GOBI

Global Ocean Biodiversity Initiative

Science • Policy • Conservation

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Contents

GOBI is funded by the International Climate Initiative (IKI). The German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) supports this initiative on the basis of a decision adopted by the German Bundestag

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The Global Ocean Biodiversity Initiative

The Global Ocean Biodiversity Initiative (GOBI) is an international partnership of institutions committed to advancing the scientific basis for conserving biological diversity in the marine environment. In particular, GOBI contributes expertise, knowledge and data to support the efforts of the Convention on Biological Diversity (CBD) to identify ecologically and biologically significant marine areas (EBSAs) by assisting a range of intergovernmental, regional and national organisations to use and develop appropriate data, tools and methodologies.

Established in 2008, the GOBI partnership comprises more than 40 organisations around the world working to generate new information to enhance the value of EBSAs and their utility for promoting environmental protection and management for specific areas of the world's oceans. The intention is to foster adaptive approaches to reduce the rate of biodiversity loss through the application of ecosystem approaches to the management of human activities, and to support the establishment of networks of representative marine protected areas in national and international waters.

GOBI is committed to supporting the 2030 Agenda for Sustainable Development, in particular Sustainable Development Goal 14, Aichi Target 11 and UNGA resolution 69/292 on the development of an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction.

GOBI's objectives are:

1. To drive and support an international scientific collaboration to assist governments and relevant regional and global organisations to identify ecologically and biologically significant areas of the ocean using the best available scientific data, tools and methods.

2. To provide guidance on how the CBD's EBSA criteria and United Nations resolutions can be interpreted and applied to inform management, including the designation of representative networks of marine protected areas.

3. To generate new knowledge, develop regional analyses and assist in regional capacity building with relevant organisations and stakeholders.

Biodiversity in the global ocean

Covering two-thirds of our planet, the oceans form the largest biome on Earth and are home to 80% of the world's biodiversity. They support an enormous wealth of productive ecosystems, specialised habitats and individual species, which collectively provide services such as the production of oxygen, food, fresh water and the regulation of the Earth's climate.

A healthy and productive ocean is critical for the functioning of our planet and for human wellbeing. However, activities such as over-fishing, habitat destruction and pollution, alongside the global issues of climate change and ocean acidification, are a direct cause of biodiversity loss and threaten the balance and resilience of marine ecosystems worldwide.

Governments increasingly recognise the marine environment as an essential component of the planet's life support system and as an asset presenting important opportunities for sustainable development. Concerns expressed by recent global assessments have prompted renewed commitments to the conservation and sustainable use of oceans and their resources. With 65% of the world's oceans falling outside national jurisdictions, this requires concerted international cooperation and collaboration.

> How inappropriate to call this planet Earth when it is clearly ocean
>
> *Arthur C. Clarke*

Protecting the oceans and the services they provide requires a sound understanding of the complex marine environment, its ecosystems and its natural variability over space and time. Developing this understanding draws on a huge range of scientific data, from physical data that describe seafloor topography and the character and movement of water masses, to biological data that highlight areas of high or low productivity, show the distribution and movement of species around the ocean, and reveal the dynamics of animal populations.

Science to support conservation

However, data alone are insufficient: aggregation, integration, visualisation, analysis and expert interpretation are required to develop reliable, evidence-based information about baselines, patterns and trends at a range of spatial and temporal scales. Traditional knowledge from local and indigenous populations also has a role to play in understanding species behaviour and the natural rhythms of the ocean over human timescales.

Underpinned by this information, assessments can be made about how marine ecosystems are or could in the future be affected by pressures such as climate change, ocean acidification and human activities. The resulting knowledge - based on sound ecological science - can be used to inform conservation and management strategies at local, regional and global levels.

Recognising special places in the ocean:

Some areas of the ocean have special importance in terms of their ecological and biological characteristics, for example by providing essential habitats, food sources or breeding grounds for particular species. In 2008, a means by which to recognise these ecologically or biologically significant areas (EBSAs) was put in place by the CBD. Based on a set of seven scientific criteria, this expert-driven process provides a framework to methodically and objectively describe those areas of the ocean that may merit additional protection to ensure a healthy global marine ecosystem.

The EBSA scientific criteria

Uniqueness or rarity
Area contains either (i) unique, rare or endemic species, populations or communities; and/or (ii) unique rare or distinct habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features

Special importance of life history stages of species
Areas that are required for a population to survive and thrive

Importance for threatened, endangered or declining species and/or habitats
Area containing habitat for the survival and recovery of endangered, threatened, declining species, or area with significant assemblages of such species

Vulnerability, fragility, sensitivity or slow recovery
Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery

Biological productivity
Area containing species, populations or communities with comparatively higher natural biological productivity

Biological diversity
Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity

Naturalness
Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation

Ecologically or Biologically Significant Areas

To date, there are more than 300 EBSAs described around the world. They occur in all regions of the planet from the poles to the equator, and in all water depths from the coast to the deep ocean. They can be found in national waters, span territorial boundaries, lie partially or wholly within areas beyond national jurisdiction, and can even overlap each other. There is no minimum or maximum size for an EBSA: they can be small or cover vast expanses of the ocean.

GOBI has supported the EBSA concept since its inception by providing technical support and scientific advice at all stages of the process. The 13th meeting of the Conference of Parties to CBD in 2016 heralded a new phase in the EBSA process: a chance to further refine EBSA descriptions by adding new information, to further share data, build capacity and inspire others.

Following the description of EBSAs across the world's oceans, a key step towards maximising their utility for the conservation of biodiversity is to use EBSA information to support measures to secure a global network of marine protected areas. An effective and coherent network of areas must include multiple replicates of distinct types of features to ensure that each type remains represented within the network should any single feature be degraded. A useful way to classify EBSAs into meaningful types of relevance to policymakers is as follows:

Type I: EBSAs representing a single static feature – features that are clearly differentiated in the physical world and fixed in space and time (e.g., a coral reef or an isolated seamount)

Type II: EBSAs representing groups of static features – a set of fixed areas that represent similar features and are generally clustered in space (e.g., a chain of seamounts), where interconnectivity between the individual features is critical for the overall health and survival of the local or regional ecosystem

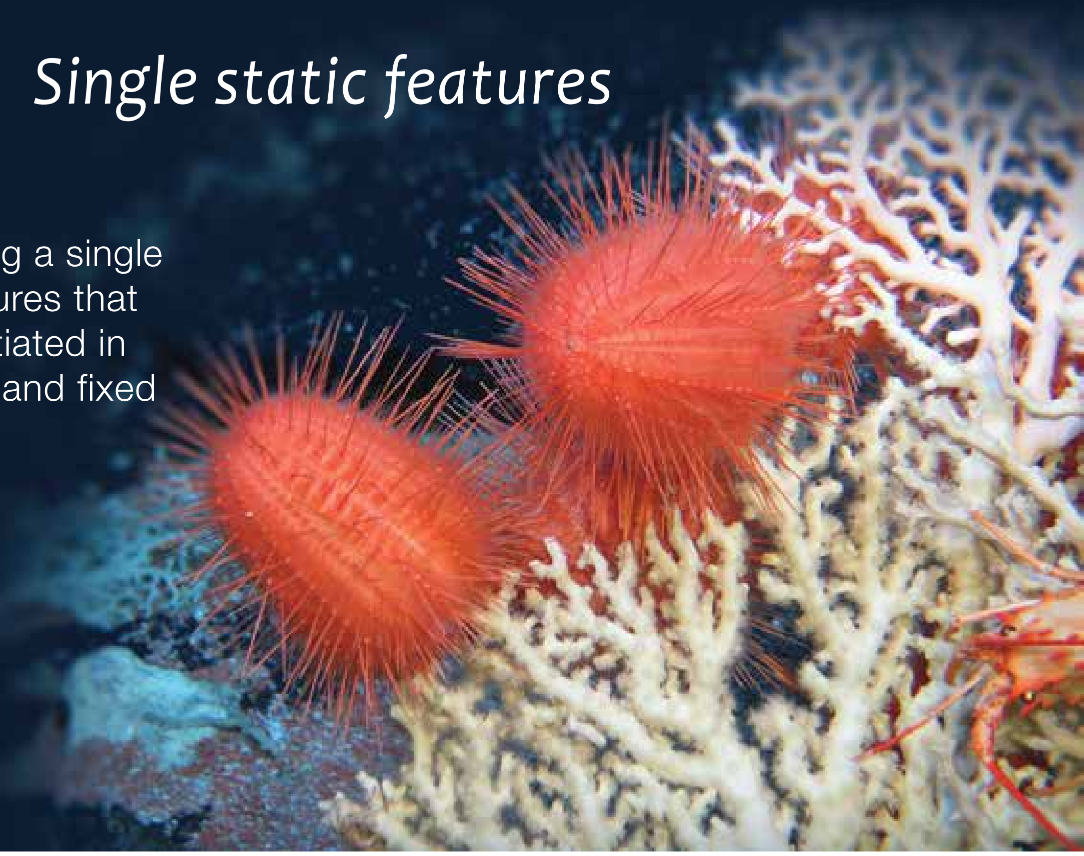
Type III: EBSAs representing ephemeral features – a fixed area in which, over time, portions of the area meet the defining criteria and other portions do not; the location of relevant portions may shift within the whole area over time (e.g., spawning areas for fish or feeding hotspots for seabirds)

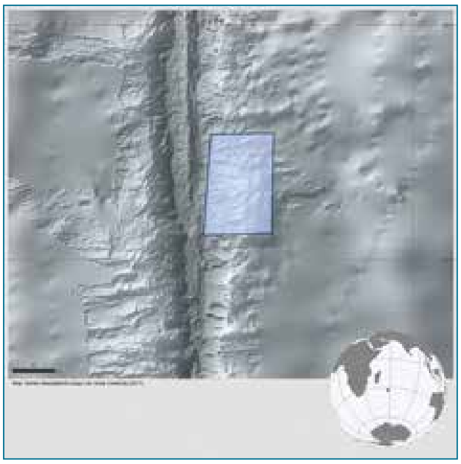
Type IV: EBSAs representing dynamic features – persistent but mobile features of the ecosystem whose boundaries may shift due to seasonal, annual or longer-term cycles (e.g., shelf-ice edges and oceanographic fronts)

Examples of the four types of EBSA are given on the following pages.

EBSA Type I Single static features

EBSAs representing a single static feature: features that are clearly differentiated in the physical world and fixed in space and time





Case study: Atlantis Seamount, southern Indian Ocean

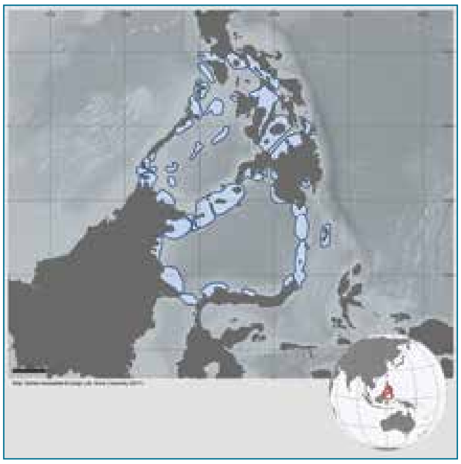
The Atlantis Seamount in the southern Indian Ocean is a remarkable underwater feature, representing the remains of a sunken island. Located in sub-tropical waters on the South-West Indian Ridge, the flat top of the seamount lies 700 m below present-day sea level and its flanks plunge to over 4,000 m deep. Around the seamount, evidence of old headlands, cliffs, stacks and beaches can be observed, millions of years after they were exposed at the sea surface. Such complex topography means that it plays host to an extremely diverse assemblage of deep-sea organisms, each adapted to distinct variations in the substrate and local environmental conditions. Like most seamounts, its steep flanks deflect nutrient-rich deep-water currents towards the sunlit surface waters, triggering a cascade of planktonic productivity that sustains dense aggregations of oceanic fish and their predators, including many species of shark new to science. In a similar way to altitude-specific vegetation zones on mountains, different depth-specific combinations of corals, sponges, sea-spiders and anemones jostle to find the optimum location in which to thrive. In addition to its ecological credentials, the Atlantis Seamount also has special scientific significance as it enabled geologists to understand the dynamics of ultra-slow spreading mid-ocean ridges.

Like solitary guyots and seamounts, other isolated features on the seabed have a similar effect on their surroundings, altering local conditions, increasing or concentrating productivity, hosting endemic species and attracting many others from far and wide. Further examples of this type of EBSA are the Hydrothermal Vent Fields along the mid-Atlantic Ridge, the Orphan Knoll in the northwest Atlantic, and the deep-ocean trenches to the east of Japan in the North Pacific Ocean.

EBSA Type II Grouped static features

EBSAs representing groups of static features: a set of fixed areas that represent similar features and are generally clustered in space, where interconnectivity between the individual features is critical for the overall health and survival of the local or regional ecosystem

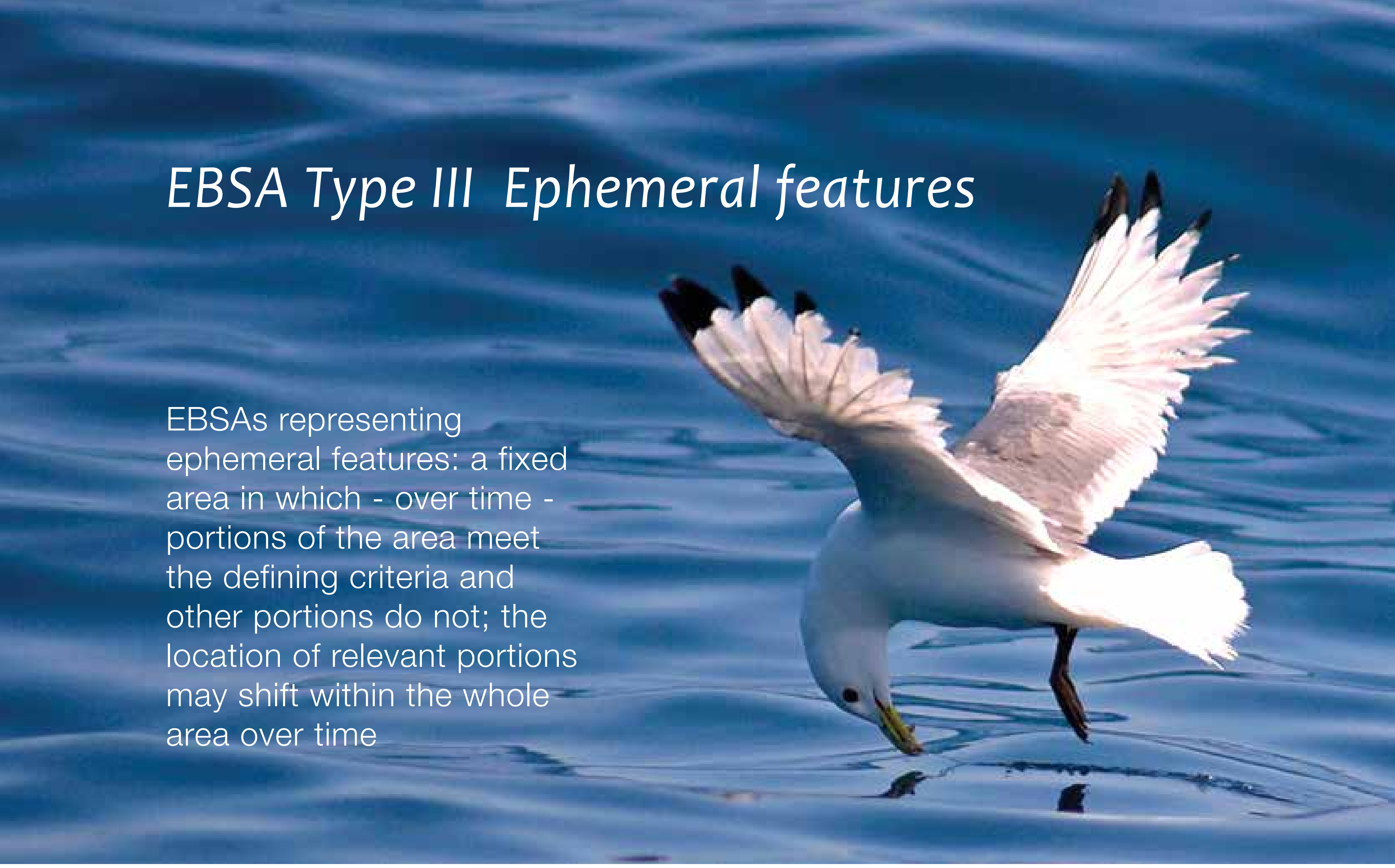
Case study: Sulu-Sulawesi Marine Ecoregion



Located in the Coral Triangle, the Sulu-Sulawesi Marine Ecoregion in southeast Asia comprises a collection of distinct and varied features, each important in its own right but collectively representing one of the most biodiverse and productive marine ecosystems in the world. This exceptional ecological diversity stems from the region’s complex tectonic history, which has shaped present-day patterns in species distribution, ocean currents and nutrient input regimes. The resultant islands and narrow channels surround and connect warm shallow seas that contain a mosaic of habitats, including mangrove forests, seagrass meadows, coral reefs, lagoons and sandy beaches. The range of habitats is reflected in the huge diversity of marine wildlife, including more than 2000 species of fish, marine algae, sea turtles and a variety of marine mammals such as rare dolphin species and the endangered dugong.

The Sulu-Sulawesi Marine Ecoregion spans the national territory of three countries – the Philippines, Malaysia and Indonesia – each with its own political priorities and sensitivities. Complexity of ecosystem is therefore echoed by complexity of management approaches, which together are crucial for conserving the region’s marine biodiversity and resources.

Other examples of EBSAs comprising several areas that benefit from being considered together are the New England and Corner Rise seamounts in the northwest Atlantic, the North-East Pacific Ocean Seamounts, and the Intertidal Areas of East Asian Shallow Seas.



EBSA Type III Ephemeral features

EBSAs representing ephemeral features: a fixed area in which - over time - portions of the area meet the defining criteria and other portions do not; the location of relevant portions may shift within the whole area over time

Case study: Seabird Foraging Zone, Labrador Sea

The Seabird Foraging Zone in the Southern Labrador Sea captures a natural phenomenon that occurs with reliable regularity. At various times throughout the year, several bird species from widely-dispersed colonies across the North Atlantic converge on an area of open ocean off eastern Canada either to feed or to evade harsh winter conditions further north. This recurrent aggregation of birds enables otherwise distant populations to overlap in space and time, which can enhance genetic connectivity across a species as a whole.

The reason for birds gathering in a discrete and predictable area of the ocean is usually the interaction of water currents with seafloor topography, leading to an increase in primary productivity or a concentration of prey that can be more easily caught by the birds. Since oceanic currents are dynamic, the fronts and eddies where prey are concentrated can intensify, drift and subside. However, the seabed with which currents interact remains constant, inducing the continual formation of new mobile fronts and eddies. At any given time there may or may not be the right conditions for birds to aggregate, but over successive seasons, years and life-stages, birds will return to the area when conditions are favourable. Many seabird species depend on these ephemeral yet predictably recurrent features for the successful rearing of their young and therefore the long-term survival of their species.

Other examples of this type of EBSA are the Olive Ridley Sea Turtle Migratory Corridor in the Bay of Bengal and the North-East Pacific White Shark Offshore Aggregation Area.

EBSA Type IV Dynamic features

EBSAs representing dynamic features: persistent but mobile features of the ecosystem whose boundaries may shift due to seasonal, annual or longer-term cycles

Case study: Marginal Ice Zone, Arctic Ocean

The Marginal Ice Zone and Seasonal Ice Cover over the deep Arctic Ocean is a unique and dynamic physical feature that supports an equally unique and dynamic biological community. The ecological significance of this zone is matched by its vulnerability, as its formation, extent and longevity are affected by short-term fluctuations and long-term trends in the global climate.

The marginal ice zone is biologically important. In the summer the upper layer of the water is mixed by a combination of melting ice and wind, leading to a brief but intense bloom of algae and phytoplankton under the ice and in the surrounding open water. Zooplankton, fish, marine mammals and seabirds exploit this boom in their prey and gather at the ice edge. A large part of the biological production eventually sinks and supports rich communities of organisms on the seabed. The ice margin itself has a unique status and value to several species of seal that use it during reproduction and calving, and to whales that use it for protection from predators.

Given its constantly shifting boundary, it is difficult to precisely delimit the marginal ice. However, due to the ecological importance of the marginal ice zone and the vulnerability of the species that dwell there, it is appropriate to recognise its entire extent over a long period of time.

Other distinct and dynamic features recognised as this type of EBSA are the Subtropical Convergence Zone in the South Atlantic Ocean and the North Pacific Transition Zone, both oceanographic features that exhibit seasonal spatial shifts.

Generating new knowledge

As well as supporting the technical process of describing EBSAs, GOBI partners are also undertaking research that will generate new knowledge and methodologies to underpin marine conservation efforts. Supported by Germany's International Climate Initiative, this work will not only add value to the EBSA process by expanding the scientific knowledge base, but will also use EBSA descriptions as the basis for promoting environmental protection and management for specific areas of the world's oceans.

Mapping species, ecosystems and habitats

Biogeographic regions are defined as having distinct biological, ecological and physical properties. However, the integration and assessment of biological, ecological and physical datasets at different scales presents a real challenge.

GOBI is active in identifying and mapping biogeographic regions in the western South Pacific Ocean and the Indian Ocean. Understanding where different biogeographic regions are located and how their ecological integrity is dependent on their connectivity will enable the assessment and protection of ecosystem coherence across an entire region. A map of biogeographic regions will assist the management of human activities at various scales, from informing the placement of marine protected areas to the choice of management measures for fishing, mining, marine traffic and industrial discharge.

Ultimately, understanding the location, extent, characteristics and connections between different bioregions will facilitate the design of coordinated regional management plans, in line with ensuring the sustainable use and long-term conservation of biodiversity.

Connectivity in the ocean

The distribution and movement of marine migratory animals highlights the connectivity between distant locations across the oceans. Ensuring that such connectivity is maintained for migratory animals is a challenge for conservationists worldwide, especially given the diverse management strategies that affect migrants as they move through waters under different political jurisdictions.

Due to their wide-ranging behaviours, migratory species experience a variety of anthropogenic pressures over the course of their life histories. Combined with conservation strategies that largely fail to consider spatial connectivity over their life cycle, these threats are resulting in declining populations across the globe.

Working with partners worldwide, GOBI is compiling information on the habits and movements of marine mammal, seabird, sea turtle and fish species to determine which areas of the ocean are most travelled, and in turn, which species are most at risk from inconsistent conservation measures across their range. Visualisation of these routes and the areas of importance that they connect, such as breeding or feeding grounds, will be critical in informing conservation efforts for migratory species in areas beyond national jurisdiction.

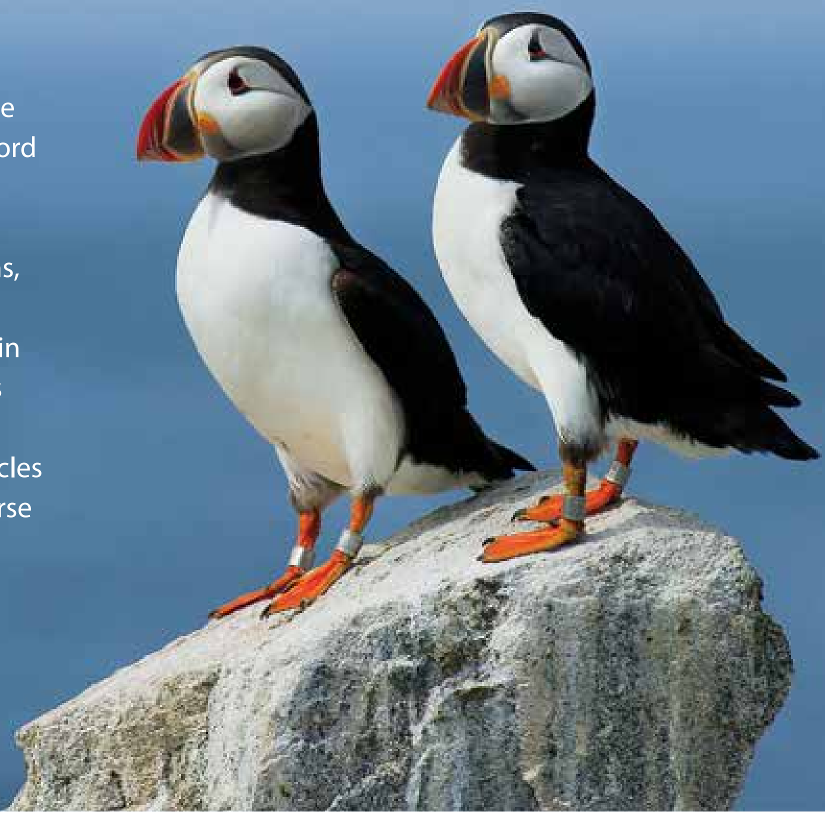
This knowledge will also be useful for devising novel ways of cooperation amongst parties with a common interest in the preservation and sustainable use of the open seas.

Developing regional governance models

Some features in the ocean are not obvious to the human eye as they are not associated with any specific geological feature above or below the water. Instead, they are the dynamic yet persistent patterns caused by the interaction between water masses. One such feature is the Costa Rica Thermal Dome off the western coast of Central America in the East Pacific. Here, cold water from the deep ocean is drawn towards the surface where it mixes with warmer sunlit water, delivering essential nutrients to photosynthesising plankton. An offshore wind jet brings this cascade of productivity near to the sea surface and attracts animals from far and wide. Nearby nations also exploit this biological bonanza through tourism, sport fishing and commercial fisheries, the latter generating more than US$750 million for Central America in 2009 alone.

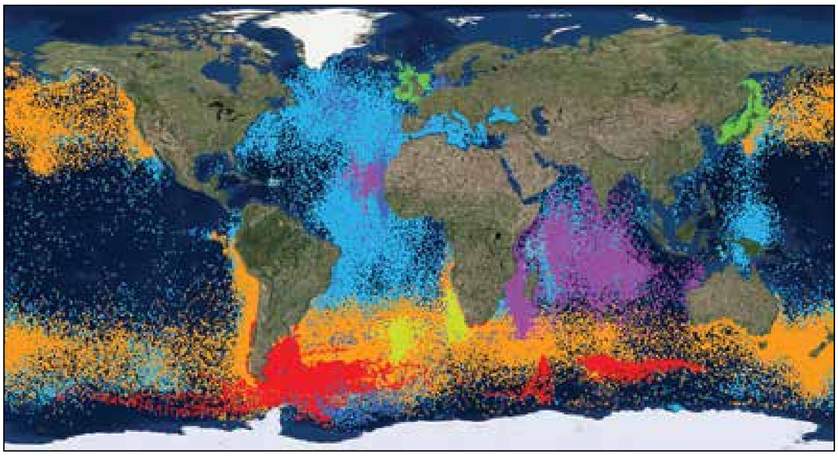
Protecting and preserving such features brings its own set of unique challenges, especially as they are often beyond the jurisdiction of a single regulatory authority. GOBI partners are working with the Central American governments towards the creation of an effective regional governance model for the Costa Rica Thermal Dome area. Engaging decision-makers is critical in order to fully respect the sovereignty, sovereign rights and jurisdiction of coastal States. A key step in these processes is raising awareness - in both public and policy arenas - of the importance of the area, not only for biodiversity but also for local economies.

Tracking the movement of seabirds



Advances in technology mean that it is now possible to attach miniscule tracking devices to animals and record their movement throughout the year. Seabirds, well known for their wandering across the world's oceans, are ideal subjects for tracking. Their routes can reveal not only patterns in their behaviour beyond the bounds of direct observation, but also the environmental cues and oceanic cycles that affect their habits over the course of their lives.

GOBI is capitalising on this rich source of information, compiling seabird tracking datasets to identify important bird and biodiversity areas, and relating them to biogeographical factors such as water currents, productivity, and climate. Incorporating a variety of factors enables the identification of seabird hotspots and their evaluation under climate change scenarios. The integration of seabird tracking data into marine management strategies is essential to ensure that life above the ocean surface is given adequate protection as well as the biodiversity below it.



Right: BirdLife International's Seabird Tracking Database contains over 10 million records of seabird movement data. It is the largest database of its kind, and one of the largest conservation collaborations, providing critical information to support seabird conservation work across the world's oceans.

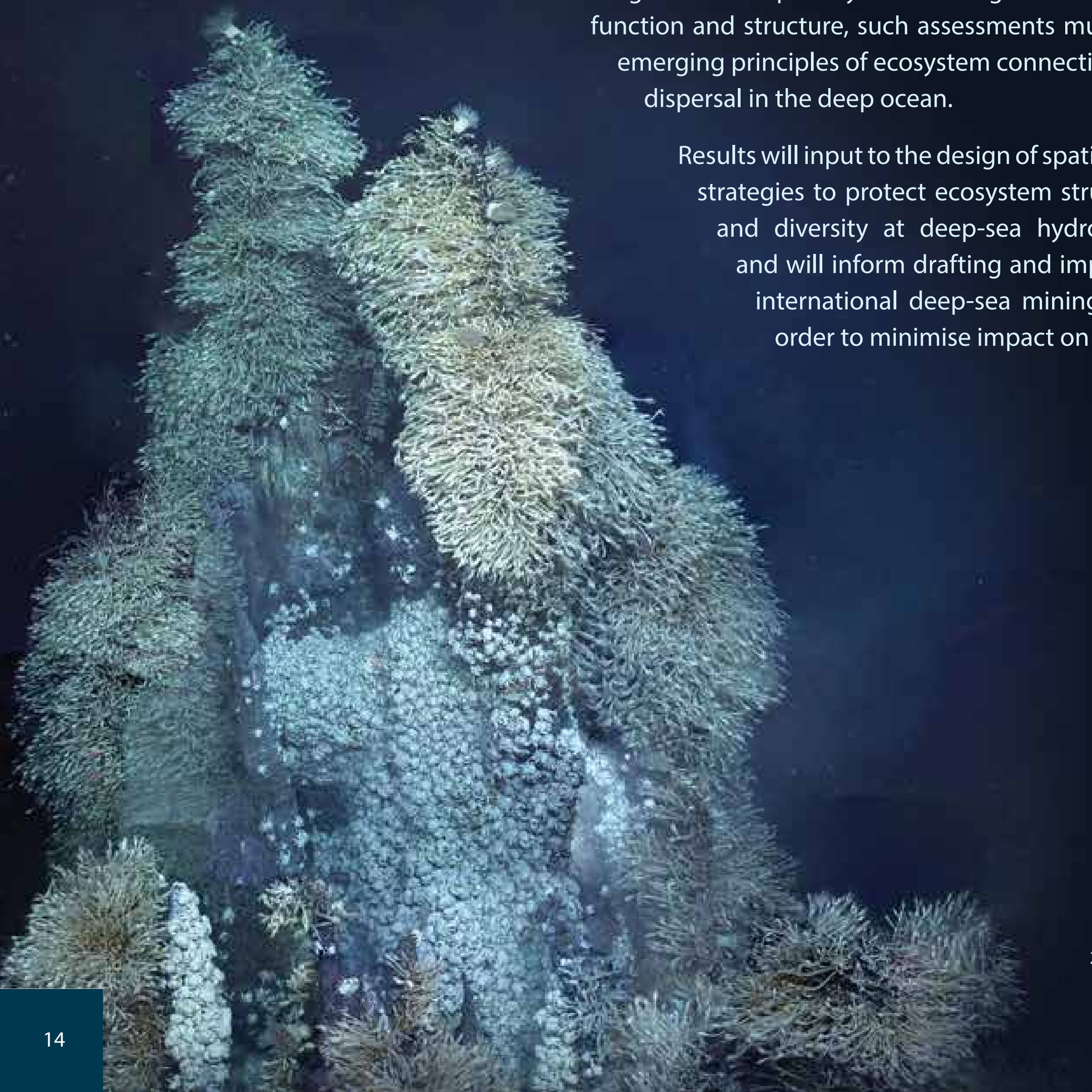
Hydrothermal vent ecosystems

Deep-sea hydrothermal vents host some of the most rare and exotic life forms on Earth. Using chemical energy rather than energy from the sun as the basis for their survival, vent ecosystems present one of the final frontiers for biodiversity exploration. The scalding temperatures and high toxicity of fluids emitted at the vents, combined with the absence of sunlight, cold background temperatures and high pressures typical of the deep ocean, might suggest these are inhospitable places for life to thrive. Yet hydrothermal vents are teeming with life, adapted over millennia to these extreme conditions.

Hydrothermal systems are often associated with rich deposits of base metal minerals, now attracting considerable attention from an emerging deep-sea mining industry and placing these extraordinary ecosystems at risk of disturbance and possibly irreparable damage.

GOBI is working to understand the physical and biological factors that shape hydrothermal vent communities on the northern Mid-Atlantic Ridge, and to identify and quantify the risks to them from deep-sea mining. Due to the paucity of knowledge about their ecosystem function and structure, such assessments must be based on emerging principles of ecosystem connectivity and species dispersal in the deep ocean.

Results will input to the design of spatial management strategies to protect ecosystem structure, function and diversity at deep-sea hydrothermal vents, and will inform drafting and implementation of international deep-sea mining regulations in order to minimise impact on biodiversity.

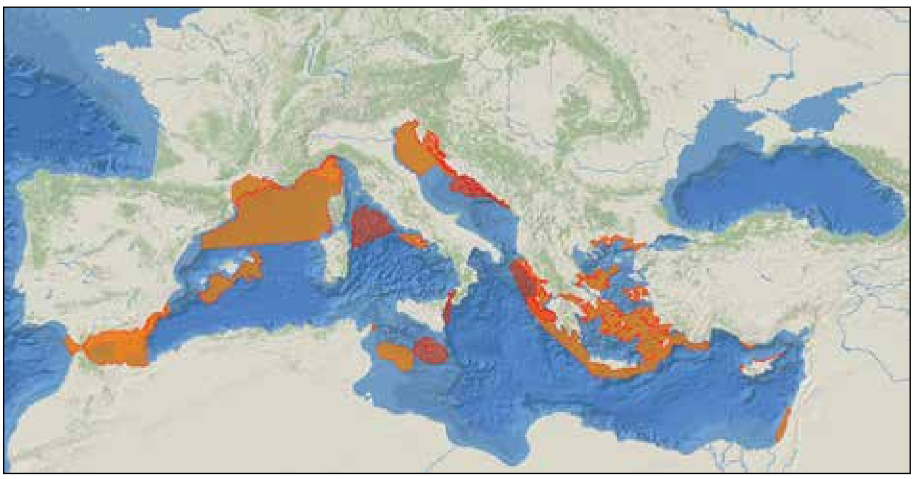


Chemosynthetic fauna thrive at the Carwash hydrothermal vent at 2400m water depth on the East Scotia Ridge.

Important marine mammal areas

Marine mammals tend to be large, charismatic and awe-inspiring, yet little is known of their habits as they spend much of their lives out of sight in the vastness of the ocean. Historically, humans have targeted marine mammals for food and resources, a legacy from which some species are still recovering. Present-day human activities, whilst perhaps not so directly damaging, continue to affect marine mammals and the important roles they perform in the ocean ecosystem.

A first step towards better understanding marine mammal behaviour and ecology is to determine which areas of the ocean are significant for their feeding, reproduction, rearing and migration habits. GOBI is at the forefront of such efforts, mobilising experts across the world to assist the IUCN Marine Mammal Protected Areas Task Force in the formal identification and recognition of those areas, known as Important Marine Mammal Areas (IMMAs). Once identified, human activities can be better managed around these areas to avoid excessive disruption of both the animals and their habitat.



Map showing Important Marine Mammal Areas (IMMAs; orange) and candidate IMMAs (pink) in the Mediterranean Sea.

The GOBI partnership

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www.aires-marines.com

ARC Centre of Excellence for
Coral Reef Studies
www.coralcoe.org.au

BirdLife International
www.birdlife.org

Convention on Biological Diversity
www.cbd.int

Convention on the Conservation of
Migratory Species of Wild Animals
www.cms.int

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Commonwealth Scientific and Industrial
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Food and Agricultural Organisation
www.fao.org

Gray's Reef National Marine Sanctuary
www.graysreef.noaa.gov

GRID Arendal
www.grida.no

Ocean Biogeographic
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www.iobis.org

Intergovernmental Oceanographic
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p1: A pink whipray and branching coral *Stylophora*, American Samoa • NOAA National Ocean Service

p2: Soft coral *Aquaumbridae*, Gulf of Mexico • NOAA OKEANOS EXPLORER Program 2014

p3: The Australian research vessel RV *Investigator* • CSIRO. Researcher surveying a coral reef • ARC Centre of Excellence for Coral Reef Studies

p4: Background image • Frank McKenna

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