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GROUP ON EARTH OBSERVATIONS BIODIVERSITY OBSERVATION NETWORK

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iDiv German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig

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For more information please contact:
GEO Secretariat – 7 bis, avenue de la Paix – CP 2300
CH-1211 Geneva 2 – Switzerland
E-Mail: secretariat@geosec.org – Telephone: +41 22 730 85 05
www.earthobservations.org/geobon.shtml

DEVELOPING NATIONAL SPECIES MONITORING FOR THE AICHI TARGETS

THE WHY: THE VITAL NEED FOR SPECIES MONITORING

Biodiversity loss results in detriment of living standards and economic loss[1]. Aware of the importance of biodiversity the Convention on Biological Diversity (CBD) has adopted the 2011-2020 Strategic Plan for Biodiversity, aimed at achieving the Aichi Biodiversity Targets[2].

Species are biodiversity units used by researchers and decision makers in order to manage biodiversity. As an example IUCN or CITES assessments are based on species and many important areas for biodiversity are selected based on which species are present.

Species are intuitive units for non-biological experts, and have great power for communicating information used in conservation of biodiversity. For example charismatic, endemic or emblematic species can mobilize resources for conservation actions.

Policy and decision-making for conservation and management of natural resources need timely delivery of adequate data to assess current state and trends of biodiversity in order to provide adequate responses, policies or actions to prevent or reduce biodiversity loss. This information is also necessary for assessing the effectiveness of national policies, conservation actions and for reporting progress towards the Aichi targets.

Monitoring species can give us data related to Essential Biodiversity Variables (EBV)[3] of different classes: genetic composition, species populations, species traits, community composition, ecosystem structure and ecosystem function. There is an urgent need for better information related to these variables in order to assess biodiversity state and trends, and relate it to benefits for human well-being[4] using the ecosystem services framework[5].

Consistent, standardized and repeated measurements of species-based information integrated into the EBV framework can answer questions such as: What is the biodiversity present at a given site? What is the ecosystem structure and function?[6] How is biodiversity related to human well-being? How can we assure good biodiversity conservation and management decisions? Answers to these questions are needed for better assessments of Natural Capital, Ecosystem Service Payment schemes[7] and Biodiversity Offsets.

Species information also allows us to evaluate the impact of drivers such as climate change, land-use change or harvesting on biodiversity loss and degradation[8]. This information can be used by different stakeholders in Early Warning Systems preventing the loss of vital ecosystem services, invasion of alien species[9], or emerging infectious disease. Species information can also be used for building and validating quantitative scenarios for proposing conservation actions and evaluating the impact of future socioeconomic development pathways on biodiversity and ecosystem services and thus providing major opportunities for better planning, conservation policies and actions[10].

Although the importance of species monitoring data is highly recognized by academic and conservation organizations, there is no a global system for integrating species monitoring information, nor are there often uniform monitoring systems, even at national level in such a way that they can contribute efficiently to the production of consistent, standardized and repeated measurements of species-based information used to produce biodiversity indicators[11,12].

Examples of such indicators are the Living Planet Index, Red List Index, Wild Bird Index and Wildlife Picture Index, which can be used to indicate progress towards Aichi targets 5, 6, 7,8,10,11,14[13]. Although these indicators are widely used, they are built on data for few taxonomic groups, mostly vertebrates, e.g. birds and mammals, and adequate data is available for only a few regions or countries in the world. Thus, although species information is necessary to build robust indicators that can inform us about extinction risk, distribution shifts, change in community structure and ecosystem function, their use is currently limited because of poor data availability; and this is where the Group on Earth Observations Biodiversity Observation Network (GEO BON) can help.

THE HOW: MONITORING PROGRESS TOWARDS THE AICHI TARGETS

Monitoring biodiversity at the national levels requires that countries have adequate funding, technical support, capacity building support and expert advice.

Because species data can be obtained from different program types and organizations, good communication is needed between different agencies, private and governmental, as well as with academia. Thus a responsible agency leading the national strategy is required in order to effectively coordinate the collection and integration of data working with the relevant national organizations and expertise.

GEO BON (www.earthobservations.org/geobon.shtml)[14], through its working group on terrestrial species monitoring (WG2) is working on the development of a Global Species Monitoring Network. Steps related to data collection, integration (including remote sensing-in situ integration), analysis and reporting are being coordinated by internationally recognized experts. WG2 is able to provide capacity building, expert support and coordination on national species data acquisition, integration and analysis in order to organize and improve terrestrial biodiversity observations globally and make biodiversity data, information and forecasts more readily accessible to policymakers, managers, experts and other users. Figure 1 illustrates GEO BON's species monitoring framework, showing the components of the system and the flow of information.

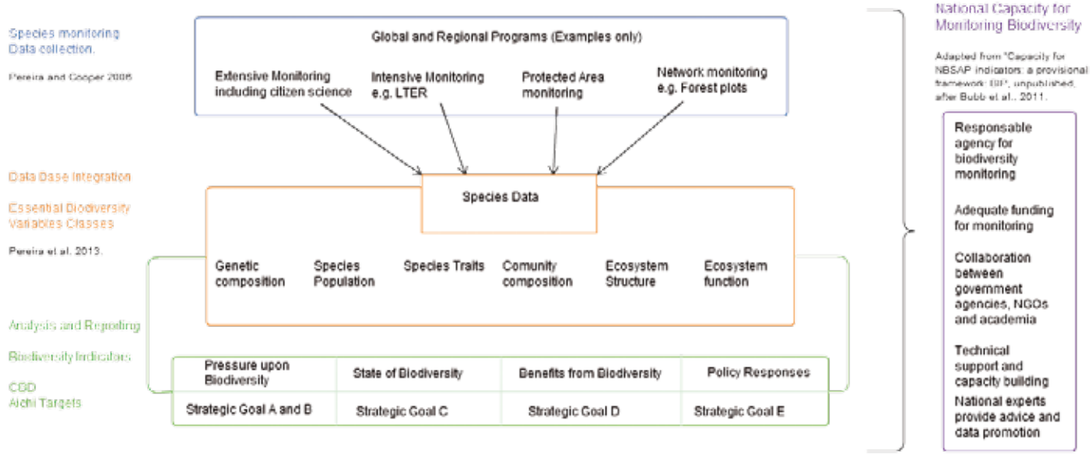

Figure 1: framework to develop national species monitoring for the Aichi targets

In many cases, biodiversity monitoring is dependent upon data collection by skilled volunteers[15] and citizen science approaches to monitoring are strongly recommended. This investment of volunteer time demonstrates the importance that people places on biodiversity monitoring, and suggests that governments should also increase their support for biodiversity monitoring. For example, it is estimated that the dedication of French volunteers on species monitoring is equivalent to an annual investment of 700k€ to 4M€ per year[15].



Parallel and complementary information can be collected efficiently through remote sensing initiatives and that will deliver both background information to help inform EBVs such as species distribution and abundances and direct measurement of particular EBVs themselves, such as Net Primary Production or Habitat Structure.[16]

Expanding current monitoring programs to regions of the world where gaps exist, and the improvement in spatial and taxonomic coverage is a key priority in the development of GEO BON in time to contribute to reporting on the 2020 Aichi targets[11].

SPECIES MONITORING CASE STUDIES

The following examples show how monitoring programs targeted at specific EBVs can be used to report indicators informing on the Aichi targets and guide policy responses.

Assessing the impacts of habitat change on biodiversity

Species monitoring:
The Pan-European Common Bird Monitoring Scheme[17] is a large-scale monitoring scheme based on fieldwork of volunteers with a standardized methodology across more than 20 countries. Every year population bird counts are made by skilled observers in multiple locations in each country.

Essential Biodiversity Variable:
Species population abundances.

Analysis and reporting:
The Wild Bird Index (WBI, Figure 2) is the average population trend in a group of bird species, often grouped by their association and dependence on a particular habitat. They are particularly suited to tracking trends in the condition of habitats through obligate or specialist species. A decrease in the WBI means that the balance of species' population trends is negative, representing biodiversity loss.

Aichi Targets:
5 - Habitat Loss, Fragmentation and Degradation; 12 - Avoided extinction.

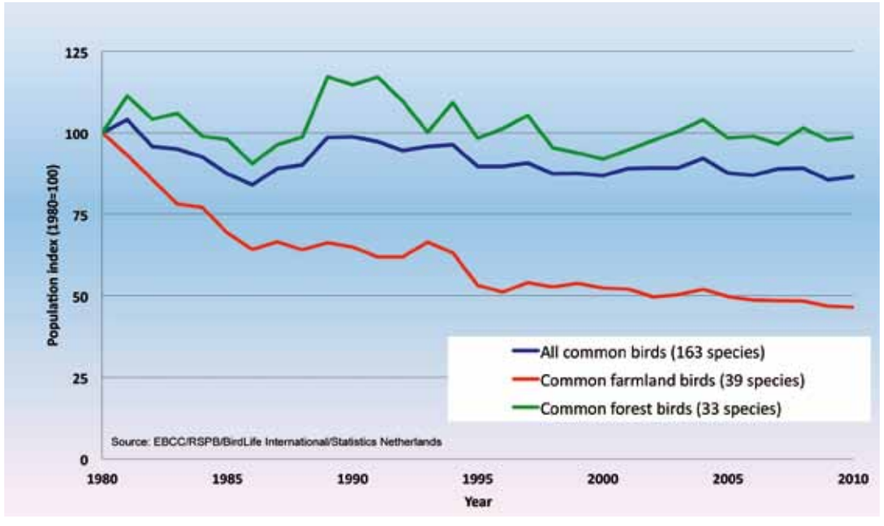

Figure 2: Population trends of widespread birds in Europe (WBI) for all birds, farmland birds and forest birds.

Assessing the effects of hunting and trade on bodiversity

Species monitoring:

Automatic cameras can be used to estimate occupancy of different species over time at multiple locations. They can be deployed using a sampling scheme to address management questions or to collect basic monitoring data (i.e. surveillance monitoring). The number of monitoring initiatives using automatic approaches is growing. Two examples are Instant Wild (http://www.edgeofexistence.org/instantwild/) and the Tropical Ecology Assessment and Monitoring Network (http://www.teamnetwork.org/).

Automatic cameras can be used to monitor medium to large mammals.

Essential Biodiversity Variable:

Species distributions.

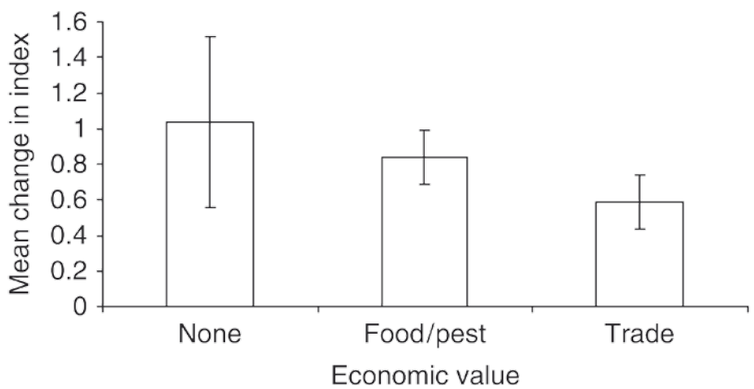

Figure 3: Average change in WPI between 1998 and 2006 in Southwest Sumatra for species that are not hunted, species that are hunted as pests or for subsistence and species that are hunted for commercial trade. Bars indicate 95% confidence intervals. © 2010 The Zoological Society of London.

Analysis and reporting:

The Wildlife Picture Index (WPI, Figure 3) aggregates camera trap data for terrestrial species in order to assess their trends and extinction risk (http://www.bipindicators.net/wildlifepictureindex). More specifically for each species detection history is used to estimate occupancy, and a species-specific index that measures the change in occupancy from initial condition is calculated. The WPI is the geometric mean of scaled occupancy statistics for several species[18]. Using this index and data from monitoring in Southwest Sumatra, it was found that species hunted declined faster than non-hunted species, and amongst the hunted species, species hunted for trade declined faster than species hunted for food.

Aichi Targets:

Target 12 - Avoided extinction; Target 6 - Sustainable harvesting.

References

1. TEEB. 2010. The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB
2. http://www.cbd.int/sp/targets/default.shtml
3. Pereira et al. 2013. Essential Biodiversity Variables. Science, 339: 277-278
4. Geijzenderffer and Roche. 2013. Can Biodiversity monitoring schemes provide indicators for ecosystem services? Ecological indicators 33: 148-157
5. Alcamo et al. 2003. Ecosystems and human well-being : a framework for assessment . Millennium Ecosystem Assessment
6. Sterk et al. 2013. Assess ecosystem resilience: Linking response and effect traits to environmental variability. Ecological Indicators. 30: 21-27
7. Sommerville et al. 2011. The challenge of monitoring biodiversity in payment for environmental service interventions. Biological Conservation. 144:2832-2841
8. Smart et al. 2012. Clarity or confusion? Problems in attributing large.scale ecological changes to anthropogenic drivers. Ecological Indicators, 20:51-59
9. Gatto et al. 2013. Evaluation of Online Information Sources on Alien Species in Europe: The Need of Harmonization and Integration. Environmental Management, 51:1137-1146
10. Pereira et al. 2010. Scenarios for Global Biodiversity in the 21st Century. Science, 330: 1496-1501
11. GEO BON. 2011. Adequacy of Biodiversity Observation Systems to support the CBD 2020 Targets. A report prepared by the Group on Earth Observations Biodiversity Observation Network (GEO BON) for the Convention on Biological Diversity
12. Pereira and Cooper. 2006. Towards the global monitoring of biodiversity change. Trends in Ecology and Evolution. 21:123-129
13. http://www.bipindicators.net/indicators
14. http://www.earthobservations.org/geobon.shtml
15. Levrel et al. 2010. Balancing state and volunteer investment in biodiversity monitoring for the implementation of CBD indicators: A French example. Ecological Economics, 69: 1580–1586
16. Tallis et al. 2012 A global system for monitoring ecosystem service change. BioSci 62: 977–986 doi:10.1525/bio.2012.62.11.7
17. Gregory, R.D. & Strien, A. van. (2010) Wild bird indicators: using composite population trends of birds as measures of environmental health. Ornithological Science 9: 3–22
18. O'Brien et al. 2010, The Wildlife Picture Index: monitoring top trophic levels. Animal Conservation 13(4): 335-343

Authors

GEO BON Working Group 2 with a special contribution of:
Maria Cecilia Londoño-Murcia, mlondono@humboldt.org.co, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Colombia
Henrique Miguel Pereira, hpereira@idiv.de, iDiv - German Centre for Integrative Biodiversity Research, Germany
Richard Gregory, richard.gregory@rspb.org.uk, Royal Society for the Protection of Birds, UK
Michele Walters, mwalters@csir.co.za, Council for Scientific and Industrial Research (CSIR), South Africa

Pictures

Chris Gomersall, Edwin Kats, Ernie Janes, Henrique M. Pereira, Nicolás Urbina-Cardona, María Cecilia Londoño-Murcia

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