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Biodiversity Monitoring and Conservation

Bridging the Gap Between Global Commitment and Local Action

Edited by Ben Collen, Nathalie Pettorelli, Jonathan E. M. Baillie and Sarah M. Durant

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Chapter 1

Biodiversity Monitoring and Conservation: Bridging the Gaps Between Global Commitment and Local Action

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Why a book on biodiversity monitoring and conservation?

As the impacts of anthropogenic activities increase in both magnitude and extent, biodiversity is under increasing pressure. Habitats available to wildlife have undergone dramatic modifications, and significant biodiversity has already been lost over modern times, while we are yet to experience the full impacts of anthropogenic climate change (Mace *et al.*, 2005; Dawson *et al.*, 2011; Pereira *et al.*, 2010b). Over the past few hundred years, humans have increased species extinction rates by as much as 1000 times compared with background rates that were typical over Earth's history (Regan *et al.*, 2001; Millennium Ecosystem Assessment, 2005), and accelerating increases in anthropogenic pressures on biodiversity may further increase species extinction rates (Balmford and Bond, 2005). In developing means to address these challenges, scientists are hampered by a lack of information on biological systems, particularly information relating to long-term trends, which is crucial to developing an understanding of how these systems may respond to global environmental change. Such serious knowledge gaps make it very difficult to develop effective policies and legislation to reduce and reverse biodiversity loss.

A further impetus for conservation action has been gained through an increasing realization that declines in biodiversity have detrimental impacts on ecosystem structures and functions as well as human well-being, particularly for the world's most marginalized and impoverished communities (Millennium Ecosystem

Assessment, 2005). Biodiversity provides many products—often plants, animals, and fungi—that directly contribute to incomes and human livelihoods. Biodiversity also provides genetic resources for the pharmaceutical industry, which can be key in maintaining human health, while the growth of nature tourism has meant that biodiversity conservation has become a major contributor to many national economies, including those of some of the world's poorest countries. As well as delivering these ecosystem services, biodiversity underpins the functioning of ecosystems, and hence the delivery of services such as access to fresh water or climate regulation. Biodiversity is therefore key to security, resilience, social relations, and human health and hence affects people not only by way of material livelihoods and macroeconomics.

In order to counter global biodiversity loss and consequent impacts on human well-being, there have been several recent high-profile international political commitments to improve biodiversity conservation. These have mainly consisted of goal setting, in the form of conservation targets to which governments, decision-makers, and the international community are committed; the most notable example of which are the targets set by the Convention on Biological Diversity (CBD; Convention on Biological Diversity, 2011; UNEP, 2002). However, because of the complexity of biological systems, and a lack of long-term biodiversity data, nations are hampered not only in assessing progress towards such targets, but also in developing appropriate policy and legislative responses to reverse biodiversity declines.

Global commitments to stemming biodiversity loss have contributed to the development of methods to track changes in many metrics of biodiversity, and addressing biodiversity information requirements has become one of the fastest growing areas of research in the field of

conservation biology. This information is critical for increasing our understanding of the manner in which biodiversity is changing, and how changes can be influenced and reversed. It is also required for setting priorities for biodiversity conservation, such as protected area placement (e.g., Araújo 1999; Possingham *et al.*, 1993; Rodrigues *et al.*, 2004), species and ecosystem priority setting among the many deserving causes of conservation attention (e.g., Isaac *et al.*, 2007; Myers *et al.*, 2000), and for the biodiversity assessments required to provide the data for such activities (Baillie *et al.*, 2008; Collen *et al.*, 2012; Mace *et al.*, 2008; Pereira *et al.*, 2010a).

The process of reversing decline in biodiversity, at the outset, might appear straightforward. We should simply measure what is happening to the components of biodiversity that we wish to conserve; put in place conservation actions to counteract declines in the taxa and places that are changing most rapidly, or which we are least willing to lose; monitor and evaluate the impacts of these actions; and continue to manage adaptively. Yet our first collective attempt to measure and slow biodiversity change (the Convention on Biological Diversity 2010 Target) met with almost universal agreement that we had failed (Butchart *et al.*, 2010; Convention on Biological Diversity, 2010). That there were only eight years between the agreement of that target (‘to achieve, by 2010, a slowing in the rate of biodiversity loss’) by parties to the CBD, and the deadline by which a change should have taken place, must at least partly explain why we failed to meet this target. Even with the strongest political will, a substantial slowing in biodiversity declines would not have been possible in the timeframe, unless the many and complex underlying drivers of decline were effectively tackled.

It has become clear though, in the myriad of post-2010 papers, reports, and evaluations, that there are some

problems in the overall approach. First of all, the target set was not action orientated, nor tied to appropriate activities from which the impact of changing pressures on biodiversity could be measured. This has to some degree been addressed in the newly agreed Aichi Target and Strategic Plan for 2020. Secondly, there appeared to be a disconnection between these laudable global commitments to improving the status of biodiversity, and the local-scale action required to ultimately ensure their achievement. From a research perspective, there has been a focus on identifying the most effective means to generate the metrics of biodiversity required to measure significant change (Dobson, 2005; Mace and Baillie, 2007), and how best to fill the many gaps in biodiversity data (Collen *et al.*, 2008; Pereira and Cooper, 2006). However, from a policy perspective it remains unclear how global targets should be harmonized with the many national responsibilities to biodiversity conservation and vice versa (Jones *et al.*, 2011; Nicholson *et al.*, 2012). Moreover, from a practical perspective there is a need to better coordinate biodiversity monitoring and conservation, at all scales, for increased efficiency and greater impact.

As the Aichi Target becomes agreed and implemented, it is extremely timely to reflect not only on lessons learned from the 2010 targets, but also on how we might better integrate national and global biodiversity monitoring and indicators over the coming decade. Such complex policy objectives present many challenges to conservation scientists and policy-makers alike. A key issue is how best to monitor progress towards such global-scale targets. There is also growing recognition of a need for biodiversity monitoring at a national, as well as a global scale, and better coordination between different monitoring approaches so as to make optimal use of all forms of biodiversity data. Although several indicators have been developed for use at the global

scale, the data on which these indicators are based frequently come from monitoring schemes carried out with quite different objectives than monitoring global biodiversity change. While a dedicated global monitoring system may be ideal, would it be prohibitively expensive? Might a more cost-effective solution be to implement monitoring at a national scale, according to national priorities, and aggregate national measures to a global indicator? The scale at which monitoring takes place may need to be taken into account when assessing progress towards both global and national targets. At the local level, the theory of optimal monitoring is advancing fast; focusing on how best to allocate limited resources in the face of the inevitable trade-offs between monitoring and intervention, and explicitly considering uncertainty. This approach could potentially be applicable to promote more cost-effective monitoring across larger regional or national scales.

In this book, which results from a symposium held at the Zoological Society of London in summer 2009, we have addressed two key themes in biodiversity conservation and monitoring, bringing together insights from science and policy spheres: evaluating a variety of approaches to biodiversity monitoring that could help to provide indicators at national to global scales, and the steps needed to reduce the barriers for successful implementation of such approaches. Specifically we have focused on addressing challenges faced by countries in meeting their obligations under the biodiversity conventions, particularly CBD, and to help bridge the gap between international commitments and local action. We have structured this book around four areas: first, we examine the use of species-based indicators, and what they can tell us about the status and trends of several important metrics directly related to the overall health of biodiversity (Balmford *et al.*, 2005; Green *et al.*, 2005). These chapters describe how each measure of