# Policy brief on High Seas biodiversity knowledge

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## Overview

Known marine life in areas beyond national jurisdiction (ABNJ) includes more than 26,000 species[1] with distributions that span national and international jurisdictions or waters and seafloor. Biodiversity beyond national jurisdiction (BBNJ) encompasses organisms across all domains of life, and includes fish, turtles, marine mammals, and birds, although the majority of species recorded are invertebrates. Pressures from human activities, including climate change, are threatening the diversity and productivity of marine life in ABNJ. Migratory species are key examples of transboundary species and good representatives of the management challenges and importance of multilateral cooperation for the sustainable management and conservation of shared biota. To address these challenges, and improve existing governance structures, member States of the UN have been developing a new international legally binding instrument (ILBI; i.e. BBNJ Agreement) aimed at improving the sustainability and protection of biological diversity in ABNJ. The BBNJ treaty encompasses four main elements: (i) marine protected areas and other area-based management tools (ABMT), (ii) environmental impact assessments (EIA), (iii) marine genetic resources and (iv) capacity building and technology transfer. The need to collect, assemble and utilize robust biodiversity knowledge cuts across all four thematic elements of the BBNJ treaty, as all rely on the ability to quantify and monitor the status of biological communities in these remote ecosystems. Therefore, an accurate, public and widespread biodiversity repository is key to operationalize the agreement.
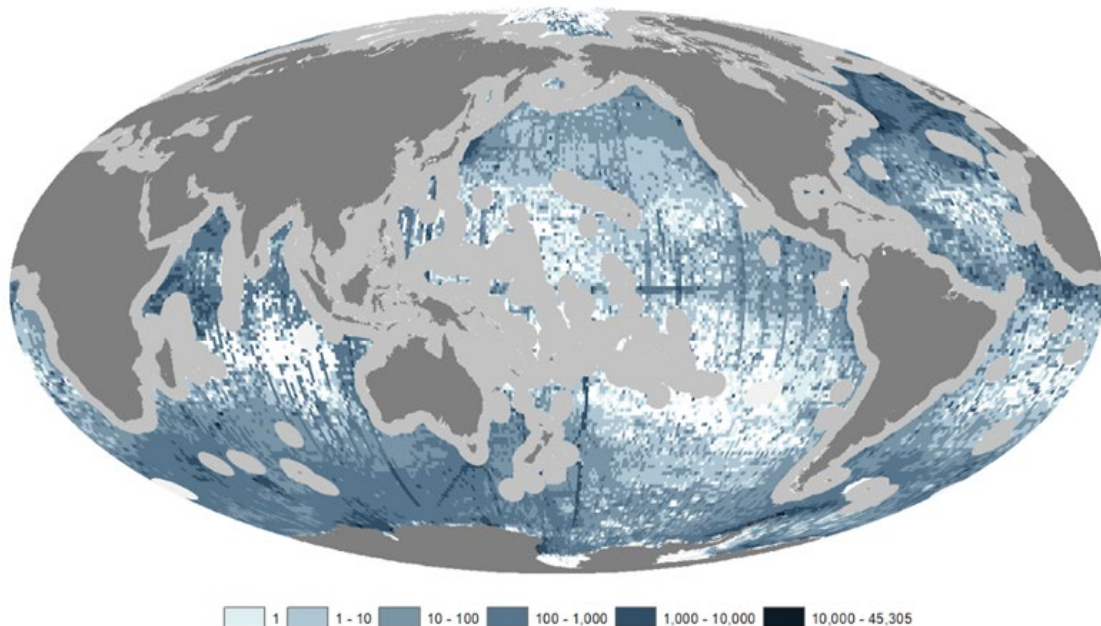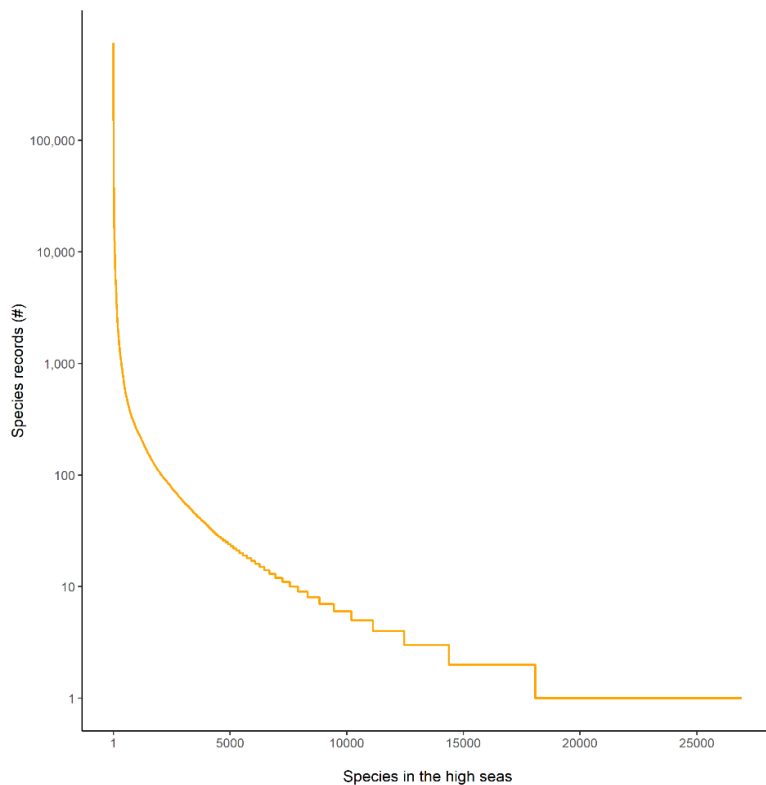


| | 1 | 1 - 10 | 10 - 100 | 100 - 1,000 | 1,000 - 10,000 | 10,000 - 45,305 |

Figure 1: geographic distribution of high seas biodiversity records in the Ocean Biodiversity Information System (OBIS).

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[1] As of late 2021, OBIS had recorded over 26,000 unique species in ABNJ; this estimate increased in early 2022 to almost 27,000 species

The Ocean Biodiversity Information System (OBIS) is currently the most comprehensive public repository of marine species observations in ABNJ, and contains ~6.18 million records[2] representing 26,927 species. In this brief, we seek to summarize the results and conclusion of a broader study in which we describe the taxonomic, geographic and institutional scope of the knowledge available in OBIS for biodiversity in ABNJ and identify the array of stakeholders engaged in generating this knowledge.

## Mapping the geographic, taxonomic and ecological coverage of BBNJ knowledge

The density of biodiversity records is highest in areas adjacent to exclusive economic zones (EEZ) of coastal and island nations, and decreases further offshore (Fig. 1). Overall, biodiversity records are skewed towards certain regions with the Southern (n= 2'133,742; 34.5%), Indian (n = 1'470,136; 23.8%) and North Atlantic Oceans (n =1'216,952; 19.7%) as the most data-rich, whereas the North Pacific (n = 369,963; 6%) and Arctic (n= 108,162; 1.75%) ranked last. Other areas of low data included the tropical coasts of South America and Africa. In terms of taxonomic richness, OBIS data for BBNJ represent 809 unique orders and 93 phyla. The richest basin was the Southern Ocean (82 phyla, 563 orders), and the highest species richness was reported for the Indian Ocean (9,256 species). From an ecological perspective, the highest spatial coverage (1°x1° cells) constituted pelagic biodiversity records (77.1%) followed by planktonic biodiversity (34.2%) and benthic biodiversity (33.3%). **Remarkably, ~90% of the high seas have less than 10 benthic records, and only 3.5% has 100 or more records.** Less than 1% of the ocean has 1,000 or more records. This suggests significant knowledge gaps for benthic biodiversity in ABNJ. Geographically, the ecological knowledge available in OBIS shows strong variability. The North Atlantic and Southern Oceans exhibited the highest coverage of planktonic biodiversity, whereas pelagic records were evenly distributed across ocean basins, but with a major gap in the central Pacific Ocean. Benthic biodiversity records were concentrated in the North Atlantic, Indian, and Southern Oceans. Overall, biodiversity knowledge in ABNJ is significantly skewed, with 80.3% of (1° x 1° cells) showing at least one biodiversity record, 74.5% showing at least 10 records, 29.4% showing 100 or more records, and just 4.1% showing 1000 or more records. Taxonomic biases tell a similar story: the majority of ABNJ species recorded in OBIS have <10 records, and many only had one record.



Figure 2: number of individual records for each of the 26,927 species recorded in ABNJ.

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[2] OBIS had 6.18 million records in ABNJ as of late 2021; the number has now been updated to 8.6 million in early 2022.

**Biodiversity records are concentrated among few species, with only ten species making up >60% of records. Only 341 species, or 1.3% of all observed species in ABNJ had 1,000 or more records (Fig. 2).** The species with the highest number of records was the elephant seal (*Mirounga leonina)* with 741,062 records, followed by the Weddell seal (*Leptonychotes weddellii)* and the Adélie penguin (*Pygoscelis adeliae)*. However, it is important to note that these species show a high volume of telemetry location data (30% of all BBNJ data in OBIS), which implies potential overestimation of the actual number of individuals, followed by human observation (37%) and preserved specimens (20%). **From an ecological representativity perspective, the fact that only 7% of recorded species in ABNJ have 100 or more records needs to be vastly improved if the international community seeks to implement ecosystem-based and precautionary approaches (Fig. 2)**
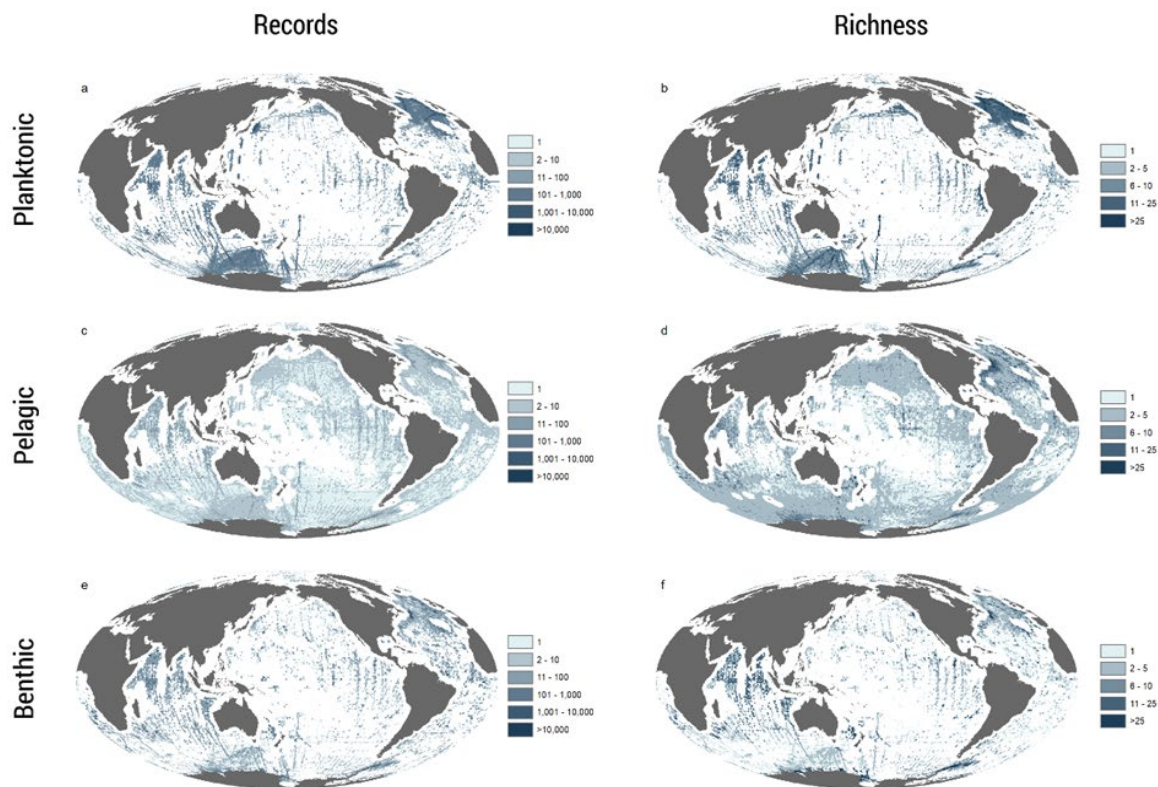


Figure 3: Record density (left) and species richness (right) spatial distributions across planktonic (top), pelagic (middle) and benthic (bottom) ecological classifications.

From a geographic standpoint, cross-sectoral ABMTs and EIAs will require information for pelagic species across the central Indian and Pacific basins and globally for benthic communities. Limitations in pelagic and planktonic biodiversity data in the eastern Indian Ocean and Central and southwestern portions of the Atlantic Ocean are of particular concern given the lack of non-tuna regional fisheries management organisations. Benthic biodiversity had the lowest number of records of all ecological groups; this shortage of deep-sea data may pose a significant challenge for designing and implementing ecosystem-based management measures for sectoral activities as well as designing ABMTs and EIAs for effective conservation outcomes in large areas of the deep-ocean where data is either unavailable or limited. The spatial coverage of benthic biodiversity knowledge was the lowest of the three groups, since only 33% of the high seas had at least one record and cells with 1,000 records plummeted to 0.6%, 0.8% for planktonic and 1.6% for pelagic species (Fig 3).

## Identifying and classifying the principal knowledge contributors

As of late 2021, the ABNJ biodiversity data in OBIS originated from 973 unique datasets which can be traced back to 263 institutions; importantly half of the 6.18 million records lacked an institutional code and could not be traced to an institution. The contributing institutions identified in OBIS can be grouped into six categories: research consortium; private sector; national government; inter-governmental; civil society; academia. National governments accounted for 62% of the records with an institutional code, while academia followed with 26%. Interestingly, different types of organisations play larger or smaller roles in specific regions and with specific taxonomic groups. National governments contributed the most pelagic and planktonic species records, while academia contributed the most benthic species records. At the taxonomic scale, the relative contribution of unique orders by academia, national governments and research consortia was relatively similar (at about 400 unique orders each). While national governments contributed some data in all ocean basins, data availability in the North Pacific, Eastern Tropical Pacific, Southwest Pacific and Northern Indian Ocean relied more heavily on contributions from other types of institutions. This highlights the important role that academia and research groups play in the generation and open access dissemination of high seas biodiversity knowledge.

## Implications for ongoing high seas biodiversity treaty negotiations

- Further description of knowledge coverage rates for identifying data-deficient regions will be important to identify research priorities to strengthen capacity of sectoral bodies for ecosystem-based management as well as to advance implementation of the BBNJ Treaty, in particular for area-based management tools (ABMTs) and environmental impact assessments (EIAs).
- Explanation of the role of biodiversity information in the design and implementation of EIAs and ABMTs, including knowledge thresholds below which a precautionary approach would be exercised and the alignment of EIA & ABMT criteria in other existing processes.
- Opportunities for strengthening the collection, curation and consolidation of high seas biodiversity knowledge together with other existing or emerging observing systems.
- Encouraging the consideration of text for Strategic Environmental Assessments to fill geographic and taxonomic knowledge gaps and to standardize existing and new biodiversity information.
- Recognizing that in order to ensure that the full breadth of biodiversity in the high seas is represented in open-access data repositories, it is crucial to ensure adequate financial and logistical support for the processes of data collection and curation, capacity development, and incentives to share existing and new data to open-access repositories, including, but not limited to, the International Seabed Authority and Regional Fisheries Management Organizations.
- We consider the provision of open-access biodiversity information to be critical to the success of the new treaty and strongly suggest that existing international institutions (e.g., the Global Ocean Observing System (GOOS), the Group on Earth Observation - Biodiversity Observation Network (GEO-BON) and its Marine Biodiversity Observation Network (MBON)) and data sharing mechanisms should be strengthened to support future needs of an ILBI. Both the data repositories, like OBIS and its sub-nodes, and the civil-society institutions that are critical data contributors, are desperately and perennially underfunded - which jeopardizes the successful implementation of a new treaty and sectoral measures. Development of structural funding mechanisms for these entities should underpin future governance frameworks.