



**Oceanic voyagers:  
Revealing the blue world-wild-web**

# International consortium releases Migratory Connectivity in the Ocean system

*By Sarah Poulin, Marine Geospatial Ecology Lab, Duke University*

Understanding how the oceans are used and connected by migratory species is crucial for their conservation and sustainable use. With improvements in animal tracking technology, researchers are able to gain greater insight about the migratory connectivity of populations and species. Recent research has revealed ocean basin-scale migrations of sea turtles, marine mammals, seabirds and fish. During these migrations, individuals traveling through national waters (i.e., within Exclusive Economic Zones) and areas beyond national jurisdiction (ABNJ) may encounter a variety of stressors, from predation and adverse weather to human impacts including habitat destruction, direct and incidental fishing mortality, ship strikes, noise, hazardous substances and other pollutants. The cumulative impact of regional-scale stressors may affect populations and is a factor in migratory connectivity, influencing how individuals and populations are geographically linked throughout their migratory cycles.

Without easily accessible and usable geospatial knowledge, full consideration of migratory connectivity in area-based planning processes is often limited. This hinders the ability of managers and policy makers to conduct meaningful environmental impact assessments and strategic environmental assessments such as those envisioned under the new treaty for the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction (BBNJ), and through the International Seabed Authority’s work to develop regional environmental

management plan (REMPs). Synthesised, integrated, and easily interpretable knowledge about migratory connectivity would greatly increase the quality of these assessments. However, the lack of mechanisms and clear incentives for scientists to contribute their data directly to policy processes and management are obstacles to greater participation.

Herein lies the motivation for the development of the Migratory Connectivity in the Ocean (MiCO) system, to be formally announced and launched on 1 April 2019 at the 2<sup>nd</sup> Intergovernmental Conference on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ).

MiCO is a growing consortium of more than 50 international organisations led by the Marine Geospatial Ecology Lab (MGEL) of Duke University. Supported by funding from GOBI’s grant from the International Climate Initiative (IKI), the MiCO system is an freely available, open-access, web-based mapping and knowledge system that seeks to provide actionable knowledge on migratory connectivity for hundreds of marine species to inform worldwide conservation and sustainable use efforts. MiCO bridges the gap between individuals or organisations generating data or products that describe migratory connectivity and the policy fora or management organisations engaged in marine resource management, conservation, spatial planning and environmental assessment processes (Figure 1). The

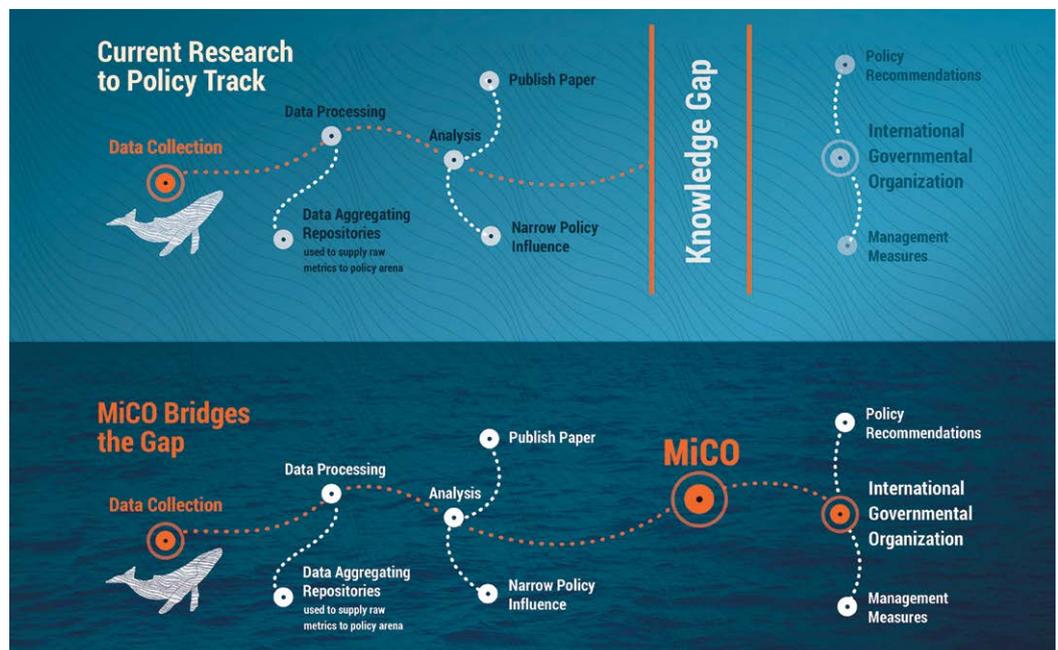


Figure 1. By providing a platform of synthesised knowledge about migratory species area use, MiCO bridges the gap between scientists generating data and the fora producing management recommendations and policies.

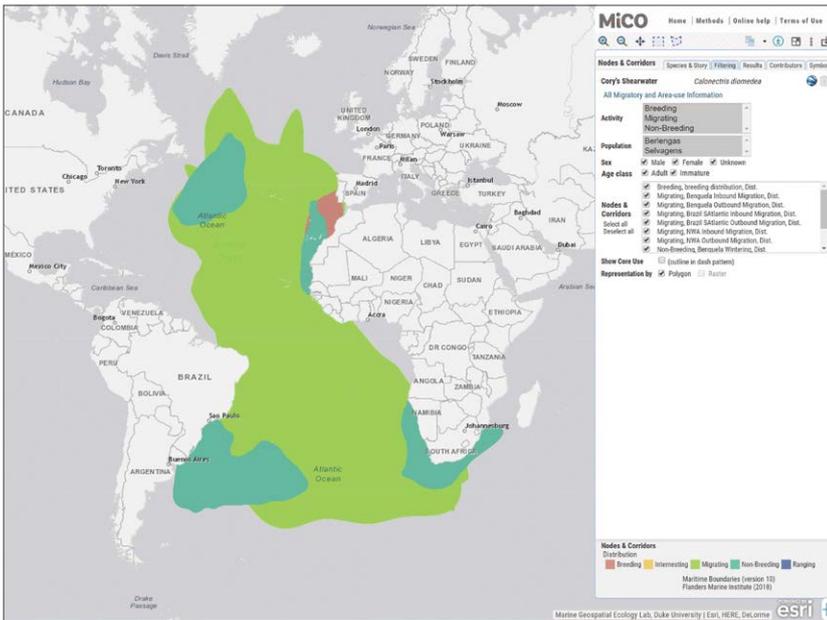
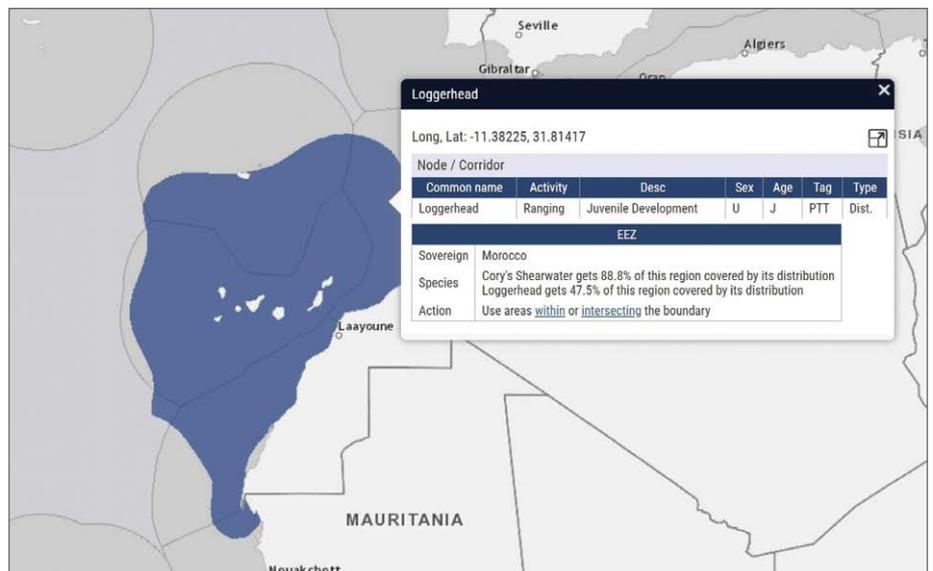


Figure 2. An example of the MiCO online tool, providing area-use information on the Cory's shearwater distribution throughout its migratory cycle in the Atlantic Ocean.



Figure 3. An example of MiCO online tool, highlighting the area use of loggerhead sea turtles within the Moroccan Exclusive Economic Zone.



objective of MiCO is to synthesise data on species area use and the oceans on which they depend. These general areas of use are further partitioned into MiCO nodes, aggregated areas of non-migratory behavior (e.g., wintering, breeding), and MiCO corridors, aggregated areas used by migrating individuals. By aggregating and producing these area-use products that can be directly downloaded and used by managers and policy makers, MiCO provides a valuable system to facilitate the inclusion of migratory connectivity into management practices. These products can demonstrate species' area use within a nation's waters (Figure 2), the connections between them, and the amount of time and area used (Figure 3). The MiCO system will also inform future research needs for data deficient regions of the ocean for particular migratory species.

Area-based management of migratory species in ABNJ is at a critical phase. With population-level declines of many migratory species, management and policy fora are being urged to incorporate knowledge generated from animal movement data and migratory connectivity into their planning

frameworks. Through the creation of this easily accessible, geospatial knowledge hub, we hope to allow migratory connectivity to be appropriately factored into area-based planning processes including review and updating of the CBD's descriptions of EBSAs, the Convention on Migratory Species efforts to develop an Atlas of Migratory Species, discussion by Regional Seas Organizations regarding expansion of their mandates into ABNJ (where appropriate), management of bycatch by Regional Fisheries Management Organizations, development of Particularly Sensitive Sea Areas by the International Maritime Organization, and identification and review of World Heritage Sites. Only by integrating and scaling up our efforts and providing useable knowledge, through systems such as MiCO, can we make the step-change necessary to conserve marine migratory species.

For further information on how migratory behavior of marine mammals, seabirds, sea turtles and fish connect the world, please see <http://mico.eco>.

# Decisions, decisions...outcomes from CBD COP14

By David Johnson, GOBI Coordinator

At the most recent Conference of the Parties to the Convention of Biological Diversity (CBD COP14) in November 2018, the Parties adopted a set of Decisions with implications for GOBI. David Johnson, GOBI Coordinator, sets out below his take on some of the key points discussed. Full Decision texts and related documents can be found on the CBD website (<https://www.cbd.int/>).

## Scenarios for the 2050 Vision for Biodiversity (CBD/COP/DEC/14/2)

This Decision expresses context for long-term strategic directions relevant to the development of the post-2020 global biodiversity framework. The 2050 vision “Living in harmony with nature” where “*by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people*”, should inform 2030 biodiversity targets. Whilst different policy mixes can be considered, transformational change is needed to reverse continued loss of biodiversity. Scenario analyses are recognised as providing a useful tool and should factor in work of the Global Biodiversity Outlook.

## Biodiversity and climate change (CBD/COP/DEC/14/5)

Recalling Article 2 of the Paris Agreement, the Parties at COP14 adopted Voluntary Guidelines for the design and effective implementation of ecosystem-based approaches to climate change adaptation and disaster risk reduction. Definitions are given for Ecosystem-based Adaptation (EbA) and Ecosystem-based Disaster Risk Reduction (Eco-DRR). Marine and coastal hazard/climate change impact examples include storm surge, cyclones, sea level rise, salinisation, temperature increases and ocean acidification. Marine and coastal EbA or Eco-DRR intervention options include mangrove restoration and coastal protection, coastal realignment, sustainable fishing and mangrove rehabilitation and coral reef restoration.

## Protected areas and other effective area-based conservation measures (CBD/COP/DEC/14/8)

This Decision defines “Other effective area-based conservation measures (OECMs)” as “*a geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural,*

*spiritual, socio-economic, and other locally relevant values*”. Voluntary Guidance on guiding principles (including criteria for identification), application and integration of OECMs is set out in Annexes to this Decision. Annex IV, Considerations in achieving Aichi Biodiversity Target 11 in Marine and Coastal Areas, covers providing an adequate base of information and specifically mentions EBSAs and IMMAs.

## Marine and coastal biodiversity: ecologically or biologically significant areas (CBD/COP/DEC/14/9)

This Decision recognised EBSAs described by the two most recent Regional EBSA Workshops (Black & Caspian Seas, and the Baltic Sea) – identifying 33 and 9 new EBSAs respectively; encouraged completion of the NE Atlantic EBSA process; and reiterated a ‘*sans prejudice*’ clause *vis a vis* sovereignty. However, the Parties failed to conclude on modalities for modifying the description of EBSAs, for describing new areas and for strengthening the scientific credibility and transparency of the EBSA process, so these matters (set out in Annex II) are carried forward to SBSTTA and COP15 in 2020. The objectives of the informal advisory group on EBSAs were amended (Annex III).

## Other matters related to marine and coastal biodiversity (CBD/COP/DEC/14/10)

This Decision specifically highlights ongoing work on mitigating impacts of marine debris; evaluating potential impacts of deep-sea mining; and protecting biodiversity in cold-water areas. It recognises efforts and interaction of CBD with other Agencies working on impacts of marine debris, deep-sea mining, anthropogenic underwater noise, marine spatial planning and mainstreaming of biodiversity in fisheries. Capacity building activities facilitated by the Sustainable Ocean Initiative and cooperation with FAO and UNEP are specifically welcomed and encouraged to continue.

The Rutzolijirisaxik Voluntary Guidelines for the Repatriation of Traditional Knowledge Relevant for the Conservation and Sustainable Use of Biological Diversity (CBD/COP/DEC/14/12) provides guidance on recovery of traditional knowledge, recognising the importance of governance practices by indigenous peoples and local communities in the context of legality, transparency and mutual respect.

# New horizons: the CBD's post-2020 agenda for marine biodiversity

*By Joe Appiott and Changsung Lim, CBD Secretariat*

The year 2020 promises to be a significant milestone in ocean biodiversity governance and management, with major events such as the 15<sup>th</sup> meeting of the CBD Conference of the Parties (COP 15), the second United Nations Ocean Conference and the third Sustainable Ocean Initiative (SOI) Global Dialogue with Regional Seas Organizations and Regional Fishery Bodies. 2020 marks the endpoint of the CBD Strategic Plan for Biodiversity 2011-2020 and its 20 Aichi Biodiversity Targets, and the opportunity to develop a new global framework for biodiversity. Thus, 2019 is a critical timeframe to prepare for the historic year of 2020.

Discussions are now underway within the CBD to develop the post-2020 global biodiversity framework. The process involves various opportunities for stakeholders to provide input, including through global, regional and thematic consultations, input to discussion documents and online

forums. All stakeholders in the ocean community should seize the opportunity of the negotiations on the post-2020 framework to contribute to developing a robust, ambitious and achievable framework that can put the ocean, its biodiversity and the communities that depend on it on a path towards sustainability.

In addition, a thematic consultation on marine and coastal biodiversity will be convened in October 2019, in conjunction with a meeting of the SDG 14 Communities of Ocean Action, to synthesise the views and perspectives of ocean stakeholders for the CBD deliberations on the post-2020 global biodiversity framework as well as the 2020 UN Ocean Conference.

Further information on the process for developing the post-2020 global biodiversity framework can be found at [www.cbd.int/post2020/](http://www.cbd.int/post2020/).

## Key dates and events - spring 2019

- 19-21 March 2019: Regional Consultation on the Post-2020 Global Biodiversity Framework for the Western European and Others Group
- 25 March - 2 April 2019: Second UN Intergovernmental Conference on an international legally binding instrument on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction
- 2-5 April 2019: Regional Consultation on the Post-2020 Global Biodiversity Framework for Africa
- 16-18 April 2019: Regional Consultation on the Post-2020 Global Biodiversity Framework for Central and Eastern Europe
- 14-17 May 2019: Regional Consultation on the Post-2020 Global Biodiversity Framework for Latin America and the Caribbean
- 22 May 2019: International Day for Biological Diversity 2019: "Our Biodiversity, Our Food, Our Health"

# Important Marine Mammal Areas described for the western Indian Ocean and Arabian Sea

*by Erich Hoyt, Co-chair of IUCN MMPA Task Force / Research Fellow WDC / Tethys Research Institute*

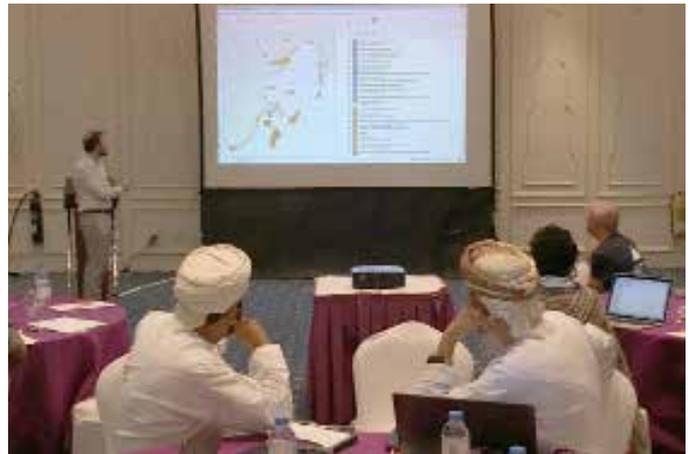
On 4-8 March 2019, the fifth Important Marine Mammal Area (IMMA) regional workshop took place in Dhofar, in the southernmost governorate of Oman. Convened by the Tethys Research Institute and IUCN Marine Mammals Protected Areas Task Force as part of GOBI's research programme funded by the International Climate Initiative, the week-long workshop hosted 38 marine mammal scientists and observers from 15 countries to map the important habitats for marine mammals in the western Indian Ocean and Arabian Seas.

An extraordinary 55 candidate important marine mammal areas (cIMMAs) were identified, along with 13 areas of interest (AoI) which will be retained as potential future IMMAs pending further research. One of these 55 candidate areas was located right outside the meeting venue in Dhofar, where small groups of endangered Indian Ocean humpback dolphins could be seen swimming close to shore early in the mornings.



The Western Indian Ocean and Arabian Sea region is special. Alongside the humpback dolphins, there are three endangered blue whale subpopulations, the rarest humpback whales in the world - the Arabian Sea humpback whale, and the largest numbers found of Omura's whale, a cryptic 10m-long tropical whale only recently identified as a species by scientists. The region is also home to the dugong, that persists in pockets along the coasts of East Africa and West Asia.

The Oman workshop follows other successful IMMA regional workshops in the Mediterranean, Pacific Islands, Northeast Indian Ocean-Southeast Asian Seas and the Extended Southern Ocean in 2016-2018, but 55 candidate IMMAs is a record total to date for a single region. IMMAs are defined as discrete portions of habitat, important to marine mammal species.



These areas have the potential to be delineated and managed for conservation. They are not marine protected areas but layers that can be used in spatial planning or for other area-based management tools.

The candidate IMMAs now go to an independent review panel. Once approved, they will be placed on the IMMA e-Atlas, and can be used for conservation planning. Those without sufficient evidence will remain as AoI. Final results from the panel are expected to be posted online later in 2019. The collective expertise, energy and commitment of the scientists, gathered in the inspirational setting of Dhofar have made this technical and scientific exercise a great success.

For more information on the Task Force and IMMAs, see [marinemammalhabitat.org](http://marinemammalhabitat.org), or contact Erich Hoyt ([erich.hoyt@mac.com](mailto:erich.hoyt@mac.com)) or Giuseppe Notarbartolo di Sciara ([disciara@gmail.com](mailto:disciara@gmail.com)).

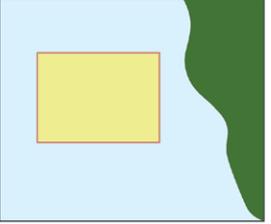
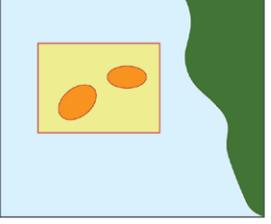
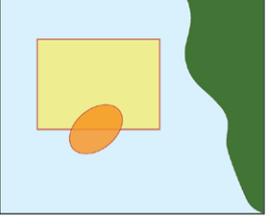
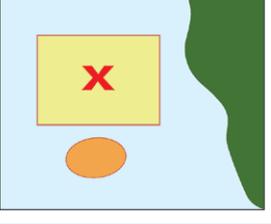
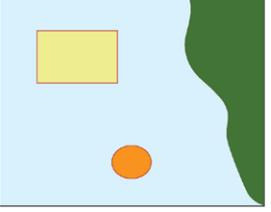


### How do IMMAs relate to the EBSA process?

The IMMA regional workshops, convened by Tethys Research Institute as part of GOBI’s research programme funded by the International Climate Initiative (IKI), represent a dedicated effort to gather additional marine science that can feed into and support the EBSA process. The spatial relationship between IMMAs and EBSAs is explained in the table below.

At CBD COP14 Parties were not able to finalise options for modifying the description of EBSAs, for describing new areas and for strengthening the scientific credibility and transparency of the EBSA process. The latest IMMA workshop

reinforces and reaffirms the reasons for modification of EBSA descriptions as set out in CBD/COP/DEC/XIV/9, Annex II, Section B. The workshop outputs (together with those of the other IMMA workshops) should be part of the strong scientific and technical basis needed to keep EBSAs current and of use to decision makers. In common with EBSAs and Important Bird Areas, IMMAs are area-based planning tools and in some circumstances may also trigger area-based management measures in their own right.

Pictorial representation (Yellow=EBSA, orange=IMMA)	Category	Action	Example IMMA from Oman workshop
	EBSA description encompasses all available marine mammal information	Noted No change	Miani Hor Pakistan EBSA = cIMMA
	EBSA description provides delineation within which more discrete areas can be identified as important for marine mammals (IMMAs)	Noted No change Extra impetus for management measures	Dhofar cIMMA and Gulf of Masriah cIMMA within the Oman Arabian Sea EBSA
	New marine mammal information complements the EBSA description but alters/extends the EBSA delineation	Possible grounds for an EBSA revision	The Gulf of Aden and Socotra Archipelago cIMMA extended from Great Whirl and Socotra EBSA
	New marine mammal information contradicts the EBSA description rationale (Notional example presupposes marine mammal data is the trigger for the EBSA - i.e. not just for reefs or mangroves).	Strong grounds for an EBSA revision	Nayband Bay EBSA includes mammals (under EBSA Criterion C3) but not enough info for cIMMA selection criteria (not threatened and endangered – changes needed for taxonomy)
	New marine mammal information suggests an area not yet considered by the EBSA process	New EBSA template proposal	Shelf and Slope Waters off Muskat, Oman

# Creating awareness of the importance to preserve High Seas ecosystems: The Costa Rica Thermal Dome

by Gustavo Arias, MarViva Foundation

The Costa Rica Thermal Dome is an oceanographic feature located in the Eastern Tropical Pacific Ocean, off the west coast of Central America. The Dome results from the interaction between trade winds and marine currents, which cause the upwelling of cold enriched waters from deep zones. This phenomenon was discovered in 1948, by researchers traveling from California to Panama. The name “Dome”, refers to the way in which surface water layers are distributed, following a temperature gradient and adopting a bell or dome shape.



Above: approximate geographic location of the Costa Rica Thermal Dome (red dotted area) in the Eastern Tropical Pacific Ocean.

Oceanographic conditions at the Dome make it one of the most productive areas in the eastern tropical Pacific region. A high concentration of nutrients favours the growth of millions of algae, supporting a complex and dynamic food web, and turning this area in an important carbon dioxide sink. The Dome is also a highly biodiverse ecosystem, harbouring some endangered and emblematic species like the blue whale



Above: Blue whale, *Balaenoptera musculus*. Image: Shutterstock.

(*Balaenoptera musculus*), the hammerhead shark (*Sphyrna lewini*) and the leatherback turtle (*Dermochelys coriacea*). Furthermore, it serves as a breeding and feeding ground, as well as migration route, for many cetaceans, sharks, turtles, pelagic fishes and sea birds.



Above: Thresher shark, *Alopias pelagicus*. Image: David Garcia/MarViva.

Many marine-based economic activities in Central America and beyond are supported directly or indirectly by the Dome’s productivity. Blue whales travel hundreds of kilometres from California and Oregon to feed on the Dome’s surface waters and have their offspring. When these gentle giants approach the North American coasts, they sustain the whale watching industry, generating important incomes for the tourism sector. The Dome also sustains fishing industries worth many millions of dollars worldwide. International fishing fleets travel across oceans to catch yellowfin tuna (*Thunnus albacares*) and giant squid (*Dosidicus gigas*). Large pelagic fish, such as the sailfish (*Istiophorus platypterus*) and the dolphinfish (*Coryphaena hippurus*), have been also detected at the Dome and surrounding areas. Migratory movements of these species create a link between the High Seas and coastal ecosystems of Central America, where profitable sport fishing activities have developed.

Despite its huge ecological and economic value for Central American countries, the High Seas portion of the Dome has been largely ignored by economists and politicians, perhaps, due to the remoteness of its core area. In fact, scientists are just beginning to understand many of the ecological processes that take place at the Dome and the ways in which they are interconnected with nearshore marine ecosystems.

Unfortunately, the Dome's biodiversity is facing several threats, including illegal fishing, unplanned maritime transit and pollution, as well as global climate-driven changes, such as ocean acidification. Managing these threats is compounded by the absence of a legal framework to conserve High Seas ecosystems, the prioritisation of economic interests and the lack of commitment at the regional scale.

In an effort to increase knowledge on the Dome and create awareness about the importance of preserving High Seas ecosystems, MarViva Foundation has gathered a multidisciplinary team of experts to produce the Costa Rica Thermal Dome Atlas. This project, supported by GOBI and Germany's International Climate Initiative (IKI), highlights the oceanographic and ecological features that make the Dome a unique environment in the eastern tropical Pacific. The Atlas also provides relevant scientific data about the diverse animals that inhabit and visit the Dome, using maps to describe species distribution, migration routes and ecosystem interconnectivity. Ecological information is complemented with estimates of the economic benefits perceived by Central American countries, as a result of the goods and services provided by this oceanic oasis. Likewise, the Atlas draws attention to threats faced by the Dome and the need to adopt governance schemes that allow the protection of the High Seas, through the regulation and spatial ordering of human activities developed beyond jurisdictional waters.

MarViva is leading important actions aimed at recognising the Dome's environmental and socioeconomic value, as well as addressing the need for governance strategies to manage the

Dome and surrounding areas. In September 2018, a workshop named *"Towards the establishment of a governance model of the Costa Rica Thermal Dome"* was held with participation of ministries of foreign affairs from the Central American countries, environmental authorities and invited experts. This workshop addressed the importance of the Dome and the fundamental principles to achieve its governance. A second workshop was held in February 2019, titled *"Conservation and sustainable use of the marine resources of the Thermal Dome in areas beyond national jurisdiction"*. Attended by environmental authorities, regional entities and invited experts, they exchanged knowledge about the Dome's biodiversity, ecology and oceanographic features. Furthermore, sectoral and multi-sectoral work sessions were developed to identify the regional needs and opportunities for the conservation of the High Seas off Central America.

Two workshops later in 2019 will deal with topics such as maritime transit and fisheries, which are critical for the management and conservation of the Dome's natural heritage. Once again, the enthusiastic participation of all the Central American countries and regional authorities will be crucial to address issues that transcend national jurisdictions. In this regard, these meetings represent the first step towards the harmonisation of efforts focused on providing integral solutions to the conservation challenges posed by the Dome's regional scope. Hopefully, in a few years, the world will witness a substantial change in the way we relate to High Seas ecosystems such as the Dome, and manage their associated resources.



*Sunset over the Costa Rica Thermal Dome region. Image: David García/MarViva.*

# Marine connectivity science to inform conservation in the eastern Pacific

*By George Shillinger, MigraMar and Executive Director of Upwell*

During July 2006, I went on a shark-tagging cruise to Wolf and Darwin Islands in the Galapagos with Drs Peter Klimley (“Dr Hammerhead”), James Ketchum, Alex Hearn, and Patricia Zárate. I joined the group as a doctoral candidate in the Block Lab at Hopkins Marine Station of Stanford University, conducting satellite-tracking studies on leatherback turtles, sharks and billfish within the Eastern Pacific. Our trip was one of the first satellite tracking expeditions conducted by the Charles Darwin Foundation’s Shark Research Program in the Galapagos. We formed two research teams, working to deploy acoustic tags on hammerhead and Galapagos sharks and satellite tags on various shark species, including Galapagos sharks, blacktip sharks and silky sharks. In addition to yielding novel and exciting findings regarding the movements and habitat-use of elasmobranchs in Ecuadorian waters, our trip inspired many new research collaborations, and served as a catalyst for the development of MigraMar.

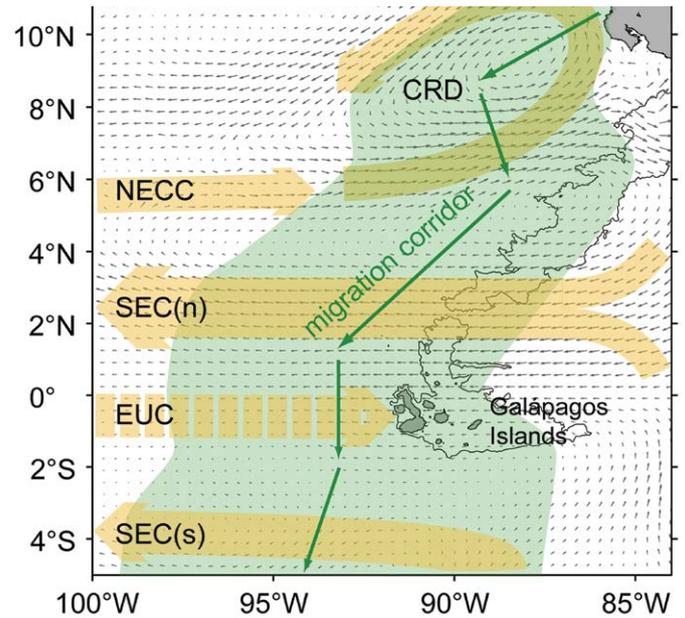
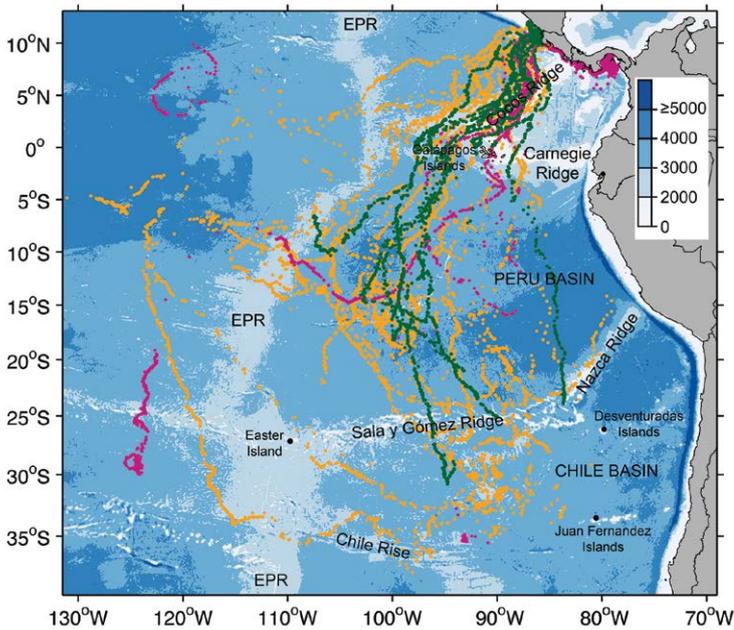
My dissertation at Stanford utilised satellite tracking and remotely sensed environmental data to describe and characterise the movements and high-use habitats of Eastern Pacific leatherback turtles. These research efforts evolved to corroborate a hypothesis that leatherbacks utilised a migration corridor from Costa Rica to Galapagos and into the Southeast Pacific. MigraMar’s work involves many different pelagic species, including the five different species of marine turtles found across the Eastern Pacific.

We tracked 46 post-nesting female turtles departing from Playa Grande, Costa Rica from 2004 to 2008. The results confirmed the presence of a migration corridor for leatherbacks from the nesting beach in the EEZs of Costa Rica and Ecuador, including Cocos Islands the Galapagos Islands, to core foraging habitats in the South Pacific Gyre. Through satellite tracking data, we identified critical inter-nesting, migration and foraging habitats throughout the range of this population of leatherbacks. We extracted and examined remotely sensed variables that enabled us to develop predictive models for identifying where and when leatherbacks are most likely to occur, and where they are most vulnerable to fisheries interactions. This information is essential for leatherback conservation and more holistic transboundary management initiatives, including the development of Swimways (MigraVias), a primary objective for MigraMar.

The MigraMar network has almost 100 acoustic receivers deployed in seven study areas in six countries along the Pacific coast, in addition to more than 400 satellite tags deployed since its inception. We have been supporting the protection of nesting beaches since 2008. Our work spans from science on genetics, demography, and habitat use and species interactions, to on-board fishing monitoring, environmental education, and citizen science. Information is essential for turtle conservation and for transboundary management initiatives like our Swimways (MigraVias) projects, a primary objective for MigraMar.



*Female leatherback turtle departing a nesting beach in Costa Rica. Image courtesy G. Shillinger.*



Above left: Satellite transmission positions for 46 leatherback turtles from 2004 (orange), 2005 (purple), and 2007 (green), tagged at Playa Grande, Costa Rica. Above right: Schematic of turtle migration corridor through the equatorial current system. Both figures from Shillinger et al. (2008).

In addition to my involvement with MigraMar, I now serve as Executive Director at Upwell, an organisation dedicated to the protection of turtles at sea. We are working together to demonstrate migratory connectivity within the Eastern Tropical Pacific region and develop transboundary conservation initiatives. In addition, the expanded network also collaborates to address fisheries-turtle interactions through the ongoing collection of satellite tracking and observer data, the development of predictive habitat-based models, promotion of increased observer coverage within high-use at-sea turtle habitats, sea turtle education and awareness efforts, and engagement of citizen scientists in data collection and monitoring efforts. This collaboration is key for the accomplishments to date, which include marine park expansions, modified policies and scientific publications. During the next 10 years, MigraMar aspires to enhance government recognition of critical migration routes and aggregation sites for the highly transboundary species that roam the Eastern Pacific.

Further reading about the information that underpinned MigraMar’s mission and to which MigraMar now contributes can be found in the following key publications:

- Migration corridor for sea turtles, by Stephen J Morreale and colleagues, in *Nature* (1996) 384: 319-320. DOI:10.1038/384319a0
- Persistent leatherback turtle migrations present opportunities for conservation, by George L Shillinger and colleagues, in *PLoS Biol* (2008) 6(7): e171. DOI:10.1371/journal.pbio.0060171

- Predicting residence time using a continuous-time discrete-space model of leatherback turtle satellite telemetry data, by Aimee L Hoover and colleagues, in *Ecosphere* (2019). DOI pending. [http://plymsea.ac.uk/id/eprint/8056/1/Predicting\\_Residence\\_Ecosphere\\_FinalDraft.pdf](http://plymsea.ac.uk/id/eprint/8056/1/Predicting_Residence_Ecosphere_FinalDraft.pdf)

MigraMar is a collaborative network of organisations from Chile, Columbia, Costa Rica, Ecuador, Mexico, Panama, Peru and USA. For more information please see [www.migramar.org](http://www.migramar.org)



# An overview of the development and application of Important Bird and Biodiversity Areas (IBAs)

*By Tammy Davies, BirdLife International*

The network of Important Bird and Biodiversity Areas (IBAs) is the most extensive site-based, spatially explicit, systematically rigorous biodiversity dataset yet compiled. This programme has now been running for 40 years and has resulted in numerous conservation successes. In this article, we review two recent publications that look at the development of IBAs and their conservation impact.

- Important Bird and Biodiversity Areas (IBAs): the development and characteristics of a global inventory of key sites for biodiversity, by Paul F Donald and colleagues, in *Bird Conservation International* (2018), DOI:10.1017/S0959270918000102
- Important Bird and Biodiversity Areas (IBAs): their impact on conservation policy, advocacy and action, by Zoltan Waliczky and colleagues, in *Bird Conservation International* (2018), DOI:10.1017/S0959270918000175

## Where did the IBA concept originate?

The IBA programme was developed in 1979, to identify areas of significance for birds that can be delineated and managed through conservation action. The initial impetus was in Europe, following the introduction of the Birds Directive legislation, which highlighted the lack of understanding of where the most important sites for birds were, thus stimulating an effort to identify and document them. This site-based approach was then expanded further afield, first identifying wintering areas for European birds in Africa, and then to the Middle East. This expansion led to the creation and development of four standardised global IBA criteria. These four global criteria are used to assess sites on the basis of: (1) the presence of globally threatened species, (2) the range-restricted species, (3) the biome-restricted species, and (4) large congregations of birds. The approach is now widely applied around the world, leading to a network of identified sites of international significance for birds.

## Moving into the seas

The IBA programme was developed for terrestrial systems, but extending it to the marine environment was a logical next step. A review identified four aspects of the seabird life-cycle as suitable for site-based conservation in the marine environment to which the IBA criteria could be applied: (i) seaward extensions of breeding colonies, (ii) non-breeding coastal concentrations,



*Snowy Albatross. Image courtesy Ben Lascelles.*

(iii) migratory bottlenecks, and (iv) at-sea areas for pelagic species. However, identifying marine IBAs presented conceptual and practical challenges, both in terms of data collection and the application of the criteria to a dynamic environment. There is an ever-growing amount of information available on seabirds to identify marine IBAs using the IBA criteria, including satellite tracking, at-sea surveys, and foraging preferences from literature reviews. Global standards for collecting, analysing and interpreting data from a range of sources have been developed. In particular, the increasing availability of seabird tracking data has also created opportunities, particularly for identifying pelagic sites. A sophisticated statistical method, drawing heavily upon analyses of seabird tracking data contributed by seabird researchers worldwide (held at [www.seabirdtracking.org](http://www.seabirdtracking.org)), has been developed to improve the identification of important bird areas at sea.

### IBAs in numbers

A total of 13,193 IBAs have been identified, covering a total area of 15,823,503 km<sup>2</sup> (mean 1,202.6 km<sup>2</sup>, median 125.0 km<sup>2</sup>). Of these, 2,621 have been identified for seabirds, of which 999 (38%) include a significant marine component, and the remainder are coastal or terrestrial (e.g., seabird breeding colonies).

### Conservation impact of IBAs

IBAs have led to a variety of conservation gains, including influence on international conservation policies, national site protection and land-use planning, and action at individual sites. They have been widely used by stakeholders at different levels to help conserve a network of sites essential to maintaining the populations and habitats of birds as well as other biodiversity. Much of this work can be attributed to the strong partnership of organisations around the world who work tirelessly in promoting and conserving IBAs at the national and international level.

IBAs have been influential with governments, multilateral agreements, businesses and others in:

- Informing governments' efforts to expand protected area networks (in particular to meet their commitments through the Convention on Biological Diversity).
- Supporting the identification of Ecologically or Biologically Significant Areas (EBSAs) in the marine realm.
- Identifying Wetlands of International Importance under the Ramsar Convention.
- Identifying sites of importance for species under the Convention on Migratory Species and its sister agreements.
- Identifying Special Protected Areas under the EU Birds Directive.

- Applying the environmental safeguards of international finance institutions such as the International Finance Corporation.
- Supporting the private sector to manage environmental risk in its operations.
- Helping donor organisations like the Critical Ecosystems Partnership Fund (CEPF) to prioritise investment in site-based conservation.

### What's next?

Despite the conservation success of IBAs, much work is still required to ensure IBAs are included in key decision-making processes. And in terms of the marine environment, there are further opportunities for identifying new sites with the increasing amount of tracking data available (more than 11 million points are now held on the seabird tracking database!), and also ensuring these sites are prioritised for protection as the international community moves forward with ocean conservation. In partnership with GOBI, we are re-evaluating the marine IBAs in the West Indian Ocean, and also evaluating threats to sites to enable us to target our efforts for conservation and advocacy.

The IBA approach has inspired the development of similar protocols to identify key sites for other taxa, and these different approaches have recently been unified under the banner of Key Biodiversity Areas (KBAs; [www.keybiodiversityareas.org](http://www.keybiodiversityareas.org)), which aims to multiply the successes of the IBA programme by extending a harmonised approach across all taxa.



*Rockhopper penguins at Amsterdam Island. Image M. Dias, BirdLife*

# OBIS 2.0: Real-time integration, quality control and analysis of rich marine data streams

*Pieter Provoost and Ward Appeltans, OBIS Secretariat*

For almost two decades, the Ocean Biogeographic Information System (OBIS) has played a key role in the mobilisation and sharing of marine biodiversity data. The increasing demand for near real-time rich datasets to support conservation, human health, and the blue economy, as well as rapidly increasing data volumes due to technological advancements in observing systems, have triggered improvements in the data model and a reengineering of the OBIS platform. The new data platform can now handle complex high-volume datasets and make them available to users with very little delay.

The new OBIS data portal (<https://obis.org>) provides statistics on species (and higher taxa), datasets, OBIS nodes, areas (EEZ, LME, IHO Sea Area, EBSA, World Heritage Sites), data provider institutions and countries (based on origin of data providers), while the new interactive OBIS mapper (<https://mapper.obis.org>)

allows the user to visualise, filter and download the data and metadata.

## Real-time data integration

Traditionally, the OBIS database was rebuilt on a quarterly schedule. This caused significant delays between the initial publishing of data and these data being available as part of the integrated dataset. Also, because quality control was often performed months after publishing, issues often remained unaddressed. The OBIS 2.0 data system architecture allows for continuous harvesting of data sources, and datasets are now fetched, processed and made available as part of the integrated dataset in less than an hour after publishing. The data flow is illustrated in Figure 1.

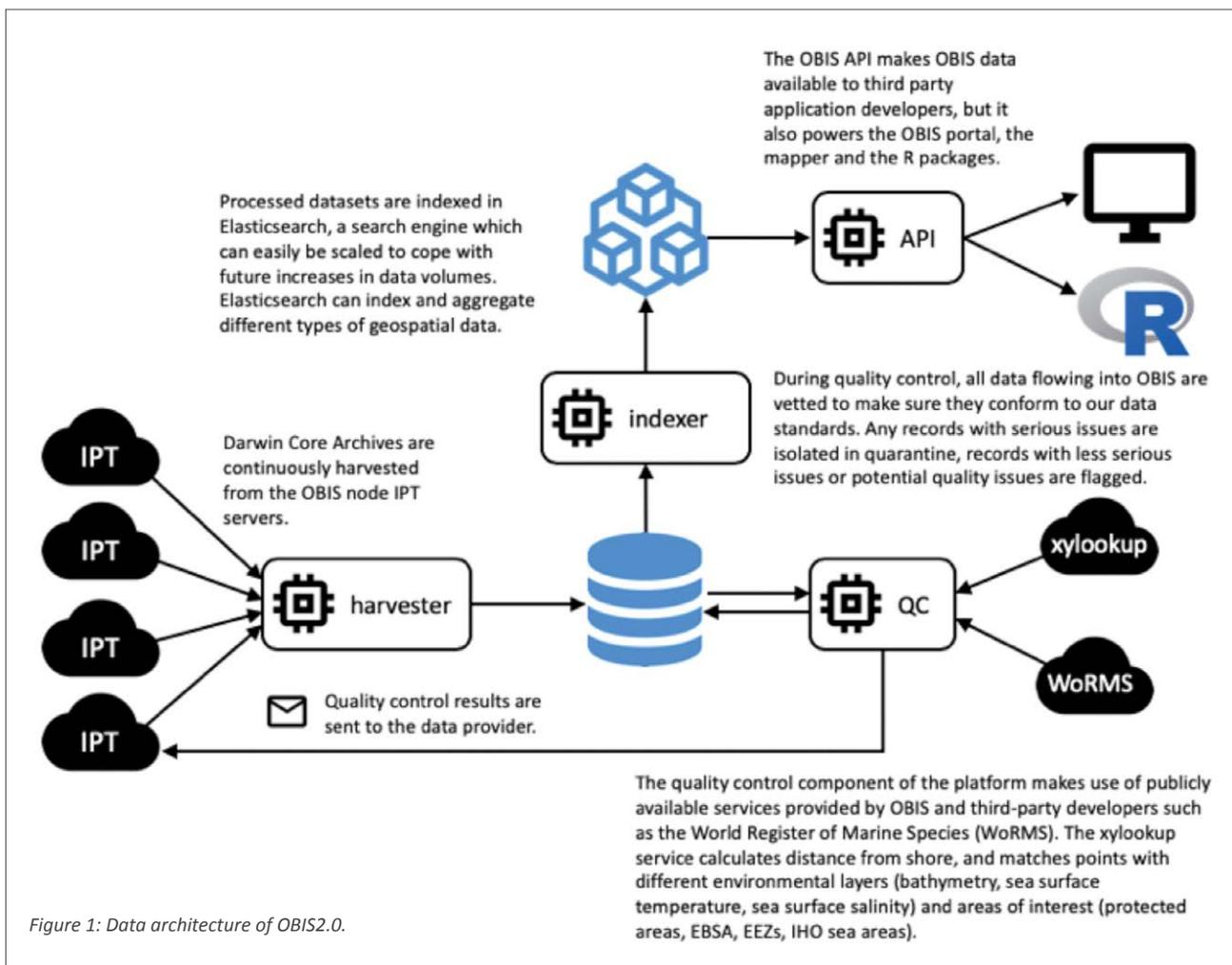


Figure 1: Data architecture of OBIS2.0.

### Structured data

Since its inception, OBIS has focused on recording species occurrences to document what lives where in our oceans. However, OBIS data providers also record sampling methodology and measure biotic and abiotic variables. Storing these data in a machine-interpretable way is essential for

OBIS to become an effective data-sharing platform which supports the development of Essential Ocean Variable (EOV) data products. To make this possible, the OBIS network has created a Darwin Core Extension which supports exchanging rich datasets containing a variety of measurements and facts linked to community-developed vocabularies (Figure 2).

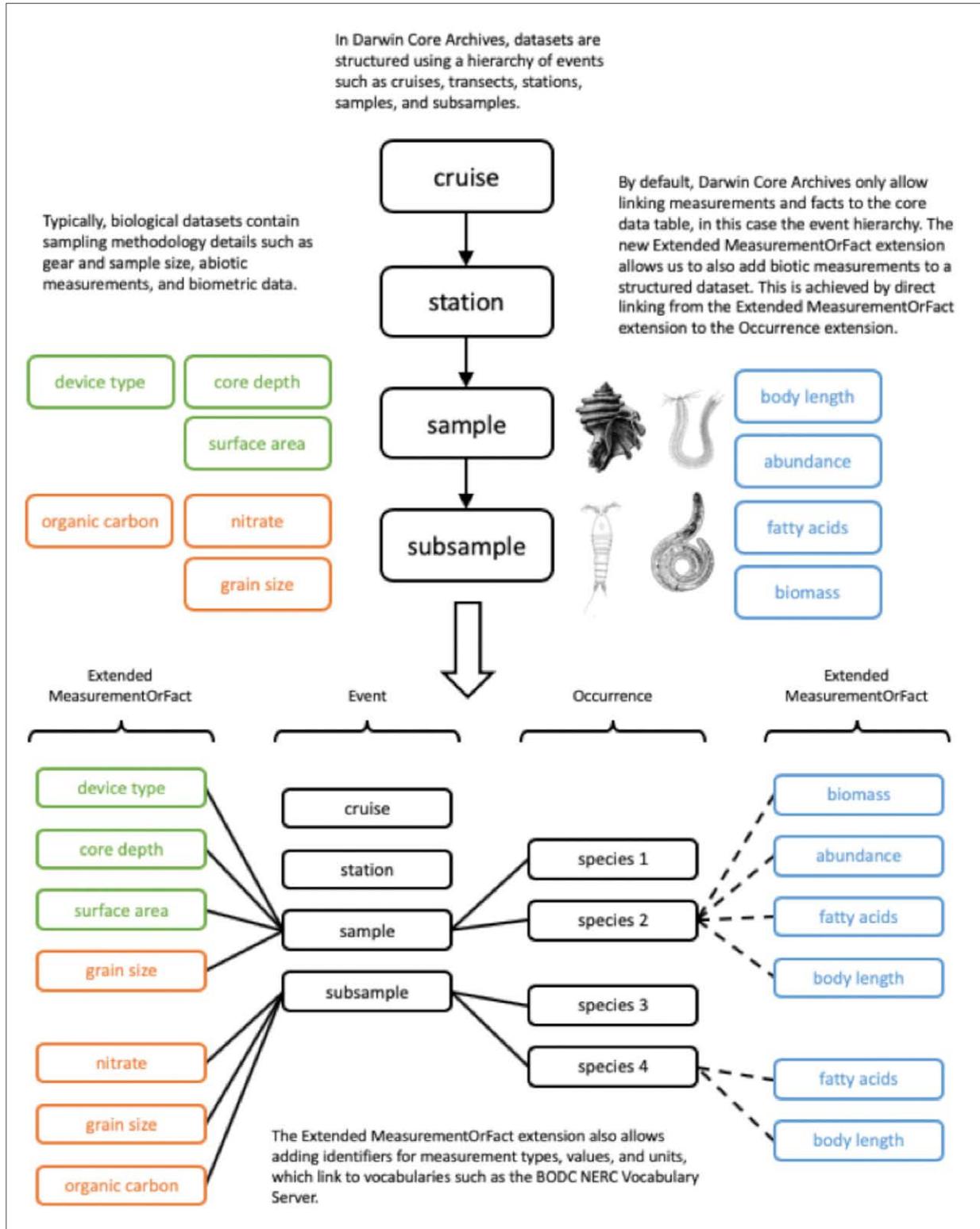


Figure 2. The OBIS-ENV-DATA standard allows the documentation of qualitative and quantitative information about both the sampling event and the species observation within that sampling event.

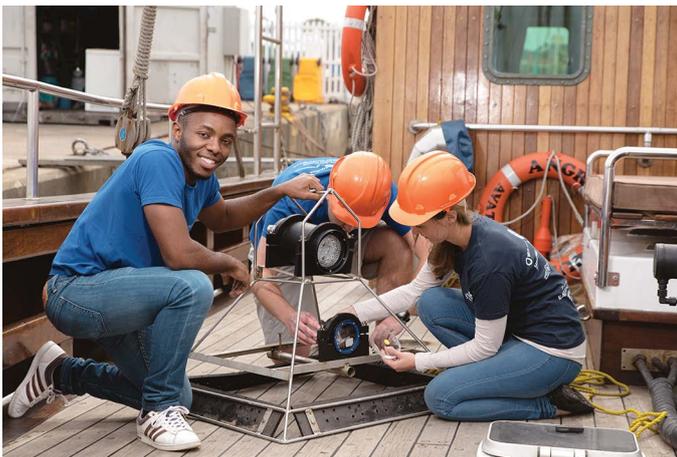
## GOBI welcomes new partners to the fold

GOBI extends a warm welcome to its newest partners who have joined the fold in the last few months. Together we hope to strengthen GOBI's position as a provider of expertise on matters of significance in global marine conservation, as well as to broaden GOBI's representation around the world. Here is a brief introduction to our newest members.

### Wild Oceans, South Africa

WILDOCEANS, a programme of the WILDTRUST, speaks directly to the Sustainable Development Goals (RIO+20) of the Blue Economy advanced by the United Nations, for improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. Through strategic action and innovative partnerships, WILDOCEANS aims to support government and communities to take advantage of services that healthy oceans offer, and improve the livelihoods of coastal communities, while protecting and restoring marine ecosystems.

The WILDOCEANS' Ocean Stewards project provides young marine science students with a formative experiential journey that gives them unique insights into marine conservation. Seventeen marine science students recently joined the fellowship of over 70 students from five universities.



Aiming for both socio-economic and conservation gains the Blue Crew project supports female waste - entrepreneurs who are cleaning our coastlines and collecting waste for recycling while supporting their families.

The WhaleTime project blends tourism product development (including guide training) with the generation of awareness and knowledge about the recovering (after near extinction from whaling) humpback whale population that migrates along the east coast.

Recognising the very low level of protection secured for South Africa's oceans, with less than 0.4% of our continental Exclusive Economic Zone (EEZ) within marine protected areas (MPAs), the WILDOCEANS' MPA Expansion project has offered support and encouragement to government to meet its MPA target of 10% by 2020, and to reach for the 30% that science indicates needs to be protected for ocean resilience and sustainability. The Only This Much campaign (@onlythismuchsa) became the mouthpiece for the project and spread awareness for MPAs and the value of healthy oceans, and the South African government announced 20 new MPAs in October last year.

Fundamental to the development of WILDOCEANS is the historic research vessel *Angra Pequena*, acquired last year. Providing exceptional ability to implement projects focused on the blue economy, she is also a signature icon for creating marine awareness and is central to our 'Our Oceans' documentary series that is currently in the making for release in mid-2019. The RV *Angra Pequena* is a unique asset for offshore research in southern and eastern African waters, filling the gap between big research ships and small coastal craft. We look forward to inspiring expeditions planned for the next year that will bring attention to ocean issues, and provide a platform for partnerships for discovery science, capacity-building and conservation action. Visit [www.wildtrust.co.za/wildoceans](http://www.wildtrust.co.za/wildoceans) for more information.

### Natural Resources Defence Council, USA

NRDC is an international non-profit environmental organisation with more than 3 million members working to protect the world's natural resources. With foundational expertise in law, policy and science, the NRDC Oceans Division and Marine Mammal Protection Project have direct relevance to GOBI's mission.

As part of its strategic plan, the NRDC Oceans Division is working to secure the international adoption of a 30% marine protected area (MPA) target by 2030. Fully protected marine reserves, where marine life can thrive undisturbed by human activities, are a key means of enhancing ocean health and resilience. Protecting 30% of the ocean is considered the minimum needed to maintain a healthy ocean that can mitigate the impacts of climate change and provide nutritional, cultural, and economic sustenance for people around the world. Securing international adoption of a target to protect 30% of the ocean by 2030 is fundamental to encouraging nations around the world to establish and manage MPAs. As part of this mission, NRDC will work in various international fora including the IUCN World Conservation Congress in 2020

to urge parties to the Convention on Biological Diversity (CBD) to adopt a 30% MPA target, and to ensure that the 30% target receives attention at the 2019 Our Ocean conference and the 2020 UN Oceans Conference.

Achieving an international target of 30% fully protected marine areas is not possible without establishing protected areas in international waters of the High Seas. NRDC has helped build momentum for a UN treaty focused in the conservation of the High Seas since 2006, highlighting the need for better management of human activity and working with partners to build consensus around key aspects of the agreement. Arctic protection is also one of the Ocean Division's priorities. NRDC participated in the CBD workshop convened to identify EBSAs in the Arctic marine environment. To continue to build the scientific basis of a network of MPAs in the Arctic, the Oceans Division funded a project to update key habitat maps and ecological connections among them. In 2015, NRDC convinced the USA State Department to include advancing an international network of MPAs in its agenda for the US Chairmanship of the Arctic Council. NRDC continues to build support for this network of MPAs at the Arctic Council and within the US and other Arctic governments. NRDC has also led a cooperative project with UNESCO's Marine World Heritage Program and others to identify Marine World Heritage Site candidates in the Arctic, and is currently working to foster political support for High Seas MPAs.



The Marine Mammal Protection Project holds specific expertise in identifying and protecting areas of biological and ecological importance to marine mammals, with a particular focus on the impacts of ocean noise pollution. Since 2015, the project has supported the efforts of the IUCN Joint WCPA/SSC Marine Mammal Protected Area Task Force (MMPATF) to identify Important Marine Mammal Areas (IMMAs), which falls under the GOBI work programme. Members of the Task Force are represented among Project staff, and securing the international identification of IMMAs is incorporated into NRDC's strategic plan to achieve 30% coverage of MPAs by 2030. Across the project, staff have significant legal expertise in

marine mammal protection in both the US and Europe, which may be useful in any future transition from the identification of IMMAs and other important marine areas to their designation and protection.



Finally, through its work to establish and support California's landmark MPA network, NRDC has built expertise in ensuring the success and effective management of marine protected areas. NRDC helped to secure the passage of California's Marine Life Protection Act (MLPA) in 1999. Since then, NRDC has worked collaboratively with the State and stakeholders to ensure that design of the MPA network was driven by best science, and is effectively managed. We have worked to integrate MPA management into State policies; to secure permitting processes that can avoid, then minimise, the impacts of industrial activities on MPAs; and to strengthen California's capacity to ensure compliance with the MPA protections and enforcement against poachers and violators. These elements are increasingly being highlighted as a model to inform MPA design and management around the globe.

### Ocean Institute, USA

For over 40 years, the Ocean Institute in Dana Point, California, has far exceeded its primary mission of educating over 100,000 students and visitors annually on ocean science. In a relentless pursuit to broaden its impact, Ocean Institute is now championing a new vision, mission and strategic plan that expands its focus beyond education to include research and conservation initiatives. This will be achieved by leveraging existing and new partnerships with the capabilities offered by its unique set of facilities, which include over 3,000 m<sup>2</sup> of educational labs as well as three ships, one of which is a 23 m oceanographic research vessel. These collaborations generate new content to be used in ongoing educational programmes. Importantly, they also introduce the incumbent team of interns and early career professionals to ground-breaking scientific advancements that will be instrumental in motivating and preparing them to become the researchers of tomorrow.

Ocean Institute has already established multiple partnerships that pursue these goals. Such collaborations include the University of Southern California's Urban Tides Community Science Initiative and the Harmful Algal Bloom (HAB) Watch programme. The Urban Tides initiative records the status of the Californian coast by visually documenting coastal changes and provides images along with recommendations to the local scientific community to help influence climate change discussions; HAB Watch assists in collecting data on harmful algal blooms to contribute to the development of improved responses to these blooms. Additionally, our facilities and manpower are used to support a local effort to replenish the local abalone population, by housing and caring for them until they reach maturity. Once matured, the abalone are transplanted to local kelp forests where they contribute to the repopulation of this federally listed Species of Concern.

Ocean Institute also collaborates with the Surfrider Foundation's Blue Water Task Force (BWTF) to monitor the health of local waters from a recreational perspective. Staff collect biweekly water samples from local beaches and marine protected areas by using water-quality testing equipment provided by BWTF. The collected data are fed into Surfrider's online database, where the information is used to inform students, the public, and elected officials on the status of water quality and pollution levels.



Through a collaboration with the Orange County Coastkeeper, Ocean Institute serves as a training ground and hub for the Marine Protected Area (MPA) Watch programme. By training volunteers to scientifically observe the human impact on MPAs, this information becomes an integral part in contributing to a database that informs communities on the protection of MPAs across the State. These citizen science initiatives will provide vital knowledge that will be used to inform the communities in which we live on protecting our important coastal areas.

Looking ahead, Ocean Institute intends to establish a marine life inventory on campus by the end of 2019. By monitoring the coastline, collected data on local fish and invertebrates will

be made available for study and will become a repository of knowledge regarding the natural, environmental and human impact on our coast.

Ocean Institute is honoured to join the esteemed members of GOBI. We look forward to contributing where possible to regional research endeavours and welcome future collaborations to expand our efforts in education, research and conservation.

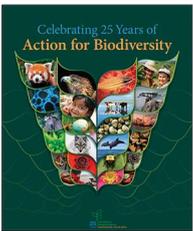
## University of Valparaíso, Chile

Dr Eulogio Soto, a scientific investigator from the Faculty of Marine Sciences and Natural Resources at the University of Valparaíso in Chile, is the lead representative of the University as GOBI partner. Dr Soto has a background in the ecology, biology, conservation and taxonomy of soft-bottom benthic communities from the intertidal zone to the deep-sea, with a particular focus on the main drivers that influence changes in these communities in space and time.

Past research projects in which Dr Soto has participated have investigated the fjord and channel system from Patagonia, southern Chile and the continental margin of central Chile. Currently, Dr Soto is collaborating in the project 'Deep-sea soft-bottom benthic communities: exploring biogeography and genetic connectivity of southeast Pacific seamounts', which involves his participation in an oceanographic expedition to explore the Southeastern Pacific Gyre (SPG). The expedition targets the southeast Pacific seamounts belonging to Nazca-Desventuradas Marine Park, Salas y Gomez and Rapa Nui Ridges, which are Marine Protected Areas, Vulnerable Marine Ecosystems and Ecologically and Biologically Significant Areas. His other research interests include coastal and ocean management, biodiversity beyond national jurisdiction, submarine mining and the disposal of mine tailings at sea. Dr Soto is an active member of the South American Research Group in Coastal Ecosystems (SARCE) network, whose main goal is the study of biodiversity of coastal marine ecosystem in both rocky shore and sandy beach ecosystem along America. He also contributes to other research groups, including the Marine Observation Center for the Study of Risks from Coastal Environment (COSTAR) at the University of Valparaíso, and the Latin-American network of integrated coastal management (IBERMAR).

To find out more about the University of Valparaíso, please visit <https://cienciasdelmar.uv.cl>.

# Hot off the press

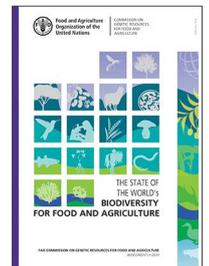


## Celebrating 25 Years of Action for Biodiversity

The CBD has been instrumental in catalysing efforts and processes to protect nature. In the 25 years since its inception, governments have implemented National Biodiversity Strategies and Action Plans to advance the vision and objectives of the Convention, supported financially since 1996 by the Global Environment Facility. This offering takes stock of the status of the implementation of the Strategic Plan for Biodiversity 2011-2020 and its Aichi Biodiversity Targets across all signatories to the CBD. Such stock-taking helps chart the course for the road ahead for the Convention and its Protocols for the remaining years of the current Strategic Plans, as well as setting the stage for the development of the post-2020 global biodiversity framework.

## The State of the World's Biodiversity for Food and Agriculture

Food provision for humans depends on countless interactions between the plants, animals and micro-organisms that comprise the living world. Biodiversity at every level, from genetic, through species, to ecosystem, underpins the capacity of farmers, livestock keepers, forest dwellers, fishers and fish farmers to produce food and a range of other goods and services in a vast variety of different biophysical and socio-economic environments. This publication provides a much-needed and long-awaited assessment of how biodiversity as a whole contributes to food and agriculture, including 'associated biodiversity', that support food and agricultural production by providing services such as pollination, pest control, soil formation and maintenance, carbon sequestration, purification and regulation of water supplies, reduction of disasters threats, and the provision of habitat for other beneficial species.

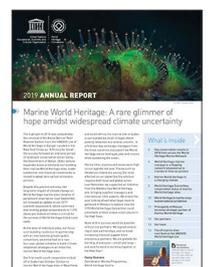


## Committed to Biodiversity: Germany's Support of the Convention on Biological Diversity

This report - full title *Committed to Biodiversity: Germany's Cooperation with Developing Countries and Emerging Economies in Support of the Convention on Biological Diversity for Sustainable Development* - highlights the commitment to biodiversity of both the German Federal Ministry for Economic Cooperation and Development (BMZ) and the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). Indeed, GOBI is one of their grateful beneficiaries, through BMU's International Climate Initiative (IKI). The contributions from GOBI and several other BMZ and BMU-IKI supported projects are highlighted, bringing into focus Germany's substantial contribution to halting the loss of biological diversity and bringing humankind closer to living in harmony with nature.

## UNESCO-WHC 2019 Annual Report

2018 was a busy yet productive year for UNESCO's World Heritage Centre – their notable achievements under the World Heritage Convention are summarised in their 2019 Annual Report. The highlight was the removal of the Belize Barrier Reef Reserve System from the UNESCO List of World Heritage in Danger, but that does not detract from their tireless work on building environmental resilience through partnerships with international private and public consortia. Of growing importance is their ambition to build climate adaptation strategies in marine World Heritage sites, as well as highlighting the scourge of marine litter, plastics and waste. For the year ahead, UNESCO-WHC will also be exploring what it would take to extend World Heritage Site-style protection to areas beyond national jurisdiction on the High Seas.



## Strengthening Regional Ocean Governance for the High Seas

Two documents produced by the STRONG High Seas project review relevant governance frameworks currently in place for the management of high seas biodiversity in these regions, as well as providing lessons learned and innovative ways forward. Both use the issues under discussion in the ongoing negotiations for a new legally binding BBNJ agreement under the UN, as well as selected Sustainable Development Goal 14 targets, as a lens through which to assess progress towards conservation and sustainable use.



# Global Ocean Biodiversity Initiative

## Providing the scientific basis for conserving biological diversity in the global ocean

The Global Ocean Biodiversity Initiative is an international partnership of organisations 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 Convention on Biological Diversity's efforts to identify ecologically and biologically significant marine areas (EBSAs) by assisting a range of intergovernmental, regional and national organisations to use and develop data, tools and methodologies.

GOBI also undertakes research to generate new science that will 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 ultimately 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.

The GOBI partnership and activities are coordinated by a Secretariat team, provided by Seascape Consultants Ltd. 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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