

<b>Institution:</b> Institute of Zoology
<b>Unit of Assessment:</b> Panel B, unit 7 - Earth Systems and Environmental Sciences
<b>Title of case study:</b> Global Biodiversity Indicators for the Convention on Biological Diversity
<p><b>1. Summary of the impact</b></p> <p>Scientists at the Institute of Zoology (IOZ) led the development of the IUCN Red List, the foremost tool for assessing species extinction risk. We further developed systems to evaluate the status of biodiversity at the national level (National Red Lists), quantify population changes (Living Planet Index) and robustly measure changing biodiversity (Sampled Red List Index), and global indicators of the status of biodiversity for the Convention on Biological Diversity (CBD). These are used to drive conservation policy and public engagement by Inter-Governmental and Non-Governmental Organisations, and national governments, and underpin measurement of adherence to CBD Targets for 2010 and 2020.</p>
<p><b>2. Underpinning research</b></p> <p>In 2002, a meeting of the Convention on Biological Diversity Conference of the Parties led to the adoption, by almost all nations, of the target of 'reducing the rate of biodiversity loss' by the year 2010. This target required indicators to quantify changes in biodiversity. Two main avenues of research were pursued at IOZ to address this need.</p> <p>The first avenue built on work by Professor Georgina Mace (then a postdoctoral researcher) to develop the International Union for Conservation of Nature (IUCN) Red List, which was formalised in 1994 [1]. Mace continued to refine the IUCN criteria and categorisation process until 2006 (during which time she became Director of IOZ) [2]. The IUCN Red List provides a quantitative means of assessing the relative extinction risk of species, is widely recognised as the most comprehensive and rigorous approach for evaluating the global conservation status of species, and has become the key information resource for fighting the current extinction crisis.</p> <p>This tool was subsequently developed between 2006 and 2010 by Professor Jonathan Baillie and Dr Ben Collen to track changes in extinction risk over time, and to generate wider taxonomic coverage (in 2006, most extinction risk classifications concerned just birds, mammals and species of commercial interest) to answer questions about changing biodiversity with greater generality. At the start of this period, Baillie and Collen were both members of IOZ's postdoctoral staff, although Baillie later became Director of Conservation Programmes at ZSL and Collen subsequently led this work as a Research Fellow. The underpinning research involved developing a new sampled approach to extinction risk assessment, the Sampled Red List Index (SRLI). The SRLI assesses a representative set of species from a broader set of groups (including invertebrates and plants) in a time and cost effective manner [3, 4]. As a result, the IUCN Red List has grown in size and complexity (from 40,000 species assessed in 2007 to 70,000 species in 2013) and plays an increasingly prominent role in guiding conservation activities of governments, NGOs and scientific institutions.</p> <p>The second avenue, developed by Collen and Baillie over the same period, is based on an aggregated indicator of abundance trends: the Living Planet Index [5]. The research demonstrated how population abundance trend data could be brought together to evaluate whether CBD targets have been achieved.</p> <p>These two avenues of research were drawn together in several publications, culminating in a paper in <i>Science</i> [6], which has become the leading article cited to show that the CBD 2010 Target was not met.</p> <p>Collaborations are an integral part of the work on biodiversity indicators. For the Red Listing work, IUCN, BirdLife International and the Royal Botanic Gardens Kew are key collaborators on the</p>

## Impact case study (REF3b)

projects mentioned. For the work on abundance trends, WWF International are central to the developments outlined in this case study. UNEP-WCMC are key proponents of global biodiversity indicators, housing the secretariat for the Biodiversity Indicators Partnership and dealing with much of the liaison with the Convention on Biological Diversity.

### 3. References to the research (indicative maximum of six references)

- [1] Mace GM, Stuart SN. 1994. Draft IUCN Red List Categories, Version 2.2. Species 21-22:13-24. Accepted as official criteria for the IUCN Red List following consultation with members, and the basis for all subsequent revisions of the criteria: see <http://www.iucnredlist.org/technical-documents/categories-and-criteria/1994-categories-criteria>
- [2] Mace GM, Collar NJ, Gaston KJ, et al. Quantification of extinction risk: IUCN's system for classifying threatened species. *Conservation Biology*. 2008;22:1424–42. <http://dx.doi.org/10.1111/j.1523-1739.2008.01044.x>. Already cited >160 times on Web of Science
- [3] Baillie JEM, Collen B, Amin R, Akcakaya HR, Butchart SHM, et al. (2008) Towards monitoring global biodiversity. *Conservation Letters* 1: 18-26. doi: <http://dx.doi.org/10.1111/j.1755-263X.2008.00009.x>. Already cited 72 times on *Google Scholar*.
- [4] Collen B, Baillie JEM (2010) The barometer of life: sampling. *Science* 329: 140. <http://dx.doi.org/10.1126/science.329.5988.140-a>
- [5] Collen B, Loh J, Holbrook S, McRae L, Amin R, et al. (2009) Monitoring change in vertebrate abundance: the Living Planet Index. *Conservation Biology* 23: 317-327. <http://dx.doi.org/10.1111/j.1523-1739.2008.01117.x>. The underpinning science for the Living Planet Index, and cited 42 times on *Web of Science*
- [6] Butchart SHM, Walpole M, Collen B, van Strien A, Scharleman JPW, et al. (2010) Global biodiversity: indicators of recent declines. *Science* 328: 1164-1168. <http://dx.doi.org/10.1126/science.118751>. Already cited >260 times on *Web of Science*

### Grants

Rufford Foundation: Delivering the IUCN Red List of threatened species and global biodiversity indicators. July 2006 (and yearly since that date). Total £617,400

GEF 2010 Biodiversity Indicators Partnership: development and delivery of the Living Planet Index and IUCN Red List Index. January 2007. £108,800

Esmée Fairbairn Foundation: Defining the status of the world's lesser-known species. January 2008. £291,950

### 4. Details of the impact

Understanding changing patterns of biodiversity and the ramifications those changes have for economies, resource infrastructure, ecosystem services, social development and human well-being is central to environmental policy. There is growing recognition that biological diversity is a global asset of tremendous value to present and future generations, and consequently the Convention on Biological Diversity (CBD) has been established as an international legal instrument for the conservation and sustainable use of biological diversity. All but six nations are signatory to this convention. Research undertaken at IOZ has achieved significant impact through its unique contribution to the development of environmental and biodiversity policy, particularly under the auspices of the CBD, by developing the IUCN Red List and Living Planet Index biodiversity indicators that enable better quantified and more effective measures to be included in evaluations of biodiversity change [a].

The IUCN Red List Index and the Living Planet Index were adopted by the CBD in 2005 to help measure progress towards the target of 'reducing the rate of biodiversity loss' by the year 2010 [b], and 193 nations are signatory to this globally binding legislation. IOZ research has had direct impact in evaluating whether and how the biodiversity target was met, linking science directly to global biodiversity policy, and in informing countries about how national biodiversity is faring. The indicators developed by IOZ underpinned the main CBD report published in 2010, Global Biodiversity Outlook 3 [c], which evaluated whether or not the 2010 target had been reached. They also formed the basis of subsequent publications such as the Global Environmental Outlook 5 (published by United Nations Environment Programme in 2012), of which Collen is a co-author, and which has the specific aim of informing environmental decision-making and facilitating the interaction between science and policy [d].

Our collaborators at IUCN, through their press releases, reports and updates of the IUCN Red List, and WWF International, through the biennial publication of the Living Planet Report (e.g. in 2008, 2010, 2012), provide evidence of further impact and outreach by raising public awareness of the on-going biodiversity crisis affecting the planet. The Living Planet Index forms a central part of the Living Planet report, which is published biennially, translated into 13 languages, and has a print run of 70,000 copies. Free downloads of the PDF number in the hundreds of thousands [e].

As a result of the expertise we have developed through the underpinning research described above, and our collaborative work with IUCN and others, we have been commissioned to undertake further work on biodiversity indicators, with associated impact. For example, the Arctic Council, a high-level intergovernmental forum to promote cooperation, coordination and interaction among the 10 Arctic nations for the protection of Arctic wildlife, commissioned IOZ to evaluate trends in Arctic wildlife, culminating in the Arctic biodiversity report produced by IOZ in 2008 in collaboration with the Circumpolar Biodiversity Monitoring Program. This report used LPI data and methodology to assess trends in Arctic biodiversity over a 34-year period, and was endorsed by Senior Officials of the Arctic Council [f].

The abundance and extinction risk monitoring tools developed by IOZ researchers are now being used by the UN Convention on Migratory Species (CMS), an intergovernmental treaty that aims to conserve terrestrial, aquatic and avian migratory species throughout their range. Migratory species threatened with extinction are listed on Appendix I of the Convention. CMS Parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Our tools are used to track trends in species listed on the CMS, a vital part of their remit and key to measuring the success or otherwise of the policy decisions taken under the CMS [g].

We have been centrally involved in the development of Red Lists at national levels. IOZ was involved in the 2009 workshop on the development National Red Lists (held at ZSL), and developed the National Red List website (the first centralised source of national-level biodiversity data, launched in 2010 [h]). IOZ scientists have also worked with countries around the world advising on the development of National Red Lists (e.g. Nepal 2011, Tajikistan 2010). In Mongolia, National Red List data feeds into a tool used for all Environmental Impact Assessments, and the resulting website has been adopted by the Ministry of Environment and Green Development [i]. National Red Lists have also been included in the CBD Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) 17 draft recommendations [j].

##### 5. Sources to corroborate the impact (indicative maximum of 10 references)

[a] The Head of Science, Economics, Policy and Partnerships at UNEP-WCMC can corroborate the role that IOZ has played in the development of global and national biodiversity indicators and the links that they have to the Biodiversity Indicators Partnership.

[b] [http://www.iucnredlist.org/about/red-list-overview#biodiversity\\_indicator](http://www.iucnredlist.org/about/red-list-overview#biodiversity_indicator)

[c] Secretariat of the Convention on Biological Diversity (2010) Global Biodiversity Outlook 3.

Montréal, 94 pages. <http://www.cbd.int/doc/publications/gbo/gbo3-final-en.pdf>

- [d] Armenteras D, Finlayson M, Rosser A, Walpole M, Agard J, Butchart S.H.M, Carino J, **Collen B**, Firbank L, Galli A, Gokhale Y, Hocking M, Hoft R, Kitzes J, Prip C, Redford K.H, McGeoch M, Oldfield T. & Toivonen H. (2012) Biodiversity. In *Global Environmental Outlook 5* (ed GEO 5), United Nations Environment Programme.
- [e] Living Planet Reports (2008, 2010, 2012) WWF, Gland, Switzerland: For 2012 report see [http://awsassets.panda.org/downloads/1\\_lpr\\_2012\\_online\\_full\\_size\\_single\\_pages\\_final\\_120516.pdf](http://awsassets.panda.org/downloads/1_lpr_2012_online_full_size_single_pages_final_120516.pdf)  
The Editor of the Living Planet Report and the Director, Footprint, both at WWF International, can corroborate the role the IOZ play in developing the Living Planet Index, and the type of impact the Living Planet report has worldwide.
- [f] Email from the Chair of the Circumpolar Biodiversity Monitoring Program, corroborates endorsement by Senior Arctic Officials of the Arctic Council. Copy available on request.
- [g] Latham J, **Collen B**, McRae L, Loh J. (2008) The Living Planet Index for Migratory Species: an index of change in population abundance. A report for the Convention on Migratory Species, United Nations Environment Programme.
- [h] <http://www.nationalredlist.org>
- [i] Website of the Ministry of Environment and Green Development Mongolia ([www.zuil.mn](http://www.zuil.mn)). Note that the site is in development but is not live as of 6<sup>th</sup> November 2013.
- [j] UNEP/CBD/SBSTTA/17/L.2 Paragraph 61 under Aichi Target 12: The IUCN Red List of Threatened Species, and assessment of threatened species at the national level, can be used to trigger conservation action, particularly where they are aligned with existing initiatives on species conservation including those under CITES. National Red Lists, or comparable assessments, can also assist with land use planning and responsible impact assessments.