royal Society in London. The IAP is a global network of the world's science academies. Launched in 1993, its primary goal is to help member academies work together to advise citizens and public officials on the scientific aspects of critical global issues.

Day 1

Session 1

The first session of the conference concentrated on conceptual issues and was chaired by **Lord Robert May** (Oxford University).

Professor Sir Partha Dasgupta (Cambridge University) introduced the concept of natural capital. He explained that macroeconomic models are often built on the assumption that an economy's assets comprise manufactured capital, human capital, knowledge, and institutions. Biodiversity is often absent from these models. In spite of this, some economists in recent years have been trying to include biodiversity into economic models in a seamless way, in what is known as inclusive wealth.

Mr Neville Ash (International Union for Conservation of Nature - IUCN) spoke about the concept and reality of ecosystem services. He gave an overview of the development of the concept of ecosystem services dating back 200,000 years, when humans were entirely dependent on these services, through to the Millennium Ecosystem Assessment (MA) and post-MA thinking. The MA brought ecosystem services to the attention of the policy community. In addition to a conceptual framework linking the consequences of environmental change to human well-being through ecosystem services, the MA provided a classification which assigned the benefits that people derive from ecosystems into provisioning, regulating, cultural and supporting services. Since the completion of the MA, considerable attention has been given to ecosystem services, most recently concerning the establishment of an Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), which is hoped to become an equivalent to the Intergovernmental Panel on Climate Change (IPCC) but for biodiversity and ecosystem services. It is hoped that IPBES will be able to provide the policy community with regularly updated scientific information on ecosystem services and strengthen the interface between the science, policy and management of ecosystem services.

Professor Paul Berkman (Scott Polar Research Institute) covered the stewardship of biodiversity in international spaces. Only around 25% of the Earth is governed by sovereign states, whilst nearly 75% of the Earth's surface lies beyond national boundaries – in the deep sea, high seas and Antarctica. Professor Berkman summarised the introduction of international treaties since World War II to govern international spaces, marking a fundamental governance transition and challenge to balance national interests with common interests on a global scale. He went on to explain that international space and its governance, whilst being vital for the protection of interconnected ecosystems, is still young and will require global inclusivity and interdisciplinary co-operation.

Professor Michel Loreau (McGill University) spoke about the ecological consequences of biodiversity loss and how we are on our way to a global biodiversity crisis. He explained the importance of both horizontal (species occupying a similar niche) and vertical (along the food chain) diversity. Horizontal diversity at any trophic level (*e.g.* primary producers) enhances the productivity of that trophic level because functional complementarity among different species leads to better collective resource use. Horizontal diversity has also been shown to act as biological insurance in the long run, stabilising ecosystem processes in the face of environmental changes. There is a strong connection between the ecological mechanisms that maintain species diversity in a community and the ecological consequences of this diversity for ecosystem functioning. However, the magnitude and complexity of these effects are still based on simple systems and single ecosystem processes. Interactions between multiple trophic levels and multiple ecosystem processes are expected to make the functional consequences of biodiversity loss stronger and more complex. Therefore, future changes in biodiversity are likely to result in major alterations in ecosystem services, with potentially considerable social and economic implications for human societies.

Professor Sandra Díaz (CONICET - Universidad Nacional de Córdoba) talked about functional trait diversity and societal benefits of ecosystems. The concept of functional trait diversity (the kind, range and relative abundance of the functional traits of the organism present in a system) is increasingly used in understanding the links between biodiversity and the various benefits that societies derive from ecosystems. Functional trait diversity has the potential to affect ecosystem services and therefore human well-being directly or indirectly through its effects on ecosystem properties that underlie them. Functional effect traits are related in complex ways to the functional response traits that underlie organism responses to environmental drivers. It is these functional response traits that determine decline or expansion in the face of global change. By shaping functional effect trait composition according to their perceptions and interests, different human populations directly or indirectly represent an active force shaping the functional response composition of ecosystems, and thus their vulnerability. The concept of functional trait diversity therefore provides a link between the evolution of functional traits, the provision of ecosystem services to various sectors of society, and the ways in which different human populations are shaping the biotic composition of Earth's support systems.

Professor Andrew Balmford (Cambridge University) considered the spatially explicit frameworks for evaluating ecosystem services. Integrating ecosystem services into real-world decision-making, depends on recognising that ecosystem services production and value vary spatially, that not all ecosystem services can be maximised simultaneously (so trade-offs are necessary), and that decision-makers need to know not about the gross values of ecosystem services but rather how these may change depending on the choices they make. Professor Balmford presented an operational framework for establishing the net economic consequences of a given land-use decision, and a model which resolves trade-offs between food production and biodiversity conservation, which could be applied to other competing ecosystem services.

Session 2

The second session of the conference focussed on case studies and was chaired by **Professor Sir Peter Crane** (Yale University).

Dr Albert van Jaarsveld (South African National Research Foundation) presented the regional assessments of ecosystem services in Southern Africa. He explained the approaches of the Southern African Millennium Ecosystem Assessment (SAfMA), what has happened since then and also future considerations.

Professor David Schindler (University of Alberta) spoke about the ecosystem services and biodiversity issues in the Canadian boreal biome. Commercial exploitation of natural resources in the boreal (logging; hydro-electric generation; base metal mining; and oil and gas exploitation) continue to increase. However, ecosystem services (carbon storage; flood control and water filtration by forests; flood control, filtration and maintenance of biodiversity in non-peatland wetlands; pest control by boreal birds; and nature-related activities) have been shown to be more valuable. Unfortunately, climate change and rapid human exploitation of the boreal biome are rapidly eroding ecosystem services and natural capital. The most urgent problems are decreasing water renewal in lakes and rivers, water pollution, increased insect outbreaks, continuing acid precipitation over large areas, decreased carbon sequestration resulting from melting permafrost and increasing forest fire, and increasing damage from hydroelectric development.

Dr Simon L Lewis (Earth and Biosphere Institute) explained the valuation, mapping and conservation of carbon stocks and other ecosystem services in the Eastern Arc Mountains of Tanzania. The Eastern Arc Mountains are unique for the multiple ecosystem services that they provide, including water, timber, non-timber forest products, biodiversity and carbon sequestration and storage as well as ecotourism potential. Despite these unique values, the forests are under multiple threats that are leading to their degradation and thus undermining these services.

Dr Heather Tallis (Stanford University) considered including ecosystem services in conservation planning and infrastructure permitting. She introduced the Natural Capital Project, which aims to align economic forces with biodiversity conservation, and also InVEST (Integrated Valuation of Ecosystem Services and Trade-offs), which is a suite of models that runs in GIS software. InVEST can be downloaded for free from http://invest.ecoinformatics.org.

Day 2

Session 3

The third session of the conference focussed on international biodiversity and was chaired by **Dr Ahmed Djoghlaf** (Executive Secretary, Convention on Biological Diversity - CBD).

Ms Ruth MacKenzie (University College London) presented the intergovernmental conventions and other bodies that influence international biodiversity management. She elaborated on the many multilateral environmental agreements and the crowded and diverse institutional landscape that currently exists. The issues concerning these conventions and bodies include poor links between science and policy, poor capacity to cover the workload, complex and bureaucratic structures, limited internal expertise, lack of funding, and duplication of work.

Professor Wolfgang Cramer (Potsdam Institute for Climate Impact Research) covered the science base for governance of the biosphere. He elaborated on a move towards a new science-policy interface for biodiversity and ecosystem services. Climate policy is supported by the Intergovernmental Panel on Climate Change (IPCC), and preparations are underway to establish a comparable entity for biodiversity and ecosystem services in the form of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES). The IPCC has fostered an entire generation of scientists who produce steadily improving knowledge in climatology, climate impact sciences and economic and technological ways to deal with climate change. However, the goals of climate policy appear to be simpler, compared to those of stabilising human use of the global biosphere. Achieving both goals will therefore require an unprecedented depth of the scientific assessment of the terrestrial and marine biosphere, its interaction with human development, and specifically its ability to provision services for all humans on the planet in a sustainable way. More information: http://ipbes.net.

Session 4

The fourth session of the conference continued the focus on international biodiversity and was chaired by **Professor Charles Godfray** (Oxford University).

Mr Pavan Sukhdev (UNEP - World Conservation Monitoring Centre) covered economic theory and practice by discussing the approaches and methodologies for valuing ecosystems including *The Economics of Ecosystems and Biodiversity* (TEEB) (www.teebweb.org) and other green accounting methods. He concluded with an account of the Toda people of south India. The Toda people are pastoralists with free roaming buffalo whose range overlaps that of tigers. As compensation for losses due to tiger predation, each time a buffalo is killed by a tiger a female calf is given to the owner from the 'buffalo bank'. The system is sustainable because the first calf born to the compensation calf is given back to the 'buffalo bank'.

Professor Daniel Murdiyarso (Center for International Forestry Research) explored the positive outcomes of biodiversity and carbon in the context of forest ecosystem services. He introduced the emerging new scheme to mitigate climate change under the United Nations Framework Convention on Climate Change (UNFCCC) called REDD-plus. REDD-plus (Reducing Emissions from Deforestation and Forest Degradation plus other activities not directly linked to emissions reductions such as carbon storage and sequestration, moderating weather and protecting biodiversity) is an effort to create a financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development.

Session 5

The fifth session of the conference was a panel discussion chaired by **Professor Georgina Mace** (Imperial College) and **Professor Alistair Fitter** (University of York). The panel (**Professor José Sarukhán** (Universidad Nacional Autónoma de México), **Professor David Tilman** (University of Minnesota), **Professor Richard Hobbs** (University of Western Australia), **Dr Robin Naidoo** (WWF-US), **Professor Carlos Joly** (Brazilian Academy of Sciences and BIOTA), **Dr David Cooper** (CBD) and **Dr Anantha Duraiappah** (International Human Dimensions Programme - UNU) were each asked to present what they thought were the three key issues facing biodiversity. Issues included: how to feed a growing human population and learning to 'garden' the planet; the need for conservation decisions and action at the local level but also to consider issues at a global level so as not to divert problems from one place to another; the need for better links between science and policy; the importance of inter-disciplinary co-operation and research; recognising 'evolution' as an ecosystem service; filling the gaps in the knowledge base; and identifying the relative social value of biodiversity and ecosystem services.

Session 6

The sixth session of the conference was the conclusion panel and was chaired by **Professor Sir John Lawton** (Royal Commission on Environmental Pollution). The panel consisted of **Professor Mohamed Hassan** (President, African Academy of Sciences), **Professor Pat Berjak** (Vice President, Academy of Science of South Africa), **Dr Ahmed Djoghlaf** (Executive Secretary, CBD) and **Mr Martin Brasher** (Defra). The panel rounded up the conference and there was a memorable quote from Professor Lawton regarding the intrinsic value of biodiversity: "We do not conserve cathedrals and Mozart concertos because they are useful, we conserve them because they enrich our lives."

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Institute News

Membership Renewals

IEEM staff, Anna Thompson and Zacyntha Dunhill-Rice have put a great deal of great effort into securing that the maximum number of IEEM members have renewed their membership for this year. We regret to say that although many members do renew promptly, a significant number this year did not do so until in receipt of the final reminder and, in many cases, a personal phone call. This is not good use of the resources of the Institute and makes the forward planning and budgeting for next year extremely uncertain. Those late payers should reflect that it is your Institute and IEEM does a great deal for its members and the profession but our resources are limited and we do need the support of the members and payment of subscriptions in a timely manner.

New Fellow

We are very pleased to report that Council at its meeting in December 2009 approved the Fellowship of **Dr David Parker**. David Parker took over as President from David Goode in 1997 at just about the time that the legal claim against IEEM was at its height. IEEM was then faced with key decisions relating to its very survival, very limited resources and the need to pick up the pieces and move forward. David gave leadership and injected a valuable measure of professional calm into the Council, which was successful in taking us forward. He has continued to take a keen interest in the progress of IEEM beyond the period of his Presidency, including the relations between the Welsh Geographic Section and Natur. He has also contributed to many IEEM activities such as conferences and other ceremonial events. He was a Director of SGS Environment for 10 years with direct responsibility for the Liverpool office. As Director of Operations for the Countryside Council for Wales (CCW) from 1998 to 2004 he had responsibility for up to 300 staff covering many aspects of its work. He is currently Director of Science and Chief Scientist and is a member of the CCW Directors team which has overall responsibility for a staff of 500 and an annual budget of £46 million. In CCW he is paying particular attention to climate change work.

Do You Feature in the Media?

It is quite pleasing to listen to a news report or a feature on wildlife and be able to recognise people as being members of IEEM and it would be good to give more recognition to such media presentations given by IEEM members. The latest is that on *Countryfile* by Paul Bradley on his favourite subject of crayfish. Remember if you are giving a presentation and you get the chance just to slip in a reference to IEEM and the Profession is would be really good publicity for the Institute as well. Apart from that it would be good if you could let us know – preferably in advance, of any significant interviews or presentations that you might be making.

New Chartered Environmentalists

IEEM is not alone in experiencing renewed interest from members wishing to become Chartered Environmentalists. A series of professional interviews has just been held and the following have been successful in becoming Chartered Environmentalists (CEnv), congratulations!

Amanda Baker, Amanda Barton, Jessica Colebrook, Philip Davidson, Deanne Gow, David Jones, Dylan Lloyd, Cormac Loughran, Christopher Manning, Graeme McLaren, Pauline Michell, Elizabeth Pimley, Delphine Pouget, Claire Rogers, and Elizabeth Seal.

New applications are always welcome so please keep the flow going.

We are also getting a number of applicants who are unable to attend the professional interviews at the last minute or miss the deadlines for producing material and then have to defer consideration of their application. This is very wasteful of resources and so an initial processing fee of £50.00 and a further fee of £30.00 if an application has to be deferred will be charged with effect from 1 April 2010.

IEEM Tony Bradshaw Best Practice Awards 2010

We are very pleased to announce the call for entries for the 2010 IEEM Tony Bradshaw Best Practice Awards. Entries that demonstrate best practice whilst contributing to the five objectives of IEEM are welcomed from all sectors of the ecology profession including the public, voluntary and consultancy sectors. For more information please see page 14 or visit the website at www.ieem.net/awards.asp.

In Practice

If you would like to contribute to future editions of *In Practice* the themes are noted below. For further information please contact Jason Reeves (jasonreeves@ieem.net).

Edition	Theme	Submission Deadline
68 - Jun 2010	Ecosystem Services	26 Apr 2010
69 - Sep 2010	Marine and Coastal	26 Jul 2010
70 - Dec 2010	Biodiversity Beyond 2010	25 Oct 2010

Call for New Committee Members

Your support on Committees is essential to the functioning of the Institute; will you volunteer? The Committees of the Institute depend on input from the membership and are serviced by the Secretariat. The following Committees are in need of new members:

- **Membership Admissions Committee**
  - looking for Full members, especially those with experience in higher education, Government Authorities and NGOs
  - Contact: annathompson@ieem.net
- **Training, Education and Career Development Committee**
  - looking for members in NGOs and Local Authorities
  - Contact: nickjackson@ieem.net

Please visit www.ieem.net/governance.asp for further information and an application form.

Consultations

Help influence nature conservation and environmental legislation by assisting us in responding to consultations. A full list of current consultations is available in the members' section of the website at www.ieem.net/members.asp.

Partnership News

Society for the Environment

This has been an active period for SocEnv. Hilary Benn, the Secretary of State for the Environment, was the guest of honour at the Christmas reception hosted by SocEnv. After a short speech he met representatives from the many Constituent Bodies. He was pleased to learn of the recent IEEM conference on Protected Areas and that IEEM had been able to celebrate not only the establishment of the South Downs National Park but also the passing of the Marine and Coastal Access Act.

The latest newsletter from SocEnv is now available, see the website and you will find that the featured Constituent Body is IEEM!

There is a first hand report from John Carstensen, the CEO who attended the COP15 meeting in Copenhagen and produced a short communiqué; *What does it mean for the Environmental Professional?* It was interesting to get from John a first hand flavour of what it was like to actually be there. He reports that every day more than 15,000 people followed events in the conference centre and the host country provided interesting examples of what a low carbon future would hold. The conference also offered a wide range of presentations by businesses and prominent individuals who do not normally appear on the environmental scene. The common theme from all of these participants was the opportunities that pursuit of a low carbon society would offer. Every day around 50 side events (organised by global insurance companies, carbon trading entities, biotechnology and energy providers, as well as media and non-governmental organisations) offered insight into these opportunities. In particular, the EU countries demonstrated innovations around buildings, transport, renewable energy and financing of green technology – all themes closely related to the interests of SocEnv.
www.socenv.org.uk

European Federation of Associations of Environmental Professionals

Following the latest General Assembly, many EFAEP members have brought forward proposals regarding topics to address in working groups. From the 15 proposals, two are to start immediately, on 'Biodiversity' and 'Water', whilst the others are still being followed up. There are two further proposals ('EFAEP Funding' and 'Professional Accreditation') that revolve around a strategic issue regarding EFAEP itself and will therefore be co-ordinated by the Executive Committee.

Meanwhile, EFAEP has decided to rent some - modest - office space within the 'Mundo-B' building in downtown Brussels, and will start looking for a Brussels-based Project Officer to support the Federation on a part-time basis. He or she will perform tasks related to network development, EU environmental policy and lobbying activities, seeking funding opportunities, *etc*. Doing this sorely needed work, this staff member will complement the activities of the Executive Committee and the Co-ordinator.

For the seventh year now, the European Environmental Press (EEP) Association along with Pollutec (French Environmental Trade Show), and with the support of EFAEP, have been organising the EEP Awards with the aim of celebrating technical and scientific environmental innovation in Europe. The judging panel for the 2009 awards consisted of fifteen EEP journalists and three EFAEP representatives (Heli Jutila, FAEP, Finland; Hans-Jürgen Wicht, VNU, Germany; and Bruno Weinzaepfel, AFITE, France). The three winners were announced at the Pollutec exhibition on 2 December 2009 in Paris. The Gold EEP Award 2009 was given to a small French company, NHEOLIS, for the realisation and commercialisation of an horizontal wind turbine capable of working within a wide range of wind speeds. The Silver EEP Award 2009 was presented to a Portuguese company, A4F-ALGAFUEL, for a technology based on the fixation (biological sequestration) of CO_2 from the combustion gases of a cement plant. The Bronze EEP Award 2009 was awarded to the Danish company GRUNDFOS for a process able to remove nitrogen oxides from the exhaust gases of diesel engines using a sensor-based urea dosing pump. For more information, or for those who would like to present an innovation at the 2010 awards, please contact Bruno Weinzaepfel (bweinz@afite.org).
www.efaep.org / www.environmentalprofessionals.eu

Europarc Federation

IEEM members may well be surprised at the range of activities carried out by Europarc and a visit to their website is well worth it. Its long-term programmes include the European Charter for Sustainable Tourism, the Junior Ranger Programme and the Transboundary Parks certification scheme. It also facilitates internships in protected areas. It awards Alfred Toepfer Scholarships to young conservationists and the Alfred Toepfer Medal to an individual who has shown particular commitment to Europe's protected areas each year. It also promotes the European Day of Parks each May and hosts an annual conference every autumn.

Recent activities include developing Europarc's lobbying skills following a meeting hosted by the French Section. The aim is to ensure that Europe's protected areas are increasingly recognised by Europe's decision-makers. There is a number of EU funding sources which are relevant for protected areas and conservation work. Europarc has put together two documents to facilitate its members with the search for this funding. The first is entitled *EU legislation of relevance to protected areas, with funding mechanisms* and the second focuses on current European Union funding opportunities.

After many years of being located in Grafenau close to the Bayerischer Wald National Park, Europarc is moving to Regensburg, Germany. This is a central location in terms of the coverage by Europarc and has much better transport links and should offer more efficient services and cost effectiveness.

Europarc Consulting GmbH is the consultancy arm of the Europarc Federation. The company specialises in the policy and practice of protected area management and is uniquely placed to provide advice, training and expertise in these fields. There is sometimes a call for outside specialists which may be of interest to IEEM members. Please visit the company's own website (www.europarc-consulting.org) for more information or contact Wilf Fenten (w.fenten@europarc.org).
www.europarc.org

IUCN-UK

The IUCN-UK Committee is holding a conference on 'Nature: What's in it For Me?', which will explore the UK contribution to the IUCN Global Programme theme of 'ecosystem management for human well-being'. The conference will be hosted by the Royal Zoological Society of Scotland on 18-20 April 2010 in Edinburgh. The programme will include an opening keynote address from IUCN Director General, Julia Marton-Lefèvre, as well as workshops co-ordinated by members of the six IUCN Commissions.
www.iucn.org / www.iucn-uk.org

Recent Publications

Collins Bird Guide - The Most Complete Guide to the Birds of Britain and Europe

Authors: Lars Svensson, Killian Mullarney, Dan Zetterstrom and Peter J Grant
ISBN-13: 9780007268146
Available from: www.nhbs.com
Price: £17.99

The second edition of the *Collins Bird Guide*, due to be available from March 2010, now has expanded text and additional colour illustrations. It covers Britain and Europe, provides all the information needed to identify any species at any time of year, with detailed text on size, habitat, range, identification and voice. Accompanying every species entry is a distribution map and colour illustrations (over 3,500) to show the species in all the major plumages (male, female, immature, in flight, at rest, feeding). The book is fully integrated, so that all this information appears on one spread, ideal for use in the field. Each group of birds also has an introduction, which covers the major problems involved in identifying or seeing them.

The Status of EU Protected Habitats and Species in Ireland

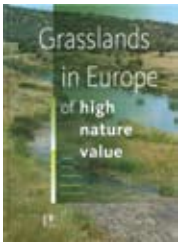
Author: National Parks and Wildlife Service
Available from: www.npws.ie
Price: free download

Each EU member state is obliged to report to the European Commission on the status of listed habitats and species every six years. In December 2007, Ireland submitted the first baseline assessments of conservation status for all 59 habitats and c.100 species that occur in Ireland. The report, with contributions from several IEEM members in Ireland, is the first such comprehensive compilation of the status of habitats, animals and plants in Ireland which have protected status under national and EU law. The assessments were carried out by expert ecologists and then screened by scientists in the National Parks and Wildlife Service. Each species was assessed according to its range across Ireland, the population, the quality of its habitat and its future prospects. A similar assessment was used for the habitats. The report found that only 7% of the habitats examined are in good status, with 46% inadequate and 47% bad. For species, roughly 50% of the species examined are in good status, while 10% are considered bad. The assessments outline the pressures and threats that habitats and species face in Ireland.

Mapping Species Distributions - Spatial Inference and Prediction

Author: Janet Franklin
ISBN-13: 9780521700023
Available from: www.nhbs.com
Price: £34.99

Maps of species' distributions or habitat suitability are required for many aspects of environmental research, resource management and conservation planning. These include biodiversity assessment, reserve design, habitat management and restoration, species and habitat conservation plans and predicting the effects of environmental change on species and ecosystems. The proliferation of methods and uncertainty regarding their effectiveness can be daunting to many users and the author here provides a practical guide by summarising the methods used in species distribution modeling and presenting a framework for spatial prediction of species distributions based on the attributes of the data and questions being asked. The framework links theoretical ecological models of species distributions to spatial data on species and environment, and statistical models used for spatial prediction.



Grasslands in Europe of High Nature Value

Editors: P Veen, R Jefferson CEnv FIEEM, J de Smidt and J van der Straaten
ISBN-13: 9789050113168
Available from: www.nhbs.com
Price: £93.00

Grasslands are an important part of European nature and about half of Europe's endemic species depend on grasslands, whether in mountains, lowlands, river plains or coastal areas. Many grasslands originate in traditional agricultural landscapes, however, modern intensification threatens many of these ecosystems. This book was written by an international team of grassland experts, who describe 24 case studies from across Europe. Together, these case studies provide an insight into the various European grasslands, their value for nature, culture and agriculture, and the threats they are facing today. The book contains a large number of full-colour photographs, and many maps and infographics. Thematic chapters provide essential background information on topics (*e.g.* grassland fauna, history of agriculture, grassland communities, and the connection between grasslands and climate). The book also analyses the opportunities and risks of EU policy to conserve these grasslands.

Rainforests

Author: John Feltwell CEnv MIEEM
ISBN-13: 9780907970088
Available from: www.nhbs.com
Price: £55.00

This comprehensive book cover almost everything, from jaguars and tapirs to birds and butterflies. The book includes historical accounts of how the rainforest was explored and how the people who now populate the Amazon have integrated with nature, their trees, herbs and flowers. The mammals, fish and fruits of the forests are also covered. There are also chapters on biodiversity and global warming that set the parameters and explain the controversies.

The Game of Conservation - International Treaties to Protect the World's Migratory Animals

Authors: Mark Cioc and James L A Webb
ISBN-13: 9780821418673
Available from: www.nhbs.com
Price: £23.50

This publication is an examination of nature protection around the world. Twentieth century nature conservation treaties often originated as attempts to regulate the pace of killing rather than attempts to protect animal habitat. Some were prompted by major break-throughs in firearm techniques, such as the invention of the elephant gun and grenade harpoons, but agricultural development was at least as important as hunting regulations in determining the fate of many migratory species. The treaties had many defects, but they also served the goal of conservation to good effect, often saving key species from complete extermination and sometimes keeping population numbers at viable levels. It is because of these treaties that Africa is dotted with large national parks, that North America has an extensive network of bird refuges, and that there are any whales left in the oceans. The authors show that a handful of treaties, all designed to protect the world's most commercially important migratory species, have largely shaped the contours of global nature conservation over the past century. The scope of the book ranges from the African savannahs and the skies of North America to the waters of the Antarctic.

In the Journals

Jim Thompson HonFSE CEnv MIEEM and Jason Reeves AIEEM

E Nicholson *et al.*
Priority research areas for ecosystem services in a changing world
Journal of Applied Ecology 2009, **46**: 1139-1144

This is an interesting and highly topical multi-author paper resulting from a workshop. The importance of research into ecosystem services has been widely recognized and rapid progress is being made. However, the prevailing approach to quantifying ecosystem services is still based on static analyses and single services, ignoring system dynamics, uncertainty and feedbacks. This is not only partly due to a lack of mechanistic understanding of processes and a dearth of empirical data, but also due to a failure to engage fully with the interdisciplinarity of the problem. The authors argue that there is a tendency to ignore the feedbacks between and within both social and ecological systems, and a lack of explicit consideration of uncertainty. Metrics need to be developed that can predict thresholds, which requires strong linkages to underlying processes, while the development of policy for management of ecosystem services needs to be based on a broader understanding of value and drivers of human well-being. They highlight the complexities, gaps in current knowledge and research, and the potentially promising avenues for future investigation in four priority research areas: agendas, processes, metrics and uncertainty.

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R Inger *et al.*
Marine renewable energy: potential benefits to biodiversity? An urgent call for research
Journal of Applied Ecology 2009, 46: 1145-1153

The marine environment presents a relatively untapped energy source and offshore installations are likely to produce a significant proportion of future energy production. Wind power is the most advanced, with development of wave and tidal energy conversion devices expected to increase worldwide in the near future. Concerns over the potential negative impacts on biodiversity of marine renewable energy installations (MREI) include: habitat loss, collision risks, noise and electromagnetic fields. The authors suggest that if appropriately managed and designed, MREI may increase local biodiversity and potentially benefit the wider marine environment. Installations have the capacity to act as both artificial reefs and fish aggregation devices, which have been used previously to facilitate restoration of damaged ecosystems, and de facto marine-protected areas, which have proved successful in enhancing both biodiversity and fisheries. MREI can cause conflict among interest groups including energy companies, the fishing sector and environmental groups. Conflicts should be minimized by integrating key stakeholders into the design, siting, construction and operational phases of the installations,and by providing clear evidence of their potential environmental benefits. MREI have the potential to be both detrimental and beneficial to the environment but the evidence base remains limited and more research is needed.

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S J Butler *et al.*
A cross-taxonomic index for quantifying the health of farmland biodiversity
Journal of Applied Ecology 2009, **46**: 1154-1162

The authors assess the detrimental impacts of agricultural change to a broad range of taxonomic groupings and derive a standardised index of farmland biodiversity health, built around an objective of achieving stable or increasing populations in all species associated with agricultural landscapes. In their assessment of the health of UK farmland biodiversity, the results suggest that the populations of two-thirds of 333 plant and animal species assessed are unsustainable under current UK agricultural practices. The paper then deals with the potential benefits of an agri-environment scheme, Entry Level Stewardship (ELS), to farmland biodiversity in the UK under differing levels of risk mitigation delivery. ELS has the potential to make a significant contribution to progress towards sustainability targets but this potential is severely restricted by current patterns of scheme deployment.

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M Öster *et al.*
Dispersal and establishment limitation reduces the potential for successful restoration of semi-natural grassland communities on former arable fields
Journal of Applied Ecology 2009, **46**: 1266-1274

The authors investigated grazed ex-arable fields of different age and adjacent semi-natural grasslands in terms of species richness of plants, community similarity, colonization pattern and recruitment ability of 16 sown grassland species. The functional trait distribution of successful and unsuccessful colonizing species was compared using five traits related to dispersal and persistence: seed mass, seed bank persistence, specific leaf area, plant height and potential for lateral spread. The youngest ex-arable fields had the lowest species richness and contained communities with the lowest similarity to semi-natural grassland. Species richness and similarity to semi-natural grassland both increased with time since grazing started on ex-arable fields, but were still significantly lower than in semi-natural grasslands even after more than 50 years of grazing. Management that aims to re-create semi-natural grassland communities in ex-arable fields should consider introducing seeds or improving germination conditions at the sites.

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J W Pearce-Higgins *et al.*
The distribution of breeding birds around upland wind farms
Journal of Applied Ecology 2009, **46**: 1323-1331

Using data from 12 upland wind farms in the UK, the authors examined whether there is reduced occurrence of breeding birds close to wind farm infrastructure (turbines, access tracks and overhead transmission lines). Bird distribution was assessed using regular surveys during the breeding season. Bird occurrence was modelled as a function of habitat, before examining the additional effects of wind farm proximity. Seven of the 12 species studied exhibited significantly lower frequencies of occurrence close to the turbines, after accounting for habitat variation, with equivocal evidence of turbine avoidance in a further two. No species were more likely to occur close to the turbines. There was no evidence that raptors altered flight height close to turbines. Turbines were avoided more strongly than tracks, whilst there was no evidence for consistent avoidance of overhead transmission lines connecting sites to the national grid. Levels of turbine avoidance suggest breeding bird densities may be reduced within a 500 m buffer of the turbines by 15–53%, with buzzard *Buteo buteo*, hen harrier *Circus cyaneus*, golden plover *Pluvialis apricaria*, snipe *Gallinago gallinago*, curlew *Numenius arquata*

and wheatear *Oenanthe oenanthe* most affected. The study emphasises the need for a strategic approach to ensure such development avoids areas with high densities of potentially vulnerable species. The results reduce the uncertainty over the magnitude of such effects, and will improve future environmental impact assessments.

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K Taylor
Biological Flora of the British Isles: *Urtica dioica* L.
Journal of Ecology 2009, **97**: 1436-1458

This account superseding that of Greig-Smith (1948) presents information on all aspects of the biology of *Urtica dioica*, the stinging nettle, 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, floral and seed characters, herbivores and disease, history and conservation. The species can be highly invasive but can be controlled by cutting and a range of herbicides. It is the food plant of the larvae of a number of attractive butterflies and other phytophagous insects. Like many others in this series, the paper is an extremely useful compendium of the available information on this species.

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A Van Geert, F Van Rossum and L Triest
Do linear landscape elements in farmland act as biological corridors for pollen dispersal?
Journal of Ecology 2010, **98**: 178-187

Habitat fragmentation in agricultural landscapes has reduced the population sizes of many plant species while increasing their spatial isolation. Restoration or maintenance of the connectivity by gene flow between the fragmented patches may be necessary to sustain viable populations, especially for insect-pollinated species. Dye dispersal was investigated for the extremely fragmented insect-pollinated herb *Primula vulgaris*, using fluorescent dye particles as pollen analogues, in a study site comprising 20 populations, of which 13 pairs were physically connected by a linear landscape elements (LLEs, *i.e.* ditches), and 11 pairs were not connected by an LLE. Dye dispersal between populations was found to be significantly higher when populations were connected by an LLE, than when populations were unconnected. For the group of population pairs connected by an LLE, dye deposition significantly decreased with the distance to dye source, but was not related to recipient population size and plant density. The maintenance or restoration of a network of populations connected by LLEs, but also by other landscape structures (*e.g.* population relays in vegetation patches and networks of small elements allowing indirect connections) should be strongly encouraged.

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W Schorcht, F Bontadina and M Schaub
Variation of adult survival drives population dynamics in a migrating forest bat
Journal of Animal Ecology 2009, **78**: 1182-1190

The authors studied annual local survival probabilities of the migratory Leisler's bats *Nyctalus leisleri* based on capture-recapture data from 1,119 individuals sampled in bat boxes over 20 years in eastern Germany. They assessed variation in survival between sex and age classes, estimated the temporal variance of survival and tested whether survival was affected by weather during hibernation or pregnancy. Among females, there were two groups of individuals present with different roosting occupancy, survival and/or dispersal. Local survival of locally born females increased with age and the high recapture probabilities indicate regular presence in the roosts. Recapture probabilities and local survival of foreign adult females were significantly lower, indicating less frequent presence in the roosts and stronger dispersal from the study area. In adult males, locally born and foreign individuals were nearly identical regarding survival and recapture, indicating a more homogenous group. Local survival was very low in the first year but increased with age. Spring temperature and winter North Atlantic Oscillation explained some of the variation in first year and adult female survival. There was evidence of a complicated social population structure of female Leisler's bats. The analyses suggest that their population dynamics are driven to a large amount by variation of survival, in particular by adult survival. The reason for the major temporal variations is unknown.

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L J Wright *et al.*
Importance of climatic and environmental change in the demography of a multi-brooded passerine, the woodlark *Lullula arborea*
Journal of Animal Ecology 2009, **78**: 1191-1202

The authors examined the influence of local weather conditions on reproductive success, timing of breeding and survival in a population of woodlark *Lullula arborea* over 35 years. Woodlarks laid larger clutches when rainfall was low and temperature high during the egg-laying and pre-laying period. Nest success increased with higher temperatures during the nesting period. In successful nests, the number of chicks fledged per egg laid was greater when weather was drier during the brood stage. Although woodlarks bred earlier in years with warmer early spring temperatures, with the onset of breeding varying by 25 days, there was no significant advance in the onset of breeding over the 35 years of study, due to considerable inter-annual variability, and no overall trend in weather. The effects of weather on productivity were minor compared to an increased rate of nest predation through the period of study, which reduced productivity by 49.8% by 2004 compared to 1971. From 1971 to 1988 the population grew slowly; during 1988-1999 the population grew rapidly, but after 1999 the population declined. Increased population growth after 1988 was associated with higher first-year survival rates. Population decline after 1999 was caused by a combination of reduced productivity (resulting from increased nest failure rates attributed to predation) and lower first-year survival rates, that appear unrelated to winter temperature. Thus climate change did not explain the marked changes observed in the population over 35 years.

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C Kraan *et al.*
Landscape-scale experiment demonstrates that Wadden Sea intertidal flats are used to capacity by molluscivore migrant shorebirds
Journal of Animal Ecology 2009, **78**: 1259-1268

Whether intertidal areas are used to capacity by shorebirds can best be answered by large-scale manipulation of foraging areas. The recent overexploitation of benthic resources in the western Dutch Wadden Sea offers such an 'experimental' setting. The authors reviewed the effects of declining food abundances on red knot *Calidris canutus islandica* numbers. Over the 10 years they lost 55% of their suitable foraging area. This ran parallel to a decrease in numbers by 42%. Although there was also a decrease in patchiness (*i.e.* less information about the location of the suitable feeding sites), this had not lead to additional loss of birds. To cope with these declines in food stocks, an increase in the capacity to process food would be required. Although the red knots enlarged their gizzards, this increase in size was not enough to compensate for the decreased feeding area. Survival of red knots in the western Dutch Wadden Sea declined from 89% in the first half of the study period to 82% in the second half of the study

period and could account for almost half of the decline in red knot numbers; the rest must have moved elsewhere in winter. Densities of red knots per unit suitable foraging area remained constant at 10 knots ha^{-1} between 1996 and 2005, which suggests that red knots have been using the Dutch Wadden Sea to full capacity.

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M Low *et al.*
Habitat-specific differences in adult survival rates and its links to parental workload and on-nest predation
Journal of Animal Ecology 2010, **79**: 214-224

Adult survival rates strongly affect population growth, but few studies have quantified if and why adult survival differs between breeding habitats. The authors investigated potential causes of habitat-specific adult survival rates for male and female northern wheatears *Oenanthe oenanthe* L. breeding in Swedish farmland. They used multistate mark-recapture models based on 1,263 breeding records between 1993 and 2007 to estimate survival rates based on habitat-type (short vs tall ground vegetation) and breeding-success state parameters. They also used breeding-season observations from 2002 to 2007 and an experimental manipulation of ground vegetation height to identify factors influencing adult mortality. Females had lower annual survival than males largely due to low female survival in tall habitats because of higher nest-predation risk and the large proportion of adult females being killed on the nest (>20%) by predation. Among successful breeders, both sexes displayed similar survival rates, but survival was lower for breeders in tall compared to short vegetation. Experimental manipulation of ground vegetation height suggested the cost of rearing young to be higher in tall habitats. Compared to adults breeding in short habitats, those breeding in tall habitats were forced to forage further from the nest which increased the estimated daily workload by c. 20%. On-nest predation and parental workload during chick rearing combine to largely explain habitat-specific adult survival rates. Short field margins are important for the conservation of farmland passerines breeding in cropland.

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S Wehling and M Diekmann
Importance of hedgerows as habitat corridors for forest plants in agricultural landscapes
Biological Conservation 2009, **142**: 2522-2530

Hedgerows have been proposed as habitat and conservation corridors for forest plant species, but their importance for the survival of these species is still not clear. The objective of this study was to examine the frequency of occurrence of forest species and total forest species richness in different parts of the hedgerows, and to relate these patterns of occurrence to the species' habitat requirements and life history traits. The authors surveyed 130 forest-hedgerow transects in north-western Germany. About 77% of all forest plant species occurring in the neighbouring forests were also found in the adjacent hedgerows. There was a negative relationship between distance from the forest-hedgerow ecotone and the number of species. Ancient hedgerows were not significantly more species-rich than more recent ones. Within 100 m distance from the forest edge, forest species richness increased with an increasing number of species in the nearby forest and with an increasing cover of the tree canopy as well as a decreasing cover of the shrub layer. The frequency of occurrence in hedgerows of species with common attributes was partly in agreement, partly in disagreement with the results obtained in previous studies. The authors conclude that patterns are difficult to generalise, probably due to a strong regional variation in the pool of forest species and in the specific environments of both forests and hedgerows.

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J A Hodgson *et al.*
Managing successional species: Modelling the dependence of heath fritillary populations on the spatial distribution of woodland management
Biological Conservation 2009, **142**: 2743-2751

Species that persist on a shifting mosaic of successional habitat offer particular challenges to conservation, to monitoring methods, and to population dynamic modelling. The conservation of the heath fritillary butterfly *Melitaea athalia* in woodland in England, for example, depends on the creation of woodland clearings by coppicing. The authors developed a model to assist in the conservation of such populations, called MANAGE. They parameterised the model for the *M. athalia* population in the Blean Woods in Kent, and used it to answer several management questions. They found that: (1) simulations predict that the observed rates of coppicing will not be enough to meet existing Biodiversity Action Plan targets, except when the most generous modelling assumptions are made; (2) the greatest uncertainty in the model outcome arises from uncertainty in the colonisation parameters; (3) in the worst case scenario, a population would require 2.3% of the Blean Woods to be coppiced each year, which is around double the currently-observed rate; (4) the four management units of the Blean where coppicing is practised are not independent metapopulations; and (5) to sustain a population in a smaller landscape would require less coppicing overall, but more as a percentage of the landscape. This modelling approach may prove useful in the development of conservation management plans for other species that inhabit successional habitats.

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M D Morecroft *et al.*
The UK Environmental Change Network: Emerging trends in the composition of plant and animal communities and the physical environment
Biological Conservation 2009, **142**: 2814-2832

This review identifies the major trends in physical, chemical and biological data between 1993 and 2007 at the 12 terrestrial sites in the UK Environmental Change Network (ECN) and assesses the effectiveness of the programme. Temperature and precipitation increased and sulphur (S) deposition decreased across the network. There were significant local trends in nitrogen (N) deposition. The decreasing S deposition was associated with increasing pH of rainfall and soils and there was widespread evidence of soil pH showing recovery from acidification. Warm-adapted butterfly species tended to increase at northern, upland sites, consistent with an effect of increasing temperatures. Carabid beetle species associated with cooler northern and upland areas showed declining populations. The increasing trend in precipitation may account for a decline in ruderal plant species in the lowlands, reversing an increase associated with drought in the early part of the time series. There was no general shift in the composition of plant communities which might reflect rising soil pH, which may reflect the slow dynamics of plant community processes or a distinction between pH trends at the surface and lower soil horizons. The ECN is effective in detecting trends in a range of different variables at contrasting sites. Its strength is the ability to monitor causes and consequences of environmental change in the same programme, improving the ability to attribute causes of change, which is essential to developing conservation policy and management in the 21st century.

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I M Abbott, D P Sleeman and S Harrison
Bat activity affected by sewage effluent in Irish rivers
Biological Conservation 2009, **142**: 2904-2914

The authors sampled bat activity and benthic macroinvertebrates at nine paired sites, upstream and

downstream from sewage effluent discharges into Irish rivers. Bat activity was measured using broadband acoustic detectors and macroinvertebrates by three 30-s standard benthic kick samples per site. Biological indices of water quality were significantly lower downstream from sewage outfalls, relative to upstream. The soprano pipistrelle *Pipistrellus pygmaeus* was significantly more active at downstream sites, while Daubenton's bat *Myotis daubentonii* was less active. These results contrast with those of a similar study in England, where *P. pygmaeus* were less active, and *Myotis* spp. were more active downstream from sewage outfalls. The authors suggest that *P. pygmaeus* were more active downstream in this study because of a preference for preying on orthocladiinid Chironomidae (non-biting midges), which were significantly more abundant downstream. *M. daubentonii* may prefer Trichoptera (caddis fly), which were significantly more abundant upstream. Organic pollution may then affect bats, but its effect appears to be more complex than previously implied. The authors suggest that the implications of changing nutrient levels in freshwaters for populations of *M. daubentonii* and *P. pygmaeus* may be different from what is currently suggested in the literature.

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H Laycock *et al.*
Evaluating the cost-effectiveness of conservation: The UK Biodiversity Action Plan
Biological Conservation 2009, **142**: 3120-3127

Ecological and economic evaluation should be a key component of biodiversity conservation programmes since it underpins the efficient allocation of resources. However, most such programmes are not currently assessed in terms of the rate of return on investment that they provide. The UK Government launched the UK Biodiversity Action Plan (BAP) in 1994 and the authors collected data from those responsible for monitoring this programme, then evaluated its effectiveness (maximising total conservation gains) and efficiency (maximising conservation gain per unit cost) at meeting the targets of individual Species Action Plans. The authors found that the distribution of spending across plans was highly biased towards vertebrates and there was no correlation between cost and effectiveness. Non-vertebrate plans tended to be more efficient than vertebrate plans. However, following a species utility-based weighting, this tendency was less pronounced and a significant positive correlation between cost and effectiveness emerged. Nevertheless, this evidence suggests that the efficiency of the UK BAP could be improved by correcting the imbalance in spending between vertebrate and non-vertebrate plans. This study highlights the importance of effective monitoring and reporting in determining the utility of biodiversity conservation programmes, demonstrates how explicit cost-effectiveness analysis can be used to evaluate such programmes, and shows that it could also be adapted to accommodate other forms of ecological and social value.

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N McQuaid, R P Briggs and D Roberts
Fecundity of *Nephrops norvegicus* from the Irish Sea
Journal of the Marine Biological Association of the United Kingdom 2009, **89**: 1181-1188

Potential fecundity, number of oocytes in the mature ovary, and realized fecundity, number of eggs extruded and attached to the pleopods of female *Nephrops*, caught at the start of the incubation period were estimated for females from the eastern and western Irish Sea grounds. Potential fecundity was found to differ significantly between eastern and western Irish Sea stocks, while realised fecundity did not differ between areas. Inter-year comparison of realised fecundity, and effective fecundity (the number of mature eggs on the pleopods of females at the end of the incubation period) in the western Irish Sea stocks revealed no significant variation over time. Egg loss during the transition from oocytes in the ovary to mature eggs increased with female size, ranging from 40% at 25 mm carapace length (CL) to 65% at 40 mm CL. No relationship was found between egg diameter or volume and female size.

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J L Rueda *et al.*
Changes in the composition and structure of a molluscan assemblage due to eelgrass loss in southern Spain (Alboran Sea)
Journal of the Marine Biological Association of the United Kingdom 2009, **89**: 1319-1330

The composition and structure of a molluscan assemblage was studied in a deep subtidal eelgrass bed located in southern Spain before and after the eelgrass decline experienced during 2005 and 2006 due to illegal trawling by fishermen. Sampling was undertaken in summer 2004 (with eelgrass) and summer 2007 (without eelgrass) in an extensive eelgrass bed located in Cañuelo Bay and in the same area once the eelgrass bed disappeared. Eelgrass was completely absent in the samples of summer 2007 and an increase in the organic content and mud was found in the sediment between 2004 and 2007. The density and the richness of molluscan species decreased significantly in summer 2007, especially for epifaunal gastropods associated with the leaf and sediment stratum. Some species disappeared completely in summer 2007. Other species increased their densities. Some dominant infaunal species did not significantly change their densities. The composition and structure of the assemblages in summer 2004 and summer 2007 was significantly different. The changes in the molluscan assemblage may have produced cascade effects in higher trophic levels because molluscs generally represent an important food source for some decapods and fish. Urgent conservation measures are needed for protecting the remaining fragmented eelgrass beds of southern Spain from further illegal fisheries activities and other types of human impacts because they support the most diverse faunistic communities for eelgrass beds in Europe due to their bathymetry and geographical location.

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E Fahy and J Carroll
Vulnerability of male spider crab *Maja brachydactyla* (Brachyura: Majidae) to a pot fishery in south-west Ireland
Journal of the Marine Biological Association of the United Kingdom 2009, **89**: 1353-1366

The Magharees fishery (Brandon and Tralee Bays in south-west Ireland) is 495 km^2 in extent and since 1981 has been occupied by a directed spider crab fishery yielding, in some years, all of the national catch of *Maja brachydactyla*. Maximum recorded landings were 336 tonnes in 1999 and effort has numbered up to 10,000 pots annually. Increasing fishing capacity and declining opportunities have accentuated fishing effort on spider crab. This paper describes a catch census undertaken in the fishing season from March to August 2000-2007 and a mark-recapture experiment from 2005-2007. A method of ageing the adult moult by attributing a chronology to the rate of erosion of the claw on the dactyl is introduced. The study found that males migrated longer distances, moved into the fishery on a wider trajectory and demonstrated greater wear on the claw than females. Recapture rate of males was twice that of females. The conduct of the fishery has changed in its 26 years in existence with landings becoming more concentrated in the earlier months of the year and the recent summer fishery was characterised by fewer male captures. Larger males were quickly removed and none over 140 mm carapace length survived in the fishery longer than one year.

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News in Brief

Defra's evidence investment strategy 2013 and beyond

Defra's new Evidence Investment Strategy (EIS), provides an agenda to prioritise and manage Defra's investment in evidence from 2010 to 2013. It highlights the need to focus efforts on climate change, protecting ecosystems and developing a sustainable food supply. The EIS will build on the progress made by Defra's first evidence strategy, Evidence and Innovation 2005-2008, by encouraging better use of evidence for policy-making. The strategy contains a number or recommendations including the importance of working with others, both internally and through partnerships with the Research Councils and other government departments aimed at improving evidence use.

Lundy Island becomes England's first marine conservation zone

The waters around Lundy Island, off the coast of Devon, have become England's first Marine Conservation Zone (MCZ) under the Marine and Coastal Access Act. Four regional projects have started working with local groups and businesses to identify further areas that will be designated as Marine Conservation Zones. Lundy Island is just over three miles long and half a mile wide and the surrounding waters are home to varied wildlife including a high population of seals, lobsters and a number of different species of coral. The waters around Lundy were a marine nature reserve, until their change of status to an MCZ. Specific conservation objectives for the island will now be developed. Local byelaws will remain in place to protect the island's wildlife.

Proposed amendments to the Habitats Regulations 1994, the Offshore Marine Conservation Regulations 2007 and the Environmental Damage Regulations 2009

Defra is planning to make amendments to the Conservation (Natural Habitats &c.) Regulations 1994 and the Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007. The 1994 Regulations transpose provisions of the European Habitats and Wild Birds Directives into law in Great Britain, whilst the 2007 Regulations apply those provisions to the UK offshore marine area. The Department is also proposing to amend the Environmental Damage (Prevention and Remediation) Regulations 2009. The need for amendments arises from new legislative provisions contained in the Marine and Coastal Access Act 2009, and the decision to executively devolve certain functions in the Scottish offshore marine area to the Scottish Ministers. At the same time Defra proposes to consolidate the various sets of amendments that have been made to the 1994 Regulations over the past 15 years.

Giant leap for Welsh salmon

The Atlantic salmon can now be found in the rivers of South Wales again after a 20-year effort to clean up rivers that were polluted by the area's mining industry. In a remarkable turnaround, a 20-year effort to clean them up has paid off - salmon have returned to all of them. Watercourses such as the Ebbw, the Rhymney, the Taff and the Rhondda now have salmon running up them from the sea to spawn. The revolution has been brought about by 20 years of work by the Environment Agency, local authorities and angling clubs, in the wake of the collapse of the South Wales mining industry at the end of the 1980s.

Decline of the little owl

Unlike similar introductions which have proved to be ecological disasters (grey squirrel, muntjac deer, *etc.*), the little owl has been an unobtrusive addition to Britain's avifauna, perhaps because it is not in direct competition with anything else and manages to fill a niche in the ecosystem as an owl which eats earthworms. It is not known why they are declining, it may be the spread of intensive farming, but they are dropping in numbers right across Europe and in Britain they have declined by 18% since 1995.

Peak District National Park secures LIFE+ funding

Long time EUROPARC member, the Peak District National Park (PDNP), is currently celebrating. In December 2009 they found out that their application to the European LIFE+ funding scheme for the project MoorLIFE was successful and that they will be receiving over £5 million to restore 9 km^2 of moorland in the park. The project is not only one of the biggest moorland restoration programmes in Europe but also secured the largest amount of funding for a LIFE project in the UK ever.

World class marine lab opens in Scotland

A £4.4 million new facility which will help secure Scotland's future as a world leader in marine research has been opened at the University of Aberdeen. The University's Oceanlab is already leading studies into the world's oceans as well as providing information on marine life in waters around Scotland. Now Oceanlab2 - a brand new complex next door to the original Oceanlab at Newburgh - will enable scientists to do much more to further our understanding of the marine environment. The University is also due to take on the directorship of the recently launched Marine Alliance for Science and Technology (MASTS), a collaboration involving 700 marine research staff from 10 of Scotland's leading research institutions

Experts fear count will reveal a deadly winter for birds

It has been the harshest winter for 30 years, but it is still unknown how this has affected the UK's wildlife, especially birds. The first large-scale attempt to find out took place in late January, in the RSPB's *Big Garden Birdwatch*. The annual survey, now the largest 'citizen science' exercise in the world, has a special relevance this year in the wake of the recent spell of extremely cold and hard weather. The results are likely to give the first true indication of the scale of winter mortality among the commoner songbirds which visit gardens, particularly the very small species which are especially vulnerable to cold. This winter is already being compared with the famous winter of 1962-63, when the freeze began on Boxing Day and did not begin to thaw until the first week of March. It was estimated that half the birds of Britain died in the cold; the Dartford warbler population was slashed by 98 per cent, wrens by nearly 80 per cent and over much of the country, kingfishers were extirpated. Although 2010 has not so far provided such an unremitting freeze, the lengthy period of snow and ice is thought likely to have been fatal for much wildlife, and to have driven other birds into gardens, where they would not normally be seen.

European harsh winter is good news for bitterns in UK

This winter's bitter cold has seen record numbers of bitterns fly to Britain from northern Europe and has led others to adopt unusual feeding grounds. The elusive bird, famed for its booming call, has been spotted in bird reserves across England, in some cases for the very first time; in others in greater numbers than previously recorded.

Disappearing Thames eels

Over the last five years scientists from the Zoological Society of London (ZSL) have recorded a 98% drop in the number

of European eels in the River Thames. Their disappearance reflects a decline across Europe, which has led to the eel being classified by the IUCN as 'critically endangered'. Conservationists believe that any serious and rapid collapse of the eel population could have a knock-on effect for other species in the river.

Geomyces fungus identified on a bat in France

There has been a confirmed diagnosis of the fungus associated with white-nose syndrome on a bat in Europe. The bat was not underweight, unlike the infected bats in the US, and was released after examination. White-nose syndrome is caused by the fungus *Geomyces destructans* and is responsible for the deaths of over a million bats since 2006. Until now, the disease and fungus had been restricted to the northeastern US, but in this case the fungus was detected in a greater mouse-eared bat *Myotis myotis* hibernating near Périgueux in France in March 2009.

EC sets options for biodiversity policy for the period after 2010

The European Commission is proposing a long-term (2050) vision for biodiversity, with four options for a mid-term (2020) target. In this vision, biodiversity and the ecosystem services we get for free from nature are preserved, valued and, insofar as possible, restored for their intrinsic value, enabling them to support economic prosperity and human well-being, and averting any catastrophic changes linked to biodiversity loss. Download the full document at: http://ec.europa.eu/environment/nature/biodiversity/policy/pdf/communication_2010_0004.pdf

Understanding and addressing the causes of biodiversity loss

The recent *ECORYS Report 2009*, commissioned by the EU, has examined the major causes of biodiversity loss as well as the issues underlying the causes of biodiversity loss, by focusing on case studies of marine, coastal, wetlands and forest ecosystems. The study identified the major direct drivers for the loss of biodiversity as the conversion of natural habitats through land use changes, pollution, unsustainable use of natural resources, the impact of climate change, and invasion by alien species. However, the authors contend that the roots of the problems lie in a series of underlying causes that are driven by social, economic and political factors that feature a lack of knowledge and understanding of the value of biodiversity and ecosystem services. The study highlights ill-fitting policies, economic and market failures and inadequate governance mechanisms and institutions from international to local levels.

Monitoring peatland from Earth and space

A recent paper in the *Journal of Environmental Quality* explains the development of a new technique for monitoring the condition of peatlands using a combination of images captured from Earth and space to measure spatial patterning in peatland surfaces as an indicator of their condition. This new method uses a novel coupled approach, using satellite images from space and airborne laser scanning data, and has resulted in improved peatland mapping products and could help monitor the damage that is being done to peatlands through human activity.

Irrigation threatening steppe birds in Mediterranean wetlands

A recent study in *Ecological Indicators* shows that intensive irrigation of agricultural land in a Mediterranean water basin is altering the habitats of associated wetlands and changing the balance of the bird population living there. The Mar Menor coastal lagoon is located in southeast Spain and inland there is an associated series of Natura 2000 protected wetlands. The wetland habitats are predominantly dry grasslands (salt steppes), but also include sandy areas, salt marshes and reedbeds. Agriculture is the main use of the land in the Mar Menor watershed, which drains into the lagoon. Over the last few decades the area under irrigation has increased substantially. Steppe birds are the key species which also support the designation of the wetlands as a Special Protection Area (SPA) under the Birds' Directive. Since birds are good indicators of agricultural impacts, the researchers analysed how steppe birds have been affected by agricultural changes in the watershed. Between 1984 and 2008, bird surveys were carried out in one of the wetlands and the results suggest that changes in the community of birds found in the wetlands reflect changes in land use at the watershed scale. The researchers suggest that it might be possible to manage cropland adjacent to the wetlands to protect bird biodiversity in these wetlands.

Engineers question algae-based biofuels

University of Virginia engineers have found that algae-based biofuel production consumes more energy, has higher greenhouse gas emissions and uses more water than other biofuel sources. As an environmentally sustainable alternative to current production methods, the researchers propose situating algae production ponds behind wastewater treatment facilities to capture phosphorous and nitrogen - essential nutrients for growing algae. Algae do however remain an attractive source of energy as they do not compete with land-based food crops and also tend to have higher energy yields than other biofuel sources such as corn.

Britain to oppose sale of stockpiled ivory

Britain has announced that it will vote against the proposed sale of stockpiled ivory in Tanzania and Zambia, which conservationists fear could lead to further slaughter of African elephants. The proposed sale will be voted on at the next meeting of the Convention on International Trade in Endangered Species (CITES) in Qatar in March. Should it go ahead, the Tanzania-Zambia sale will be the third such 'one-off' ivory auction to have taken place since the international ban on the trade was brought in 20 years ago to halt the severe decline in African elephant numbers due to ivory poachers. Although the ban was at first successful in halting the decline, the two sales of ivory from four southern African countries, in 1997 and 2008, are considered by conservationists to have considerably weakened the ban by reviving a legal ivory market into which illegal, poached tusks can be laundered. The 2008 sale of ivory, from South Africa, Namibia, Botswana and Zimbabwe, is believed to have triggered a considerable revival of the illegal trade with a consequent upsurge in poaching during 2009.

US ecologists outline necessary action on climate change

In a recent statement, the Ecological Society of America (ESA) has outlined strategies that focus on restoring and maintaining natural ecosystem functions to mitigate and adapt to climate change. The ESA recommends four approaches to limiting adverse effects of climate change through ecosystem management:

1. prioritise low-alteration strategies;
2. critically evaluate management-intensive strategies;
3. acknowledge the ecological implications of geoengineering; and
4. address long-term risks.

In addition to mitigating climate change, the ESA outlines four adaptation strategies to safeguard ecosystem services in the face of climate change:

1. take additional steps to protect water quality and quantity;
2. enable natural species migration across human dominated landscapes;
3. improve capacity to predict extreme events; and
4. manage collaboratively at the ecosystem level.

Tauro-Scatology and Political Espionage

Regular *In Practice* readers will know that Basil O'Saurus, our resident Professor of Tauro-Scatology, is on a personal mission to incorporate environmental management into every aspect of popular culture. This time, we catch him stubble-chinned and with a Gauloise hanging from the corner of his mouth, as he types the final chapters of his latest novel. Can we interrupt you for a moment, Prof?

Must you? The subject is highly topical and I'm working to a tight deadline…

So what is it? A radical new policy for environmental management? Something with a climate change theme?

Not quite in that league. More a way to buy the latest hot publishing sensation and submit the receipt as a legitimate business expense. Us columnists need to do our 'research'.

The quotation marks are significant, I guess?

Of course. I need to be able to look my accountant in the eye when she questions my expenses. You've heard of Stieg Larsson, who wrote crime thrillers set in Sweden? About a girl with amazing computer talents who is able to hack into highly secure databases, access information and manipulate data at her will?

Of course: *The Girl With The Dragon Tattoo*, *The Girl Who Knew Too Much* and so on. Many of us will have read these on our summer holidays. So what are you going to do?

I've written an outline for a UK-based follow-up and I want to get it into the shops before the election.

What is it called?

The Girl With The Dolphin Tattoo.

Intriguing. Tell us more.

OK. The novel starts with an account of a dystopic parallel universe in which there has been financial meltdown, leading to a worldwide recession and widespread cynicism about the ability of governments to manage a globalised economy and of the banking sector to self-regulate.

Completely fictional, of course?

But of course. What is more, in this parallel-but-entirely-fictional world there is increasing disillusionment with the present government, to such an extent that the opposition can field an Old Etonian as their candidate and still come across as credible. Now some of this may sound vaguely familiar to *In Practice* readers as too many of our politicians, of whatever hue, glide seamlessly from university to politics whilst only wetting their toes in the outside world for a short period. In our case, the Leader of the Opposition spent a few years working in PR which counts, just, as the outside world, insofar as he spends his time telling partial truths on behalf of a commercial organisation rather than a political party.

Where is this heading?

Well, my Sunday paper was speculating on David Cameron's likely policy positions on a variety of topics, bearing in mind his poll-lead means that he could be Prime Minister after the election, and I was rather shocked by the vapid nature of some of his environmental pronouncements.

Steady on Prof, with an election coming up, *In Practice* shouldn't show any political bias.

And it doesn't. Coupling the current financial squeeze with an inevitable prioritisation of electorally-sensitive sectors such as education and health, all the major parties have environment policies that veer towards the vapid.

Fair enough.

So, I was thinking that we needed a way of getting some hard, clear-sighted environmental ideas into the Cameron brain quickly and I came up with a brilliant solution…

Which is…?

The Girl With The Dolphin Tattoo.

I'm lost. You'll have to explain.

It is the everyday story of a girl who, if she doesn't have quite the same amazing talents as Lisbeth Salander, does at least have a sufficiently privileged upbringing to bring her into the orbit of an up-and-coming Tory politician. But – and here is the ingenious twist – she also has a radical streak. She went from public school to the University of the West of England to study fine art, hung out with an alternative crowd, and, apparently, played pool with the trip hop artist Tricky. More importantly from our point of view, she is rumoured to be a member of Greenpeace.

So what does this mean for us?

Nothing at all. I'm pitching an idea for a novel, remember? I just thought it interesting to riff on the idea that Greenpeace might be infiltrating the highest reaches of Government. And what this might mean for almost all areas of environmental regulation. And what it might mean for IEEM members: many of us are worried about how environmental policy is going to develop over the next few years, regardless of which political party is in power.

But this, you say, is a work of fiction?

Of course. Surely you can't really conceive of a world in which the wife of a Tory Prime Minister has a tattoo on her ankle? How would the Home Counties react to that? Pure fantasy.

We'll just have to wait and see.

New and Prospective Members

APPLICANTS

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 Executive Director by telephone or letter before **9 April 2010**. Any communications will be handled discreetly. The decision on admission is usually taken by the Membership Admissions Committee under delegated authority from Council but may be taken directly by Council itself. IEEM is pleased to welcome applications for Membership from the following:

APPLICATIONS FOR FULL MEMBERSHIP

Associates applying to upgrade to Full membership were listed previously for their Associate application and are not listed again.

Ms Ann Y Deary, Mrs Jill Gillard, Ms Dunia Hatuqa, Mr Gerard F Hayes, Miss Tawny Lord, Dr Katherine Massey, Miss Ann-Marie MacMaster, Miss Karen A McArthur, Mr Jon H Mellings, Miss Joanna Ramsay, Miss Samantha Smith, Mr Vincent BT Smith, Dr Mark J Whittingham, Mr Christian Williams, Miss Nicola J Wiltshire

APPLICATIONS FOR ASSOCIATE MEMBERSHIP

Miss Vanessa Burley, Mr Martin J Derbyshire, Mr Michael J Hattersley, Mr Ryan Oakley, Mr Simon Parkes, Prof Judith A Smith, Mr James I Webster

APPLICANTS WISHING TO UPGRADE TO ASSOCIATE MEMBERSHIP

Mr Adam D Bratt, Miss Jane Brinkley, Mr Joseph W Bull, Miss Nicola MA Darwin, Mr Jamie T Glossop, Miss Katie Glover, Mr Aaron SM Grainger, Miss Rosamund M Hall, Mr Paul Hiscocks, Miss Eszter Horvath, Miss Samantha Mellor, Mrs Melissa Phillips, Dr Richard D Sandifer, Mr Matthew G Scott-Campbell, Miss Natasha Stentiford

ADMISSIONS

IEEM is very pleased to welcome the following new Members:

FULL MEMBERS

Dr David C Bradley, Dr Catherine AL Bridge, Miss Mabel Cheung, Mr Keith M Henson, Mr Robert E Llewellyn-Smith, Ms Saoirse O'Donoghue, Mr Damien Nixon, Mr Julian Ridge, Mrs Alice R Robinson, Miss Jennifer R Trendall, Mr Alex R Watson, Mr Paul L Wilkinson

ASSOCIATE MEMBERS

Miss Donna Caswell, Miss Katie Gaisford, Mr Michael J Kurs, Miss Deborah J Marchant, Miss Fiona M Percival, Mr Brian Robinson, Mr Lee P Schofield, Miss Laura A Turner, Miss Samantha Wilkinson

GRADUATE MEMBERS

Mr Kieren Alexander, Miss Sophie Batterton, Ms Linda A Beard, Miss Catherine E Bourne, Mr Daniel WS Challender, Miss Rebecca Close, Miss Susannah J Dickinson, Mr Christopher Dosser, Mr Matthew Guy, Miss Julia Henney, Mr Christopher C Hill, Miss Carys Hutton, Mr Timothy P Mann, Miss Lucy R Monday, Mr Andrew C Morris, Miss Gillian Murray, Miss Emma FM North, Mr Richard Pain, Miss Sali A Palmer, Mr Robert Pelc, Mr Matthew P Powell, Miss Aimee Reading, Ms Amy Richards, Mr Paul J Rowntree, Miss Anna Sadowska, Miss Jennifer Spelling, Mr Keith O Thomas, Miss Hannah Wheatley, Mr Christopher M Willans, Mr Ridley C Windland, Miss Stephanie E Winnard, Mr Simon Wright-Rosie

AFFILIATE MEMBERS

Mr George Burton, Mr Neville Davies, Mr Rid Hollands, Ms Sophie Holley, Mr Stephen Lingwood, Miss Claire L Oliver, Mr Keir P Parsons

STUDENT MEMBERS

Miss Jennifer L Allen, Mr Stuart K Andrew, Mr Richard Ayre, Mr James D J Bird, Miss Jacqueline B Bodimead, Mr Keir Burrows, Mr Philip O Bych, Miss Lauren J Clarke, Miss Eleanor M Cooper, Miss Caroline Cope, Mrs Amy Cunliffe, Miss Anna JE Darby, Miss Alison E Flynn, Mrs Caroline French, Mr Alasdair J Grant, Mr Geoffrey Guy, Miss Alexandria Hale, Mr Philip A Higginson, Miss Sasha CA Hollingworth, Miss Nseabasi O Ikput, Mrs Penny Jeffreys, Miss Ruth Kernohan, Mrs Suzanna M Lockyer, Mrs Louise Moray, Miss Katie M Murray, Miss Alexandra Phillips, Mr George Phillips, Miss Laura J Price, Mr Peter Robinson, Mr Stephen Sanger, Mr Chrispian L Snell, Mr Etienne Swarts, Mrs Christina Taylor, Mr Simon Taylor, Mr Matthew Trigwell, Mr James P E Williams

UPGRADES

The following have successfully upgraded their Membership:

UPGRADES TO FULL MEMBERSHIP

Mr Simon Allen, Mr Henry L Andrews, Miss Kate S Baldock, Mr Guy Benstead, Mr James Bowkett, Mr Iain H Bray, Mr Andrew Brennan, Mr Freddy Brookes, Miss Elizabeth Brooks, Mr Lee Bullingham-Taylor, Mr Luke Casey, Mr Christopher Cathrine, Miss Clare Caudwell, Miss Kerry Elliott, Miss Lucy J Emery, Mr Tristan J Evans, Miss Claudia K Gebhardt, Dr Joanne B Harkness, Dr Alice F Helyar, Mr Nicholas J Henson, Miss Anna Hield, Miss Rebecca L Hill, Mr Darren Ivey, Mr Jim Jones, Dr Tessa Knight, Miss Kay Marriott, Mrs Gemma Melvill, Miss Maral Miri, Miss Ruth Morton, Mr Hing Kin Lee, Mr Martin O'Connor, Mr William J O'Connor, Miss Lucy Philpott, Miss Annie Porter, Mrs Rachel Price, Miss Kate Priestman, Miss Sally Prosser, Mr Thomas E Rogers, Miss Elizabeth J Rose-Jeffreys, Mr Philip W Saunders, Miss Samantha L Shove, Mr Thomas R Stephenson, Mr Matthew Tooby, Miss Naomi Waite, Mrs Gemma Waters, Mr Daniel C Watkins, Miss Verity Webster

UPGRADES TO ASSOCIATE MEMBERSHIP

Miss Joanne Barker, Mr Richard Barnard, Miss Hayley Bishop, Miss Sally Brookes, Me Rolf A Brown, Miss Julia Clark, Miss Jessica Crowley, Mr Thomas J Docker, Miss Judith Eley, Mrs Mandy J Elford, Miss Lucy Fay, Mr Robert Fennelly, Dr Karen S Frake, Mr Stephen Hancock, Mr William M Holden, Miss Joanne Jameson, Miss Carly Jefferies, Ms Liz Juppenlatz, Miss Victoria Kelly, Miss Katherine Kennedy, Miss Crystal Leung, Mr James Mullholland, Mr Thomas I Oliver, Miss Melanie Pritchard, Mrs Rebecca M Purslow, Mr Daniel J Reynolds, Miss Elizabeth K Richell, Ms Jeni Roche, Mr Andrew Ross, Miss Melanie Roxburgh, Mr Alan Salkilld, Miss Victoria C Shearman, Miss Ruth Snelson, Mr Roger Spring, Mr Simon Thomas, Ms Helen Ward, Mr Steven Ward, Miss Natalie White, Miss Caroline R Wood, Mr Thomas J Woollam

UPGRADES TO GRADUATE MEMBERSHIP

Miss Rosalind Atienza, Ms Clare Black, Miss Michelle Brown, Miss Lucy E Franks, Miss Ruth Gregory, Miss Victoria Hughes, Mr Neil C Page, Mr James Segar, Miss Nathalie Stephens, Miss Maja K Thorsen, Mr Jeremy Wood

Forthcoming Events

IEEM Conferences

DATE	EVENT	LOCATION
24 March 2010	IEEM 2010 Spring Conference - Ecosystem Services	London
2 - 4 November 2010	IEEM 2010 Autumn Conference - Beyond 2010: Missed Opportunities, New Targets	Dublin

For more information on conferences please visit: www.ieem.net/conferences.asp

IEEM Training Workshops

8 April 2010	How to Complete a Farm Environment Plan (Preliminary Data Collection and FER) (Workshop 1 of 3)	South West England
10 April 2010	Great Crested Newt Survey and Evaluation	South East England
12 April 2010	Freshwater Invertebrates Identification and Survey Skills	West Midlands
13 April 2010	Great Crested Newt Survey and Evaluation	South East England
13 - 14 April 2010	Survey Techniques and Habitat Management for Amphibians (focus on Great Crested Newts)	Scotland
14 - 15 April 2010	Introduction to Bryophytes and the New BBS Field Key	North East England
14 April 2010	Using Ancient Woodland Vascular Plants in Scotland	Scotland
16 April 2010	Dormouse Ecology and Survey	South East England
21 - 22 April 2010	Beginning Professional Bat Work	South West England
21 -22 April 2010	Reptile Survey (Best Practice)	South East England
22 April 2010	Ecological Impact Assessment (EcIA)	South West England
22 - 23 April 2010	Bird Surveys for Beginners	East of England
24 April 2010	Introduction to Bryophyte Identification for Habitat Survey	Ireland
28 - 29 April 2010	Reptile Mitigation (Best Practice)	South East England
29 April 2010	How to Complete a Farm Environment Plan (Preliminary Data Collection and FER - Workshop 1 of 3)	South West England
10 May 2010	Woodland National Vegetation Classification (NVC) Survey for Beginners	Yorkshire and Humber
10 May 2010	Identifying Hedgerow Plants and Trees and Carrying Out Hedgerow Assessments	South West England
11 May 2010	Woodland National Vegetation Classification (NVC) Survey for Practitioners	Yorkshire and Humber
12 May 2010	Great Crested Newts: Ecology, Survey and Evaluation	East of England
13 May 2010	Phase 1 Habitat Survey	East of England
13 - 14 May 2010	Field Ornithology: Improving Your Skills	East of England
13 - 14 May 2010	Introduction to Plant Identification and Phase 1 Habitat Survey	East Midlands
14 May 2010	Botanical Identification	East of England

For the full list of workshops and more information please visit: www.ieem.net/workshops.asp

IEEM Geographic Section Events

17 March 2010	IEEM East of England Section Event - The changing face of ecological consultancy: policies, perception and practice	Cambridge
17 March 2010	IEEM Yorkshire and Humber Section Event - Assessing the quality of habitats and grazing impacts	Leeds
3 June 2010	IEEM Yorkshire and Humber Section Event - Explore Potteric Carr (and barbecue)	Doncaster

For more information on IEEM Sections please visit: www.ieem.net/geographicsections.asp