

OBIS

OCEAN BIODIVERSITY
INFORMATION SYSTEM

Sound scientific ocean management and conservation starts with comprehensive biodiversity and biogeographic data

OBIS in a nutshell

Accessible high-quality data on ocean biodiversity and biogeography is key to an information-driven approach to restore our ocean and curb future degradation. Following from the to date largest effort to decrypt the mysteries of our ocean – the Census of Marine Life – the **Ocean Biodiversity Information system (OBIS)** was created to collate existing and manage new information on the diversity, abundance and distribution of marine life.

OBIS goes beyond traditional data archives. In addition to making an integrated product of the archived data, OBIS trains and educates its members and collaborators to collect and standardise marine data in a way that makes the data findable, accessible, interoperable and easily reusable by others. The OBIS database captures the full spectrum of marine diversity both in the types organisms and data, such as abundance, habitat, or even genetic.

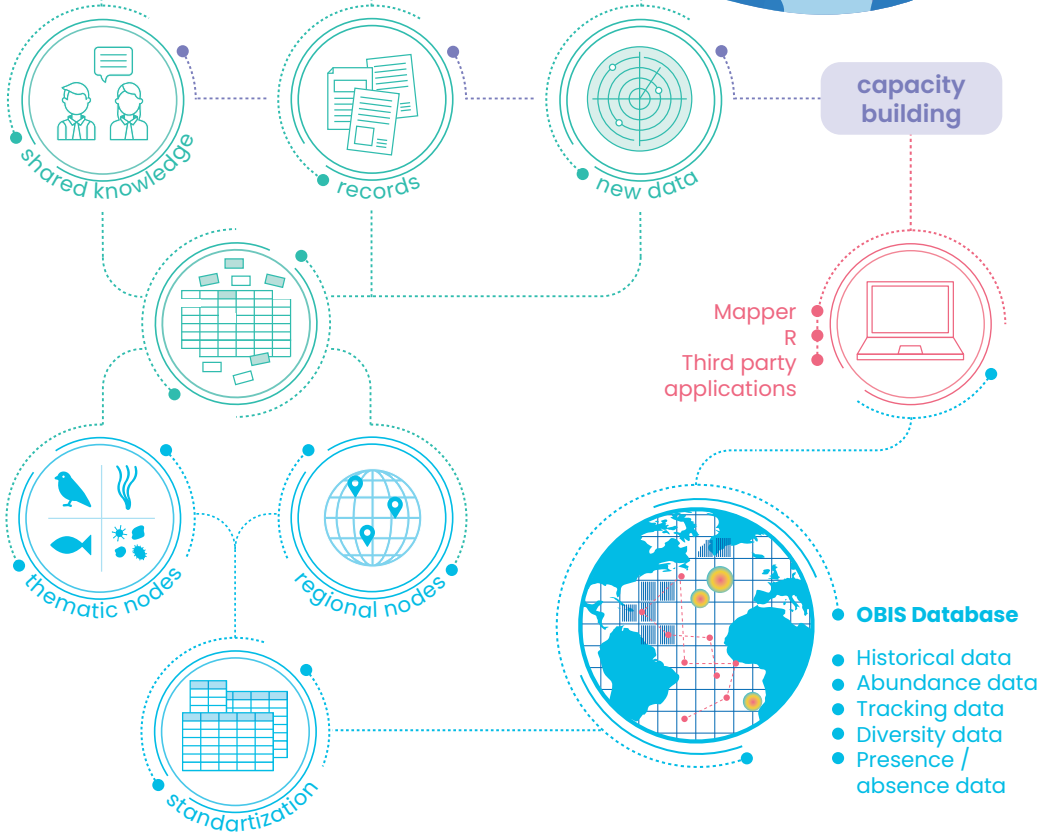
In providing open-access data, OBIS removes barriers of historic inequality and fosters fair access to and benefit-sharing of information. It is a community built on the culture of collaboration and the plurality of perspectives and ideas of its network. Ultimately, by sharing expertise and data, OBIS is shaping the design and delivery of data-driven ocean knowledge to promote nature-based solutions contributing to the UN 2030 Agenda for Sustainable Development and the UN Decade of Ocean Science for Sustainable Development.

OBIS secretariat

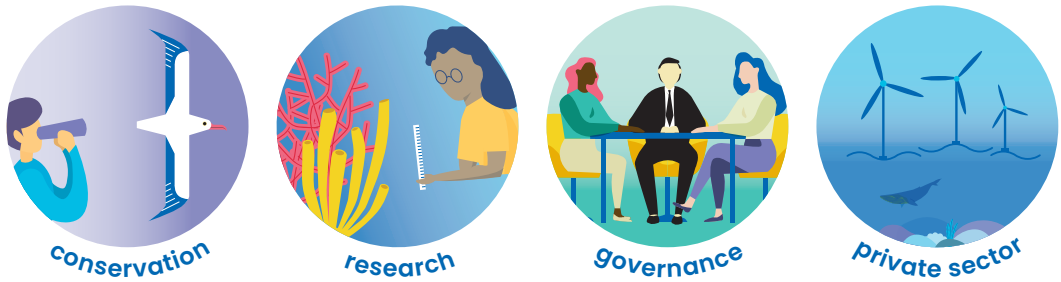
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How is OBIS data used?



A healthy ocean is a diverse ocean

Our ocean provides essential services to humankind. It offers food, medicine, valuable resources and even space for recreational activities. Most importantly, our ocean regulates bio-geo-chemical processes, such as our climate. A healthy ocean teeming with life performs many more such services and each more effectively.

But the oceans' biodiversity continues to be threatened by poor governance, neglect and outright exploitation.

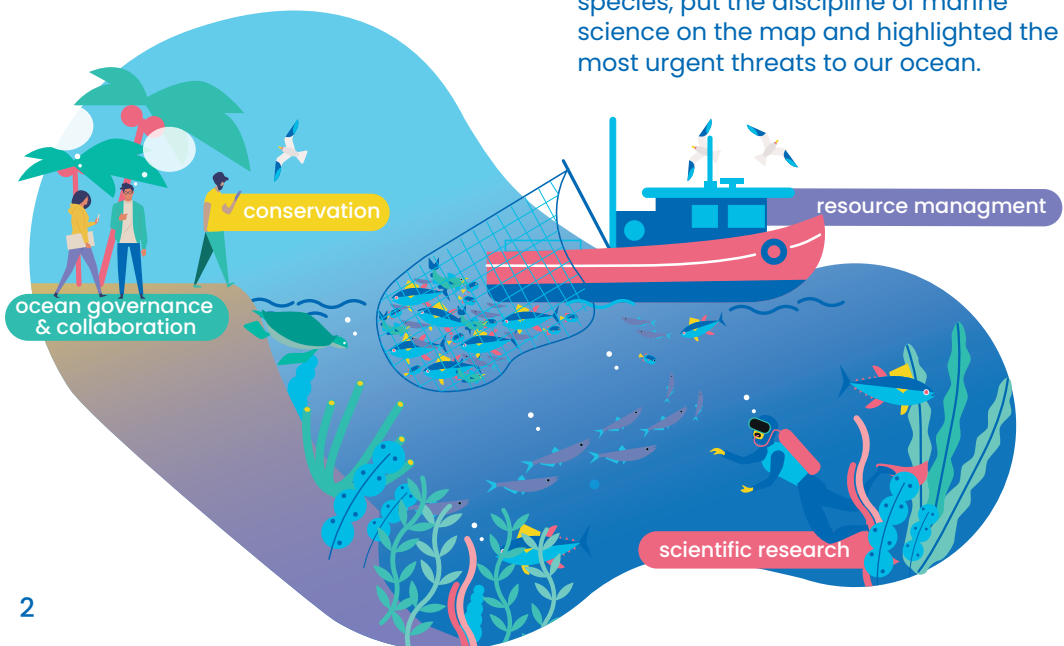
To counter global issues and ensure the sustainable use of marine resources, data-driven research, conservation and ocean management are key.

Collect, analyse, archive, repeat

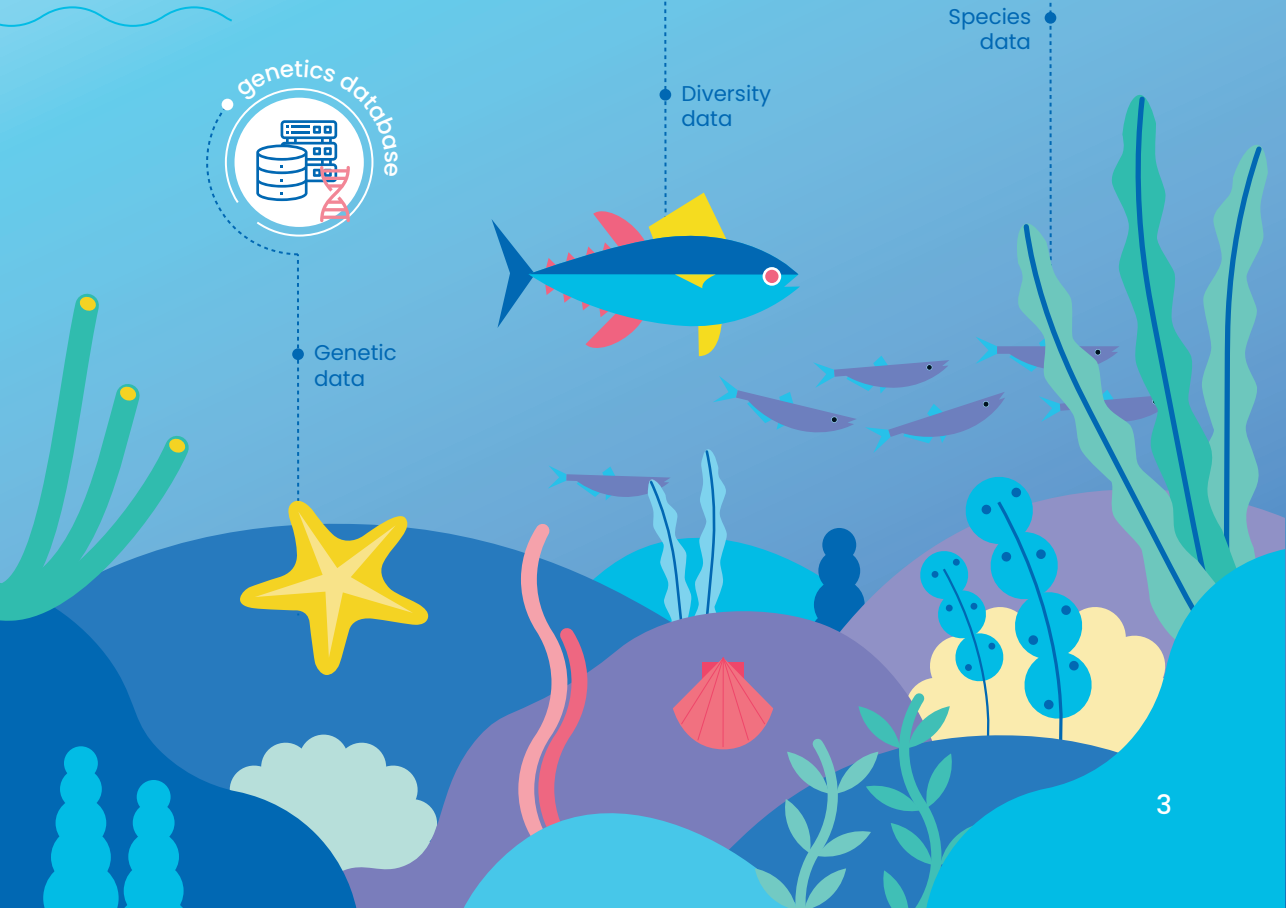
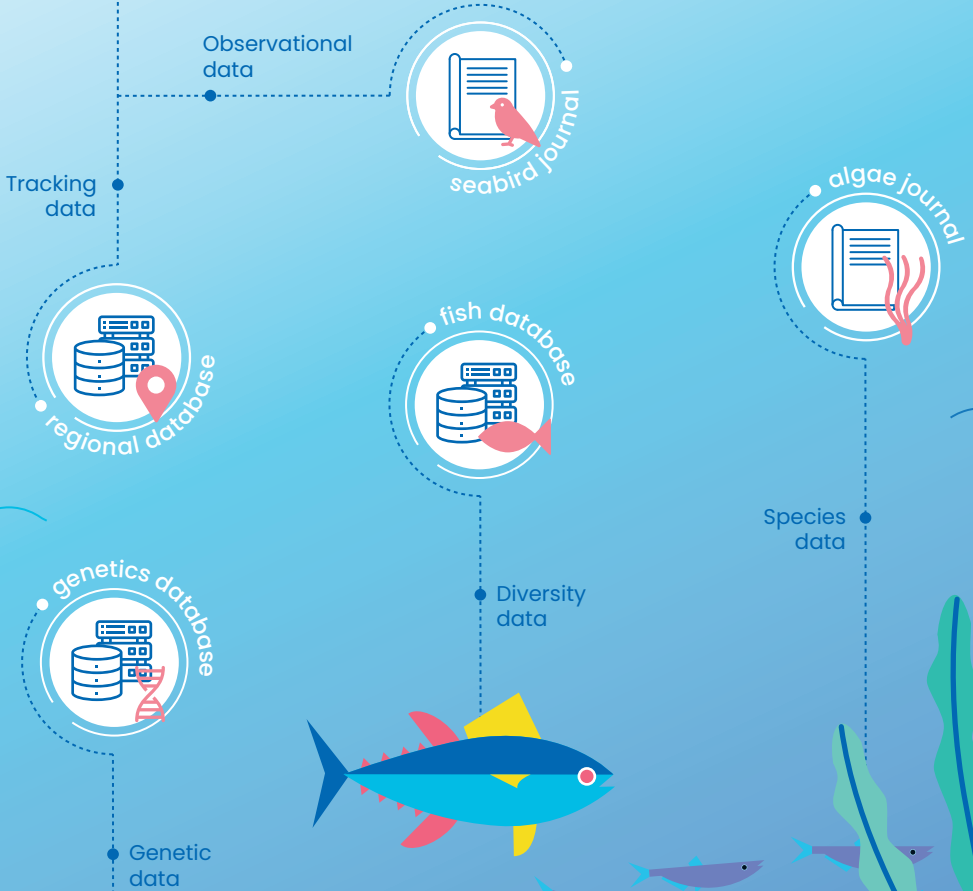
Data is central to a concerted effort to tackle the global biodiversity and climate crisis of our ocean. Problematically, however, lifespan of data is often short and ends in its archival on private or public databases.

The challenge lies in finding, accessing and making sense of the myriad of existing, but cryptic data pieces. What makes this endeavor even more challenging is little compliance with universal recording language and structure. **A generalisable code to data management makes data comparable in space and over time.** It also means research, conservation, private sector operations and governments can base their decisions on the same high-quality and reliable information.

The **Census of Marine Life** (2000–2010) – a multimillion-dollar initiative – represented the first collaborative efforts from more than 2700 scientists and 80 nations to strengthen our understanding of our ocean. And in fact, the initiative discovered more than 6000 new marine species, put the discipline of marine science on the map and highlighted the most urgent threats to our ocean.



A wealth of data about various marine species, habitats and whole ecosystems already exists, but **accessing such data requires extraordinary efforts** from individual users to gather and assemble disjunct pieces of information.



OBIS – free, accessible and detailed marine data

Emanating from the *Census of Marine Life*, the Ocean Biodiversity Information System (OBIS) was founded to collate existing information and manage new data.

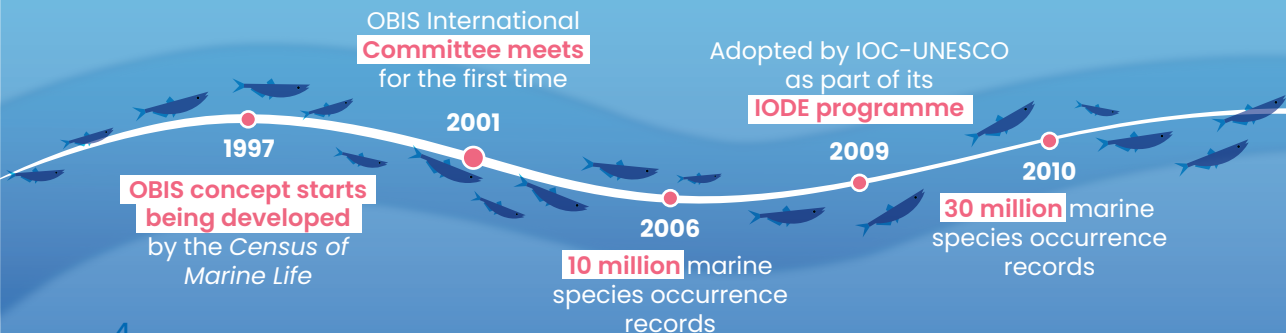
Realizing its importance, governments soon assumed the responsibility for OBIS and the Intergovernmental Oceanographic Commission (IOC) of UNESCO adopted OBIS in 2009 as part of its International Oceanographic Data and Information Exchange (IODE) program.

Operating as a **collaborative network of regional and thematic nodes** that guarantee high data quality, OBIS is now the most comprehensive and free source of information about marine life.

Objectives

- **Provide data** and tools to help in identify and manage key marine and coastal habitats
- **Operate a platform** for international collaboration on marine biodiversity and ecosystem monitoring
- **Promote the use** of biodiversity data in education, research and decision making
- **Support data-driven policy-making** to tackle regional and global issues
- **Enable inter-disciplinary research** and cross-sector initiatives by including environmental data for use in environmental impact assessment, for instance
- **Facilitate contributions** to the world's largest database on marine life
- **Nurture a FAIR approach** to data archival and sharing

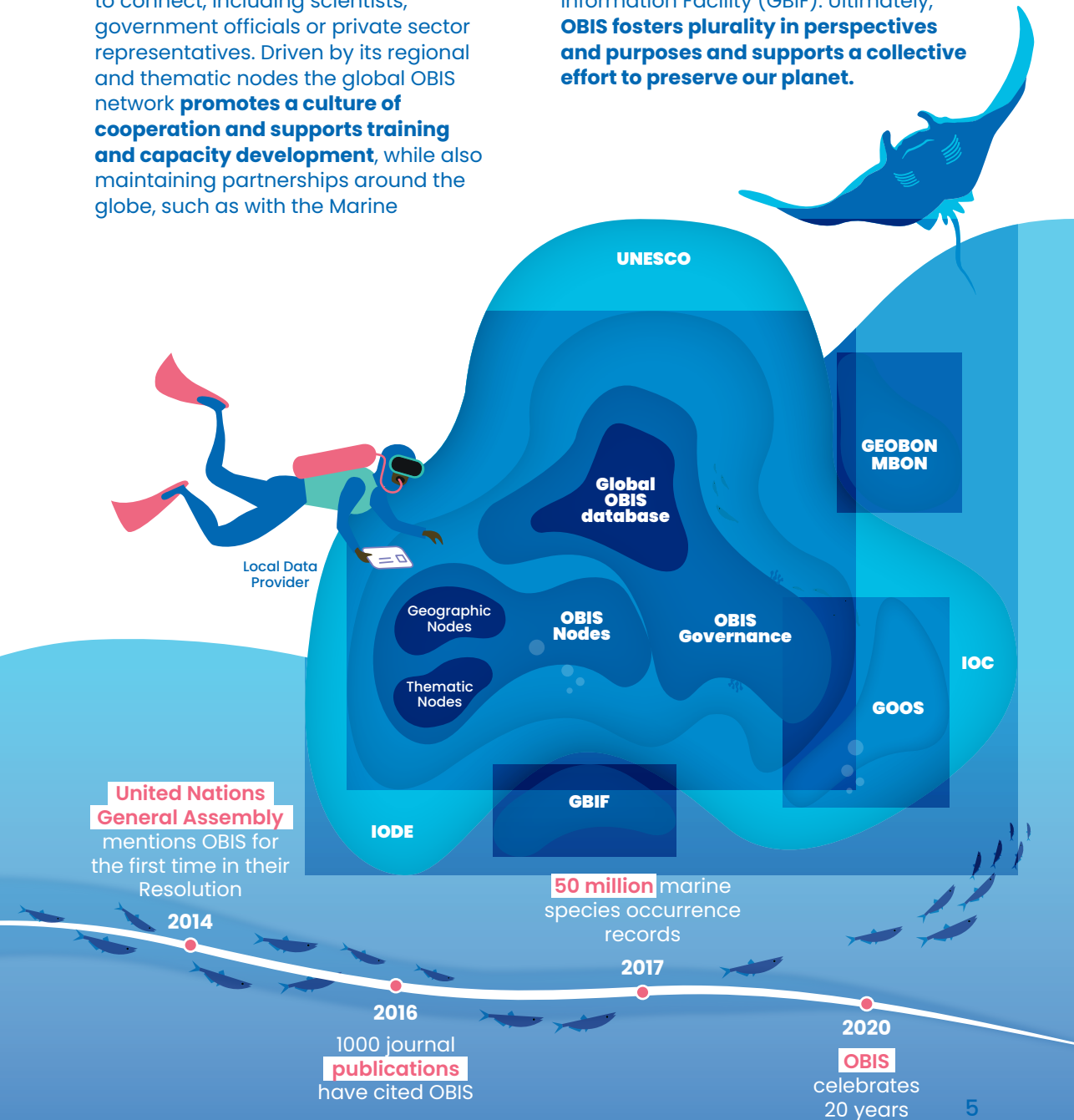
Origins, History and Achievements



The global biodiversity crisis requires a global response

OBIS sees data as dialog between people and nature. Shared information allows communities from diverse backgrounds to connect, including scientists, government officials or private sector representatives. Driven by its regional and thematic nodes the global OBIS network **promotes a culture of cooperation and supports training and capacity development**, while also maintaining partnerships around the globe, such as with the Marine

Biodiversity Observation Network (MBON), the Global Ocean Observing System (GOOS) or the Global Biodiversity Information Facility (GBIF). Ultimately, **OBIS fosters plurality in perspectives and purposes and supports a collective effort to preserve our planet.**



From nature to numbers

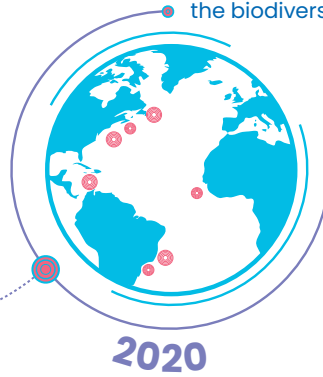
At the core of OBIS is its database. In the more than 60 million records strong archive OBIS compiled and continues to compile a diversity of different data types.



HISTORICAL DATA

Characterises historic records and findings preserved in archives, libraries and older data series which enable comparative analysis over time.

Such long-term data is key to tackling the biodiversity and climate crisis.



TRACKING DATA

Animal movement is frequently tracked via satellites or even drones. Making the movement of marine life visible unlocks new research directions and optimises conservation management.





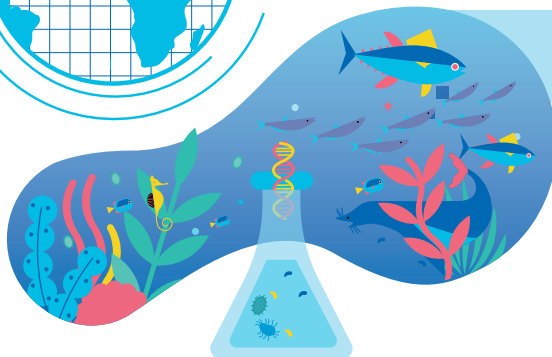
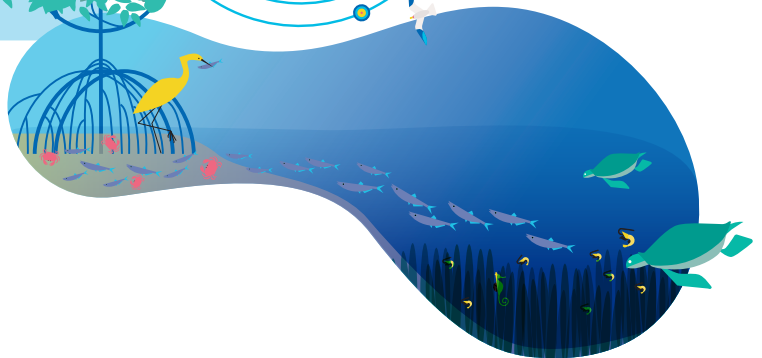
ABUNDANCE DATA

Represents the number of individuals of a species in a given area or volume. This is a key metric for the conservation of vulnerable organisms and the management of species populations like fish stocks.



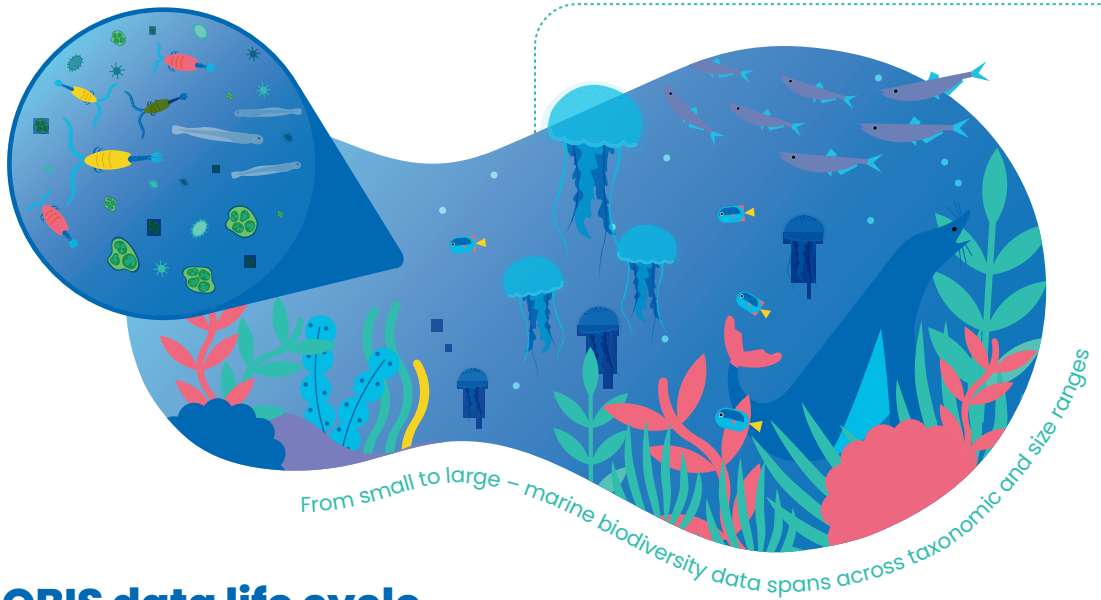
HABITAT DATA

Embodies data about biological as well as habitat and geographic diversity. This allows establishing cause and effect patterns vital to understand biodiversity shifts and inform conservation and ecological impact assessments.



PRESENCE / ABSENCE DATA

Can originate from sporadic sighting or novel detection methods such as environmental DNA. This qualitative data allows the establishment of species ranges, for instance, which have been shifting due to environmental change.



OBIS data life cycle

A lot of human and financial resources have been and are being invested into the **collection** of a vast amount of biogeographic and biodiversity data. Much of the future of scientific discovery, conservation management and policy will therefore rely on making sense of existent data in connection with novel findings.

With this in mind OBIS was founded as an holistic reservoir of ocean biodiversity and biogeographic data.

Before **contributing** data to the OBIS archive, the network of regional and thematic OBIS nodes execute stringent quality checks, such as validating

accurate scientific nomenclature, and transform the data to meet Darwin Core standards and, ultimately, magnify the available data.

Open-access to standardized and enriched data follows the FAIR principle of scientific data: findable, accessible, interoperable and reusable. Moreover, the inclusion of event-based data, such as details about sampling method, adds contextual depth to OBIS data sets.

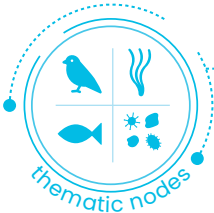
Data stored on the OBIS database can be **accessed** via the online Mapper, the R package robis or third party applications powered by the OBIS API webservice.



CAPACITY DEVELOPMENT

OBIS is further dedicated to train its partners and members as to build, improve, and retain their skills and knowledge.

COLLECTION



During the standardisation process the OBIS nodes check data quality and apply **Darwin Core principles**



The data is then deposited in the **OBIS database**, integrated into one big dataset, and made accessible to everyone

CONTRIBUTION



ACCESS

OBIS data and its diverse uses

The application of OBIS data ranges from scientific research and conservation management to impact assessments and ocean governance.

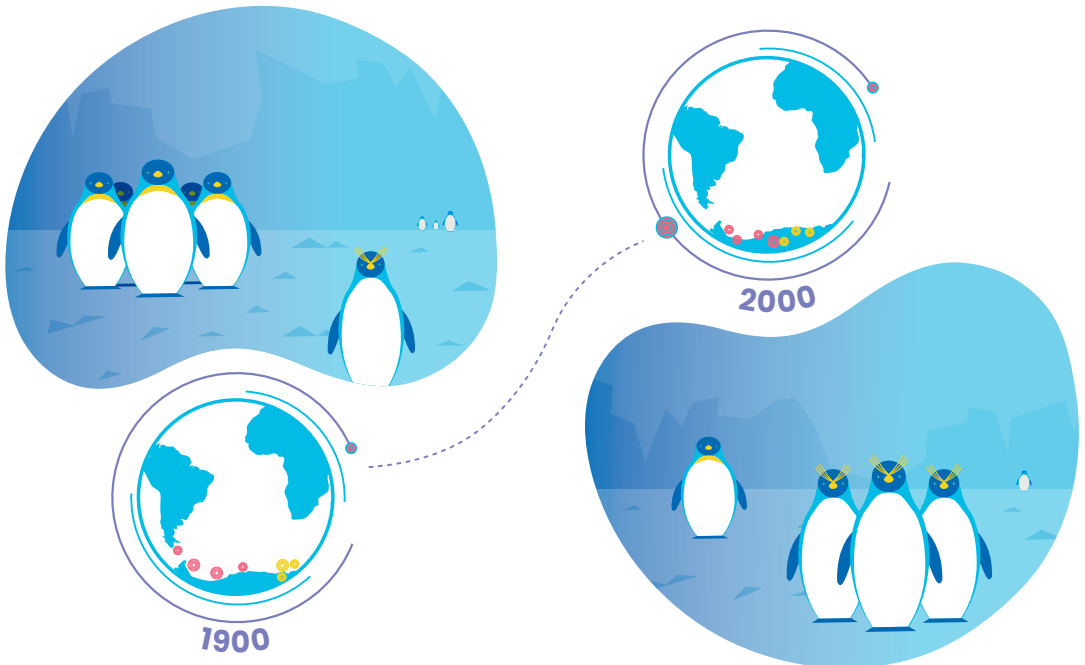
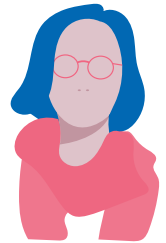
CLIMATE CHANGE AND BIODIVERSITY RESEARCH

Human-induced climate change impacts species in different ways. This means ecological communities have been changing and will continue to change, as supported by a publication by Dr Maria Dornelas and collaborators¹.

Consulting the OBIS database, the researchers compiled more than 6.1 million species occurrence records, representing 35,613 species from large marine megafauna to small invertebrates and plants. The analysis showed that climate change shrank, widened and overall altered species ranges, permanently transforming communities.

“OBIS is really good at establishing trust with who collects the data and giving credit to scientists generating data. They magnify the effect of each contributor so that each scientist is properly acknowledged.”

Maria Dornelas
University of St. Andrews, UK



CONSERVATION OF ECOLOGICALLY SIGNIFICANT AREAS

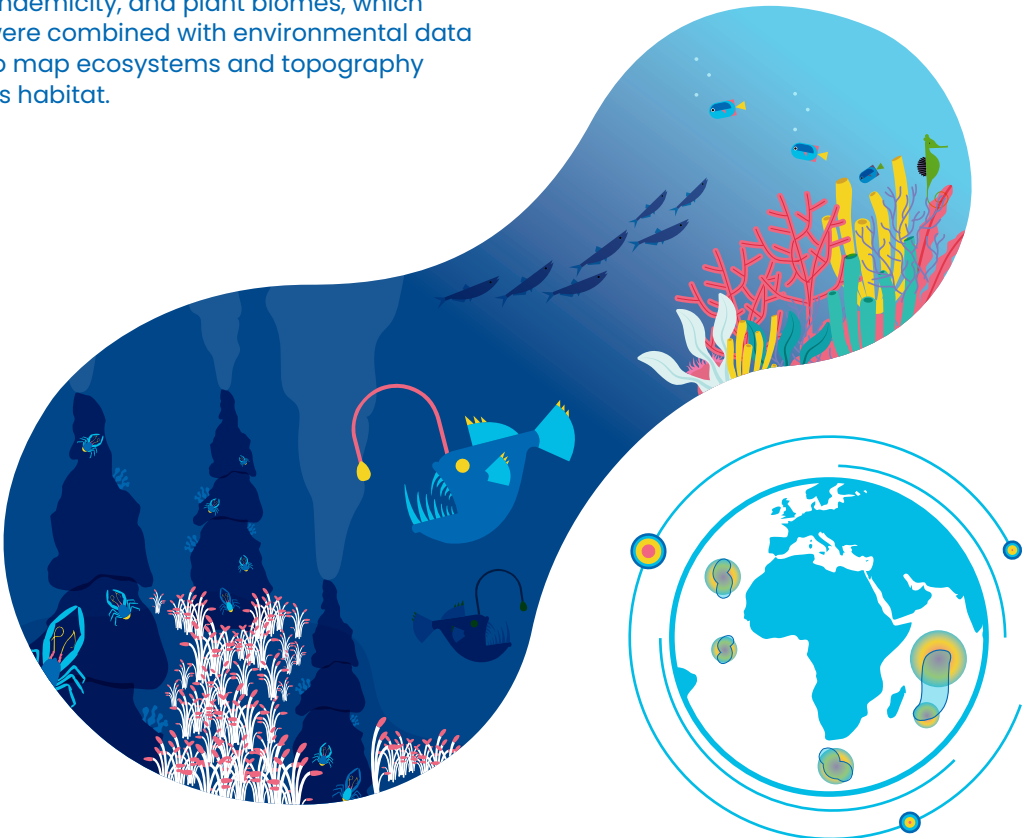
Detailed and reliable biodiversity and biogeographic data is vital for targeted area-based conservation management to safeguard key environments of ecological and biological significance.

Following a call from the International Union for Conservation of Nature (IUCN) to protect 30% of marine habitats, the research group around Prof Mark Costello set out to tackle the question of which areas to prioritise².

The scientists quantitatively mapped the 30% of the ocean that has most biodiversity using decision-support software. OBIS provided the data that enabled mapping of species richness, endemism, and plant biomes, which were combined with environmental data to map ecosystems and topography as habitat.

“I have used OBIS data multiple times. It is marvellous. The standardisation by OBIS nodes makes data comparable and adds real value and depth to our research.”

Mark Costello
University of Auckland, New Zealand





REGIONAL AND GLOBAL OCEAN GOVERNANCE

The future of data-driven policy making will rely on good data and sharing of information (“collect once, use many times”). The standardised and historic data compiled in OBIS for instance allows to improve country estimates for fisheries and conservation management.

Regional and global policies already base their decisions either directly on OBIS data^{5,6} or on research, which employs OBIS data⁷.

Additionally, the circum-global network and free access to data **removes historic barriers of inequality** and allows everyone to tackle marine concerns based on the best information around.

PRIVATE SECTOR USAGE

The ocean is a vital source for food, energy and resources. But whether for the extraction of valuable resources via deep sea mining³ or the exploitation of wave energy to generate electricity⁴, **environmental impact assessments are now essential to marry economic considerations with ecological concerns.**

OBIS data is regularly recommended as trusted resource for biodiversity and biogeographic data.

“Sharing of knowledge (e.g. OBIS) and open access to information and data streams, particularly across sectors, should be encouraged in order to ensure that the data collected are made available to all.”

UN World Ocean Assessment



Tackling the current biodiversity crisis will require sound decision making that rests on reliable data from trusted sources like OBIS.

1. Dorneias, M. et al. Assemblage time series reveal biodiversity change but not systematic loss. *Science*. 344, 296–299 (2014).
2. Zhao, Q. et al. Where Marine Protected Areas would best represent 30% of ocean biodiversity. *Biol. Conserv.* 244, 108536 (2020).
3. Thornborough, K. J., Juniper, S. K., Smith, S. & Wong, L.-W. Towards an Ecosystem Approach to Environmental Impact Assessment for Deep-Sea Mining. In: *Environmental Issues of Deep Sea Mining*. Environmental Issues of Deep-Sea Mining (2019).
4. Magagna, D. et al. SOWFIA-Streamlining of Ocean Wave Farms Impact Assessment. IEE/09/809 - *Intell. Energy Eur.* (2012).
5. IPBES. The IPBES regional assessment report on biodiversity and ecosystem services for Asia and the Pacific. Karki, M., Senaratna Sellamuttu, S., Okayasu, S., Suzuki, W., (eds). *Sec. of the Intergov. Science-Policy Platform on Biod. and Eco. Services* (2018).
6. United Nations. *The First Global Integrated Marine Assessment: World Ocean Assessment I*. Cambridge Cambridge Univ. Press. (2017).
7. FAO (2018). *Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options*. FAO Fisheries and Aquaculture technical paper, T627.