

The tree of life: Conserving our evolutionary heritage to ensure benefits for future generations

Recognising non-monetary benefits from biodiversity (Goal B)

It is essential that the Global Biodiversity Framework’s goals and targets for the coming decades are not only ambitious in the amount of biodiversity to be protected, but also that they consider the many biodiversity facets and the interlinks among them. There is a strong focus on species and ecosystems, but we must recognise the importance of other components of biodiversity, specifically the variety across the tree of life, as has been recognised by IPBES¹, IUCN² and others. Current indicators capture information per species (e.g. the proposed genetic diversity indicator and the Red List Index) but do not account for between-species diversity and the features and traits that arise as a result of our planet’s evolutionary history. This diversity is an essential basis for biodiversity’s provision of benefits to people. This concept is captured in IPBES’s use of Nature’s Contributions to People, which highlights how the loss of species and of variety leads to a loss in NCPs. The proposed replacement of this term with Ecosystem Services should include explicit reference to the contributions from biodiversity. These contributions must also include non-monetary benefits, particularly the maintenance of options, which is the overall capacity of biodiversity to support a good quality of life into the future¹. This is essential to ensure intergenerational justice in the context of a changing environment and the challenges that biodiversity faces going forward. Recognition of the link between conserving the Tree of Life and maintaining the benefits of biodiversity provides an opportunity to address this.

It has been acknowledged that, if global policy is to ‘bend the curve’ of biodiversity loss whilst securing a broad range of benefits, we must set and attain highly ambitious goals that include prioritising the conservation of evolutionarily distinct lineages to effectively safeguard the Tree of Life³.

Box 1: An important mechanism to value such benefits from biodiversity is through Phylogenetic Diversity (PD)⁴, a critical and often overlooked facet of biodiversity which measures the evolutionary heritage represented by a set of species across the Tree of Life. By conserving PD globally, we conserve the variety of different evolutionary features of species, and so benefits and future options for humanity. For example, prioritising plant species for conservation based on PD most effectively safeguards a larger and wider variety of benefits to people⁵. And, those future options include surprising benefits arising from evolutionary features, such as the potential to develop treatments from the regenerative abilities of *Ambystoma* salamanders. This indicator has been used by IPBES for maintenance of options (NCP 18), and as relevant to medicinal, biochemical and genetic resources (NCP 14) and learning and inspiration (NCP 15)¹.

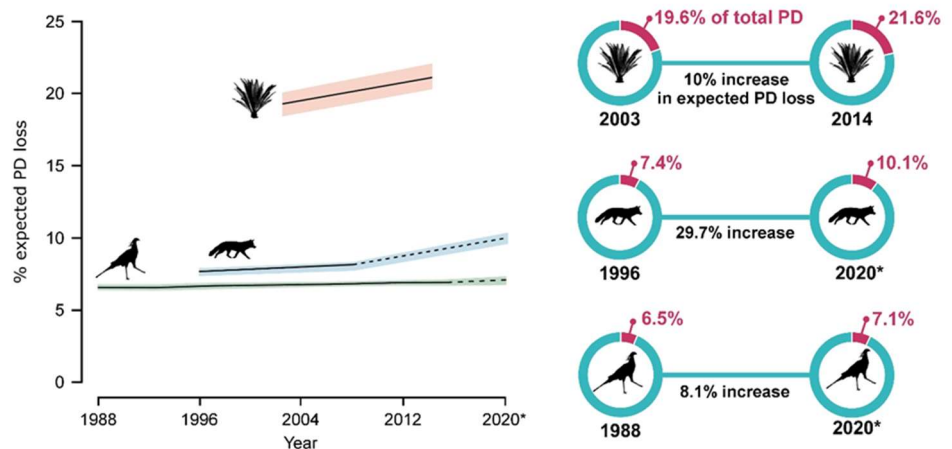
However, the proposed SEEA headline indicator to be used for Goal B relates only to ecosystem services and assets, and does not capture benefits from biodiversity at all. This neglects an entire set of non-monetary benefits and options that biodiversity provides, which must be secured.

To fill this gap, we propose the indicator:

- ‘Expected loss of Phylogenetic Diversity’⁶

PD also provides a measure of the diversity between species, currently lacking in Goal A indicators such as the RLI and the genetic diversity indicator, and can be calculated at a variety of taxonomic and spatial scales⁷.

Figure 1: The PD indicator: tracking expected PD loss through time. Left panel: trends in percentage of expected PD loss for the world’s mammals (blue), birds (green) and cycads (pink), based on current and historical IUCN Red List assessments; right panel: detail of this change, baseline (left circle) and latest (right circle) estimations of expected PD loss for each clade, with the percent change in overall expected PD loss.



¹ IPBES 2019

² IUCN Resolution 019 (2012)

³ Diaz et al. 2020

⁴ Faith 1992

⁵ Molina-Venegas et al. 2021

⁶ Gumbs et al. 2021

⁷ Faith et al. 2018

Creating linkages between benefits from biodiversity (Goal B) and species conservation (Goal A)

In addition, there is no formal linkage between goal B on benefits from biodiversity, with the conservation of species in Goal A, in comparison to the existing links between area conservation and valuing ecosystem services. This omission risks prioritising conservation activities for maintaining ecosystem services while assuming that sufficient biodiversity will also be conserved.

Given the importance of variety across the Tree of Life to maintaining biodiversity benefits and options, we propose a paired species-focused component indicator for Goal A that tracks the change in conservation status for the most distinctive and threatened species through time, to highlight species whose conservation can safeguard large amounts of threatened evolutionary history:

• **Changing status of Evolutionarily Distinct and Globally Endangered species (EDGE Index)⁶**

This newly developed indicator adds value to existing broader species measures and Goal A indicators; and can be applied to trends in conservation status, extinctions, and recovery.

Box 2: A practical methodology to apply the concept of phylogenetic diversity to conservation is embodied in the EDGE lists produced by the Zoological Society of London (ZSL). EDGE (Evolutionarily Distinct and Globally Endangered) species are those which disproportionately represent threatened phylogenetic diversity, collectively representing billions of years of threatened evolutionary history⁸. These species represent major opportunities to avert loss of PD and the associated loss of options, alongside their heritage and existence values as highly distinctive species⁹.

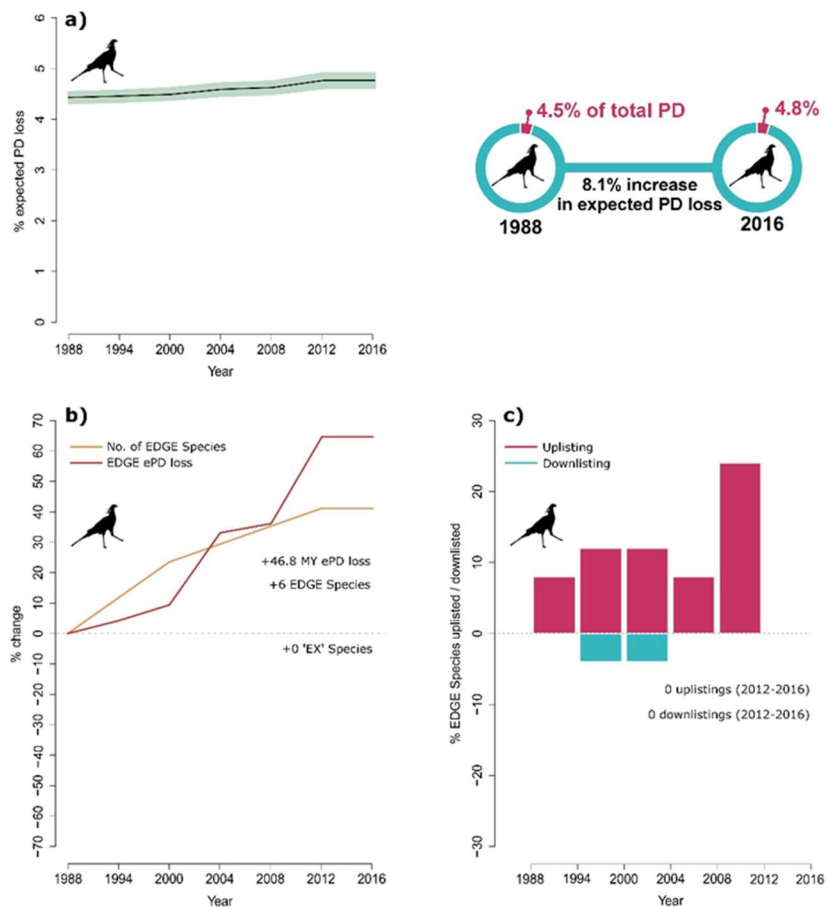
Country-level disaggregations

The IUCN Species Survival Commission’s Phylogenetic Diversity Task Force has committed to generate both indicators at the global and national level and make these publicly available and accessible through an online tool currently in development. Data is available for terrestrial and marine vertebrate groups, gymnosperms, and corals, and will eventually be available for all seed plants under the Global Strategy for Plant Conservation. Here we show the disaggregation for Kenya, a biodiverse country.

National-level indicators for conserving the Tree of Life: Birds of Kenya

Figure 2: Example of national disaggregations for the two indicators for the birds of Kenya. The expected PD loss of Kenyan bird species (a) is calculated as a percentage of the total PD associated with bird species present in Kenya.

The EDGE Index for Kenyan birds (b-c) is subset from the global pool of priority EDGE birds to ensure national priority species align with those of global value. Left panels: tracking changes through time in the total number of EDGE species, associated expected PD loss (ePD loss), and extinctions (EX Species), of priority EDGE Species per clade; and (right panels) the changes in extinction risk (uplistings and downlistings: species moving into higher or lower Red List categories) within sets of EDGE Species.



⁸ Gumbs et al. 2020

⁹ Owen et al. 2019