

symposium

AT THE ZOOLOGICAL SOCIETY OF LONDON

BIODIVERSITY MONITORING AND CONSERVATION: BRIDGING THE GAPS BETWEEN GLOBAL COMMITMENT AND LOCAL ACTION

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Organised by

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ABSTRACTS TO SPOKEN PRESENTATIONS

INTRODUCTION

Chair: Jon Hutton (UNEP World Conservation Monitoring Centre)

The importance of biodiversity monitoring

Sebastian Winkler, IUCN Regional Office for Europe, Belgium

...tick, tock, Tick, Tock, TICK, TOCK...Less than 200 days separate us from the 2010 biodiversity target. After setting the 2010 target, the next important step is to put in place the mechanisms to meet the target, and to track progress towards doing so.

In terms of understanding which actions over the last 9 years have helped the most to come closer to the 2010 target, we have few indicators to provide information. The 2010 target is accompanied by a "Framework for Evaluation of Progress" comprised of seven 'Focal Areas', a set of Goals and Sub-targets and a set of 26 indicators including the Red List Index, the Living Planet Index and the Ecological Footprint. This framework was only adopted in 2006, and it is also integrated into the programmes of work of the Convention on Biological Diversity (CBD). However, many of the indicators are not ready for immediate use and are still being developed by the '2010 Biodiversity Indicators Partnership' coordinated by the UNEP-World Conservation Monitoring Centre. At a regional level the European Environment Agency has made some progress with its SEBI 2010 initiative (Streamlining European Biodiversity Indicators).

There is a broad consensus on the importance of biodiversity monitoring; however, there have been numerous challenges in particular in relation to the monitoring progress towards the 2010 target.

- What are we monitoring? Overall, only about 2.5% of species have been monitored or evaluated and very little is known about the status and changes in most ecosystem types, and virtually nothing is known about trends in genetic diversity. The sample is small and non-representative to understand the status of biodiversity. In fact, there are few consistent and robust datasets which can be used to develop them, because the goals set for indicators were unrealistic and, in some cases, political rather than scientific.
- What are the time frames for monitoring? Nine years since the adoption of the target is rather a short time to monitor biodiversity changes and the 2010 target did not include a baseline. In addition, we have only been collecting information for a handful of species for many years.
- What do we mean by "rate of loss"? Depending on the scenario there might be some cases that failure can become a success. For instance, numbers of fishes have plummeted so severely that there are not enough individuals left to maintain the rate of loss, so the rate declines and the target could be considered to be achieved.

In sum, this presentation will highlight some of the challenges in monitoring progress towards the 2010 biodiversity target and also address the issue on how to bridge the gap from global commitments to local action by highlighting some efforts in monitoring policy response at the global, national and local level.

National reporting on biodiversity

Jamison Ervin, United Nations Development Programme – Global Environment Facility

Nearly all of the world's nations have confirmed their commitments to biodiversity conservation and protection by ratifying international agreements and conventions, including: the Convention on Biological Diversity (CBD), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Migratory Species of Wild Animals (CMS), the Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar), and the Convention Concerning the Protection of the World Cultural and Natural Heritage (WHC). This presentation describes reporting requirements for one component of the CBD – the Programme of Work on Protected Areas.

There are a number of problems and challenges in effective national reporting on biodiversity, including: an absence of clear reporting templates and frameworks, duplicative and overlapping reporting requirements, expensive and complex reporting procedures, inadequate capacity to report, and the lack of integration of reporting into relevant policy and action. Moreover, current reporting frameworks are unsatisfactory in answering the fundamental question: "How effectively is biodiversity being conserved?"

There are a number of recommendations for improving national biodiversity reporting. (1) Report on an integrated measure of 'effective conservation'. (2) Focus on a small suite of key indicators. (3) Report on outcomes and activities. (4) Report against targets, goals and thresholds. (5) Spatially integrate data sets. (6) Use easily understandable reporting formats. (7) Ensure robust data of high quality. (8) Create mechanisms to ensure accountability. (9) Create 'real-time' reporting mechanisms. (10) Link reporting results to actions.

There are also several recommendations for enabling more effective reporting. (1) Streamline reporting requirements across and within the different conventions. (2) Create voluntary levels of reporting. (3) Create user-friendly on-line templates in multiple languages. (4) Create indices (e.g. of threat, viability, representativeness, management effectiveness). (5) Create global taxonomies (e.g. of threats, ecosystems). (6) Provide technical and financial support to countries. (7) Create indicators that work at multiple scales. (8) Link reporting results to broader national and international policies and agendas.

Monitoring in the real world

Julia Jones, School of the Environment and Natural Resources, Bangor University, UK

Biodiversity monitoring is needed at many scales and for many different purposes, from measuring progress against global or national targets to understanding trends and informing management at the local level. There are a number of challenges to implementing successful monitoring in the real world, most of which relate to limited capacity and resources. Such constraints apply to data collection but, just as importantly, to successful archiving and sharing of data. A recent project to develop a biodiversity indicator for Wales, for example, identified 35 potentially useful datasets but only five were able to provide data disaggregated to the Welsh level. In a widely cited paper from 2006, Colin Legg and Lazlo Nagy stated that "Most conservation monitoring is a waste of time" because it lacks power (the ability to measure true change in a system). In fact powerless monitoring is worse than a waste of time, as it deflects resources from useful interventions and monitoring. Power can be improved in a number of ways. Increasing the sample size increases power but in a world of constrained resources, hard decisions on what to monitor sometimes need to be taken. Accepting an increased risk of mistakenly identifying a non-existent trend will also increase the power. Such an error may result in unnecessary conservation action; however, missing a

true trend may result in failure to take action when action is needed. Conservationists therefore need to consider the relative risks and costs of each type of error when designing monitoring programmes. Successful biodiversity monitoring in the real world is a significant challenge. But given its importance for understanding the present and planning for the future, it is certainly worth investing in doing it well.

SESSION I: THE STATE OF BIODIVERSITY: SPECIES-BASED INDICES

Chair: Jonathan Loh (WWF International)

National Red List and biodiversity monitoring

Jonathan Baillie, Conservation Programmes, Zoological Society of London, UK

Regional Red Lists are currently used by countries throughout the world to assess the status of species and assist in national conservation planning and priority setting. In addition to contributing to national conservation efforts, this information is important for reporting to international conventions such as the Convention on Biological Diversity (CBD). When Regional Red Lists are repeated at regular intervals, they can provide insight into national level biodiversity trends. The United Nations' eight Millennium Development Goals (MDGs) aim to achieve significant and measurable improvements in the lives of the world's poor by 2015. The CBD target of a reduction in the current rate of biodiversity loss by 2010 has been adopted to measure one of the eight goals, and measuring change in the proportion of threatened species has been adopted as the indicator to assess whether this target has been met. Thus, signatories to the MDGs are obliged to monitor the changing status of species in their countries.

However, many countries lack the resources and/or in-country technical capabilities to produce robust regional Red Lists. This includes countries that harbour the majority of the world's biodiversity and the world's poor. If we are serious about setting biodiversity baselines and developing indicators based on trends in extinction risk, then significant funding needs to be made available through international donor organizations and a regional Red List network needs to be formalized. This network, involving IGOs, NGOs and countries producing regional Red Lists, would ensure that the latest technical tools for producing Red Lists are accessible and that trained experts in applying the IUCN categories and criteria are available to assist. The network would also provide advice on how to implement national Red Lists that will be useful for generating biodiversity indicators and provide guidance on how the information can feed into decision making at the national level.

The Wildlife Picture Index

Timothy G. O'Brien¹ & Margaret F. Kinnaird²

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Although the Convention on Biological Diversity (CBD) has mandated development of indicators that can meet the needs of monitoring biodiversity by 2010, we still have a dearth of data from the tropics where the majority of biodiversity is found. Recognizing that existing data are insufficient to fill the gap in knowledge from tropical regions, the Wildlife Picture Index (WPI) was developed to take advantage of recent advances in camera trapping to sample rare and elusive mammals and large birds. The WPI uses area-of-occupancy

estimates derived from camera-trap sampling at a landscape scale in a composite indicator based on the geometric mean. The WPI measures the component of biodiversity composed of mid- and large-sized terrestrial mammals and birds in tropical forest and savannah ecosystems. This component contains broad taxonomic groups that are well described and represent the upper strata of trophic levels. They often exert top-down control of ecosystems, and are sensitive to habitat loss and deterioration, and exploitation. Camera trapping is an efficient method of monitoring diurnal and nocturnal communities of rainforest and savannah animals, detecting species that are cryptic, avoid humans, and occur at lower density than other methods. WPI has been designed to meet the needs of a CBD indicator while avoiding many of the pitfalls that characterize use of secondary data sources or expert opinions. We present a rainforest example from Sumatra, Indonesia, to show that the WPI is capable of detecting changes in the rate of loss of biodiversity over time, a key requirement of a CBD indicator. We also present a savannah example from Laikipia District, Kenya, to illustrate the use of WPI to detect the impact of livestock management on biodiversity. A comparison of WPI sampling to line-transect sampling shows that, in spite of higher start-up costs, WPI is more cost-effective in rainforest and savannah environments. More work is required to determine the robustness of the WPI, but we conclude that the WPI is a useful indicator for monitoring large terrestrial mammals and birds in rainforest and savannah ecosystems and can help fill the gap in knowledge about trends in tropical biodiversity.

The Living Planet Index

Ben Collen, Jonathan Loh, Louise McRae & Julia Latham, Institute of Zoology, Zoological Society of London, UK

Indicators of species population trends are arguably some of the most sensitive and useful measures of change in biodiversity status. The Living Planet Index measures aggregated population trends among vertebrate species across all biomes and biogeographic regions of the world. In this talk we describe the methods, including the use of generalized additive models and in aggregating large quantities of time-series population data, used to produce indices that assess trends in biodiversity geographically, taxonomically, ecologically, or by thematic area. This indicator reveals patterns of declining abundance across vertebrate species over the past 35 years. It shows that over a period of time in which the human population has doubled, animal populations have declined on average by 30%. Decline rates in tropical regions are more severe than those seen in temperate regions and taxonomic differences are apparent. We evaluate the potential to produce regional and national indices from this global dataset and assess bias that results from the availability of data on population trends. Our results show strengths in length and completeness of time-series, little evidence of bias toward threatened species, and the possibility of disaggregation into meaningful subsets. However, limitations of the dataset are apparent, in particular the dominance of bird data and geographical gaps in the tropics. Population-trend data complement the more comprehensive, but more coarse-grained, perspectives gained by evaluating species-level extinction risk. To measure progress towards and beyond the Biodiversity Convention's 2010 target, indicators must be improved and strategically supplemented with new data, particularly on less well-studied taxa, regions and ecosystems.

SESSION II: THE STATE OF BIODIVERSITY: INDICES OF THREATS AND DRIVERS

Chair: Matthew Hatchwell (Wildlife Conservation Society)

The human and ecological footprints: measures of consumption and development

Eric Sanderson, Landscape Ecology & Geographic Analysis Program, Wildlife Conservation Society, USA

Perhaps the most important component of biodiversity to monitor is us, the human species. Many if not all of the current threats to biodiversity can be traced back to the ever-expanding, ever-ravenous, ever-developing human population, currently standing at 6.7 billion individuals and expected to reach 8–10 billion by the close of the 21st century. Two key measures of human impact on the biosphere are denoted metaphorically as footprints: the human footprint map and the ecological footprint calculation. The human footprint map is a map of the collective human influence on the planet, derived by summing spatial measures of human influence on the land (e.g. population density, land use, access from roads, rivers and rail, power use) and in the oceans (e.g. reductions in biomass – mainly fishing, physical alteration of habitats, pollution, biological introductions, climate change). The human footprint shows the sum total of human influence on the planet and how it is distributed but cannot be traced back to any one individual. The ecological footprint, in contrast, is a calculation at the individual level. It begins with the consumption patterns of an individual, evaluated through a set of questions and premised within the culture where that person lives. From the answers, a calculation is made about how much “productive area” a person needs to support them (in my case, 26.6 global acres according to a representative Internet calculator.)

What is currently missing is a way to connect these two kinds of footprints – the individualized ecological footprint and the generalized human footprint – into a unified map-calculation that would enable one person to see not only how much land and water they need but also, crucially, where it is allocated, and thus how it impacts on biodiversity. The first step in making this connection requires bringing statistics from economic geography into the calculation of both footprints, so that we can measure national-level consumption patterns not only against their domestic sources, but also their international supply. A spatially aware, personal human footprint could provide a baseline against which gains in sustainable development and improved environmental choices could be monitored, while demonstrating how individual, business and national consumption patterns are connected to wild nature at home and over the horizon.

Satellite data-based indices to monitor land use and habitat

N. Pettorelli, Institute of Zoology, Zoological Society of London

Studying ecosystem responses to increased surface temperature is a major concern of the scientific community. Moreover, human activity has profoundly affected ecosystems so that the need to assess how environmental changes might affect the distributions and dynamics of vegetation and animal populations has become increasingly important to terrestrial ecologists. Field data currently available are generally difficult to use for assessing or predicting regional or global land-use and habitat changes because such data are traditionally collected at small spatial and temporal scales, and vary in their type and reliability. In this context, satellite imagery has become a potential “goldmine” for ecologists.

Satellite data can indeed provide valuable information regarding land-use changes, primary productivity changes, phenological changes, or regarding the spatial distribution of human disturbances (e.g. night-time light brightness, human footprint). Satellite-based indices, such as the Normalized Difference Vegetation Index (NDVI), have proven successful to help detect temporal and spatial trends, and variation in vegetation distribution, productivity and dynamics, allowing monitoring of habitat degradation and fragmentation, or the ecological effects of climatic disasters such as drought or fire. NDVI has also given ecologists a promising way to couple vegetation with animal distribution, abundance, movement, performance or population dynamics. Satellite-based information is generally freely and globally available, and at various spatial and temporal resolutions. Climatic models can be used to predict spatiotemporal changes in satellite-based estimates of primary productivity, potentially enabling ecologists to forecast how environmental changes might affect habitats and wildlife.

Indices of climate change impacts on biodiversity

Wendy Foden¹ & Georgina Mace²

¹Species Programme, IUCN; ²NERC Centre for Population Biology, Imperial College London

Despite the clear need for indicators of climate change impacts on biodiversity by a range of International Treatise including the Convention on Biological Diversity, few currently exist. Such indicators are important for providing accessible summaries of both the magnitude and mechanisms of such impacts, and are needed both for developing appropriate mitigation and adaptation responses, and for monitoring them.

We highlight examples of emerging national and regional approaches to climate change indicator development, including those for European birds, European butterflies and alpine plants. At a global scale, however, trends in certain migratory species make up the only published approach. We discuss plans for incorporating climate change driven extinction risk into Red Listing guidelines, thereby allowing the use of the Red List Index approach to track climate change impacts on global biodiversity. We also present a newly developed Species Vulnerability to Climate Change approach for assessing the relative vulnerability of individual species to climate change, based on measures of climate change susceptibility, adaptability and exposure. Illustrated by preliminary results for global birds, amphibians and corals, we suggest ways in which this approach could be adapted to serve as a global indicator of climate change impacts on species.

Indices of invasion: how to monitor invasive alien species

Piero Genovesi¹ & David B. Roy²

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Biological invasions are a major and increasing threat to biodiversity, and have been identified as the most important factor causing extinction of species in the last two centuries. There are growing global commitments to prevent and mitigate the impacts caused by invasive alien species with increased efforts to identify trends in invasion, to monitor response actions carried out by states and institutions, and to detect the efficacy of these policies. For example, the Millennium Ecosystem Assessment has addressed the threats posed by invasive alien species to the diversity of life, the Convention on Biological Diversity has included invasions as one of the only two indicators of threat to biodiversity, and Europe

has developed the indicator-based assessment of its biodiversity - SEBI2010 - that includes invasive alien species as a key measure.

Despite these efforts, work towards monitoring biological invasions continues to face many technical challenges. Invasions are a global phenomenon and monitoring techniques must encompass all environments (from marine, to freshwater and terrestrial) and taxonomic groups (from plants to animals, from vertebrates to invertebrates, etc). The assessment of invasions is also hampered by ambiguity in the definition of 'invasive' and lack of standardisation within the monitoring data that underpins the development of reliable indicators. Also, more so than for other indicators, is the critical need to extend invasive species monitoring beyond the biological patterns (number of invaders and geographic patterns of spread), to include the impacts they cause (threats to endangered species but also economic losses and human health impacts, etc), and information to enhance better responses (pathways of arrival, geographic origin of invaders, correlates of establishment success, etc). Furthermore, with increasing effort devoted to identifying alien species, effective indicators need to account for sampling effort biases

In this presentation we review ongoing global efforts to develop an indicator of trends in invasive species. We discuss the different datasets available to monitor invasions and responses, with a review of their strengths and weaknesses. We suggest approaches to the future development of large-scale monitoring of biological invasions, with increased emphasis on enhancing the global ability to prevent and respond to invasions. For example, identifying key areas or pathways for surveillance, and producing alarm lists for prevention and rapid response, are key tools for the development of effective policies to tackle the growing threat of biological invasions.

Indices of disease: how to monitor invasive pathogens

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Invasive pathogens have been a cause of considerable concern for conservation and are proposed as the cause of population declines in a taxonomically wide range of species and, in a few cases, the proximate cause of extinction. Transmission of generalist pathogens among wildlife, human and domestic-animal populations also affects livestock production, rural livelihoods, land-use conflicts and land-use strategies, public health and wildlife tourism, which have important implications for the conservation management of protected areas.

Attempts to collate information on wildlife diseases are few, and where monitoring and surveillance schemes have been implemented, approaches have often focused on diseases of concern to public health and the livestock industry, exemplified by the enormous recent efforts invested in avian influenza. Much less attention has been paid to infections that primarily affect biodiversity conservation. However, over the past decade, several national and international monitoring and reporting systems have been established to try to capture major wildlife disease events, including the U. S. Geological Survey (USGS) wildlife disease mortality event table, World Organization for Animal Health (OIE) disease reporting system, and Canada's National Wildlife Disease Surveillance Strategy. In the UK, monitoring and surveillance strategies have tended to focus on specific taxonomic groups (e.g. marine mammals, amphibians and garden birds).

One of the key issues surrounding this subject is the quantity and quality of data on most aspects of the diseases of concern in wildlife, and the challenges and costs of gathering

reliable data. Monitoring and surveillance of wildlife pathogens pose a particular suite of problems. Detection of pathogens in free-living wildlife is notoriously difficult, hampered by the enormous practical problems of finding, collecting and storing appropriate samples under field conditions, as well as the lack of species-specific diagnostic tests. Even where numerator data can be obtained (e.g. cases of infection, morbidity or mortality), reliable denominator data are rarely available to determine epidemiological indices, such as incidence, prevalence and case-fatality rates. We also need to be mindful that pathogen monitoring itself cannot solve the problems associated with these diseases. Decisions about whether and how to implement appropriate, timely and effective responses to wildlife surveillance data are often complex and the capacity to implement prevention and control measures in wildlife are often limited.

In this presentation, we discuss the current approaches to collation and dissemination of disease monitoring and surveillance data, review the different indices that can be used for monitoring and surveillance of invasive pathogens of wildlife, including case-incidence and prevalence data, serological and age-seroprevalence data, population abundance and demographic indicators. We describe different approaches that have been used to generate these indices, including pathogen and disease detection methods, phylogenetic analyses, population monitoring, epidemiological modelling, sentinel surveillance, household and community surveys, hospital surveys and risk monitoring. We illustrate the practical application of these tools with reference to the monitoring and surveillance of two diseases threatening endangered carnivores, canine distemper virus and rabies.

Exploitation: developing national indices of wildlife trade

Rosamunde Almond¹ & Elizabeth Bennett²

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Wild animals and plants are essential for human livelihoods and well-being, and as the world's population increases, our use is having a greater and greater impact on both the species being targeted and the ecosystems in which they live. In order that wild species meet our present needs without compromising the needs of future generations, it is vital that these species are used in a biologically sustainable way. Indicators which track changes in the impact of use on wild populations and wildlife trade are useful tools in assessing how well we are balancing the conservation of species and ecosystems with the needs of people. There are a number of well-developed sustainable-use indicators for specific sectors, such as forestry and marine fisheries. However, the use of wild species extends far beyond these resources and millions of individual plants and animals from tens of thousands of species are traded every year. Currently, several new indicators are being developed which focus on the changes in status and the impact of use on a broad range of utilised terrestrial, freshwater and marine species. At a global scale, these indicators will give a broad picture of changes in these species, and will add information on drivers and pressures to existing population and species-based indicators. In parallel with these global overviews, it is also essential that we build up a picture of what, where and how people are using wild species at a national level. Indicators have the potential to provide information that allows countries to both prioritise efforts to address potential threats and incorporate information on use and trade into policy and decision making processes. Indicators of exploitation are primarily population and species based, and therefore are ideally suited to being scaled to a regional or national level. In this talk we will provide an overview of the existing and newly developed indicators of

exploitation, and the potential ways in which these indicators can be applied to a national and regional level.

SESSION III: THE NEXT GENERATION OF BIODIVERSITY INDICES

Chair: Stuart Butchart (BirdLife International)

Biodiversity indicators: new approaches and measures

Georgina Mace, NERC Centre for Population Biology, Imperial College London, UK

The 2010 biodiversity target was a bold and commendable step and has generated much interest and activity. In order to build on it and the other areas of science and policy that have developed over the past 10 years, the next phase should shift away from a static target assessed largely through using available data, and towards a process to develop and track a smaller number of more specific, relevant targets related to avoiding dangerous biodiversity change. I will present some possible formulations and ideas for what these new targets might be.

Indicator Bats Program: using bats as indicators of sustainable development across Eastern Europe

Kate E. Jones¹, Colin Catto², Alanna Maltby¹, Ivan Pandourski³, Jon A. Russ², Abigel Szodoray-Paradi⁴, Farkas Szodoray-Paradi⁴, Elena Tilova⁵ and Charlotte Walters¹

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Bats have the potential to be useful biodiversity monitoring indicator species as they are distributed widely, use a wide range of landscapes and play an important role in ecosystem functioning (controlling insect populations, pollination and dispersing seeds) and their population declines reflect changes in climate, water quality and agricultural practices. However, attempts to establish bats as indicator species are hampered by the lack of basic information on how species abundances and distributions change in response to global change. Here we present the progress in establishing national bat monitoring programmes in Romania, Bulgaria and Hungary as part of the Indicator Bats Program (iBats). iBats was set up in 2006 as a partnership project between the Zoological Society of London, the Bat Conservation Trust and a number of national NGOs across the world. Using a network of over 300 volunteers, iBats in Eastern Europe has generated distributions and abundances of 14 bat species from over 6000 acoustic records collected along road transects between 2006–2008. We discuss the monitoring and volunteer management techniques established in Eastern Europe (based on the UK's National Bat Monitoring Program) and the novel web-enabled data and project-management systems developed to manage this citizen science project. We present the results to date, and compare relative species abundance rates with the UK, Ireland and France. We also examine the potential of the project to provide regional biodiversity monitoring statistics to meet national and regional obligations to the Convention on Biological Diversity.

Socio-economic monitoring in conservation projects

Tom Clements, Research and Policy Advisor, TransLinks, Wildlife Conservation Society, USA, and University of Cambridge, UK

Recent debates about the impacts of conservation on local people have highlighted the importance of social monitoring in order to improve implementation and to provide evidence to inform policy debates. The World Parks Congress in 2003 laid out a basic standard: "Protected areas should strive to contribute to poverty reduction at the local level, and at the very minimum must not contribute to or exacerbate poverty". Social monitoring is, however, far from straightforward. As with biodiversity monitoring, a wide range of measurement indicators exist. Poverty, for example, can be defined restrictively in terms of income (less than \$1 per day in purchasing power parity) or more broadly in terms of mortality rates or longevity, literacy and GDP per capita (Human Development Index of United Nations Development Programme (UNDP)). Definitions of livelihoods extend this further to include access to land and natural resources, social relationships, vulnerability and access to services, all of which might be affected (positively or negatively) by conservation. Other factors, such as population growth rates or levels of in-migration, might also be important to measure. Finally, conservation projects are often ultimately most concerned with local attitudes and support for conservation interventions, which can be measured through attitude surveys and participatory impact assessments.

A wide range of methods and tools exist, ranging from highly quantitative exhaustive household surveys, such as the World Bank Living Standards Measurement Surveys which have 450 questions, to participatory assessment techniques that focus on local perceptions and reported behaviours. The choice of method will depend on a variety of factors including the types of indicators and results that are to be monitored, and the extent to which results are to be compared between sites. Three examples include: a highly quantitative household survey modelled on the World Bank standards used to measure the social impacts of new protected areas created in Gabon, a less comprehensive quantitative approach that includes participatory measure of local poverty lines, and participatory impact assessment focusing on local attitudes to conservation.

Occupancy methods for conservation management: loris and amphibian monitoring in Sri Lanka

Darryl I. MacKenzie¹ & James T. Reardon²

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Obtaining reliable information on the abundance of individuals within an area can be prohibitively expensive for conservation programmes. Alternative metrics that could be considered to describe the current state of the system include proportion of area occupied by a species (PAO) and number of species within an area, or species richness (SR). Which metric is more appropriate will depend on whether the programme has a single- or multiple-species focus. Field methodologies for these alternative metrics are generally less intensive than when focusing on true abundance or density of individuals over the same area, hence preferable for application in management circumstances where resources are limited or access to technically competent staff is a challenge.

A key practical consideration is imperfect detection: a species might be present at a location yet go undetected during monitoring resulting in underestimation of PAO and SR. Occupancy methods are useful statistical tools that could be applied to either PAO or SR

explicitly to account for imperfect detection. They not only enable improved estimation of PAO or SR, they also provide a robust framework for assessing the influence of factors such as habitat type or management actions. Changes in these alternative metrics through time can also be investigated with these methods. Recently, occupancy methods have been extended beyond binary-type data (i.e. presence or absence of a species at a location) to situations where the status of a species might be categorical (e.g. relative abundance: none/some/many individuals). In order to account for imperfect detection, a key requirement of these methods is that the monitoring programme is designed such that there are repeated opportunities of detecting the species at each location within a relatively short timeframe.

Here we illustrate some of the potential uses, limitations and design issues by considering the planned application of occupancy methods to loris and amphibian monitoring in Sri Lanka.

Building sustainable national monitoring networks

Sarah M. Durant^{1,2,3}, Maurus Msuha^{1,2}, Charles Foley^{2,3} & Simon Mduma²

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If countries are to be accountable for biodiversity conservation within their borders it is necessary for biodiversity monitoring to be reported at the national level. This is important, not only to identify areas of biodiversity loss and conservation success, but also to identify areas where outside support is needed, particularly in the case of developing countries with few resources. Countries also need to meet reporting obligations to international biodiversity conventions. There is therefore a need for sustainable biodiversity monitoring to be institutionalised at a national level. This presentation outlines important considerations in the achievement of such a monitoring strategy. There are six key components of monitoring that should be considered: monitoring design, data collection, database management, data analysis, data dissemination and capacity development. All these have practical constraints, for example, there may be little point in designing a plan to cover all taxa if resources can only stretch to monitoring a subsection of taxa, or in using highly technical methods if it is impossible to train sufficient people in these methods to ensure implementation. Finally, a monitoring plan needs to take into account the national institutional and human environment. An examination of national programs of monitoring of taxa of medium to large mammals in Tanzania is used as a case study. Three approaches have been taken: aerial surveys of national parks and game reserves initiated in 1957; distribution mapping using a volunteer network of data contributors initiated in 2002; camera trap surveys initiated in 2004. The volunteer network provided limited coverage, mainly of the northern sector which is the focus of the tourist circuit. This suggests that, whilst volunteer networks can provide important data (for guiding national conservation action planning exercises and in engaging a wide set of stakeholders), they are unlikely to be sufficient on their own in developing countries which generally have a limited network of willing volunteer naturalists or conservationists able to contribute data. Instead, in the short term, this approach needs to be supported by additional methods carried out by wildlife professionals, such as those already implemented in Tanzania. However, because most current survey activity focuses on protected areas, there may be a need to monitor biodiversity outside the protected-area system. One potential way of doing this is by making use of data generated by a rapidly increasing community-based monitoring sector.

SESSION IV: IMPLEMENTATION, COMMUNICATION AND PERSPECTIVES

Chair: Eimear Nic Lughadha (Royal Botanic Gardens, Kew)

Current international frameworks and commitments for biodiversity conservation: the costs and benefits for national governments

Linda Krueger, Vice President for Policy, Wildlife Conservation Society, USA

Current frameworks for implementation and review of the biodiversity related conventions, particularly the Convention on Biological Diversity (CBD), are inadequate for evaluating treaty compliance and effectiveness. One cause is that the CBD is an umbrella convention and, as such, does not contain explicit commitments that would provide legal frameworks to inspire nations to comply with overall objectives. Though countries rarely sign onto treaties they don't intend to implement, the absence of binding protocols (such as Montreal Protocol under the Vienna Convention or the Kyoto Protocol under the Climate Change Convention) reduces the incentive of countries to prioritise implementation of the CBD in their national agendas. The development of targets and indicators is one way to obviate the lack of more formal implementation systems, but such a system will carry the additional burden for being unsupported by legal commitments in an underlying protocol.

In the absence of a binding protocol, targets and indicators can provide a "soft law" implementation of the biodiversity regime. While this presents a challenge, there are a number of studies that suggest that soft law can over time be highly effective at changing norms and behaviors. Developing an implementation and review mechanism for biodiversity around effective use of targets and indicators is possible through the construction of an epistemic community responsible for delivering on biodiversity assessments. Though biodiversity needs to be assessed at multiple scales from local to global, the most important level of analysis from the standpoint of improving compliance (meaning consistency between international commitments and domestic policies) is the national level. Targets and indicators that are relevant to national decision makers and that must and can be developed at the national level bestow authority, and officials and scientists responsible for delivering this knowledge can build more robust domestic constituencies for biodiversity conservation.

The very language of benefits as conceived in the CBD creates a faulty paradigm for assessing costs and benefits. In the CBD the concept of benefit was derived from the potential commercialization of biodiversity through access to its genetic resources—an approach that has yielded little in terms of actual gains for either governments or communities. Conservation scientists generally approach biodiversity benefits in terms of a global public good, increasingly with attempts to value ecosystem services as the ultimate "indicator". These divergent norms within and among the biodiversity treaties [the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) being another example in its tension between conservation and sustainable use] hinder implementation and reduce incentives for many developing nations to divert scarce resources to carry out conservation monitoring frameworks.

Beyond the terrestrial environment: monitoring marine ecosystems

Ray Hilborn¹, Boris Worm² & Trevor Branch

¹School of Aquatic and Fishery Sciences, University of Washington, USA;

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Marine ecosystems contain much of the world's biodiversity and while they have been historically less impacted by humans than terrestrial systems, the impacts are nevertheless significant and growing. Global warming and ocean acidification promise dramatic changes in the future, with the potential for loss of most coral reefs and the majority of species that depend upon calcium-based shells. Marine biodiversity can be monitored by a wide range of technologies, including visual observation via cameras or divers, quadrat sampling, tagging, acoustics and use of fishing gear.

Because of the commercial importance of fish, many countries have engaged in long-term systematic sampling of their continental shelf ecosystems within their Exclusive Economic Zone (EEZ). Some data from these surveys are available from the early 20th century, and many series have been conducted annually for over 40 years, and provide quite detailed records of the trends in abundance and diversity of these ecosystems.

We assembled 20 datasets from North America, Europe, Australia and Thailand. When the surveys were available when fishing began, the total abundance typically declines significantly with the onset of fishing, and relative species composition changes significantly. There are no detectable changes in diversity indices. Most of the datasets began after fisheries had been long established, and do not show the initial impacts of fishing. In these ecosystems we found remarkable stability of total abundance and the species of different size. In a meta analysis of all the data we found no significant trends in abundance since 1980.

These surveys are largely limited to the demersal fish communities of continental shelves, and provide no information on many important ecosystems including coral reefs, deep ocean and pelagic fish communities. We discuss the prospects for monitoring the biodiversity of these systems.

Finding the balance: how much biodiversity monitoring is enough? Bridging the gap between scientific ideals and conservation management imperatives

Sultana Bashir

In a world of growing environmental problems, limited resources and competing conservation and development priorities, decisions have to be made about how much is invested in biodiversity monitoring and how much in conservation action. Although biodiversity monitoring is essential for effective conservation management, there are many barriers to the comprehensive biodiversity monitoring required of countries that have ratified the Convention on Biological Diversity (CBD). Many of the barriers to biodiversity monitoring are discussed in other presentations. When considered together, these suggest that we will only have effective biodiversity monitoring and adaptive conservation management, when countries value biodiversity enough to invest adequately in these activities and, as a result, biodiversity monitoring becomes properly institutionalized. This is likely to take a long time. Meanwhile, there is need for urgent action to address environmental problems, which are multiplying and becoming more severe. It therefore seems imperative to: (a) be more pragmatic and targeted in how we approach biodiversity monitoring and environmental information demands on countries, and (b) make better use of existing opportunities for biodiversity monitoring, by seeking out new partnerships and collaborations to both maximize the utility of existing

monitoring efforts and to overcome some the key local barriers to biodiversity monitoring and effective conservation action.

This presentation explores these issues further, based on the insights gained by the author between 2004 and 2009 from working with a diverse set of biodiversity projects co-financed by the Global Environment Facility (GEF) and implemented through United Nations Development Programme (UNDP) in Asia-Pacific. These projects are significant because they are designed to meet internationally agreed biodiversity conservation objectives and targets, including the 2010 targets, as the GEF derives its mandate and objectives from the CBD and the guidance of the Conference of the Parties. Furthermore, the GEF is a major financier of global biodiversity conservation, particularly in developing countries, and contributed an estimated US\$1.7 billion to biodiversity projects around the world between 1991 and 2003.

Based on a review of case studies of monitoring and evaluation (M&E) at the project level, including biodiversity monitoring, and GEF, UNDP and other broader reviews of M&E of GEF projects, the talk concludes that some of the key barriers to effective M&E at the field level, could be overcome through a combination of more pragmatic and targeted approaches to monitoring, management of donor and scientists' expectations, capacity development of conservation practitioners and managers on the ground, and stronger collaborations with research institutions and the international conservation community. Generally, there is a need for greater understanding of field realities by the broader international scientific community and donors and a need to simplify our approaches to M&E: perhaps do less, but do it better.

It should be noted that the views put forward in this presentation are solely those of the author, and not of any agency or institution mentioned, unless otherwise stated.

¹The GEF is the financial mechanism for several multilateral environmental agreements, including the Convention on Biological Diversity (CBD), the UN Framework Convention on Climate Change, the Stockholm Convention on Persistent Organic Pollutants, and the United Nations Convention to Combat Desertification. Additionally, the GEF provides operational guidance for activities relating to international waters and ozone, the latter in line with the Montreal Protocol on Substances that Deplete the Ozone Layer and its amendments.

Scaling up or down? Linking global and national biodiversity indicators and reporting

Philip Bubb, Senior Programme Officer, Ecosystem Assessment Programme, UNEP-WCMC, UK. E-mail: philip.bubb@unep-wcmc.org

There are two main scales and drivers for the production of biodiversity indicators, the global and the national, as well as some regional processes. However, in many cases the global and national development and use of biodiversity indicators are poorly connected. UNEP-World Conservation Monitoring Centre is the secretariat for the 2010 Biodiversity Indicators Partnership, which includes supporting linkages between global and national biodiversity indicators. This presentation looks at why there are only limited linkages between these scales of work, and how international organisations could encourage more effective national-level indicators and monitoring.

One reason for limited global-national linkages is that the two scales of operation are designed to meet rather different needs and users. Global-scale biodiversity indicators are sought for guiding strategic issues of international processes, such as the Convention on Biological Diversity (CBD), as well as for raising understanding and actions of topics promoted by particular interest groups, such as for threatened species. National-scale indicators may be produced as part of assessments and strategic planning, such as for National Biodiversity Strategies and Action Plans (NBSAPs), and sometimes for reporting to international agreements such as the CBD. However, the motivations for regular calculation of

national indicators tied to monitoring systems are usually weak unless they are for subjects of economic importance.

Other challenges for the application of many global-scale indicators at the national level include, conceptual difficulties in using some indicator topics and data at different scales, different classifications of data across regions and scales, and countries usually do not want indicators to be used for comparisons across countries.

The majority of biodiversity conservation strategies and actions are developed at the national to local scales. Commonly reported obstacles to the use of biodiversity indicators at these scales include lack of data and monitoring capacity, and lack of understanding of biodiversity concepts and issues amongst policy makers and the public. Poor scientific understanding of biodiversity concepts can also occur amongst the technicians who choose and produce indicators, and now also extends to the topic of ecosystem services. Perhaps a more fundamental constraint in some countries can be a weak information or evidence-based culture for decision-making, of which indicators are a part.

International organisations could encourage more effective national-level indicators by supporting the development of indicators as part of information management systems designed to meet priority national needs, including monitoring systems. For indicators to be produced on a regular basis they require a 'champion' organisation to be responsible for them, whether government or NGO, and international support can help develop such capacity.

How do we ensure that biodiversity monitoring and conservation is incorporated into national and global priorities?

Simon N. Stuart, IUCN Species Survival Commission, UK

The world's political leaders have set various national, regional and global targets in relation to the conservation of biodiversity, including the 2010 Biodiversity Target of the Convention on Biological Diversity, and the 2015 UN Millennium Development Goal 7 on Environmental Sustainability. However, despite modest increases in the overall funding available to biodiversity conservation over recent years, the mismatch between the funding needed (for both monitoring and conservation) and the funding available is massive. Furthermore, this gap is probably growing as the biodiversity crisis grows ever more serious.

A trend in the last few years has been to emphasise the link between biodiversity and ecosystem services, with the expectation being that if only senior decision-makers could be convinced of this argument, suddenly the funding taps will be turned on. Experience suggests that such thinking is naïve. Arguments based on ecosystem services go back at least as far as the 1972 UN Conference on the Human Environment, and they form the basis of the excellent Millennium Ecosystem Assessment released in 2005. There is no evidence that decision-makers have been captivated by this line of thinking, even though much of it is scientifically valid. Indeed, the powers that be have had over 30 years to respond to the logic of safeguarding ecosystems services, and all the evidence shows that they have not.

So we clearly need new thinking on how we might incorporate biodiversity monitoring and conservation fully into national and global priorities. There is probably no single answer, but the following are ideas to explore:

1. Demonstrating that the cost of inaction in terms of conservation is likely to be much greater than the cost of action. This is to some extent the focus of TEEB (The Economics of Ecosystems and Biodiversity) but to argue the point successfully, TEEB is going to have to deploy the highest-calibre and hardest-nosed scientists and economists, or it will be dismissed as another well-meaning academic study.

2. Creating dependence on biodiversity data. Biodiversity monitoring could be put on a sustainable footing if the use of biodiversity data could become a requirement in the implementation of national legislation, and in the execution of environmental impact assessments, and in the monitoring and evaluation of the impacts of national and international agencies.
3. Getting over our embarrassment with species. Some of the greatest opposition to a species focus in conservation comes from within conservation organisations. Yet time and again it has been shown that people relate to species, not to concepts like ecosystems services. Governments in the end respond to public opinion, and it is time for the conservation community as a whole to mobilise public opinion around the extinction crisis.

CONCLUSIONS AND SUMMING UP

Chair: Tim Blackburn (Institute of Zoology, ZSL)

ABSTRACTS TO POSTERS

TESS: a transactional “glocal” approach to biodiversity monitoring (and not only monitoring)

Stratos Arampatzis¹, Robert Kenward², Basil Manos³ & Jason Papathanasiou⁴

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Europe is losing biodiversity and the ability to provide ecosystem services. In response to this, formal “top-down” conservation measures protect 17% of EU land. However, most changes in land-use and biodiversity result from decisions made by individual local stakeholders who manage land and species. These individuals make myriad informal decisions within a loose envelope of regulations, based mainly on finance and local factors. These decisions summate to change the environment we all live in. However, there is currently little opportunity to monitor how these informal decisions impact biodiversity, or to steer them towards conservation.

We seek to complement formal conservation measures with an internet-based Transactional Environmental Support System (TESS) that:

(a) mobilises local communities to collect information on the state of biodiversity in their areas, collates all ways to leverage biodiversity enhancement, uses models to predict economic & biodiversity impacts of small-scale actions, and delivers context-adaptive decision support, so that local people can optimise incomes from ecosystem services, in exchange for

(b) information on their decisions, and monitored results, which integrate to support decisions of central assessors for adaptive governance (regulations & fiscal incentives) and thus to guide central policy in relation to biodiversity conservation.

TESS is currently being designed with the support of the European Commission (FP7-Environment programme, grant agreement no. 212304, www.tess-project.eu), with the goal to enable policy makers to integrate knowledge from the regional and local level into the decision making process, while also encouraging local people to maintain & restore biodiversity & ecosystem services.

Global status of plant conservation and priority areas for local action

Neil Brummitt, Steven Bachman, Sara Contu, Florence Ramond-Monnier, Christine Loftus, Hannah Thacker & Philippa Dyson, Royal Botanic Gardens, Kew. E-mail: n.brummitt@kew.org

The scale of the global biodiversity crisis means that international efforts to identify, conserve and monitor threatened species must be carried out at a greater speed than ever. This is especially true for plants, with currently only 3% of species worldwide assessed and on the IUCN Red List. These are a miscellaneous collection of species thought a priori to be Threatened, or which come under remit of a particular Specialist Group. Information technology presents an opportunity to speed up the production of species conservation assessments, and methods and prospects for this are presented through work being conducted at the Royal Botanic Gardens, Kew, on assessments of a representative sample of plants for the IUCN Sampled Red List Index (SRLI). For the first time we are able to give an objective assessment of the global number of Threatened plant species (24%) and, furthermore, since the assessments are ultimately based on verified and geo-referenced herbarium specimen data, we can explicitly tie biodiversity monitoring and conservation efforts to local priorities. A global map of these priorities for Threatened plant species conservation is also presented here, again for the first time, from the plant SRLI data. There is an obvious need for an internationally agreed, comparable, authoritative system, such as the Red List, but in addition more efficient techniques can also be developed within the Red List framework to supplement the existing approach and meet the global demand for plant conservation assessments.

BICCO-Net: the Biodiversity Impacts of Climate Change Observation Network

Dan Chamberlain¹, David Roy², Steve Willis³, James Bell⁴, Alice Broome⁵, Karen Haysom⁶ & Trevor Dines⁷

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Climate change is projected to have substantial impacts on wildlife and their habitats in the UK over the coming century. Much of the evidence for this is obtained by relating wildlife and habitat distributions to existing climate. A considerable range of biodiversity monitoring schemes exists, which provides data of potential use in assessing the effects of climate change on UK biodiversity. However, there is no current centralised collation and reporting structure in place for the provision of this information to policy-makers. The BICCO-Net project has, for the first time, collated the best UK biodiversity monitoring datasets, and analysed and interpreted them in a consistent way in relation to climate change impacts. The project covers a wide range of taxa, including aphids, bats, birds, butterflies, common plants, larger mammals, moths and trees. Using a combination of statistical analysis and qualitative assessment, the project will identify those species, communities and habitats that are most likely to be impacted by climate change in the UK.

Output from BICCO-Net will inform the development of adaptation strategies by enabling an adaptive management approach, refining techniques in the light of emerging evidence. The findings of the project will thus have a significant influence on climate change adaptation policy and future strategies for monitoring climate change impacts.

This poster will provide an outline of this important project, still in its early stages, and give some examples of the kind of outputs that will be produced as the project evolves.

The role of natural history museums in animal conservation research, with particular reference to amphibian conservation

Barry T. Clarke

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Conservation research typically involves field investigations to monitor population numbers and identify factors involved in declines in endangered species. Museum collections, museum curators and researchers are also a source of data and expertise relevant to conservation. National collections, like those in The Natural History Museum, London, are a major source of data on basic animal biology. Information on distribution, behaviour, habitat preferences and breeding biology, etc., are critical to the success of conservation management programmes, including captive breeding programmes. Museums are primary centres for facilitating species' identification, an essential part of the successful communication of biological information.

Modern museum collections-based research and conservation biology treat wildlife as an irreplaceable, valuable resource. There are parallels between the need to preserve museum specimens for use by future generations of biologists, and conservation research on endangered species. The use and development of non-invasive, non-destructive methods in both areas of research are outlined. Sampling museum specimens for DNA sequencing and fingerprinting provides a conservation-friendly alternative to sampling species in the field. Insights into the origins of emerging infectious diseases, like chytridiomycosis in amphibians, may also be obtained from museum specimens, using a new non-invasive sampling method (Soto-Azat, Clarke, Fisher, Walker and Cunningham, in press, *Diseases of Aquatic Organisms*). Recent research has shown the earliest incidence of chytrid infection in museum specimens of African Clawed frogs (*Xenopus* spp.) to be 5 years earlier than suggested by previous records (1933 instead of 1938) and pan-African in distribution at that time rather than confined to southern Africa.

The Living Planet Index: taking the pulse of the planet

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The task of measuring the decline of global biodiversity, and instituting changes to halt and reverse this downturn, has been taken up by the scientific community in response to the Convention on Biological Diversity's (CBD) 2010 target. It is an undertaking made more difficult by the complex nature of biodiversity, and the consequent difficulty in gauging its depletion. Measuring change in population abundance over time can provide sensitive and easily communicable indicators of the rate of change of biodiversity, to address whether or not the 2010 target has been achieved.

Given that the CBD is implemented from the national and regional level within a global framework, one of the key challenges is engaging data-holding networks to mobilize information and ensuring the greatest possible coverage at national, regional and global levels. In this poster we demonstrate how population based indicators such as the Living Planet Index (LPI) can be implemented at regional and national level, and present how we intend to develop the LPI indicators to create more extensive networks and to make data freely available.

The poster demonstrates the ability of the LPI method to measure trends in:

- vertebrate taxa
- terrestrial, freshwater and marine biomes
- biogeographic realms
- selected groups of species
- countries and regions

Tackling data deficiency in the SRLI

Sara Contu & Neil Brummitt
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The IUCN Sampled Red List Index (SRLI) for plants project at the Royal Botanic Gardens, Kew, has already completed conservation status assessments for African species. Assessments are generally based on a preliminary GIS range analysis under Criterion B, but Data Deficient (DD) species with less than three specimens are a large and problematic proportion of the SRLI sample (>30%). However, each species has at least the type specimen, and herbarium specimens provide important locality notes so that even without current information on population trends and dynamics, locality information can be used as the starting point for planning field surveys. A high proportion of DD species in areas with a high proportion of threatened species turn out to also be threatened after fieldwork and additional research.

This poster presents a detailed analysis, incorporating further research and full IUCN assessments for species which are DD under their Extent of Occurrence (EOO), of preliminary-DD species as a proportion of all threatened species and of total diversity within individual areas and ecosystems in Africa, as a means of deciding which areas require greater monitoring and conservation effort, and which should be given priority in current research. Detailed population surveys of these species will ensure that SRLI data are used at the present time for local biodiversity monitoring, as well as analysing changes in the conservation status of individual species. Results from this approach might also reveal critical regions for further research in other taxonomic groups where the proportion of DD species is high.

Large mammal population declines in Africa's protected areas

Ian Craigie^{1,2}, Jonathan Baillie³, Andrew Balmford², Chris Carbone¹, Ben Collen¹ & Rhys Green²
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Protected Areas (PAs) are the cornerstone of global conservation efforts but their performance in retaining their key biodiversity features remains poorly understood. Here, we address this gap using a new database of 583 population time series for 69 species of large mammals in 78 African PAs. Population trends were aggregated to form a multi-species index showing the overall change of population abundance. The index reveals a 45% decline in average population sizes between 1970 and 2005. Indices for different parts of Africa demonstrate large regional differences, with southern African PAs typically maintaining their populations and western African PAs suffering the most severe declines. These results indicate that African PAs have generally failed to mitigate human-induced threats, but with some successes. Further development of our index could be used to help measure future progress against post-2010 targets for reducing biodiversity.

Monitoring woodland biodiversity in relation to population structure and field techniques

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Three woodlands in Britain varying in age were surveyed to measure habitat diversity. This study was conducted to investigate two factors. Firstly, to determine if older woodlands contained higher habitat diversity. Secondly, to establish the difficulties measuring biodiversity, especially alpha diversity, in woodlands. This study produced interesting results. Habitat diversity showed an intermediate age correlation. Interestingly, however, the semi-ancient woodland site contained the least habitat diversity out of all three sites. This pattern highlights concerns for woodland conservation management as younger woodlands may be neglected from conservation schemes but are shown to contain higher diversity than areas that are being conserved. This issue raises concerns both in conservation assessments and conservation practices. In relation to biodiversity measurements three different habitat diversity measurements were used: vegetation diversity, gall diversity and ground-litter diversity. All of these three proxies showed different diversity results. These results highlighted concerns in diversity measurements. Alpha-vegetation diversity was difficult to measure in woodlands. Gall diversity highlighted concerns in data collection. Ground-litter diversity, however, highlighted a potential for ground litter, especially dead-wood diversity, as a key diversity measurement to highlight areas of high biodiversity. Overall this study showed that semi-ancient woodlands do not always contain high diversity and therefore this study suggests that woodland conservation should be reassessed to include younger woodlands. Furthermore, this project also showed the difficulties in measuring biodiversity and how this factor can affect diversity assessments on a local and global scale.

Conserving *Trochus niloticus*, a large, over-exploited marine gastropod

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The topshell *Trochus niloticus*, a large reef gastropod in the Indo-West Pacific Region, has been used as food and its shell as ornaments since prehistoric times. Its commercial value in the manufacture of mother-of-pearl buttons was realized in the early 1900s. Because of its patchy distribution and the high demand for its shell, decades of translocation were carried out, expanding its range. It became

an important source of revenues, but statistics on the volume of exports were often absent or under reported. In many cases, severe stock depletion due to overfishing occurred a few years after harvesting started. Populations have, in many cases, recovered after prohibition of harvesting or the implementation of other conservation initiatives. But this has not occurred in some reef areas.

The Philippines was once a major topshell producer but has failed to manage this very important resource and, although *T. niloticus* was recently designated as threatened species, illegal harvest continues. Topshells inhabit shallow areas and are large and easily seen. They are immobile and have limited larval dispersal, so are vulnerable to overexploitation and poaching. At Tubbataha Reefs Natural Park and World Heritage Site, populations had recovered after a decade of conservation, but declined sharply when poaching started in 2006. Better management of the species requires information on its population biology to determine sustainable harvesting strategies, knowledge of the dynamics of trade and subsistence use, and the development of novel site-specific management regimes to control poaching.

The UK Terrestrial Biodiversity Surveillance Strategy

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This poster introduces the UK Terrestrial Biodiversity Surveillance Strategy. It describes why a strategy to co-ordinate surveillance activity is useful, who it is designed for, what it is, and how it has been used. The Surveillance Strategy has been designed for funders or organisers of surveillance schemes, for people designing or reviewing schemes and for policy makers wanting to know if surveillance can provide the answers to their questions; e.g. if pressures are having an effect on biodiversity. The Surveillance Strategy works by developing tools for comparing needs and solutions, and helping partners to apply them. For example, it has produced comparisons of the surveillance requirements of different drivers (e.g. climate change, EC directives), and has assessed the surveillance in place to meet these requirements. This enables gaps in surveillance activity to be identified and priorities to be established for future action. Examples are given of where the Surveillance Strategy has been put to use; for example, during a review of UK mammal surveillance, and a review of vegetation surveillance.

Co-management approach: a successful story of Baikka beel

Kazi Ahmed Kabir, Imtiaj Hasan & Dil Rowshan

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Despite its small area the inland freshwater fish production of Bangladesh ranks third in the world behind China and India. With extensive rivers and floodplain wetlands of the Ganges-Brahmaputra delta, over half of the country can be termed as wetlands. The floodplains of Bangladesh are one of the world's most important wetlands other than home to hundreds of species of plants, fishes, birds and other wild flora and fauna. The wetlands provide the habitat for over 260 fish species, thousands of local and migrating birds as well as are an important source of income and nutrition for millions of households in rural Bangladesh, especially the poor. Baikka beel is about 100 hectares of wetland in the eastern part of Hail Haor situated about 200 km north-east of the capital city, Dhaka. It was announced as a permanent sanctuary by the Bangladesh government on 1 July 2003 and the project is running successfully by following a co-management approach.

Collaborative management or co-management can be defined as "the collaborative and participatory process of regulatory decision-making among representatives of user-groups, government agencies and research institutes." With the cooperation of the non-governmental organizations the government of Bangladesh is trying to fulfil the dual goal of improving the wetland ecosystems and the livelihood of the resource users by demonstrating the viability of this approach to communities, local government and policy-makers. Rather than solely focusing on fisheries management, the sustainable productivity of all floodplain resources is targeted to increase. The

adopted community-based management is actually a multidisciplinary, multi-sectoral, participatory approach to address declining fisheries and environmental degradation of wetlands in Bangladesh. As a consequence of this approach Baikka beel is now developed as an excellent safe habitat for fishes, birds and wildlife.

How can conservation respond to climate change impacts?

Aylin McNamara¹, Paul Pearce-Kelly¹, Wendy Foden², Deborah Hemming³, Richard Betts³, Professor Barry Brook⁴ and Ove-Hoegh-Guldberg⁵

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There is an urgent need to integrate climate change into conservation strategies in order to increase their long-term viability. Some of the processes in which climate change is being incorporated into conservation strategies include:

- species' experts identifying the traits and characteristics of species that makes them most vulnerable to climate change;
- tools, such as Red List Assessments, are being updated to allow incorporation of species' climate change vulnerability into threat evaluation and management;
- vulnerability and predicted changes are being assessed at different levels including systems level, regional/country levels and habitat levels;
- climate models are being used to assess the impacts on habitat ranges and species composition at different scenarios. Increasing resolution of this work to provide meaningful information for conservation management plans will be a key step.

Reviewing the response options will be key to integrating climate change into conservation, including adaptive management and measures to avoid conservation-action mismatch. There is an imminent need to prioritise key species and habitats for conservation action in a changing climatic situation.

Climate change must also be incorporated into conservation strategy development tools, including Conservation Assessment and Management Plans, and Population and Habitat Viability Assessments, etc. Other essential actions to carry forward include increased capacity building and communication within and between conservation and climate change organisations, prioritisation of action to prevent high emission scenarios, the building of resilience in ecosystems and assisting adaptation in species, habitats and ecosystems to changing climate as a tool for mitigation, buffering impacts and stabilising ecosystem services.

Climate change impacts: biodiversity and conservation considerations

Aylin McNamara¹, Paul Pearce-Kelly¹, Deborah Hemming², Richard Betts², Wendy Foden³ and Professor Barry Brook⁴

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Climate change effects can already be seen with the melting of polar ice caps, recorded rises in air and oceanic temperatures, and rising sea levels. However present emissions of carbon will have much longer-term effects, committing us to further negative impacts, including habitat die-off and alteration, desertification, coastal-habitat flooding, changes in plant productivity, coral bleaching, species assemblage changes and migration-pattern changes.

Pressure for survival of species will come from habitat-level changes with habitat range shifting to higher altitudes, towards the poles and shrinking. Pressure will also occur from species-level changes, including phenological mismatch between inter-dependent species, mismatch of migration patterns among inter-dependent species, increased competition, alien invasive species and

disease risk. These will culminate in a higher risk of species extinctions, as stated by the Intergovernmental Panel on Climate Change.

Ecosystems, and the biodiversity that forms these systems, play a direct role in climate regulation. Biodiversity conservation provides an important opportunity for mitigating, adapting and buffering the impacts of climate change.

Marine and terrestrial ecosystems not only provide sources and sinks for CO₂ but also other potent greenhouse gases, such as methane and nitrous oxide. As these ecosystems are degraded by human activities, their capacity to act as carbon sinks and impact buffers is being reduced. In addition, there is also the danger of reaching temperature thresholds where feedback loops within natural systems are created that will further amplify climate change. Hence, biodiversity loss and ecosystem degradation should be of major concern to decision-makers around the world.

Biodiversity threats in Gulf of Mannar

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Gulf of Mannar (GOM) is a rich marine destination in south-eastern India with a spread of 10,500 km² in sheltered Gulf on the west coast of Srilanka. It harbours nearly 3600 species of marine organisms. It is highly productive and harvests nearly 40% of the production made by Tamilnadu state. It has rich endemism and many of the organisms are endangered. It has been identified as important whale and dolphin watch location identified by International Whaling commission. The dependent fishing population in GOM is nearly 0.5 million spread along 320 km coastline. Bottom trawling, dynamite fishing, coral removal, coastal pollution are some of the anthropogenic pressures pushing the rich biodiversity to dwindle and perish. GOMBRT, a special government body of Government of Tamilnadu, India, recently formed in 2003, has pioneered many initiatives through people participation to conserve the marine resources of the area. The results are encouraging and the project is emerging as a successful model in marine area management in Indian waters.

Volunteer bird monitoring contributions to policy-relevant biodiversity indicators in Europe

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Large-scale annual volunteer-based bird survey programmes in the UK and other European countries provide the data to produce reliable population trends for a range of widespread bird species. Since the late 1990s, a wide range of wild-bird indicators have been produced by aggregating species trends for species groups inhabiting particular landscapes or regions into composite indices. This approach has proved very successful, distilling a complex array of changes into a relatively simple message such as the steep declines in farmland birds. Moreover, because the constituent population trends are based on counts in sample locations, statistical methods could be developed to assess the significance of temporal changes in the derived indicators. Differences among regions, between landscapes and between functional species groups constitute a useful research aid in identifying potential causal events and contributing factors. Composite bird indicators derived from species trends have proved a very useful tool for policy-makers in the UK and Europe, but by their nature, reflect the impact of multiple factors and must be interpreted carefully.

Local contributions to meet the 2010 target to halt the loss of biodiversity

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A Nordic project was launched in 2006, setting up a network of Nordic municipalities to implement specific projects relevant to the 2010 target. The network is intended to form a forum where the local authorities can exchange their experiences, and to demonstrate the necessity of local efforts to reach

the 2010 target. The network currently consists of 14 municipalities. The projects range from restoration, nature conservation, the use of municipal plans as instruments and combating alien species to safeguarding species through management. Key features of most of the projects include local participation and providing information on biodiversity. In order to reach the 2010 target, the municipalities in the network are obliged to conduct projects relevant to the 2010 target. The results of these projects are to be measurable. The municipalities will submit final reports before the end of 2009 and set up websites to publicise information on the projects. If possible, they should also sign the Countdown 2010 declaration.

This Nordic project demonstrates the importance of nature conservation on a local scale, and also the key role of municipalities as the land-use planning authorities. The project will end in 2010. The final report on the project will demonstrate the necessity of local contributions for reaching the 2010 target. The results can motivate other municipalities, so that Nordic municipalities can set an example in local work for biological diversity.

The Nordic Council of Ministers' Terrestrial Ecosystem Group (TEG) has a broad mandate which covers the preservation and sustainable use of nature, biological diversity, landscape, cultural monuments and cultural environment as well as outdoor life. The work also covers the relation between climate change and biological diversity, landscape and cultural environment.

For more information see www.dirnat.no/content.ap?thisId=500026558.

Target 2010: ensuring a project ticks all the boxes

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The Convention of Biological Diversity (CBD) launched Countdown 2010, a mechanism by which an organisation can pledge to make a difference and play their part to halt biodiversity loss by 2010. The focal areas laid down by the CBD provide an excellent framework when project planning. Whilst using a flagship species is still useful, using the focal areas, goals and sub targets of 2010 before going all out with a programme can ensure the maximum impact on halting biodiversity loss.

This poster shows the process for Twycross Zoo's programme BONOBO! The programme was designed so that rather than pumping large sums of money into a single *in situ* project, several elements were covered, including:

1. protecting the components of biodiversity;
2. promoting sustainable use of biodiversity;
3. addressing the major threats to biodiversity;
4. maintaining the ability of the ecosystem to support human well-being;
5. protecting traditional knowledge.

BONOBO! consists of four 'solutions' to ensure that all of these elements are covered. These include local capacity building, protecting and increasing genetic diversity, encouragement of sustainable forest use, restoration of traditional knowledge, mitigation of threats and increased scientific knowledge.

Partners and funders

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IUCN Red List Index (sampled approach): putting diversity into biodiversity

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While species coverage in the IUCN Red List has increased in number each year since the inception of the Red Data Book in the 1960s, assessments have generally been restricted to the better-known

taxonomic groups. The number of described species still lags a long way behind the estimated global total species richness; even describing biodiversity remains a significant challenge, and so defining its status is larger still. A new initiative aims to broaden the taxonomic coverage of the IUCN Red List in order to represent biodiversity better, increase data coverage and improve our understanding of the status of biodiversity. The Sampled Red List Index (SRLI) presents an indicator for those species groups where a comprehensive Red List Index, based on conservation assessments of all species within a taxonomic group, is impractical.

By 2010, the SRLI will include a wide variety of species groups, including reptiles, dung beetles, reef-building corals, freshwater crabs, cephalopods and monocotyledon plants. As an indicator for change in global biodiversity, the SRLI measures – and, in future, monitors – trends in the extinction risk of global biodiversity and selected taxonomic groups. This will enhance the accuracy of key indicators of biodiversity change, and improve the breadth of information provided to inform key targets like the Convention on Biological Diversity 2010 target and the UN Millennium Development Goals. This information will allow policy makers, scientists and conservation practitioners alike to improve and target conservation action at those taxonomic groups, regions or ecosystems that are most under threat.

Ecological studies on the status of the Indian Flying Fox in Karnal City, Haryana, India

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The preliminary studies were conducted on the bat species *Pteropus giganteus*, commonly called Indian Flying fox. It is one of the 114 bat species present in India. The general public has very little information regarding these flying mammals. The present studies will make them aware about the different aspects of the behaviour of the bat species present in the centre of an urban settlement. The roosting sites of the Indian Flying fox were identified and observed. Their home range was categorically investigated. The population was noted and the population dynamics worked out. The effect of urbanisation on the Indian Flying fox behaviour and the resulting behavioural shifting were also investigated.

Monitoring advocacy – experiences from WWF

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Understanding of the globalised nature of the underlying drivers of species and habitat loss and environmental degradation has increased. The WWF Network has responded by moving from small-scale projects to large-scale landscape and ecoregional programmes, and by increasing efforts to influence behaviours, policy processes and institutions at multiple levels (field, local, national and international).

Are we being effective in creating the changes we want to see through our advocacy work? Are we adopting the right strategies? Are we taking advantage of emerging opportunities and remaining relevant in an ever-changing world?

Monitoring advocacy work has particular challenges due to the fast-moving, highly political and reactive nature of the work, where causality is notoriously difficult. To support WWF programmes improve practice in this area, we have developed guidelines and are currently piloting them with a selection of projects and programmes funded by WWF-UK. These guidelines have been incorporated into our WWF Network Project and Programme Standards and have huge relevance for other conservation organisations grappling with similar challenges.

This poster will present an overview of WWF's recommended approach to advocacy monitoring, share the challenges and highlight some of the top tips that are emerging as we start to learn and improve practice.