Marine habitat diversity

Indicator name — **Marine Habitat Diversity Indicator (MHDI)**

Indicator unit — The MHDI measures the bathymetric complexity of marine protected areas, expressed as variation in the vertical relief, which can serve as a proxy of habitat complexity and diversity. Being the logarithm of the standard deviation of the bathymetry, it is dimensionless. The higher the MHDI, the more complex is the marine habitat.

Area of interest — The MHDI is computed for each marine protected area of size ≥ 5 km^2.

Related targets

Sustainable Development Goal 14 on life below water

Aichi Biodiversity Target 11 on protected areas

Aichi Biodiversity Target 12 on species

Policy question — How important is a given marine area in terms of habitats and species diversity? By identifying marine protected areas with a high level of complexity in the habitat structure, we highlight marine areas with a larger variety of structural and functional ecosystem properties and, indirectly, a potentially larger species diversity.

Use and interpretation — Each protected area can be characterized by a set of environmental parameters that describe the variety of ecosystems and species potentially hosted. Topographic complexity is often considered positively associated to biodiversity, for example, marine areas with high value in habitat complexity are more likely to support a larger variety of species (see e.g. Thrush *et al.*, 1997, 2001; Ellingsen, Hewitt & Thrush, 2007). The value presented as the MHDI for a protected area is defined as the logarithm of the standard deviation of the bathymetry. The use of the logarithm facilitates comparisons across a wide range of values.

Note that the bathymetry statistics combined with a virtual elevation profile, as well as the monthly statistics of the sea surface temperature of the area, can help assessing the environmental characteristics of the marine habitat.

Key caveats — Data about the marine environment are notoriously uncertain and oversimplified given the difficulty to monitor such a complex realm. The MHDI provides a basic proxy for the complexity of the marine habitats and cannot capture the full ecological complexity of the studied area.

Indicator status Published in peer reviewed papers (Dubois *et al.*, 2015) and technical reports (Dubois *et al.*, 2016). Standard statistics, no modeling involved.

Available data and resources

Data available The values of the MHDI for each marine protected area can be downloaded from the DOPA Explorer website available at http://dopa-explorer.jrc.ec.europa.eu/ .

Data updates Planned with each update of DOPA.

Codes Standard GIS operations applied to vector and raster data.

Methodology

Methodology A 15 arc-sec (≈ 0.5 km^2) gridded global elevation of the world (GEBCO 2020) is used to compute the MHDI for any marine protected area larger than 5 km^2. The MHDI is computed as the logarithm of the standard deviation of the bathymetry found in the marine area.

Input datasets The indicator has been produced using the following input datasets

Protected Areas

- WDPA of January 2021 (UNEP-WCMC & IUCN, 2021).
    - Latest version available from: www.protectedplanet.net

Elevation (bathymetry and topography)

- GEBCO 2020 (Weatherall P. *et al.*, 2014).
    - Latest version available from: http://www.gebco.net/data_and_products/gridded_bathymetry_data/

References

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Ellingsen K.E., Hewitt J.E. & S. F. Thrush (2007). Rare species, habitat diversity and functional redundancy in marine benthos. *Journal of Sea Research*, 58: 291-301. https://doi.org/10.1016/j.seares.2007.10.001

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Weatherall P. *et al.* (2014). A new digital bathymetric model of the world's oceans. *Earth and Space Science*, 2, https://doi.org/10.1002/2015EA000107

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