Global Ocean Biodiversity Initiative

Newsletter
Summer 2014

Federal Agency for Nature Conservation

Finalising the 'first round' of EBSAs...

2014 is an important year for the EBSA process. In late June, the 18th meeting of the CBD's Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA 18) will deliberate the descriptions of 160 ecologically or biologically significant areas - the results of the seven Regional EBSA Workshops that have taken place since the CBD's 11th meeting of the Conference of the Parties (COP 11) in 2012. The Workshops have brought together experts from Parties and scientific organisations in a way not achieved before. Technical teams tasked with gathering together and visualising datasets have provided a consistency to the process, which has also been clearly and ably articulated by the CBD Secretariat. The process to date has covered approximately 68% of the global ocean, and plans are well advanced for additional Regional EBSA Workshops in 2015 that will contribute significantly to a scientific and technical assessment of the remaining 32%.

What then? The process will always be open to new information as it becomes available. The Repository and information sharing mechanism, supported by an EBSA portal, should ensure that the descriptions and their underpinning data are publically accessible. Attention must then be given to using EBSAs to help secure protection for marine biodiversity, where the significance that has been recognised is threatened by human activities.

This edition of the GOBI newsletter provides a short commentary on the most recent Regional Workshops and emphasises the importance of collating data to inform future management measures. We also include an insight into how autonomous monitoring systems could be used in the future to 'fine tune' EBSA descriptions.

David Johnson
GOBI Coordinator

Arctic sea ice. Image: L. Murphy

In this issue

Convention on Biological Diversity's Arctic Regional EBSA Workshop

David Johnson, GOBI Secretariat

A Regional EBSA Workshop for the Arctic took place in Helsinki, 3-7 March 2014, hosted by the government of Finland. The Workshop described 11 areas meeting the EBSA criteria, of which 9 areas were within the national jurisdiction of the Russian Federation. The Workshop acknowledged the complementary efforts of the Arctic Council Working Group on Conservation of Arctic Flora and Fauna, and intergovernmental organisations and national processes applying EBSA criteria or similar criteria. Duke University provided technical facilitation to the meeting, including biogeographic context and more than 75 physical and biological data layers. The Workshop also gave a particular focus to sharing experiences and challenges on incorporating traditional knowledge and applying socio-cultural criteria to EBSA process.

A key challenge for the Workshop was how to represent and define the ice margin with respect to depth and jurisdiction. This resulted in two separate EBSA descriptions of geographically and temporally dynamic ice features as follows:

a. Marginal ice zone and the seasonal ice-cover over the deep Arctic Ocean, noting dynamics of its nutrient supply and associated ecological features (e.g. Polar Bear, Bowhead Whale and Ivory Gull);

b. Multi-year ice of the Central Arctic Ocean (i.e. ice surviving the summer time melt), defined for the EBSA by ice greater than 2 years old, with ice-dependent communities.

The Workshop had to take account of projections of changing ice conditions due to climate change (e.g. less multi-year sea ice over a 30-year trend), national submissions to the Commission on Limits to the Continental Shelf, and an ongoing EBSA process for that part of the Arctic within the maritime area of the OSPAR Commission and North East Atlantic Fisheries Commission.

The nine Russian Federation EBSA descriptions drew on reports from a IUCN/NRDC (2011), the Arctic Council AMSA IIc report (2012) and WWF Barents Ecological Biodiversity Assessment (2003). The areas identified comprehensively cover a series of open sea areas (White Sea, Pechora Sea, Barents-Kara Sea) and their margins with associated islands; coastal / fjord areas (Wrangel Island, Northern Chukoyka) including polynas such as the Great Siberian Polynya, and the Ob-Euisey river mouth. The EBSA descriptions give additional weight to national processes underway within the Russian Federation and recognise important sub-regional features and their interconnected biological diversity.

As a specific GOBI input, Dr Mike Tetley (WDS) conducted a meta-analysis of marine mammal information for the Arctic region on published range, presence and density estimates, compiled from a list of ~300 available publications. This information was further compared to cetacean species' range and richness estimates using published IUCN range maps and expert-reviewed Relative Environmental Suitability outputs from Aquamaps. Furthermore, a preliminary gap analysis was conducted to determine the features and areas already proposed via previous workshops applying EBSA criteria in this region (e.g. OSPAR/NEAFC workshop, IUCN/NRDC workshop) and additional areas for cetacean features not previously assessed (e.g., sub-Arctic whale species). This assessment has led to the description of 19 areas that contain evidence for marine mammals, thereby contributing additional data to this workshop.

Above: Participants at the Regional EBSA Workshop in Helsinki

Given that the majority of the EBSAs proposed prior to the workshop focused on the biological and ecological significance of physical or geomorphological features of

the ocean area, there was also discussion on the need to ensure that appropriate consideration is given to critical types of biodiversity in the Arctic region, particularly birds, marine mammals and benthic biodiversity. A breakout group was formed, led by GOBI partners, to specifically examine available data related to birds, marine mammals and benthic biodiversity in the Arctic to determine if the existing EBSA proposals adequately incorporate important areas for these types of biodiversity or whether additional areas should be discussed based on these biological factors.

Above, L-R: David Johnson (GOBI Coordinator) and Pat Halpin, Ben Donnelly and Jesse Cleary from MGEL, Duke University.

Finally, the Workshop recognised a number of data gaps. A number of issues were identified by GOBI partners as follows:

- Further tagging and collation of data is needed in order to strengthen available datasets when considering possible areas meeting EBSA criteria in areas such as the Chukchi Sea cetacean population (Luque & Ferguson, 2010).
- Benthic sampling is needed in a broader range of areas in order to build upon and consolidate existing data.
- Data gaps for benthic fauna are primarily due to challenging sampling logistics (e.g. the northern section of the Lomonosov Ridge). Particular sampling gaps to note include the Arctic deep-sea invertebrate benthos (>3000m) on the eastern side of the Canada Basin and in the megafauna fraction (Bluhm et al., 2011).
- Within the Arctic, marine Important Bird Areas (IBAs) have only been identified comprehensively for Alaska and the network of sites for the rest of the Arctic remain incomplete. The work undertaken by Audubon Alaska to identify marine IBAs can be used as a model for the rest of the region, although the value of tracking data should be assessed in future updates. Ongoing work in the Russian Far East (by Birds Russia) is due to deliver a new assessment of seabird breeding colonies and associated foraging areas that qualify as IBAs in 2015. Ongoing work in Iceland (Fuglavernd) is identifying new marine IBAs around seabird breeding colonies and a first assessment is expected to be completed in 2014. Additional information that may support new marine IBAs in Greenland has been compiled but has not yet been integrated into BirdLife databases (Christiansen et al., 2012). Work to identify marine IBAs is underway in Arctic areas of Canada, Norway and western Russia.
- A number of known seabird tracking datasets were not available for this workshop. The compilation of known seabird tracking datasets would contribute to a more complete assessment of seabird migration routes and movements.

References

Arctic Biodiversity Data Service (ABDS), Arctic Council Working Group on the Conservation of Arctic Flora and Fauna (CAFF). Available at: www.abds.is

Bluhm, B.A., Ambrose, W.G., Bergmann, M., Clough, L.M., Gebruk, A.V., Hasemann, C., Iken, K., Klages, M., MacDonald, I.R., Renaud, P.E., Schewe, I., Soltwedel, T. and Wlodarska-Kowalczuk, M. (2011) Diversity of the Arctic deep-sea benthos, Marine Biodiversity, 41: 87-107. doi: 10.1007/s12526-010-0078-4

Christensen, T., Falk, K., Boye, T., Ugarte, F., Boertmann, D. & Mosbech, A. (2012). Identifikation af sårbare marine områder i den grønlandske/danske del af Arktis. Aarhus Universitet, DCE – Nationalt Centre for Miljø og Energi. 72 pages

Luque, S.P. and Ferguson, S.H. (2010) Age structure, growth, mortality, and density of belugas (*Delphinapterus leucas*) in the Canadian Arctic: responses to environment? Polar Biology 33(2): 163-178.

Polar bear feeding on seal carcass. Image courtesy L. Murphy.

Convention on Biological Diversity's Northwest Atlantic Regional EBSA Workshop

David Johnson, GOBI Secretariat

The Northwest Atlantic Regional EBSA Workshop took place at the CBD offices in Montreal, 24-28 March 2014, hosted by the Government of Canada. The Workshop agreed descriptions for 7 EBSAs including seamount complexes, shoals, bank features, hydrothermal vents, seabird hotspots / Important Bird Areas and a unique deep-water oceanographic feature of ecological significance. Information was also discussed for canyon features, migratory corridors and an oceanographic transition zone associated with the Gulf Stream, but for these features it was concluded that insufficient information was available to support any additional EBSA description. Discussions to agree the Workshop boundary were influenced by the interface with previous Regional EBSA Workshops to the north, east and south. A rationale was agreed to include consideration of an area within the scope of the Arctic Regional Workshop, but which had not been fully taken into account: seamount complexes within the delimitation of the previously agreed Sargasso Sea EBSA to the south; and a subset of hydrothermal vents not considered by the Southeast Atlantic Workshop. The Workshop only considered Area Beyond National Jurisdiction.

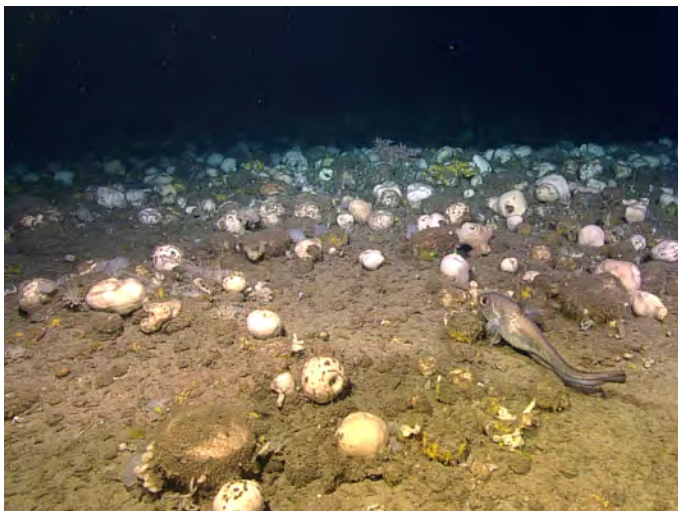
The Workshop was informed by the ongoing national EBSA process within Canada; by benthic work to define Vulnerable Marine Ecosystems (VMEs) undertaken by the North Atlantic Fisheries Organisation (NAFO); by a US bloom analysis at the scale of the whole North Atlantic, and by an assessment of available cetacean and bird information by WDS and Birdlife.

a. The EBSA process on the east coast of Canada has developed over the past decade and results were presented for three sub-regions, namely i) Newfoundland and Labrador, ii) the Scotian Shelf and iii) the Estuary and Gulf of St Lawrence. It was emphasised that identification of these Canadian EBSAs was based on aggregation of data but was open to new data and re-evaluation, and connectivity (both for different life stages and different ecological functions) needed further work.

b. The VME process (UN Res. 61/105, 2009) as applied by NAFO has identified significant concentrations of VME indicator taxa (large size sponges, gorgonian corals, sea pens, erect bryozoans, large sea squirts, cerianthid anemones, crinoids) through mapping known concentrations, kernel analysis of research vessel survey catch data and species distribution modeling. This analysis has been ground truthed and correlated with VME elements (canyons, spawning grounds, steep flanks > 6.4 degrees, seamounts and knolls). Current closures are in place to protect these significant concentrations and a review with possible revision of the boundaries is scheduled for late 2014.

c. Analysis of spring bloom dynamics at an ocean scale, forming the basis of integrated ecosystem assessment, was deemed to have important ramifications for how energy is flowing within marine ecosystems.

d. The Northwest Atlantic as a transition zone for highly migratory and mobile species diversity between tropical, temperate and subarctic groups of species, as evidenced by the transition of cumulative overlapping IUCN Red List ranges of cetaceans, pinnipeds, sea turtles and sharks, tuna and billfishes when mapped across the region.



Above: Slow growing sponges on the North East Flemish Cap (photo courtesy DFO)

The contextual data provided by the technical team was supplemented by contributed detailed data on marine mammal movements, specific deep-sea oceanographic information, seasonal Northwest Atlantic climatologies and details of Mid-Atlantic Ridge vent fauna and chemosynthetic ecosystems.

GOBI input to this Workshop comprised:

- Inputs of data for cetaceans and seabirds;

- Coordination of specific EBSA descriptions and sourcing evidence/information;
- Initial drafting of a Sargasso Sea Annex;
- Coordination of information on data gaps.

In respect to the latter, the Workshop acknowledged the Northwest Atlantic is a relatively well-studied area compared to many of the world's oceans but recognised specific shortcomings, particularly for deep-water biological data. Data gaps were identified for specific features (e.g. seamounts) both at the scale of named features likely to warrant an EBSA description and, for those features described, data gaps for individual EBSA criteria (e.g. importance for threatened and endangered or declining species).

Details of specific EBSA descriptions will be finalised in the CBD Workshop report that will be presented to SBSTTA 18. A number of lessons learned from this Workshop can be summarised as follows:

- The later EBSA Workshops now use annexes to highlight important Region-specific features not included as EBSAs – in this case canyons off the East coast of North America, mostly within national jurisdiction, that are a distinctive and significant feature of the Northwest Atlantic;
- The extent of seabird foraging areas were discussed at length as well as the inter-relationship between the EBSA and Birdlife IBA processes;
- Categorisation of EBSAs (spatially stable, individual features; spatially stable, grouped features; spatially stable features containing unknown individual positions (e.g. modeled parameters); seasonally non-fixed features) has become a requirement / emphasis since the North Pacific Workshop;
- The iterative nature of the process is interesting. Consistency of the process is helped by an experienced chair and some participants who have been to several Workshops. This is an added value of GOBI participation;
- The challenge of interdisciplinarity was recognised. A strength of this Workshop was the breadth of expertise within the Canadian delegation.

Sinking and swimming: The Economist jumps into the Global Ocean

Jeff Ardron (PACMARA / IASS) reflects on an opportunity to influence the global debate

In late February, when the northern European soul was wintery and pallid, sunny yellow Californian optimism beckoned me to The Economist's World Ocean Summit, hosted in association with National Geographic in San Francisco. It confidently promised to "*unite the widest possible group of stakeholders to explore new ideas about how to sustainably manage the growing human impact on the world's oceans*". The first Summit set the scene, this second event intended to look towards solutions and the role business can play.

There, we were treated to a parade of high-placed eloquent speakers such as HSH Prince Albert II of Monaco, HRH The Prince of Wales (pre-recorded), John Kerry (US Secretary of State - remotely), Leon Panetta (Former US Secretary of Defense), several CEOs, financial officers, and well, you get the picture. From the get-go, the quality was top notch and the room literally buzzed with high expectations.

In amongst this shiny brass, GOBI was well represented in the form of a diamond known as Kristina Gjerde (IUCN) who spoke at the breakout session on high seas governance. Also, your faithful GOBI correspondent managed to navigate his way through a short plenary presentation outlining international governance agreements and their institutions.

At the start of the conference, participants - many of them from industry - were asked if they would support some sort of new World Ocean Organisation. Surprisingly, most said that they would. However, as the two days progressed it became clear that there were doubts about this choice, and how to best cure the various oceanic ills became less and less clear. José María Figueres (former President, Republic of Costa Rica and Co-chair of the Global Ocean Commission) and David Miliband (also Global Ocean Commission) warned at one point in their joint discussion that we should be "careful what we wish for..."

There is no doubting Editor-in-Chief of The Economist John Micklethwait's ambition when he stated "*The oceans are a natural subject for a global publication that seeks to apply the tools of economics to policy problems: Oceans issues affect billions of people, in ways that bring together business, politics, academia and science*". However, trying to distil valuable and unusual ideas into a limited number of critical points inevitably reduced the discussion to well-worn workshop platitudes. In the end the outcome was unclear and the Californian dreaming was over.

The Convention on Biological Diversity's Mediterranean Regional EBSA Workshop

Giuseppe Notarbartolo di Sciara (Tethys) and Tundi Agardy (Sound Seas)

The Mediterranean region comprises a vast set of coastal and marine ecosystems that deliver valuable benefits to the coastal inhabitants of the 21 countries that border the sea, and is recognised as one the world's 25 top biodiversity hotspots. The recent Mediterranenan Regional EBSA Workshop, which took place in Malaga, Spain on 7-11 April 2014, highlighted the vast array of both coastal and pelagic habitats, the impressive species richness, and the high degree of endemism present in this region.

The Workshop was hosted by the Government of Spain, and attended by experts from Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, European Union, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Tunisia, Turkey, the Secretariat to the Barcelona Convention/ Mediterranean Action Plan (UNEP/MAP), the Secretariat of the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS), Food and Agriculture Organization of the United Nations, Intergovernmental Oceanographic Commission-UNESCO, UNEP-Mediterranean Action Plan/ Regional Activity Center for Specially Protected Areas, IUCN-Centre for Mediterranean Cooperation, Network of Managers of Marine Protected Areas in the Mediterranean (MedPAN), BirdLife International, Global Ocean Biodiversity Initiative, OCEANA, World Wide Fund for Nature (WWF), Universitat Autonoma de Barcelona (Spain), University of Crete (Greece), University of Corsica (France), State Institute for Nature Protection (Croatia) and Duke University (Technical Support Team).

Long-finned pilot whales in the Pelagos Sanctuary, August 2011. Image courtesy N. Pierantonio/Tethys.

GOBI had a strong participation in the meeting, represented by Dr Giuseppe Notarbartolo di Sciara (Tethys Research Institute), Ben Lascelles, (BirdLife International), Dr Tundi Agardy (Sound Seas USA) and of course the Duke University team of Pat Halpin, Jesse Cleary, Ben Donnelly, and Daniel Dunn. Guidance was provided by the CBD Secretariat, including Dr Jihyun Lee, Environmental Officer, who has been spearheading the many regional seas EBSA processes worldwide.

The process to describe EBSAs in the Mediterranean takes place in the context of wide regional cooperation and a long history of collaborative research. The Barcelona Convention formalised long-standing regional cooperation in marine research and management in 1982, establishing a Mediterranean Action Plan Secretariat and seven modules (a Mediterranean pollution tracking centre known as MedPol, plus six regional activity centres, including RAC/ SPA - the Specially Protected Areas Regional Activity Centre), which played a large part in providing data for the EBSA process. The workshop participants had the added advantage of previous activities to define ecologically important areas carried out by RAC/SPA, including amassing information on significant ecosystems in the Mediterranean open seas, deep seas, geological features of the seabed (seamounts, mud volcanoes, canyons and hydrothermal vents), oceanographic features such as fronts and upwelling areas, ecological features of certain vulnerable habitats (e.g. coralligenous facies, white coral communities), marine mammal, bird and marine turtle important areas, and biogeographic features of commercial pelagic species and species subject to incidental capture or by-catch (spawning and nursery areas).

Using these analyses and additional information collected by the Duke University technical support team and data contributed by various organisations, the Workshop discussed and agreed on descriptions of 17 areas meeting EBSA criteria in the Mediterranean.

GOBI was instrumental in helping to lay the foundation for this rigorous EBSA process, and provided input to this Workshop by:

- Placing the current effort within the framework of existing regional marine conservation activities;
- Providing key inputs of data for migratory species, with

an emphasis on cetaceans and seabirds;

- Coordinating specific EBSA descriptions and providing sources of new information.

The context for the Mediterranean EBSA process provided a starting point for participants, some of whom were new to Mediterranean regional initiatives. Tundi Agardy delivered a presentation on initial integrated assessment of the Mediterranean in the context of the Ecosystem Approach adopted by the contracting parties to the Barcelona Convention, while Giuseppe Notarbartolo di Sciara delivered a presentation on Important Marine Mammal Areas in the Mediterranean region and Ben Lascelles presented a methodology for using seabird data to describe areas meeting EBSA criteria.

Much deliberation in the workshop centred on the question of scale, and what constituted a regionally significant EBSA as opposed to a more localised area of biological interest or importance. Having the group work through the EBSA criteria to achieve consensus on 17 regionally important areas is a milestone event, sure to support existing conservation processes and spark new ones. Details of specific EBSA descriptions will be finalised in the CBD Workshop report that will be presented to SBSTTA 18 in June of 2014. Once finalised, these EBSAs can be expected to catalyse the regional Ecosystem Approach process to which all 21 countries and the EU have committed; EBSAs might serve as pilot sites for monitoring of whether the agreed ecological objectives are being met, and could well serve as foci for targeted cooperative research on marine biota, ecology and impacts of anthropogenic activity.

The Workshop participants noted that the Mediterranean marine and coastal areas have significance for a number of reasons. Though the region is globally recognised as a biodiversity hotspot, vast areas within the region are subject

Scopoli's Shearwaters, photographed off NW Mallorca in spring 2014. Image courtesy R. Wynn.

to rapid urban sprawl, with more than a third of the human population living in coastal administrative entities totalling less than 12% of the surface area of the Mediterranean countries, which brings various threats and impacts to the coast and the sea. The Mediterranean Sea is a good example of a region where particular and specific responses to global changes have been observed. Its relatively small size, high biodiversity, temperate climate and semi-enclosed nature make it a place where the effects of climate change will be most exacerbated. Its semi-enclosed nature prevents rapid water exchange and therefore makes it more sensitive to temperature and pH variations. Together with the high degree of pressure exerted by densely populated coastal areas, this makes the Mediterranean Sea an especially vulnerable place. Many areas within the region meet all of the EBSA criteria, and the highlighted significant areas will likely catalyse further efforts to conserve this globally important hotspot of marine biodiversity.

GOBI calendar: upcoming events

- **16-19 June 2014:** Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction (BBNJ). New York, USA.
- **18 June 2014**: 6th meeting of the GOBI Advisory Board. New York, USA.
- **23-28 June 2014**: 18th meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA 18). Montreal, Canada.
- **14-19 August 2014:** International Marine Conservation Congress - special GOBI session on 16 August. Glasgow, UK.
- **18 August 2014**: GOBI 2014 Annual Meeting, Glasgow, UK.
- **6-17 October 2014:** 12th meeting of the Conference of the Parties (COP 12) to the Convention on Biological Diversity. Pyeong Chang, Republic of Korea.
- **12-16 October 2014**: Third World Conference on Marine Biodiversity. Qingdao, China.
- **12-19 November 2014**: IUCN World Parks Congress. Sydney, Australia.

Advancing Governance of Areas Beyond National Jurisdiction: a special issue of *Marine Policy*

Jeff Ardron, PACMARA/Institute of Advanced Sustainability Studies

A new issue of the journal *Marine Policy* focusses on the better protection and sustainable use of marine areas beyond national jurisdiction (the 'high seas'). Containing 14 articles written by leading experts in the field, it highlights the current state of affairs in high seas governance, gaps, and ways forward.

These papers are intended, in part, to contribute to ongoing discussions at the UN on how biodiversity on the High Seas should be better protected. There, a few reluctant nations are currently arguing that the status quo institutions are good enough. In the opening commentary article (*Charting pragmatic courses in ocean governance*), the Directors of IASS and IDDRI, Klaus Töpfer and Laurence Tubiana, point out that, on the contrary, research suggests that a variety of complementary governance approaches will be necessary, using both existing and new instruments.

The special issue puts forward options ranging from regional initiatives, better global institutional cooperation, and the establishment of integrated marine reporting and indicators through the UN's 'Sustainable Development Goals'. Also discussed are medium- and longer-term solutions such as the establishment of overarching legal principles for High Seas governance, and the development of a comprehensive new legal agreement under the UN Convention on the Law of the Sea.

Advancing Governance of Areas Beyond National Jurisdiction was compiled and guest-edited by the Institute for Advanced Sustainability Studies (IASS, Potsdam) and the Institute for Sustainable Development and International Relations (IDDRI, Paris). It will be published as part of Marine Policy Vol. 49, and can be viewed online at www.sciencedirect.com/science/journal/0308597X

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SPECIAL ISSUE: MARINE POLICY

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Providing a solid foundation: The role of data management in the EBSA process

Jesse Cleary and Pat Halpin, Duke University

The Secretariat for the Convention on Biological Diversity has recently organised three Regional Workshops to facilitate the description of marine areas meeting the EBSA criteria. These latest workshops covered the Arctic, Northwest Atlantic and the Mediterranean regions (see articles elsewhere in this newsletter). GOBI has facilitated participation of regional experts in this process and several GOBI partners have provided the core scientific and technical support for each workshop.

The application of the criteria for EBSAs is a scientific and technical exercise applied at a regional scale. Given this regional approach and the diversity of regional experts, the provision of data for each workshop was established as an important method to work from a common baseline and develop a level of standardisation into the process.

Scientific data were compiled into data reports prior to each workshop by technical support groups from either the Commonwealth Scientific and Industrial Research Organisation of Australia (CSIRO) or the Marine Geospatial Ecology Lab at Duke University (USA). These technical teams covered all nine of the CBD EBSA regional workshops held to date and coordinated their collection of baseline data for each workshop. These data reports provided a consistent and comprehensive understanding of environmental conditions across the workshops that could be then supplemented by regionally relevant datasets.

The datasets covered three primary data themes: i) biogeographic; ii) biological, and iii) physical/oceanographic. These data were obtained from global oceanographic and biogeographic data centres as well as individual researchers active in each workshop's region of interest. Building upon this baseline, datasets of regional interest were added as discovered by the technical teams or submitted by Parties and organisations (including workshop participants) prior to the workshop.

Baseline Data

The data includes both relevant scientific documents/ reports and submissions of potential areas that meet EBSA criteria, using a template provided by the CBD Secretariat for that purpose. Data reports and GIS databases containing the following scientific data were made available to each workshop for its consideration.

- ***Biogeographic data:*** Marine Ecoregions of the World (MEOWs), Large Marine Ecosystems (LMEs), Vulnerable Marine Ecosystems (VMEs), Longhurst marine provinces; GOODS pelagic and bathyal provinces.
- ***Biological data***: Marine mammal distribution data/ models; catch of commercial pelagic species; sea turtle telemetry and nesting beaches; Ocean Biogeographic Information System (OBIS) biodiversity data; predictions of deep-sea corals and octocorals; Important Bird Areas (BirdLife International);
- ***Physical data:*** Seamounts; vents and seeps; bathymetry; distribution of large submarine canyons; seafloor geomorphology; CSIRO Atlas of Regional Seas (CARS) physical ocean climatologies; ocean surface temperature; sea surface temperature front occurrence; chlorophyll-A climatology; VGPM ocean productivity; sea surface height; mesoscale eddy density; eddy kinetic energy; drifter climatology of near-surface currents; surface current velocity.

Regional Data

The baseline data were supplemented by the technical support teams to include available data on features, geographies and species of unique interest to each region. Prior to each workshop, the CBD Secretariat and technical teams facilitated an extensive communication effort with Parties, relevant scientists, and institutions that might have data to contribute to the EBSA workshops. Examples of regionally specific datasets include data on regional migration patterns, distribution of endemic species, and regional oceanographic cycles (e.g. El Nino/Southern Oscillation, North Pacific Transition Zone).

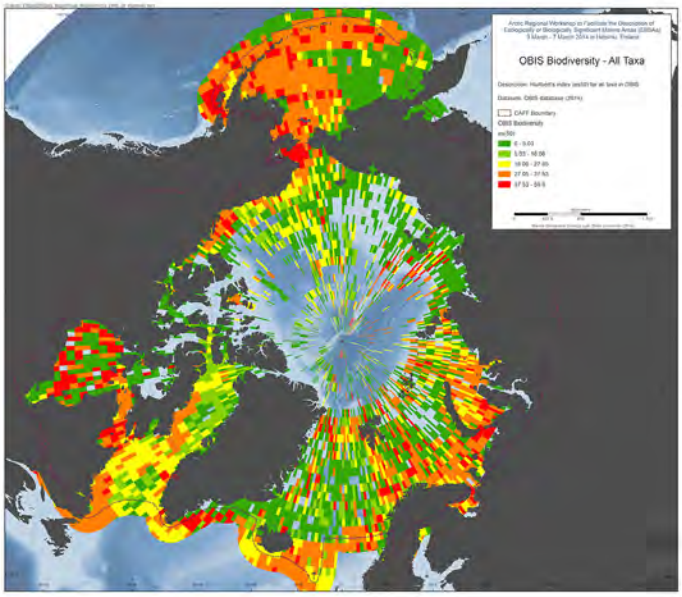
Data Use

The digital data were compiled and collated by the technical support teams of CSIRO and Duke University into a Geographic Information System (GIS). The data were then compiled into data reports, provided to workshop participants prior to each regional workshop. Each individual dataset was described in the data report with appropriate references, metadata and map representation. The maps within the data reports were also brought to each workshop in large format printed hardcopies for review and discussion by workshop participants. All data compiled in the workshop data reports were provided to each workshop in several

laptop computers containing GIS mapping and analysis software, and each workshop group discussion was assisted by the technical support teams for mapping and analysis for application of EBSA criteria as needed throughout the workshop plenary and breakout sessions. An overview of the available maps and GIS data was provided during the opening plenary session of each workshop. In addition the large-format printed maps were displayed around the meeting room and several smaller-format map books were circulated for review by the workshop participants.

Post-Workshop capacity building

An added benefit of the regional workshop process was to establish connections between regional experts, the CBD Secretariat and technical support teams. These relationships have often evolved after the meeting and further developed into data sharing arrangements and technical capacity building. To the best extent possible, many of the baseline data collected for the data report and workshops were made available to regional experts and organisations. In this way the CBD and technical teams are building a living legacy that will further biodiversity science and conservation planning in these regions into the future.



Above: Map of the Arctic region showing biodiversity data drawn from the Ocean Biogeographic Information System (OBIS), presented at the Arctic Regional EBSA Workshop in March 2014.

The Ocean Biogeographic Information System (OBIS): a gateway to the world's ocean biodiversity and biogeographic data and information

Ward Appeltans, UNESCO-IOC/IODE/OBIS

With over 37 million observations of 115,000 marine species from 1,400 datasets provided by nearly 500 institutions in 56 countries, the OBIS information system is currently the largest single data repository for biological data for the world's oceans. OBIS was established by the Census of Marine Life, and since 2009 continues to grow under the auspices of Intergovernmental Oceanographic Commission of UNESCO's International Oceanographic Data and Information Exchange (IODE) programme. OBIS operates through a network of national and thematic nodes, and a secretariat based at the IOC project office for IODE in Oostende, Belgium.

OBIS plays a vital role in building the scientific knowledgebase to support ocean governance and management, and provides baseline information for global assessments on the state of the marine environment, area-based management tools, such as the identification of EBSAs (UNEP-CBD, 2013) and environmental impact studies. OBIS can play an important role in activities in Areas Beyond National Jurisdiction (ABNJ). Technical experts at the UN BBNJ workshop in May 2013 (UN, 2013) identified OBIS as an appropriate mechanism for data sharing, hereby contributing to capacity building, benefit sharing and transfer of marine technology. OBIS is also quite unique because it holds data from all marine species including non-commercial, non-target fishing species, which allows a holistic (ecosystem) approach to measure impacts of activities in ABNJ. Recently the Deep-Ocean Stewardship Initiative (DOSI) collected signatures of +85 scientists and 14 international organisations or initiatives (and the GOBI Secretariat) to call for an international field program and coordinated data repository be developed in conjunction with e.g. the International Seabed Authority and IOC-UNESCO's OBIS. Mengerink et al. (2014) called for a funding mechanism as part of a benefit-sharing regime in ABNJ to support scientific research and information generation including support for a global deep-ocean data repository, which could be part of OBIS.

References

- Mengerink et al. (2014) A Call for Deep-Ocean Stewardship. Science 334: 696-698. DOI: 10.1126/science.1251458
- UN (2013) Summary report of the Intersessional Workshops aimed at improving understanding of the issues and clarifying key questions as an input to the work of the Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction (A/AC.276/6).
- UNEP-CBD (2013) Progress report on marine and coastal biodiversity: Use of scientific and technical information for describing ecologically or biologically significant marine areas (EBSAs). UNEP/CBD/SBSTTA/17/INF/3.

A robotic revolution: new technologies for marine mapping and observing

Dr Russell B Wynn, National Oceanography Centre, UK

In recent years there has been a growing demand for increased marine mapping and observational data at higher spatial and temporal resolution, driven by a number of factors:

- Increased commercial activity, e.g. offshore windfarms and deep-sea mining;
- New policy requirements, e.g. Marine Protected Area monitoring and the EU Marine Strategy Framework Directive;
- Strategic defence needs, e.g. operations in unfamiliar terrains;
- Topical scientific research, e.g. impacts of environmental change and human activities on the marine environment;
- Surveillance and enforcement, e.g. monitoring of unauthorised fishing activity in restricted areas.

These drivers are coinciding with an ongoing increase in the costs of marine operations, largely due to escalating fuel prices for survey vessels. As a result, the marine community is increasingly turning to energy efficient Marine Autonomous Systems to help meet this upsurge in marine data requirements.

The term Marine Autonomous Systems (MAS) describes a variety of robotic vehicles that, unlike traditional platforms such as Remotely Operated Vehicles (ROVs), are not tethered to a host vessel and can therefore be operated fully autonomously. This article describes the three main forms of MAS in use today and highlights some of their applications.

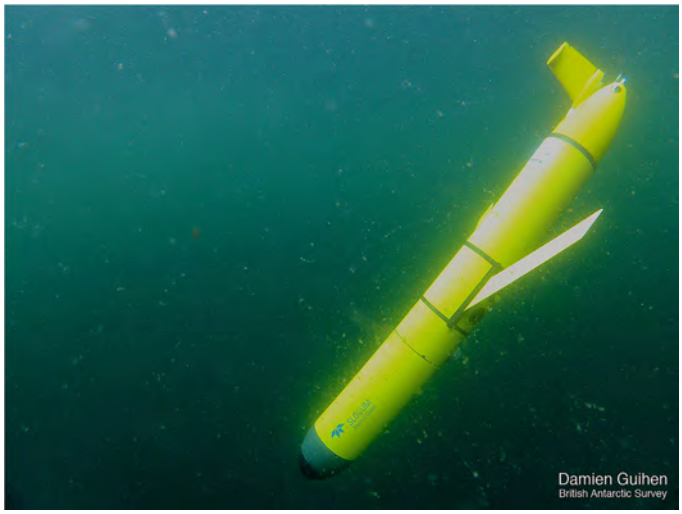
Autonomous Underwater Vehicles (AUVs) are propeller-driven vehicles that move directly through the water column. They are typically lozenge-shaped and are capable of operating at depths of up to 6000 m. Although their endurance is quite low (most missions last no more than one or two days) they can carry a wide range of high-power sensors. AUVs are able to operate independently of a host vessel and, once deployed, follow a pre-programmed track using a variety of sophisticated navigational tools. When operating in fully autonomous mode, the AUV can be left 'on mission' while the host vessel collects data elsewhere, therefore increasing the amount of data that can be collected for a given amount of time.

AUVs have been used to explore extreme environments, such as beneath Antarctic ice sheets where conventional platforms are unable to operate. In the deepest parts of the ocean they have discovered new hydrothermal vent fields, through deployment of chemical sensors that can 'sniff' active hydrothermal plumes in the water column.

The Natural Environment Research Council (NERC) Autosub6000 AUV, which operates down to 6000 m and is used for a wide variety of seafloor mapping and oceanographic applications. Photo: R. Wynn.

One of the most common AUV applications is seafloor mapping using high-resolution multibeam echosounder or sidescan sonar instruments mounted on the underside of the vehicle. This capability was recently highlighted by the use of an AUV to assist in the search for a missing plane (Malaysian Airlines Flight MH370) in the Indian Ocean at water depths of 4500 m. AUVs used for seafloor mapping are able to bridge the resolution gap between vessel-mounted multibeam echosounders (that can map large areas relatively quickly at low resolution) and ROVs (that collect very high-resolution mapping data and video/samples from small areas). AUVs can now carry full-colour camera and flash systems to enable benthic megafauna and associated habitats to be directly imaged at cm-scale resolution, even in the darkest depths of the ocean. They are therefore being tested for future mapping and monitoring of Marine Protected Areas, and also for routine monitoring of large areas of seabed to search for potential leakages from sub-seafloor carbon capture and storage sites; pilot projects are underway in the North Sea to test this capability.

Submarine gliders are buoyancy-driven platforms that move up-and-down through the water column on an oscillatory track. They are a similar shape to AUVs but are smaller and have lateral wings that drive forward propulsion. Gliders move relatively slowly but have high endurance, and are primarily used for making oceanographic and biological measurements using relatively low-power sensors. Their ability to undertake continuous measurements for several weeks means they are well suited to monitor seasonal changes in the ocean, such as the development of spring plankton blooms. Regular contact with an onshore operator can be achieved by programming the glider to surface after a set number of dives; this allows 'parcels' of data to be uploaded via satellite link and for new co-ordinates to be sent to the glider. Recent studies have deployed sensors on gliders that allow simultaneous measurements across multiple trophic levels, from plankton to cetaceans.



A Teledyne Webb shallow-water slocum glider in action, operated by NOC. This vehicle is fitted with a 120kHz echosounder and can be used to image fish shoals and zooplankton aggregations. Photo: Damien Guihen (British Antarctic Survey, UK).

Unmanned Surface Vehicles can harvest power from one or more of wind, waves and sun to drive forward propulsion across the sea surface. They are the newest form of MAS, and new vehicles are currently being developed in several countries. USVs can be used to collect data at the ocean-atmosphere interface, e.g. meteorological data used in operational weather forecasting. Their surface presence means they can be tracked by GPS and can transmit and receive data from satellite and subsurface platforms; as a result they also have potential to act as data 'gateways' between subsurface platforms actively collecting data, e.g. AUVs or seabed observatories, and those using the data back on land. They can also be equipped with camera systems for monitoring seabirds and acoustic monitors for cetaceans, allowing simultaneous measurement of oceanographic parameters such as oceanic fronts and distributions of mobile species far offshore.

The major challenge is now to integrate these new vehicles into established networks of marine observations, including vessels, moorings and seafloor observatories. Although they have potential to replace and/or enhance some vessel-based measurements, they are perhaps best viewed as part of a future coherent marine observation network that allows marine stakeholders to meet new challenges and make the best decisions for the sustainable use of the oceans.

Data collected from autonomous monitoring systems could be used to fine-tune EBSA scientific descriptions and to complement surveillance and enforcement of these largely remote locations once management measures are in place. However, it should be noted that there is anecdotal evidence of fishermen damaging scientific ocean buoys, hence it cannot be ruled out that (more expensive) autonomous monitoring systems would not also be at risk, particularly by those engaged in illegal, unreported and unregulated activities.

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About GOBI

The Global Ocean Biodiversity Initiative is an international partnership advancing the scientific basis for conserving biological diversity in the deep seas and open oceans. It aims to help countries, as well as regional and global organisations, to use and develop data, tools and methodologies to identify ecologically or biologically significant areas in the oceans, with an initial focus on areas beyond national jurisdiction. The GOBI Secretariat is provided by Seascape Consultants Ltd, supported and funded by the German Federal Agency for Nature Conservation (BfN; www.bfn.de).

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