Indicators for genetic diversity in post-2020 CBD Framework

This document is meant to reinforce the feasibility, relevance, coherence, and scientific basis for three indicators of genetic diversity, two of which are suitable as Headline indicators (A.0.4, A.8.1, CBD/SBSTTA/24/L.10), for CBD Indicator discussions in Bonn Germany.

Genetic diversity is vital for species to adapt and ecosystems to recover. Monitoring and managing genetic diversity is needed to provide resilience in the face of climate change, extreme events, habitat loss and fragmentation, novel pests and diseases, and pollution.

Specific genetic indicators were lacking in the previous Framework. For the post2020 framework three genetic diversity indicators are proposed. Their meaning is described below. They *do not require costly genetic laboratories*- they can be calculated using existing non-genetic data. Indicators 1 and 2 would be calculated for *select, representative species* (e.g. 100 to 1000 species per country).

1. The proportion of populations within species with a genetically effective population size (Ne) > 500. Populations must be large enough to maintain genetic diversity within populations and allow the process of adaptation. *This indicator can be inferred using census size, Nc, from available reports or databases.* The effective size threshold of 500 is well established as a minimum sustainable safe Ne for maintaining genetic diversity (see Reference List). (indicator A.0.4)
2. The proportion of populations maintained within species. Populations and their unique, local adaptations and characteristics must be maintained. Loss of genetically distinct populations reduces species-wide resilience in the face of environmental change. *This indicator can be calculated from existing databases and species-specific reports.* (indicator A.8.1)
3. The number of species and populations that are genetically monitored. Genetic monitoring helps guide protection efforts and management. As a Complementary (optional) Indicator, this can help track increases in the study and management of genetic diversity, as more countries develop this capacity in the coming years.

These indicators support, and are included in, CBD draft text. They received support from numerous Parties at the Geneva meetings. They are ideally suited and designed for reporting on 'maintaining genetic diversity' (Goal A) and targeted efforts to support and restore species and their genetic diversity (Target 4). The methodology has been presented and improved in 8 peer-reviewed scientific papers.

The indicators have been employed successfully, and are being refined by 7 countries.
- A pilot project in 2021-2022, led by the Swedish Environmental Protection Agency, determined that *data for the indicators are available and can be extracted from textual analysis of national Red List reports and national biodiversity databases*, and can be used for these indicators, *for at least thousands of species* (20-30% of all species examined). A high proportion of amphibians and reptiles had low effective population sizes (indicator 1), while a high proportion of mammals are losing distinct populations (indicator 2) (report [here](#)).
- An ongoing project by biodiversity and environment agency personnel in South Africa, Mexico, Sweden, Japan, Belgium, France and Australia are further testing the indicators. They are *trialing different data sources, automating data collection, and creating a detailed guidance document for Parties to use*. These projects will be complete and a report available in late 2022. The countries are following a common protocol with clear metadata, but adapting it for each country's needs and

resources. Initial results show that a reasonable proportion of species per country have available data, and that populations are being lost and genetic diversity is declining within populations. Data can be gathered with reasonable effort e.g. 2 to 4 weeks' person time for 100 species, and stored in a standard format which will help make subsequent reporting easier and faster. The project will produce a very detailed updated methodology. *The indicators can be updated easily on a five year time scale, which matches genetic processes and updates to many country reports and surveys.*

- The indicators have been reviewed in a framework of the threats to genetic diversity within species, and considered in the context of existing genetic monitoring programs in Sweden, Switzerland and Scotland, in an open access article [here](). The threats described are: loss of among and within population genetic diversity (including local adaptations), low recruitment, lack of in situ and ex situ protection or safeguarding, and lack of monitoring. *These threats to genetic diversity must be addressed by the CBD, and the indicators proposed will help.*

No Digital Sequence Information/ genetic data is required for any of these indicators. Parties would report proportions of populations meeting the above criteria - population size, population maintenance, or numbers of previously completed studies or reports. The indicators are calculated using primarily available demographic or ecological data or public databases of reports. Parties do not provide, submit, share, or report sequence information in any form. *Therefore there are absolutely no connections between these indicators and concerns over DSI.*

Relation to other indicators. Indicators such as the Red List Index and number of threatened breeds are not sufficient for reporting on genetic diversity. The indicators proposed above are connected to the maintenance, protection, restoration, and monitoring of genetic diversity and are necessary.

The indicators have several advantages: These are: flexible methodology adaptable to country; leverages within country data and expertise; very closely connected with the process of maintaining genetic diversity; good potential future alignment with Red List assessment updates.

The Coalition for Conservation Genetics, a global network uniting professionals in IUCN, GEOBON, the Society for Conservation Biology and G-BIKE, in coordination with other governmental and non-governmental organizations, will continue to provide advice and guidance for these indicators.

Reference List

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