

## 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  $\geq 5 \text{ km}^2$ .

### 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 MHDl 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** The GEBCO global gridded bathymetric dataset (spatial resolution 15 arc-sec, approximately equal to 0.5 km<sup>2</sup>) is used to compute the MHDl for any marine protected area larger than 5 km<sup>2</sup>. The MHDl 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 February 2023 (UNEP-WCMC & IUCN, 2023).
  - Latest version available from: [www.protectedplanet.net](http://www.protectedplanet.net)

### Elevation (bathymetry and topography)

- GEBCO (version 2023, Weatherall P. *et al.*, 2014).
  - Latest version available from:  
[http://www.gebco.net/data\\_and\\_products/gridded\\_bathymetry\\_data/](http://www.gebco.net/data_and_products/gridded_bathymetry_data/)

## **References**

Dubois, G., *et al.* (2016). Integrating multiple spatial datasets to assess protected areas: Lessons learnt from the Digital Observatory for Protected Area (DOPA). *International Journal of Geo-Information* 5(12): 242. <http://dx.doi.org/10.3390/ijgi5120242>

Dubois, G., *et al.* (2015). *The Digital Observatory for Protected Areas (DOPA) Explorer 1.0*. EUR 27162 EN. Publications Office of the European Union, Luxembourg, 53 p. <https://dx.doi.org/10.2788/436594>

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>

Thrush, S.F., *et al.* (1997). Matching the outcome of small-scale density manipulation experiments with larger scale patterns: an example of bivalve

adult/juvenile interactions. *Journal of Experimental Marine Biology and Ecology*, 216: 153-170. [https://doi.org/10.1016/S0022-0981\(97\)00094-4](https://doi.org/10.1016/S0022-0981(97)00094-4)

Thrush, S.F., *et al.* (2001). Fishing disturbance and marine biodiversity: role of habitat structure in simple soft-sediment systems. *Marine Ecology Progress Series*, 223: 277-286. <http://dx.doi.org/10.3354/meps221255>

UNEP-WCMC & IUCN (2023). Protected Planet: The World Database on Protected Areas (WDPA) [On-line], [February/2023], Cambridge, UK: UNEP-WCMC and IUCN. [www.protectedplanet.net](http://www.protectedplanet.net)

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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