Update on the GEO BON Activities
AP BON Meeting 23.10.18

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www.geobon.org
GEO BON in a nutshell

Mission
Improve the **acquisition, coordination** and **delivery** of biodiversity observations and related services to users including decision makers and the scientific community.

GEO Flagship

Vision
A **global biodiversity observation network** that contributes to **effective management policies** for the world’s biodiversity and ecosystem services.
A Global Partnership
The network in numbers
± 500 members in 66 countries and 341 Institutes
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± 500 members in 66 countries and 341 Institutes

Realm
- Terrestrial 54%
  - Marine 24%
  - Freshwater 22%

Earth Observations
- In situ 35%
- Remote Sensing 25%
- Both 40%

Gender balance
- 60.7% Male
- 37.5% Female
GEO BON core focus

Developing the Essential Biodiversity Variables

Producing Policy Relevant Outputs

Developing the Biodiversity Observation Networks
Some Milestones for 2018
Some Milestones for 2018
Some Milestones for 2018
Some Milestones for 2018
GEO BON core focus

Developing the Essential Biodiversity Variables

Supporting the development of Biodiversity Observation Networks

Producing Policy Relevant Outputs
GEO BON core focus

Developing the Essential Biodiversity Variables

Supporting the development of Biodiversity Observation Networks

Producing Policy Relevant Outputs
A standard and flexible framework for biodiversity observations: the Essential Biodiversity Variables

**EBVs:** Minimum set of measurements, complementary to one another, that can capture major dimensions of biodiversity change.

Navarro et al., (2017)
Acquisition, Mobilization and Integration of biodiversity observations

- Genetic Composition
  e.g. Allelic diversity
- Species Populations
  e.g. Species distribution
- Species Traits
  e.g. Body size, phenology
- Community Composition
  e.g. Species interactions
- Ecosystem Structure
  e.g. Ecosystem extent
- Ecosystem Functions
  e.g. Disturbance
Challenges and opportunities for EBV development

Challenges

- Consultation processes on-going to agree on and prioritize lists of EBVs in the different classes
- Spatial and taxonomic bias in biodiversity observation → Gaps identification
- Lack of within species temporal variation observation (e.g. traits)
Challenges and opportunities for EBV development

Opportunities

- Popularization of next generation sequencing, metagenomics (eDNA), and hyperspectral remote sensing
- Increased data collection (e.g. citizen science), sharing, and integration
- Development of modelling approaches that combine species observations with remotely sensed environmental data
Developing and documenting workflows for the production of EBVs

**EBV-useable data sets**
1. Identify and import raw data and associated metadata
2. Check data-sharing agreements and licenses
3. Check data completeness and consistency (e.g. dates, units, spatial information etc.)

**EBV-ready data sets**
4. Combine and join data sets from different sources
5. Match taxonomy
6. Check data quality and clean data (errors, outliers, duplicates etc.)

**Derived & modelled EBV data**
7. Check data coverage and fit for purpose, create input files
8. Identify analysis tool (and covariates if needed)
9. Apply statistical analysis
10. Calculate uncertainty
11. Visualize results

- Publish data and metadata
- Publish data and metadata
- Publish data and metadata
Data Sources

Red List IUCN
GBIF
GRIIS

Data Processing Management & Publishing

Standards:
Darwin Event Core
Humboldt Core

Tools:
GBIF IPT

Taxonomic backbone:
Catalog of Life/best available authority

Data Analysis & Modelling & Publishing

Map of Life
GDM
MaxEnt

Standards:
WMS
WFS

Data sharing agreements examples

Reporting & Indicators

Species Habitat Indicator
GEO BON Portal

Field Data Collection

Field guides

Data ingestion templates (e.g. ALA, GBIF)

Automatic image classification tools (e.g. iNat tool)

iNaturalist
eBird

Chapter 4
Monitoring Essential Biodiversity Variables at the Species Level

Hernandez M. Penteiro, Jana Belong, Manika Birke, Neil Brummitt,
Jaime Garcia-Morera, Richard Gregory, Laura Harris, Cai Peng,
Vilma Proaño, fick Schneider and Chris van Swaay

Abstract: The Group on Earth Observation’s Biodiversity Observation Network (GEO BON) is developing a monitoring framework around a set of Essential Biodiversity Variables (EBVs) which aims at facilitating data integration, spatial scaling and contributing to the filling of gaps. Here we build on the framework to explore the monitoring of EBVs chosen at the species level, species populations, species traits and community composition. We start by choosing a number of indicators on species observation such as the identification of the question to be addressed, the choice of variables, tools and spatial sampling schemes. Next, we discuss how to monitor EBVs for specific taxa, including mammals, amphibians,
Data and metadata standards:

INDEXING

VISUALIZING

ANALYSING / SUMMARIZING
GEO BON core focus

Developing the Essential Biodiversity Variables

Developing the Biodiversity Observation Networks

Producing Policy Relevant Outputs
Building a Network of National, Regional and Thematic BONs

Contribute to the collection and analysis of harmonised biodiversity observations, the development of integrated and interoperable biodiversity monitoring programs, the adoption of data standards.

National and Regional BONs

BON Endorsement

Thematic BONs
Marine BON (MBON)
Freshwater BON (FWBON)
Soil BON
Supporting the development of BONs – BON development process

**ENGAGEMENT**
1. Create an Authorizing Environment
2. Establish design and implementation team

**ASSESSMENT**
3. User needs assessment and choice of regional assessment units
4. Inventory of data, tools and platforms

**DESIGN**
5. Focal Ecosystems, Conceptual Models, EBVs and Primary Observations
6. Data collection Methods
7. Sampling Framework
8. Data management, Analysis and Reporting

**IMPLEMENTATION**

Design and implementation team
Scientific community
Decision and Policy makers

BON Development Manual
Supporting the development of BONs – Capacity building and knowledge exchange

BON IN A BOX

Improving Capacity for Biodiversity Conservation

BON in a Box (Biodiversity Observation Network in a Box) is a customizable and continually updated toolkit. It provides access to the latest biodiversity observation design, data collection protocols, and data management, analysis and reporting tools. It serves as a technology transfer and capacity building mechanism to ensure you have access to the best and most up-to-date tools and technologies for building a biodiversity observation system.

BON in a Box connects tools users and developers to promote ongoing tool improvements and the development of new tools. The goal is to lower the threshold for the start-up or enhancement of biodiversity observation networks and support more effective conservation actions through the improved supply of quality biodiversity data. BON in a Box is a Group on Earth Observations – Biodiversity Observation Network initiative and the development of this Latin American regional version was led by Colombia’s Alexander von Humboldt Institute.
## Documenting Biodiversity Observations

### China BON level metadata

<table>
<thead>
<tr>
<th>Taxonomic group</th>
<th>Number of species being monitored</th>
<th>Spatial unit/region</th>
<th>Method</th>
<th>Reps</th>
<th>Frequency</th>
<th>Metric</th>
<th>Start</th>
<th>End</th>
<th>Data management</th>
<th>Published</th>
<th>Spatial and temporal resolution of published data</th>
<th>DwC Standard</th>
<th>Data aggregation per country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birds</td>
<td>1000</td>
<td>380 Counties</td>
<td>transect</td>
<td>100</td>
<td>county</td>
<td>no</td>
<td>2011</td>
<td>present</td>
<td>national database</td>
<td>not yet</td>
<td>national population density/line transect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mammals</td>
<td>large-medium body size</td>
<td>70 counties</td>
<td>camera trap</td>
<td>100</td>
<td>county</td>
<td>no</td>
<td>2011</td>
<td>present</td>
<td>national database</td>
<td>not yet</td>
<td>national population density/line transect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butterflies</td>
<td>all</td>
<td>380 Counties</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amphibians</td>
<td>all</td>
<td>380 Counties</td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

### Species Populations EBVs

<table>
<thead>
<tr>
<th>Taxonomic group</th>
<th>EBV being produced (1)</th>
<th>EBV being produced (2)</th>
<th>EBV being published and in what form</th>
<th>Are the EBV's accessible via the GEOBON portal</th>
<th>Indicators calculated</th>
<th>Policy relevance/link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birds</td>
<td>maps of species richness across sites</td>
<td>distribution and abundance map for each species</td>
<td>Scientific publications in Chinese</td>
<td>No</td>
<td>LPI - GMA to be calculated</td>
<td></td>
</tr>
<tr>
<td>Mammals</td>
<td>maps of abundances across sites for each species</td>
<td>population occupancy probability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butterflies</td>
<td>maps of abundances across sites for each species</td>
<td>population density/sample region</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Amphibians</td>
<td>maps of abundances across sites for each species</td>
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</tr>
</tbody>
</table>
GEO BON core focus

- Developing the Essential Biodiversity Variables
- Developing the Biodiversity Observation Networks
- Producing Policy Relevant Outputs
Policy relevant outputs: Supporting users’ reporting needs

EBV based indicators: Integrating in situ and remote sensing observations for open access & real-time indicators

- **SHI** Species Habitat Indices
- **BHI** Biodiversity Habitat Index
- **SPI** Species Protection Index
- **PARC** Protected Area Representativeness & Connectedness (PARC) Indices
- **GERI** Global Ecosystem Restoration Index
- **SSII** Species Status Information Index

**Essential Biodiversity Variables:**
- Ecosystem extent and fragmentation
- Species distributions
- Taxonomic diversity
- Net primary productivity

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**GEO BON**

**Global Biodiversity Change Indicators**

Model-based integration of remote-sensing & in situ observations that enables dynamic updates and transparency at low cost

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**CBD**

**Convention on Biological Diversity**
Supporting decision-making

The **Beijing 2018 call on biodiversity observations for post-2020 decision-making**: ”We call on the Parties to the CBD to step up efforts on the collection, analysis and delivery of biodiversity observations [...]”.

Participation in the **CBD COP 14**, including with two main side-event submitted: ”**From biodiversity data to reporting**” (co-organized with GBIF Sec. and NatureServe) ”**Global Biodiversity Change Indicators**” (Presentation of the GBCIs and their applications to parties, Presentation of the EBV portal)

By December 2018, invitation to contribute to the CBD’s **post-2020 strategy for Biodiversity**
We, the Group on Earth Observation Biodiversity Observation Network (GEO BON), have gathered scientists and practitioners from over two dozen countries, on the occasion of our 10th anniversary, in Beijing, to discuss the future of biodiversity monitoring globally. **We call on the Parties to the CBD to step up efforts on the collection, analysis and delivery of biodiversity observations.**

Despite significant progress over the last decade in gathering biodiversity observations and on the development of indicators, significant gaps and barriers remain. At the time of the mid-term assessment of progress towards the Aichi biodiversity targets for 2020, uncertainties remained in the evaluation of most of the targets. Repeated, long-term biodiversity observations are crucial to detect changes in biodiversity and ecosystem services and for assessing current and future policy options through scenarios and models. Without a significant increase in global investment in biodiversity monitoring it is likely that existing observation gaps will continue to impair not only the assessment of policy goals but also their effective implementation.

To achieve a step change in action, **we propose that the post-2020 targets explicitly include development of operational and sustainable national biodiversity observation networks.** These networks would collect observations on multiple Essential Biodiversity Variables to inform the development, implementation and evaluation of national biodiversity policies. Such nationally encompassing monitoring systems would collect in situ and remote sensing data; aggregate and publish the data into public repositories using existing data standards; estimate or model Essential Biodiversity Variables; report on indicators relevant to national biodiversity strategy goals; and greatly facilitate policy implementation at a critical time for the world’s biodiversity.

Beijing, 13 July 2018
Integration of primary biodiversity observations

EBVs (Ecosystem-based Variability)

Community Composition

Species Populations Traits

Genetic Composition

Ecosystem Structure Function

Ecosystem Services

Knowledge exchange

Thematic BONs

National and Regional BONs

Environmental assessments

Indicators and projections

Conservation targets

Strategic plans

NBSAP (National Biodiversity Strategy and Action Plan)

Aichi Biodiversity Targets

Scientific community

Decisions and policy makers

User needs

Research & observations

Assessments

Policy
EBV Labeling System: Minimum Information Standards for an EBV

*Is the EBV dataset fit for purpose?*

- Report on the maturity / readiness of EBV products (Draft in progress)

- Template for reporting biodiversity change at different levels from subnational to global, and in a way that datasets are flagged according to their usability at each of these levels
EBV Labeling System: Minimum Information Standards for an EBV

**Spatial Extent**
- **High**: Global
- **Intermediate**: National to supranational (inc. marine exclusive zone)
- **Low**: Subnational (e.g. P.A. network)

**Spatial coverage**
- **High**: Fully continuous
- **Intermediate**: Interpolated (incl. modelled)
- **Low**: Site sampling distribution

**Spatial resolution**
- **High**: Relevant for local management
- **Intermediate**: Relevant (supra) national
- **Low**: Only for global-level applications

**Temporal extent**
- **High**: Temporal length of observations allows to inform long-term biodiversity targets.
- **Intermediate**:  
- **Low**: Temporal length only can inform short-term (regional to local) decisions

**Temporal coverage**
- **High**: ≥ 2 time slices that already allow to detect changes relevant for management/policy decisions
- **Intermediate**: ≥ 2 time slices but insufficient to detect relevant changes
- **Low**: One temporal slice (no possibility to detect change)

**Data uncertainty**
- **High**: Uncertainty assessed. Likelihood of capturing significant changes is reliable
- **Intermediate**: Uncertainty assessed. Likelihood of capturing significant change is uncertain.
- **Low**: Insufficient or missing uncertainty assessment