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Working towards a High Seas Marine Protected Areas Network:

Development of an Interactive Map (IMap) and review of spatial databases containing information on marine areas beyond the limits of national jurisdiction

A report of the UNEP World Conservation Monitoring Centre (UNEP-WCMC) to the Convention on Biological Diversity (CBD)

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UNEP WCMC

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Executive Summary

Several recent international meetings have agreed on the need to establish and effectively manage representative networks of marine protected areas (MPAs), which are currently a favoured strategy for conserving not only biodiversity and habitats, but also fish stocks. Efforts undertaken by numerous organizations around the world demonstrate the progress that has been made in planning and implementing marine protected areas, particularly in coastal and nearshore zones. However, with respect to areas beyond national jurisdiction, or high seas, there are few policies existing to legally enforce protection of marine resources of the deep oceans. Despite this challenge, a growing body of knowledge on cold-water corals, seamounts, and highly migratory species is creating a basis for setting priorities for protection of high seas areas.

In response to the increasing efforts of many researchers, institutions, and governments to better understand deep sea and open ocean areas, a number of organizations are building databases to support decisions. The objective of this report is to fulfill part c of CBD Decision VIII/24, paragraph 44, namely to bring together spatial databases on high seas marine protected areas (HSMPAs) and habitats and outline how future management and collaborations may continue to develop. UNEP-WCMC has compiled a number of these sources of spatial data on areas beyond national jurisdiction as well as produced an Interactive Map (IMap) that highlights up-to-date information on high seas protective measures, critical habitats and species and allows users to turn data layers on and off. The IMap can be found at http://bure.unep-wcmc.org/marine/highseas.

We expect that this information should assist with the increasing interest in developing a high seas marine protected area network. Applying the resources gathered in this report with the development of selection criteria, such as vulnerability and representativeness, for priority high seas areas in need of protection will allow for the implementation of and frameworks necessary to move forward on conservation of high seas resources.

Major findings from this report are as follows:

- The Interactive Map (IMap) provides some utility regarding current knowledge on high seas protection measures; however, it is built on old technology. Transferring this data to an information module for inclusion in the redeveloped World Database on Protected Areas (to be released in 2008) will allow for a more robust, web-based, interactive system of data on high seas marine resources and areas. The user instructions for IMap are found in Appendix 1.
- Over 40 different data sources containing information about areas beyond national jurisdiction have been identified (Appendix 9). Future collaborative efforts should be focused on developing strong linkages between these ongoing research initiatives and designating points of contact from each institution or initiative.
- Criteria for designating high seas marine protected areas, once agreed upon, could potentially be linked with available data sources (Appendix 9), as

identified in this report, to determine gaps in knowledge and to establish priority actions.

- A recommended approach to high seas data management and information flow is outlined in Figure 3. Key partners, including the WCPA Marine High Seas Task Force, The Sea Around Us program at the University of British Columbia, and the Ocean Biogeographic Information System (OBIS), would work with UNEP-WCMC and other institutions to inform at least six information modules relevant to high seas conservation and marine protected areas. All of this could be linked through the World Database on Protected Areas.

Introduction

More than two-thirds of the world's surface is covered by oceans and seas. About 64 percent of this surface is located beyond any national jurisdictions or territorial waters, where it lacks any rules or enforcement that would ensure important conservation measures are being enacted (UNEP 2006). Recent assessements of marine life, including deep sea corals and migratory species, have revealed the range of high biodiversity that exists in waters more than 200 miles from coastal environments. Even though the 1982 United Nations Convention on the Law of the Sea (UNCLOS) commits countries to protect the marine environment and use marine resources wisely even if beyond national boundaries, these areas are still at risk (UNEP 2006).

The high seas, or areas beyond national jurisdiction, are a topic of growing interest. Research and management is evolving fast, due to a realisation that it needs to catch up with exploitation, the largest current threat to the high seas. Deep-sea fisheries are particularly vulnerable, with impacts affecting both fish stocks and habitats. Impacts on seamounts are almost completely due to fishing (Rogers 2004). Illegal, unreported and unregulated (IUU) fishing, carried out by vessels operating outside existing regional management agreements and without regard for sustainable fishing practices, accounts for 30% of the world's fish catch (Riddle 2006) and is one of the major reasons why the international community is failing to conserve and manage high seas stocks (Gianni and Simpson 2005). Despite having management plans based on science, actions to implement these plans are not often carried through by decision-makers.

While conservation efforts for the world's marine environment have increased and expanded in recent years, there is still a great deal of work that needs to be done in order to meet a variety of global targets, particularly the target of the Convention on Biological Diversity's programme of work on protected areas (Decision VII/28, Annex), which states 'By 2010, terrestrially and 2012 in the marine area, a global network of comprehensive, representative and effectively managed national and regional protected area systems is established.' Efforts are needed to develop systems of protected areas that reflect ecologically-representative marine areas in the high seas as well as suitable approaches for managing and enforcing off-shore environments. The 2007 UNEP Global Marine Assessments report reiterates previous findings: *key knowledge gaps exist in the high seas and deep ocean realms*. While advances have been made in the understanding of threats and deep-sea biology, there is a need to begin correlating conservation planning with policy.

One of the potential actions recommended to address the conservation and sustainable use of the high seas is the development of marine protected areas in waters beyond national jurisdiction. The Conference of the Parties to the CBD, in Decision VIII/24, paragraph 44c, requested the Executive Secretary to 'collaborate in the further development of spatial databases containing information on marine areas beyond the limits of national jurisdiction, including the distribution of habitats and species, in particular rare or fragile ecosystems, as well as the habitats of depleted, threatened or endangered species'. Though HSMPAs are not currently defined by any international body, high seas protection measures have been adopted through a number of

arrangements (Ardron 2007) as discussed in this report. In addition, there are several efforts in place regarding proposals for HSMPAs, including a list of 50 priority sites being developed by the IUCN High Seas Task Force, a design for a global network of high seas marine reserves (Greenpeace), and other initiatives.

Because there are no legal HSMPAs currently in place, comprehensive mapping of key habitats and species should allow for a more informed selection of HSMPA sites in conjunction with the application of MPA selection criteria. Mapping should also aid the incorporation of biological data into the future development of high seas ecoregions. Mapping HSMPAs allows spatial gaps in existing management to be identified. Overlaying physical and biological data (bathymetry, seamounts and cold-water corals) allows identification of locations that are potentially biodiverse or vulnerable. The analysis of high seas fishing pressure in the form of catches from dredging and bottom trawling allows assessment of the likely naturalness of locations, given their historical fishing pressure. Finally, one global marine ecoregional approach developed by the IUCN World Commission on Protected Areas (WCPA) was plotted to allow 'representativeness' of existing management areas to be assessed.

While this report does not provide a complete representation of high seas data, it does give background to IMap by briefly reviewing existing high seas management regimes and ecoregional approaches and identifying databases with critical relevant content. Importantly, it outlines how high seas spatial information, particularly on HSMPAs, could be collected and disseminated in the future. This is an essential step in the development and application of high seas spatial data to research and decision-making.

Chapter 1: *The Interactive Map (IMap)*

The Interactive Map, or IMap, is an up-to-date internet accessible map of protective measures related to High Seas Marine Protected Areas (HSMPAs) and key habitat distributions, such as deep sea corals and seamounts, and ecological regions. The IMap can be found at http://bure.unep-wcmc.org/marine/highseas.

IMap was built using an **i**nteractive **m**ap **s**ervice (IMS). ArcIMS is one solution for delivering dynamic maps and Geographic Information System (GIS) data via the web. This IMS enables integration and publication of data from multiple sources and creation of a central metadata repository for the publication and browsing of metadata by the web.

The IMap, or interactive map, offers tools for viewing, querying spatial and attribute data and performing spatial analysis tasks such as selecting and measuring features. A full list of instruction for how to use IMap is included in Appendix 1. Using the ArcIMS viewers, the user can

- Pan and zoom the map extent
- Query spatial and attribute data
- Measure distances on your map
- Create buffers around features
- Print a hard copy of map display

The CBD describes an MPA as 'any defined area within or adjacent to the marine environment, together with its overlying waters and associated flora, fauna and historical and cultural features, which has been reserved by legislation or other effective means, including custom, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings' (Decision VII/5, paragraph 10). This definition incorporates all protection levels of the IUCN categories. Therefore, for the purposes of IMap, all high seas management regimes were included if they were spatially explicit, included any areas beyond national jurisdiction, or conferred greater protection on any subset of taxa. The following management regimes were included: Regional Fisheries Management Organisations (RFMOs), closures within RFMOs, Regional Seas Conventions, and marine mammal sanctuaries beyond national jurisdiction. Non-spatially explicit management regimes or international conventions governing the high seas are not included. Those seeking overviews of high seas legal regimes and management should refer to the reports by Gjerde (2006) and Kimball (2005).

The IMap tool includes a variety of data (see Appendix 2) from multiple sources, such as spatially explicit management regimes, including any areas beyond national jurisdiction, protecting all or a subset of taxa. Following is a list of data layers in IMap:

- *Physical data:* bathymetry, seamounts: (biodiverse and vulnerable)
- *Biological data:* Cold-water coral reefs: (biodiverse and vulnerable)

- *Ecoregions:* WCPA Marine regions (representativeness)
- *Fishing pressure:* Catches from dredging and bottom trawling by decade
- Regional Fisheries Management Organisations (RFMOs) including species-specific RFMOs
- Closures within RFMOs
- Regional Seas Conventions
- Marine Mammal Sanctuaries

Chapter 2: *MPA Criteria and Ecoregionalisation*

Marine Protected Area (MPA) criteria are essentially characteristics that candidate sites for protection can be judged against in order to gauge their relative importance. Criteria are used to aid the site selection process and provide transparency, covering a broad range of aspects. For example, the main categories of the IUCN criteria for MPAs are naturalness, economic importance, social importance, scientific importance, international or national significance, practicality or feasibility and duality or replication (Kelleher 1999).

The MPA selection criterion has been incorporated into the goals of international conventions. The Conference of the Parties to the CBD called for comprehensive, effectively managed and ecologically representative MPAs, that, *inter alia* through a global network, contribute to achieving the objectives of the Convention and the 2010 biodiversity target (Decision VII/28). This has spurned particular interest in 'ecological representativeness' as a criterion for establishing MPAs. One approach for adopting selection criteria into MPA siting is ecoregionalisation.

An ecologically representative network of MPAs should, by definition, capture the full range of ecological variability of the area in question in its protected sites. This requires a mapping process to determine the variation. Bio- or ecoregionalisation is essentially a classification process that aims to partition a large area into distinct regions using quantitative analysis and expert opinion. An ecologically representative network of MPAs would be expected to have at least one MPA site in each ecoregion. In essence, developing a classification system of open ocean and deep sea regions ensures that key habitat types and species are represented in the high seas MPA network.

Regions are usually classified through quantitative analysis of a range of environmental and biological data across the area, combined with expert opinion (Grant, Constable et al. 2006). The type and the scale of data used are dependent on the objectives of the ecoregionalisation. For example, an ecoregionalisation designed to inform the establishment of a global network of MPAs for protecting marine mammals might use coarse-scale data of relevance to the specific taxa under consideration. Examples of the types of data used in bioregionalisation in the marine environment include physical oceanography (e.g. water masses, fronts, gyres and wave energy), geomorphology (depth, substratum, sediment), biological oceanography (primary and secondary production), and biological data (fish stock, marine mammal distribution and abundance) (Grant, Constable et al. 2006).

Six different approaches have been made regarding global marine ecosystems. Although there have been substantial efforts at ecoregionalisation on a local scale, there are few global marine ecoregionalisations. Of these, two focus on coastal areas: Marine Ecoregions of the World (MEOW) and Large Marine Ecoregions (LME) (Appendix 3). The main limitation to global ecoregionalisation is acquiring global data. The only purely data-driven global ecoregionalisation process (Longhurst 1998) uses oceanographic, rather than species data. Although there are global initiatives to map marine species globally, it is likely to be several years before a global ecoregionalisation including marine species distribution is possible.

Creating ecoregions requires the delineation of boundaries, even if these do not exist in reality. Boundaries are more likely to be gradual in the ocean due to the fluid nature of the environment and may even shift over time. Due to strong relationships between physical parameters, biological parameters and species, many ecoregionalisation approaches produce similar boundaries. The biogeochemical provinces in Longhurst's (1998) coastal biome overlap to a good extent with Sherman and Alexander's LMEs (Pauly et al. 2001). Some of Longhurst's boundaries are also fairly close to those suggested by taxonomic biogeographers (Spalding, Fox et al. 2006). In the end, agreement upon and delineation of these spatial boundaries will assist with mapping of HSMPAs and thus their effective management.

Chapter 3: *Management regimes*

This section provides further information on the protective measures related to HSMPAs plotted on the IMap including an up-to-date summary of spatially explicit management regimes in the high seas. It does not include overarching international agreements nor does it provide an opinion on the suitability or otherwise of these management regimes for protecting the high seas. Both these topics have been covered in depth by Gjerde (2006) and Kimball (2005). Management regimes related to high seas protection are divided in to three main types: Regional Fisheries Management Organisations (RFMOs) and their closures, Regional Seas Conventions, and marine mammal sanctuaries.

I. Regional Fisheries Management Organisations

Regional Fisheries Management Organisations (RFMOs) are organisations or commissions of States Parties established by Regional Fisheries Management Conventions to administer that convention (Kimball 2005). They can vary considerably in their scope (Kimball 2005), which is why RFMOs dealing with all marine resources or using the ecosystem approach (e.g. CCAMLR) are differentiated from those dealing with only a small group of species (e.g. ICCAT) (Appendices 4 and 5).

A. Regional Fisheries Management Organisations dealing with overall marine resources

The Convention on the Conservation of Antarctic Marine Living Resources, CCAMLR**,** is unlike other RFMOs in that it has formally adopted the ecosystem approach. CCAMLR is a sub-treaty of the Antarctic Treaty. The Southern Ocean, under CCAMLR management, is particularly plagued by Illegal, Unreported, and Unregulated (IUU) fishing, especially for Patagonian toothfish (Gianni and Simpson 2005). Although CCAMLR have not managed to completely address this problem, it has successfully implemented methods to limit the access of IUU fishing vessels to ports in the area (Riddle 2006) and significantly reduced the illegal catch of toothfish. The Committee for Environmental Protection (CEP), established under the 1998 Madrid Protocol (see below), has authority, through an annex to the Protocol, to establish certain types of MPAs. Antarctic Specially Protected Areas (ASPAs) represent the highest level of protection and require a permit for entry. They were designated on the basis of being 'outstanding' areas and are designed to protect the seabed from anchorage, but not the water column. They are generally small areas near countries' bases. Fisheries responsibility for ASPAs is delegated to CCAMLR. Antarctic Specially Managed Areas (ASMAs) are larger, managed areas originally designated for scientific reasons. Recent discussion within CCAMLR fora has focused on the need for further protection to be afforded to, inter alia, representative, vulnerable or scientific areas. Such additional protection might be established using CCAMLR's existing provisions for closed areas and special areas for protection or scientific study.

The **General Fisheries Commission of the Mediterranean**, GFCM**,** aims to promote the development, conservation and management of living marine resources, formulate

and recommend conservation measures, and encourage training cooperative projects. It closed Mediterranean waters deeper than 1000m to bottom trawling in 2005 (FAO 2007), and in January 2006 closed three additional areas to bottom trawling that were shallower than 1000m, including a deep sea coral reef, an area of rare corals and a seamount (IUCN 2007). Mediterranean countries also now require that trawlers use a minimum mesh-size opening of 40mm in the "cod end" section of their nets in order to allow smaller, juvenile fish to escape, thereby conserving breeding stocks. This measure should also help to reduce accidental catches of non-target species (FAO 2007).

The **Northwest Atlantic Fisheries Organisation,** NAFO**,** agreed to incorporate an ecosystem approach into its mandate in 2006 (Gjerde 2006). As of 1st January, 2007, and until 31st December, 2010, four areas containing seamounts have been closed to all fishing activities involving demersal fishing gears (NAFO 2007). As of 1st January 2008, 20 % of the area suitable for fishing at each seamount may be opened to a small scale, exploratory fishery. However, if hard corals are encountered, the fishery will be subject to closure. These measures will be reviewed in 2010 when they may be ended, extended, or made permanent (Gjerde 2006).

The Northeast Atlantic Fisheries Commission, NEAFC**,** closed five areas on an interim three-year basis to bottom fishing in response to a proposal from Norway and a request from OSPAR in late 2004 (Hatton Bank, Hecate and Faraday Seamounts, Reykjanes ridge, Altair seamounts and Antialtair seamounts). NEAFC agreed to close Hatton Bank and three areas of Rockall Bank in November 2006 until 2009, based on advice solicited from the International Council for the Exploration of the Seas (ICES). However, one of the areas recommended by ICES "South Rockall" was not accepted. OSPAR has expressed an interest in incorporating these temporarily protected areas into their regional network of MPAs (Gjerde 2006). Contracting Parties include the EU, the Faroe Islands, Norway, Greenland, Iceland and the Russian Federation (NEAFC 2007).

In October 2006 the **Southeast Atlantic Fisheries Organisation**, SEAFO**,** agreed to cease all deep-sea fishing activities in 10 areas for three years as of 1st January 2007. Similar to the NAFO closures, small scale exploratory fishing may resume in 2008 in 20% of these areas, but if hard corals are encountered, an immediate temporary closure would be declared (Gjerde 2006). As of 1st January 2007, Parties include Angola, the European Union, Namibia and Norway (SEAFO 2007).

The **South Indian Ocean Fisheries Agreement,** SIOFA**,** aims to ensure the long-term conservation and sustainable use of fishery resources other than tuna, in areas outside national jurisdiction in the southern Indian Ocean. SIOFA was agreed in July 2006 by six countries including the Comoros, France, Kenya, Mozambique, New Zealand and Seychelles and the European Community (FAO 2007).

The **South Pacific Regional Fisheries Management Organisation** was initiated by Australia, Chile and New Zealand in 2006 and aims to control unregulated fishing in international waters. It is still under negotiation. The third international meeting was held from 28th April – 4th May 2007 in Chile. At their last meeting in November

2006 in Tasmania, the EU resisted measures to control bottom trawling in the area (Tilzey 2006).

The **North Western Pacific Ocean Region**, specifically Russia, Japan, Korea and the United States, met in August 2006 to discuss a possible arrangement to regulate deep-sea fishing in an area in the North Pacific, where the first deep-sea bottom fisheries emerged in the late 1960s (Gjerde 2006). They met again in Korea this year to set out arrangement due to take effect no later than December 2007.

B. Regional Fisheries Management Organisations dealing with specific species or groups of species only

The **Commission for the Conservation of Bluefin Tuna'**s (CCSBT) objective is to ensure, through appropriate management, the conservation and optimum utilisation of the Southern Bluefin Tuna (SBT) fishery. The Commission also provides an internationally recognised forum for other countries or entities to actively participate in SBT issues (CCSBT 2007). Australia, Japan, Korea and New Zealand are member parties and Taiwan is a member of the 'Extended Commission' (Internet-Guide-to-International-Fisheries-Law 2007). In 2003, the CCSBT agreed to invite countries with an interest in the fishery to participate in its activities as formal Cooperating Non-Members (without rights to vote). This is regarded as a transitional process to full membership. Cooperating Non-Members are required to adhere to catch limits and conservation objectives of the CCSBT. The Philippines, South Africa and the EU were accepted as Cooperating Non-Members in 2004, 2006 and 2006 respectively. Indonesia may also join this status soon (CCSBT 2007). The proper functioning of the Commission has been severely impeded due to disputes between members regarding the level of fishing, which has not fully been resolved (Internet-Guide-to-International-Fisheries-Law 2007).

The main objectives of **Inter-American Tropical Tuna Commission** (IATTC) are to maintain the populations of tuna and other fish species taken by tuna vessels in the Eastern Pacific Ocean and to cooperate in the gathering and interpretation of factual information to facilitate maintaining the populations of these fish at a level which permits maximum sustainable catches year after year. Since extension of jurisdiction in the region, IATTC has only played a minor role in tuna management, although it has continued an extensive research programme (Internet-Guide-to-International-Fisheries-Law 2007). However, IATTC was revised in 2003 to incorporate the precautionary approach and many principles of the United Nations Fish Stock Agreement. It has also agreed to reduce and potentially eliminate bycatch of dolphins in purse seine fisheries and bycatch of sharks and marine turtles (Kimball 2005). IATTC, ICCAT and IOTC have developed lists of vessels that are authorised to fish in their areas.

International Commission for the Conservation of Atlantic Tunas (ICCAT) has implemented trade sanctions against eight different countries for noncompliance with ICCAT measures: two against ICCAT member states (Equatorial Guinea and Panama) and six against nonmember states (Belize, Bolivia, Cambodia, Honduras, Sierra Leone, and St. Vincent and the Grenadines). This is effective, but anecdotal

evidence suggests that the vessels involved are now registered under different countries (Riddle 2006). Taiwanese fishing companies have built a fleet of vessels that fall just under the 24m minimum length for application of most ICCAT measures. These vessels have been operating in the Caribbean and affecting shark stocks and causing billfish bycatch (Gianni and Simpson 2005). Blue and mako sharks are caught as bycatch in the tuna and swordfish fisheries regulated by ICCAT. ICCAT has been collecting data on sharks since the mid-1990s with the intention of gathering enough information to assess whether the current levels of catch and bycatch are sustainable over the long term (Pew-Institute-for-Ocean-Science 2005).

The objective of the **Indian Ocean Tuna Commission** (IOTC) is to promote cooperation among its members to ensure, through appropriate management, the conservation and optimum utilisation of stocks covered by this Agreement and encourage sustainable development of these fisheries (IOTC 2007). There are few vessels flagged to Taiwan on the IOTC list of authorized vessels, but a relatively large fleet of Taiwanese flagged longline vessels is likely to be fishing in the Indian Ocean area (Gianni and Simpson 2005).

The objective of the **North Atlantic Salmon Conservation Organization** (NASCO) is to contribute through consultation and cooperation to conservation, restoration, enhancement and rational management of salmon stocks subject to the Convention, and taking into account the best scientific evidence available to it (NASCO 2007). Parties to NASCO include Canada, Denmark (in respect of the Faroe Islands and Greenland), European Union, Iceland, Norway, Russian Federation and United States of America (NASCO 2007).

Parties to the **North Pacific Anadromous Fish Commission** (NPAFC) include the primary states of origin for salmon stocks in the North Pacific: Canada, Japan, Republic of Korea, Russia and the United States (NPAFC 2007). The main objective of the Convention is to promote the conservation of anadromous stocks in the Convention Area. Its conservation measures include:

1. Prohibition of directed fishing for anadromous fish in the Convention Area.
2. Minimizing to greatest extent the incidental taking of anadromous fish.
3. Prohibition of the retention on board a fishing vessel of anadromous fish taken as an incidental catch during fishing for non-anadromous fish (NPAFC 2007).

Riddle (2006) maintains that NPAFC provides an exceptional example of successes by international cooperation with regards to stopping illegal high seas driftnet fishing in the North Pacific. The Convention set a precedent by allowing officers of other states to board, inspect, and seize non-flag vessels when in violation of the Convention (Riddle 2006).

The **Western and Central Pacific Fisheries Commission's** (WCPFC) main aim is to ensure through effective management the long term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean in accordance with the 1982 UN Convention on the Law of the Sea and the 1995 UN Fish Stocks Agreement. 15 nations in the region have ratified and acceded to the Convention since November 2004.

II. Regional Seas Conventions

Regional Seas Conventions are agreements, generally with accompanying action plans, established by groups of countries sharing common seas. About half are formulated under the auspices of the United Nations Environment Programme's Regional Seas Programme. Although the Regional Seas Programme plays an important role in regional cooperation (Kelleher 1999), these agreements are limited in their coverage of areas beyond national jurisdiction (Kimball 2005), especially in comparison to RFMOs. Only four of thirteen regional seas conventions cover areas beyond national jurisdiction (OSPAR, Mediterranean, South Pacific and the Antarctic Treaty) (Kimball 2005) (Appendix 6). Some regional seas conventions that precede UNEP include the Northeast Atlantic, Baltic Sea and Antarctic.

The **Pacific Regional Environment Programme** (SPREP), a regional intergovernmental organization now based in Samoa, was initially established in 1982 as a programme of the South Pacific Commission. SPREP has grown into the main organization responsible for conservation collaboration and environmental management in the Pacific, and its Secretariat serves as the Secretariat for three Conventions (the Apia Convention, the SPREP or Noumea Convention, and the Waigani Convention). SPREP encourages community-based conservation areas extending into the marine environment (Kelleher 1999)

The 1992 **Convention for the Protection of the Marine Environment of the North-East Atlantic** (OSPAR) is the current instrument guiding international cooperation on the protection of the marine environment of the North-East Atlantic (OSPAR 2004). Parties to the OSPAR Convention committed to developing an ecologically coherent network of MPAs by 2010. This includes a large proportion of the Northeast Atlantic that is beyond national jurisdiction. OSPAR has expressed an interest in incorporating the temporarily protected areas under NEAFC (see RFMOs) into their regional network of MPAs (Gjerde 2006). However, some Parties do not believe that OSPAR has the competence to establish and manage such MPAs without an agreement at the international level. There are 16 Parties to the OSPAR Convention: Belgium; Denmark; EC; Finland; France; Germany; Iceland; Ireland; Luxembourg; Netherlands; Norway; Portugal; Spain; Sweden; Switzerland; and the United Kingdom (Owen 2006).

The **Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean** (CPMECRM) was adopted in 1995 in Barcelona and entered into force in 2004. It covers the maritime waters of the Mediterranean Sea proper, inclusive of its gulfs and seas (though not the internal waters of the Contracting Parties) with the main aim of protecting the area from pollution.

Antarctic Treaty System/ Madrid Environmental Protocol commits the Signatory Parties to the "comprehensive protection of the Antarctic environment" and designates Antarctica as a "natural reserve, devoted to peace and science". It came into force in

June 1961 after ratification by the twelve countries then active in Antarctic science. The Treaty covers the area south of 60°S latitude. The treaty remains in force indefinitely. The success of the treaty is demonstrated by growth in membership. Forty-four countries have acceded to it. Consultative (voting) status is open to all countries that have demonstrated their commitment to the Antarctic by conducting significant research. The Treaty has adopted over 200 recommendations and negotiated five separate international agreements. These, together with the original Treaty provide the rules that govern activities in Antarctica.

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III. Marine Mammal Sanctuaries

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Some marine mammal species, particularly cetaceans, have life history patterns that include extensive migrations to grounds where feeding, breeding, and nursing take place. For instance, Gray Whales travel thousands of miles between the Bering and Baja seas each year to breed, raise their offspring, and feed. Other groups, such as the beaked whales, are deep divers and are often found in high seas areas. The International Whaling Commission (IWC) established its first sanctuary in the Antarctic in the 1930s to provide an area of immunity to whales from the commercial whaling sector. See Appendix 7 for a summary of the following sanctuaries:

The **Indian Ocean Whale Sanctuary** was established by the IWC in 1979, extending south to 55°S latitude, as an area where commercial whaling is prohibited. Designation of sanctuaries like this requires three-quarters majority vote by the Commission. The Indian Ocean Sanctuary was initially established for 10 years and has been extended twice for 10-year intervals (http://www.iwcoffice.org/index.htm).

The **Southern Ocean Whale Sanctuary** is recognised as part of a host of treaties aimed at protecting Antarctica (Hoyt 2005).

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The **Pelagos Sanctuary** was created as a result of data accumulated during research cruises in the Ligurian Sea over nearly three decades. It is included in the list of Specially Protected Areas of Mediterranean Importance (SPAMIs) and is the largest of these sites. SPAMIs are designated under the Barcelona Convention (see Regional Seas Conventions). It was agreed by Italy, France and Monaco and ratified in 2003.

Chapter 4: *High Seas spatial data management*

This section deals with future collaboration and management of high seas spatial data. It outlines the role of UNEP-WCMC and partners in the acquisition, management and application of high seas data. Current research initiatives and important databases relevant to knowledge of high seas species, habitats, and processes are reviewed in Appendix 9.

High Seas Marine Protected Area data and the WDPA

Information management for areas beyond national jurisdiction (High Seas) will follow the same process of data acquisition and integration used for the World Database on Protected Areas (WDPA). However, there will be a targeted approach on the sourcing of data on High Seas, the acquisition and integration of these spatial datasets into the WDPA, visualisation through a web mapping service as well as integration into other conservation datasets held at UNEP-WCMC.

This process will seek to greatly improve the breadth of background information held on High Seas, including the standardisation of data formats and production of streamlined up to date and Internet accessible outputs for a wide range of processes.

WDPA - Background

The WDPA is the only global repository of marine and terrestrial protected areas information. A joint project of IUCN - the World Conservation Union and UNEP-WCMC, it has been in existence since 1981 and is playing an increasingly important role in delivering on the mandates of the United Nations Millennium Development Goals and the CBD. UNEP-WCMC has a long history of sourcing, acquiring and integrating data from around the world into standardised spatial and aspatial datasets. The WDPA is one product of many developed as a result of this unique experience.

WDPA - Protected Area Information Management

The WDPA and the data flow management process that encompasses it are currently undergoing re-development. The WDPA receives data from all over the world in a variety of formats, projections, languages and structures that need comparison with, and verification against, existing information in the database and integration into a standard structure (Fig. 1).

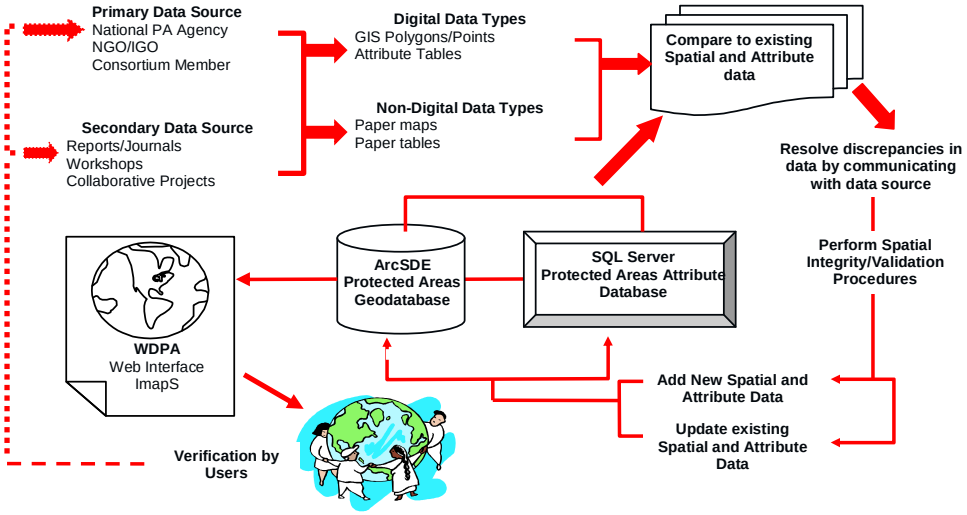

Fig. 1. Overview of current information flow into the WDPA

With the current system, UNEP-WCMC is unable to effectively interact with the 192 UN member countries and their respective protected area agencies to the degree necessary for adequate information exchange. This is due to the large amounts of data available, a diverse range of stakeholders, and limited staff and budget for management of the WDPA.

WDPA Redevelopment

To address these shortcomings, UNEP-WCMC, supported by ESRI (technical partner) and the private sector is developing a new WDPA system, moving towards distributed data management, allowing data providers to upload, edit and download protected areas data through a web-enabled spatial and aspatial database platform.

This technological development of the WDPA system places the responsibility for data quality in the hands of the data provider. This provides UNEP-WCMC with a renewed ability to integrate, manage and serve this information with limited resources (whether manpower or financial) in standardised format via the web or other media.

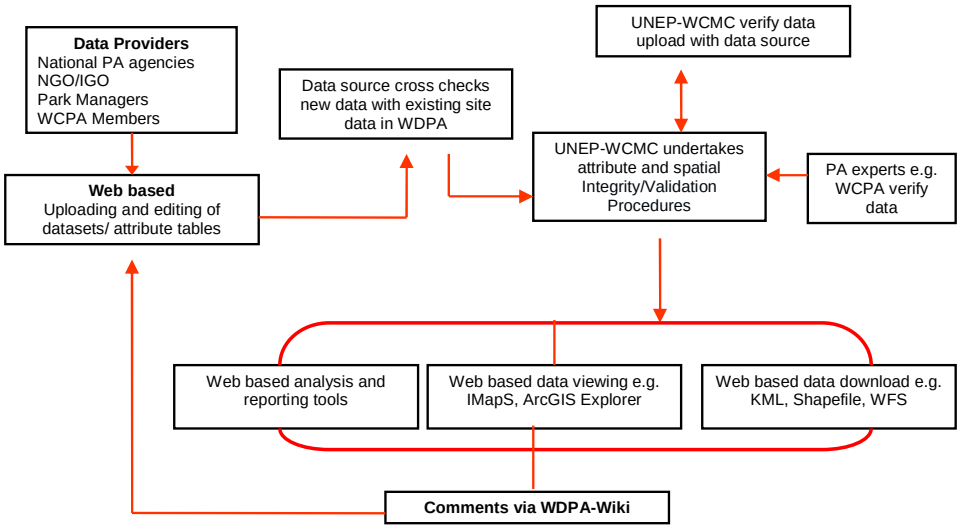

Fig. 2. Overview of the future information flow into the redeveloped WDPA System

This new system (Fig. 2) will enable the protected areas community (e.g. World Commission on Protected Areas), data providers and any interested parties to engage fully with the WDPA. UNEP-WCMC will be able to call on the experience and knowledge of the protected areas community to aid the verification of any submitted data and enable the data provider to track the progress of their data submission through a systematic assessment process. Interested parties will also be able to comment on the data presented in the WDPA through a Wiki style interactive site

Information collected by the WDPA

Spatial data, such as site boundary details, is of fundamental importance to the success of any analysis looking at gaps, trends or representativeness of protected area networks. Therefore a system that will enable automated transfer of spatial data via the Internet from national authorities and other entities with relevant data would be a huge step forward.

Coupled with the redevelopment of the WDPA is the re-evaluation of the site attributes (supporting information) that the WDPA stores about individual protected areas. Our knowledge of new approaches in protected areas design and management has directly influenced the data model and attributes in the new system. The management of data within the WDPA will include the ability to track changes at the individual attribute level as well as at the site level. This will include full sourcing for each change. The data model recognises the current trend towards multiple management zones within protected areas as well as hierarchies in protected area design and management e.g. multiple single designated sites can also form a single larger protected area.

Focusing on Marine Protected Areas (MPAs)

There is a renewed focus in the WDPA on site attributes that are specific to marine protected areas and high seas. This focus was born out of a collaborative project, MPA Global, between UNEP-WCMC, WWF and the Seas Around Us Project at the University of British Columbia. In the past, MPA coverage in the WDPA had several limitations permitting only relatively broad scale analyses on the total number and area of MPAs. The MPA Global project aimed to extensively revise and update the MPA data in the WDPA, in response to calls for better information on MPAs.

MPA Global was developed from the WDPA, with the addition of MPA specific field attributes such as no-take area, marine area etc. These fields from MPA Global have been included and extended upon within the new WDPA system design (Table 1).

Table 1: Proposed MPA specific fields in the new WDPA. See Appendix 8 for a full list of the proposed site attributes for the WDPA.

MPA Specific Attributes
Marine Area
Marine Component e.g. subtidal or intertidal
MPA Depth Range
No Take Area
MPA Zonation
IUCN MPA Definition
CBD Marine and Coastal PA (MCPA) Definition
Area beyond national jurisdiction

Presenting information from the WDPA

The new WDPA website will provide three types of query interface: simple, advanced and a map search. Each interface will have increasing numbers of options for the user to search for sites, with the map search being enabled through an interactive mapping service similar to IMap.

The WDPA system will use ArcGIS Server and ArcGIS Explorer to provide high performance map services, globe services (2D/3D), geoprocessing services and data download to all users. The data delivery options available within the WDPA will be based on accepted standards such as Web Map Services (WMS), Web Feature Services (WFS) although it will also include other commonly used download options such as ESRI shapefiles and Google Earth KML. Access to key reports derived from the WDPA will be written as web service enabled ASP.net/Coldfusion components to enable the possibility of external bodies to query the database directly from their own website.

Focusing on High Seas

UNEP-WCMC, the WDPA and the data management process that flows around it have the tools to acquire, integrate, coordinate, manage and present data on High Seas now and into the future (Fig. 3).

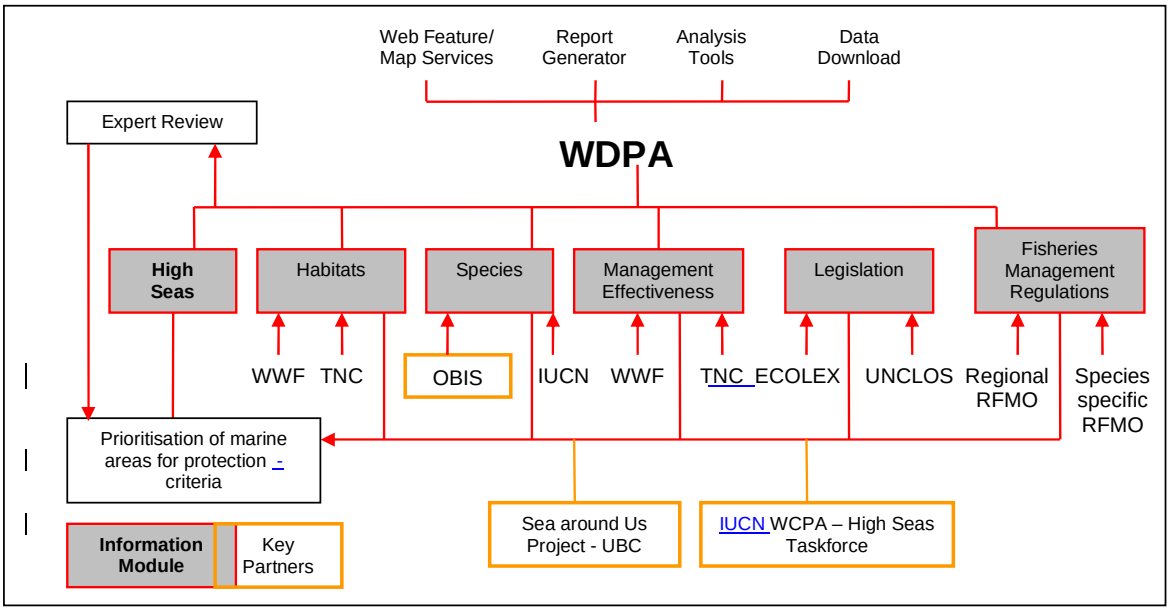

Fig. 3 High seas information flow into the WDPA

The focus of the WDPA is the collation, management and publication of data on protected areas. The web, GIS and database technologies employed in the redevelopment enable the WDPA to also encompass information modules containing attributes and spatial information specific to themes such as species, habitats, management effectiveness, legislation, and so on.

These modules can link directly to databases (spatial or attribute) held by other organizations or data partners (that actively seek to maintain and update these records) as well as store data directly in a standard structure. Figure 3 above shows the proposed development of a number of information modules, each of which would contain data that could feed into a High Seas Information Module and vice versa. The content of each information module would be developed in consultation with experts and key partners. For the High Seas module, the criteria developed to prioritise marine areas for protection could act as a framework for additional information to be collated from data providers and partners (Table 2). Where the information contained with a module specifically relates to a protected area, it is possible to link directly to that site record in the WDPA.

The ability to link directly from the WDPA portal into these readily available resources is important to the breadth of information that UNEP-WCMC can offer to the scientific community and the private sector as well as in its continued support of a wide range of analyses and processes. Additional funding will be required for all module development.

Table 2: Potential key data partners for the High Seas Information Module and/or UNEP-WCMC and the WDPA as a whole

Possible Data Partners	**Data Provided**
OBIS	Marine species
TNC	Marine Ecoregionalisation of the World, marine and terrestrial protected areas
WWF	Terrestrial Ecoregions, marine and terrestrial protected areas including proposed areas
ECOLEX	Legislation on protected area
DOALOS	UN Atlas of the Oceans
IUCN	Expert opinion from WCPA, High Seas Task Force, marine and terrestrial protected areas, Red List, global marine species assessment
NOAA	Marine managed areas
ERA	Antarctic protected areas
FAO	Mapping of vulnerable seabeds

Conclusions and recommendations

The complexity of working with high seas marine protected areas is apparent. Very short-term regional closures are not sufficient for adequate, sustainable protection of key species and habitats in open ocean and deep sea environments. Threats to areas beyond national jurisdiction continue to put pressure of marine resources. However, the number of organizations working on developing proposals for high seas marine protected areas and approaches for planning marine conservation at such a grand scale provides much promise for the future. Approaches to developing high seas protected areas currently exist within the context of regional fisheries management organizations, which have closed areas to protect seamounts, cold-water corals, and certain fisheries. Several regions and organizations, including Greenpeace and the IUCN High Seas Task Force, have developed proposals for HSMPAs.

Developing stronger, linked databases containing high seas spatial and other data will only enhance these current HSMPA efforts. The data regarding these existing and potential protected areas is best managed and made accessible through one central mechanism, such as the WDPA, that provides best available science for making decisions. This approach will also allow for identification of remaining knowledge gaps and the development of plans for how to move forward in spite of these gaps.

Recommendations based on this report and further development of the IMap tool include:

- Develop a High Seas information module to be incorporated into the redeveloped World Database on Protected Areas, using data layers and lessons learned from the IMap system
- Dedicate efforts to collate key data as identified in this report, leading to the development and application of high seas spatial data to research and decision-making
- Expand the information module initiated by IMap with the addition of further biodiversity and habitat information
- Integrate final scientific-based selection criteria for representative networks of HSMPAs with available data and generate a prioritized list of data gaps
- Create a mechanism for increased collaboration among the many institutions that are working to advance the protection and sustainable management of species, habitats, fisheries, migration routes, in the open ocean and deep water systems beyond national jurisdiction
- Produce global analyses and reports, via the collective group of organizations contributing to this body of high seas knowledge, for the purpose of informing policy makers

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List of acronyms and abbreviations

ASMA(s)	Antarctic Specially Managed Area(s)
ASPA(s)	Antarctic Specially Protected Area(s)
BATS	Bermuda Atlantic Time-Series Study
CBD	Convention on Biological Diversity
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CEP	Commission for Environmental Protection
CoML	Census of Marine Life
COP	Conference of the Parties
CORE	Consortium for Oceanographic Research and Education
CPMECRM	Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean
CPR	Continuous Plankton Recorder
DEOS	Dynamics of Earth and Ocean Systems
DOALOS	(United Nations Office of Legal Affairs) Division for Ocean Affairs and the Law of the Sea
EC	European Community
EEZ	Exclusive Economic Zone
ERA	Environmental Research & Assessment
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GEOROC	Geochemistry of Rocks of the Oceans and Continents
GFCM	General Fisheries Commission of the Mediterranean
GIS	Geographic Information System
GMES	Global Monitoring for Environment and Security
GOOS	Global Ocean Observing System
HSMPA(s)	High seas marine protected area(s)
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICES	International Council for the Exploration of the Seas
IMap	Interactive map
IMS	Interactive map service
IOTC	Indian Ocean Tuna Commission
IUCN	World Conservation Union
IUU	Illegal, unreported and unregulated (fishing)
IWC	International Whaling Commission
LME	Large Marine Ecoregions
MARIS	Marine Information Service
MarLIN	Marine Life Information Network for Britain and Ireland
MCPA(s)	Marine and coastal protected area(s)
MEOW	Marine Ecoregions of the World
MPA(s)	Marine protected area(s)
NAFO	Northwest Atlantic Fisheries Organisation
NASCO	North Atlantic Salmon Conservation Organization
NEAFC	Northeast Atlantic Fisheries Commission

NGDC	National Geophysical Data Center
NOAA	National Oceanic & Atmospheric Administration
NPAFC	North Pacific Anadromous Fish Commission
OBIS	Ocean Biographic Information System
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PETDB	Petrological Database of the Ocean Floor
RFMO	Regional Fisheries Management Organisation
SADCO	South African Data Centre for Oceanography
SAHFOS	Sir Alister Hardy Foundation for Ocean Science
SBT	Southern Bluefin Tuna
SEAFO	Southeast Atlantic Fisheries Organisation
SIOFA	South Indian Ocean Fisheries Agreement
SPAMI(s)	Specially Protected Area(s(of Mediterranean Importance
SPREP	Pacific Regional Environment Programme
TNC	The Nature Conservancy
UBC	University of British Columbia
UHSLC	University of Hawaii Sea Level Center
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNEP-WCMC	UNEP Word Conservation Monitoring Centre
WCPA	World Commission on Protected Areas
WCPFC	Western and Central Pacific Fisheries Commission
WDPA	Word Database on Protected Areas
WFS	Web Feature Services
WMS	Web Map Services
WWF	World Wide Fund for Nature/World Wildlife Fund

Appendix 1: Instruction for the Interactive Map (IMap)

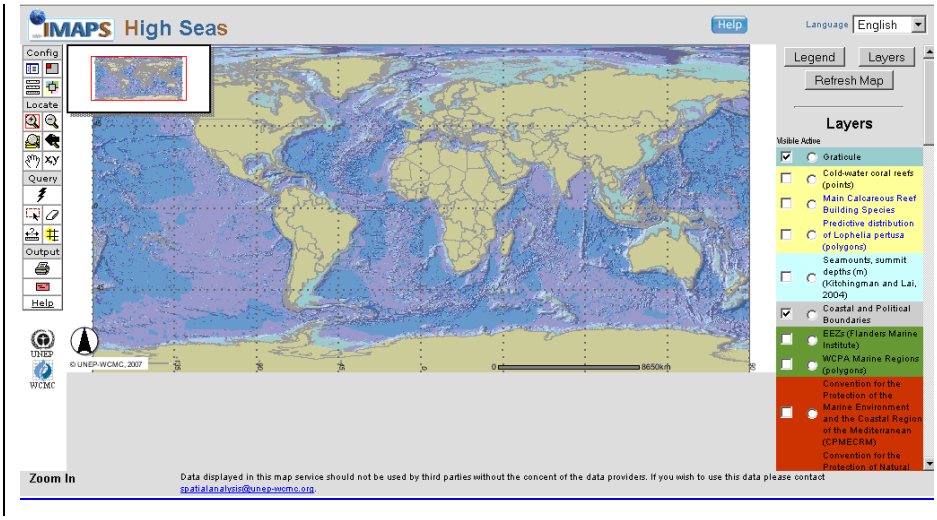


Figure. Demo High Seas Interactive Map Service

The URL for the IMap is found on http://bure.unep-wcmc.org/marine/highseas. Data was divided into the categories and plotted using layer titles (see Table 1). Figure 1 shows the High Seas Interactive Map Service developed by UNEP-WCMC. We have found that the wide range of GIS data resources on High Seas, including databases such as OBIS, SEAMOUNTS Online and the Sea Around Us Project – High Seas portal, cannot be efficiently coordinated, integrated or displayed using current IMS technology.

The limitations of current IMS technology has seen UNEP-WCMC look towards integrated server based products capable of complex spatial data management, web mapping services that support 2D dynamic/cached and 3D globes and server based analysis and geoprocessing, for the redevelopment of the World Database on Protected Areas (WDPA).

Each IMap tool enables you to actively change the appearance of your map to display the information, location and data you require. The IMap tools are located to the left and right of the map. Brief instructions on how to use each tool will appear if you hover the mouse over the tool icons. Below is an index of the tools available in IMap, providing you with brief descriptions of their function and application.

Zoom In 

Use to pinpoint your area of interest within IMaps - Select Zoom In and click once on the map in the centre of your chosen area. IMaps will generate a new map.

Zoom Out 

Displays a larger geographic area on your map - Select "Zoom Out" and click on the point in the map that you wish to make the centre of the larger area to be displayed. IMaPs will automatically update your map.

Previous Extent 

Acts as a one-step back button; enabling you to return to the previous map you have created. Selecting "previous Extent" again will return you to your current map so you can only toggle between these two maps.

Full Extent 

Displays the full extent of the area covered by IMaps. Use the "previous extent" tool to return to your current map.

Pan Tool 

The "Pan" tool allows you to shift your map to display adjacent areas. Select the pan tool in the toolbar and holding down the select button on the mouse, click on the map. You will be able to grap your map to move it to a new position within the map window.

Coordinates Tool 

The "Coordinates tool" allows you to precisely define the location of your map within the IMaps. By using coordinates, defining the country or region of interest or by using the Gazetteer, you have complete control over the map displayed by IMaps. Select the "coordinates" tool from the toobar and the control panel opens up to display the functions available for selection.

Data Query 

The data query tool allows you to access information directly related to the layer that is currently Active on your map. Click on the point of interest on your map and a pop-up will appear, presenting data and information relating to the precise location of your data query.

Data Select 

Data Select allows you to access information relating to a selected area within the Active layer. This tool is ideal if there are a number of symbols within close proximity displayed in the Active Layer as shown in the image here.

Eraser 

Clears any selections visible on the map

Measure 

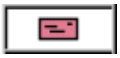
Allows you to calculate distances between the locations displayed on your map. Select the "measurement tool" from the toolbar, a small frame will open up to lie on top of the map. Click on the point you wish to measure from and to, a red line will appear on the map joining these 2 points - the measurement frame will display the total distance between these 2 points

Buffer 

The buffer tool allows you to compare the location of active symbols in an Active Layer to features located nearby in other layers. By querying a specific area within an Active layer, you can create a buffer zone around that area to locate features of other layers within a specified distance.

Print 

Allows you to print a permanent copy of your map retaining all the information and features displayed. Select the Print tool in the toolbar. The control panel will open up to display a number of options to customise your printout. You can customise the title, layout and size of your printout. Click "Create Print" and a pop up preview of your printout will appear - proceed to print as normal.

Email 

Use the email facility to share your map with others. Click on "email" in the toolbar. A pop-up email service appears including a URL unique to the map you have created.

Appendix 2: IMap Data Layers and Sources

Layer title	Layer category	Data description	Data source
Cold-water coral reefs			Freiwald et al 2004
Main Calcareous Reef-Building Species			
Predictive Distribution of Lophelia pertusa			
Seamounts	Seamounts		Kitchingman and Lai 2004
EEZs (Exclusive Economic Zones)	EEZs		Flanders Marine Institute, Netherlands
WCPA Marine Regions	Ecoregion		
Bottom trawling by year and decade	Fishing pressure		Reg Watson SAUP
Dredging by year and decade	Fishing pressure		Reg Watson SAUP
Committee for Environmental Protection (CEP)	Regional Seas Convention		
Charlie Gibbs fracture zone WWF proposed MPA (OSPAR area)	RFMO closures		Sabine Christiansen WWF NE Atlantic Programme
Pelagos sanctuary for Mediterranean marine mammals /Ligurian Cetacean sanctuary	Marine mammal sanctuary		
Indian Ocean Whale Sanctuary	Marine mammal sanctuary		http://www.iwcoffice.org/conservation/sanctuaries.htm or WDCS Australasia info@wdcs.org.au
Southern Ocean Sanctuary	Marine mammal sanctuary		Grant et al 06 and http://www.antarctica.ac.uk/About_Antarctica/Treaty/protocol.html
Noumea Convention (Convention for the Protection of Natural Resources and Environment of the South Pacific Region)	Regional Seas Convention		Kimbal 05
Barcelona Convention or Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (CPMECRM)	Regional Seas Convention		Kimbal 05

OSPAR	Regional Seas Convention		
GFCM (General Fisheries Commission of the Mediterranean)	RFMO		http://www.oceanlaw.net/orgs/gfcm.htm
NAFO (Northwest Atlantic Fisheries Organisation)	RFMO		http://www.nafo.int/about/frames/about.html
NEAFC (Northeast Atlantic Fisheries Commission)	RFMO		http://www.neafc.org/measures/measures-2007/9_hatton-rockall-closures-07.htm
SEAFO (South East Atlantic Fisheries Organisation)	RFMO		http://www.seafo.org/welcome.htm
South Pacific Regional Fisheries Management Organisation	RFMO		http://www.southpacificrfmo.org/Home/
South Indian Ocean Fisheries Agreement (SIOFA)	RFMO		WCMC- area no. 15 in Map 4 of seamounts report
CCAMLR (Convention on the Conservation of Antarctic Marine Living Resources)	RFMO		WCMC- area no. 1 in Map 4 of seamounts report
WCPFC (Western and Central Pacific Fisheries Commission)	Species-specific RFMO		WCMC- area no. 17 in Map 4 of seamounts report
IATTC (Inter-American Tropical Tuna Commission)	Species-specific RFMO		http://www.oceanlaw.net/orgs/iattc.htm
IOTC (Indian Ocean Tuna Commission)	Species-specific RFMO		http://www.oceanlaw.net/texts/summaries/iotc.htm
ICCAT (International Commission for the Conservation of Atlantic Tunas)	Species-specific RFMO		http://www.oceanlaw.net/orgs/iccat.htm
NASCO (North Atlantic Salmon Conservation Organisation)	Species-specific RFMO		WCMC- area no. 10 in Map 4 of seamounts report
CCSBT (Commission for the Conservation of Southern Bluefin Tuna)	Species-specific RFMO		WCMC- area no. 3 in Map 4 of seamounts report
NPAFC (North Pacific Anadromous Fish	Species-specific		WCMC- area no. 12 in Map 4 of seamounts report

Commission)	RFMO		
GFCM (General Fisheries Commission of the Mediterranean) 3 areas closed to bottom trawling	RFMO closures		http://www.fao.org/fi/body/rfb/GFCM/gfcm_mapandmem.htm
NAFO (Northwest Atlantic Fisheries Organisation): 4 seamounts closed for 3 years	RFMO closures		NAFO website, part 5 of Article 12
NEAFC (Northeast Atlantic Fisheries Commission): 2 areas closed for 3 years	RFMO closures		NEAFC website http://www.neafc.org/measures/measures-2007/9_hatton-rockall-closures-07.htm
Closed areas within CCAMLR (6 ASPAs and 2 ASMAs)	RFMO closures		Colin Harris ERA Cambridge UK
SEAFO 10 areas for 3 years closed to trawl	RFMO closures		http://www.seafo.org/welcome.htm
Bathymetry	Bathymetry		GEPCO

Appendix 3: Review of current global marine ecoregionalisation approaches

Ecoregional approach and author	Area covered	Classification	Factors considered	Method used
Large Marine Ecosystem (LME) (Sherman and Alexander 1989)	Coastal areas from river basins and estuaries to the seaward boundaries of continental shelves and the outer margins of the major current systems	64 LMEs, each one approx 200km2	Bathymetry, hydrography, productivity, and trophically dependent populations	Expert consultation
Marine Ecoregions of the World (MEOW) (Spalding, Fox et al. 2006)	Coasts and continental shelves only	12 realms, 58 provinces, 229 ecoregions		Review and synthesis of existing biogeographic boundaries and expert consultation
Ecological geography of the sea (Longhurst 1998)- now updated 2007	Global oceans, includes high seas	4 biomes, 57 biogeochemical provinces	Abiotic factors only: satellite imagery and physical oceanography	
(Bailey 1998)	Global oceans as well as terrestrial	Oceans are divided into 3 domains (polar, temperate, tropical) and 14 divisions. Continents have four domains (humid tropical, dry, humid temperate, polar)		Boundaries of oceanic ecoregions are based primarily on the hydrologic regions of Dietrich and continental ecoregions based on the climatic zones of Koppen-Trewartha

		and 15 divisions		
WCPA marine regions (Kelleher, Bleakley et al. 1995)	Global oceans including high seas	18 marine regions	Biogeography, political and practical boundaries	
UNESCO International Oceanographic Commission (IOC) workshop	Global oceans including high seas	Under development	Under development	Review and synthesis of existing biogeographic boundaries and expert consultation

Appendix 4: Summary of Regional Fisheries Management Organisations (RFMOs) dealing with high seas areas

Name of RFMO	Acronym	Area covered	Fisheries covered	Challenges in that area	Recent regulations
RFMOs dealing with most marine resources in the area					
Convention on the Conservation of the Antarctic Marine Living Resources	CCAMLR	Area defined ecologically, continues north of CEP and includes South Georgia	All fisheries are managed following the ecosystem approach. This approach, although incorporating all species, does not include factors such as pollution	Predominantly IUU fishing	Antarctic Specially Protected Areas (ASPAs) Antarctic Specially Managed Areas (ASMAs) Have also recently introduced new rules which prevent bottom trawl gear use
General Fisheries Commission of the Mediterranean	GFCM	All Mediterranean waters	All living marine resources; Administered by FAO		Ban on towed trawl nets and dredges deeper than 1000 metres in 2005 Three areas closed to bottom trawling in shallower waters in 2006 Trawlers being required to have a minimum mesh-size of 40mm in the "cod end" section of their nets in order to allow juvenile fish to escape and reduce by-catch
Northwest Atlantic Fisheries Organisation	NAFO	Northwest Atlantic-those areas outside or straddling EEZs	Most fishery resources of the Northwest Atlantic except salmon, tunas, marlins, whales, and sedentary species (e.g. shellfish) (NAFO 2007).		4 seamounts closed for 3 years to demersal fishing gears (2007-2010)
Northeast Atlantic Fisheries Commission	NEAFC	Atlantic and Arctic Oceans east of a line extending south from	Fish stocks; However, NEAFC is the only RFMO		Hekate,Faraday, Reykjanes ridge, Altair, Antialtair, areas closed (2005-2007)

		the southern tip of Greenland Overlaps with NASCO, ICCAT and OSPAR.	that applies to species fished by means of bottom-trawling (Owen 2006)		2 areas (Hatton Bank and Rockall Bank [North west Rockall bank, Logachev mounds, West Rockall mounds]) closed for 3 years (2007 to 2009)
Southeast Atlantic Fisheries Organisation	SEAFO	South East Atlantic Ocean, including the EEZs of member countries	All fisheries resources, including discrete high seas fish stocks		10 areas closed to trawling for 3 years from 1 Jan 2007
South Indian Ocean Fisheries Agreement	SIOFA	South Indian Ocean	All fishery resources other than tuna		Established in July 2006
South Pacific Regional Fisheries Management Organisation		Proposed area: Eastern part of the South Indian Ocean through the Pacific towards the EEZs of South America. Overlaps with WCPFC and IATTC	It could cover both pelagic and demersal discrete high seas stocks and stocks which straddle high seas and EEZs of coastal states (Anon. 2007).		Under development
South Pacific Regional Fisheries Management Organisation		Vast area extending roughly from the Equator to the Antarctic Circle and from Australia and New Zealand to the west coast of South America	Observers and ship locator monitoring systems are to be used, and vessels must remain at least five nautical miles from deep-water corals and other vulnerable marine ecosystems.	High Seas trawling	September 30, 2007
North Western Pacific Ocean (Japan, Republic of Korea, Russian Federation and the USA)		FAO statistical area No. 61	Sustainable management of fish stocks and protection of vulnerable marine ecosystems in the high seas areas of the North Western Pacific Ocean		Latest implementation Dec 2007

Appendix 5: Summary of species-specific Regional Fisheries Management Organisations dealing with areas beyond national jurisdiction

Species-specific RFMOs					
Name of RFMO	**Acronym**	**Area covered**	**Fisheries covered**	**Challenges in that area**	**Recent regulations**
Commission for the Conservation of Southern Bluefin Tuna	CCSBT	The Convention does not define any specific geographical area.	Southern Bluefin tuna management only		
Inter-American Tropical Tuna Commission	IATTC	The area of competence of the Commission is defined as the "Eastern Pacific Ocean." There is no precise definition in terms of longitudes and latitudes. Overlaps with the proposed South Pacific Regional Fisheries Management Organisation	Yellowfin and skipjack tuna; fish used as bait for tuna and other fish taken by tuna vessels (Internet-Guide-to-International-Fisheries-Law 2007)		
International Commission for the Conservation of Atlantic Tunas	ICCAT	All waters of the Atlantic Ocean and adjacent seas, including the Mediterranean Sea. There is no precise definition in terms of	Tunas and tuna-like species	Taiwanese fishing vessels operating in the Caribbean; Blue and mako sharks are caught as	ICCAT has implemented trade sanctions against 8 countries for noncompliance with its measures

Comment [ph1]: I don't understand this!

		longitude and latitude. Overlaps with NEAFC and NASCO		bycatch in the tuna and swordfish fisheries	
Indian Ocean Tuna Commission	IOTC	The Indian Ocean and adjacent seas, north of the Antarctic Convergence, insofar as it is necessary to cover such seas for the purpose of conserving and managing stocks that migrate into or out of the Indian Ocean. FAO Statistical Areas 51 and 57	Tuna and tuna-like species	Taiwanese vessels operating in the Indian Ocean without authorization from IOTC	
North Atlantic Salmon Conservation Organisation	NASCO	The Convention applies to salmon stocks, which migrate beyond areas of fisheries jurisdiction of coastal States of the Atlantic Ocean north of 36°N latitude; Overlaps with ICCAT and NEAFC	Salmon stocks	Salmon farms	
North Pacific Anadromous Fish Commission under the Convention for the Conservation of Anadromous Stocks in the North Pacific	NPAFC	The waters of the North Pacific Ocean and its adjacent seas north of 33 degrees North Latitude and beyond 200-miles zones of the coastal States.	Chum salmon, coho salmon, pink salmon, sockeye salmon, chinook salmon, cherry salmon, steelhead trout (NPAFC 2007)	In 2006, there was a significant increase in suspect high seas drift netting in the	Each Party has the authority to board, inspect and detain fishing vessels of the other Parties found operating in violation of the Convention (NPAFC 2007)

Ocean				west of the Convention Area. (NPAFC 2006)	To deal with high seas fishing for salmon, the NPAFC recently drafted guidelines for boarding vessels of non-member countries targeting salmon in the area. NPAFC is also examining the possibility of applying the FAO's Port State Control Measures (NPAFC 2006)
Western and Central Pacific Fisheries Commission	WCPFC	Overlaps with proposed South Pacific RFMO	Only highly migratory species		The WCPFC entered into force in 2004 (Kimball 2005). In 2006 it passed measures to prevent the accidental killing of seabirds by longline fishing vessels in the Pacific (Birdlife International 2006)

Appendix 6: Review of Regional Seas Conventions covering areas beyond national jurisdiction

Name	Acronym/Alternative name	Area and Location	Comments	Recent Regulations
Convention for the Protection of Natural Resources and Environment of the South Pacific Region	South Pacific Regional Seas Convention /Noumea Convention	Areas of high seas enclosed from all sides by the 200 nautical mile zones of the member countries	The Secretariat of the Pacific Regional Environmental Programme's (SPREP) mandate is to promote cooperation in the Pacific islands region and to provide assistance in order to protect and improve the environment and to ensure sustainable development for present and future generations (SPREP 2007). Includes oversight of the 1976 Convention on the Conservation of Nature in the South Pacific.	
Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean	CPMECRM /Barcelona Convention	Overlaps with ICCAT	The specially protected areas and biological diversity it governs are applicable to the seabed and subsoil as well as the sea. CPMECRM selects special protected areas of Mediterranean interest (SPAMIs) (Kimball 2005) (see Pelagos marine mammal sanctuary)	
Convention for the Protection of the Marine Environment of the North-East Atlantic	OSPAR	Same area as NEAFC		Might incorporate recent NEAFC closures in to their network of MPAs
Antarctic Treaty System/ Madrid Environmental Protocol		Antarctic	Sets out principles for environmental protection; bans all commercial mineral resource activity; and requires Environmental Impact Assessment (EIA) of all activities before they are allowed to go ahead.	

Appendix 7: Summary of marine mammal sanctuaries including areas beyond national jurisdiction

Name	Area and Location	Mandate	Recent regulations
Indian Ocean Whale Sanctuary	Entire Indian Ocean extending south to 55°S latitude (103.6 million km^2) (Hoyt 2005)	Protect whales from commercial whaling and encourage cetacean research and conservation (Hoyt 2005)	Adopted by the International Whaling Commission in 1979, it prohibits commercial whaling. It was initially established for 10 years and its duration has since been extended twice.
Southern Ocean Whale Sanctuary	Overlaps with CEP and CCAMLR		Adopted by the International Whaling Commission in 1994, prohibits commercial whaling, reviewed at ten year intervals and open to revision by IWC
Pelagos Sanctuary for Mediterranean Marine Mammals	87, 000 km^2, 53% of which is beyond national jurisdiction (Kimball 2005) It extends over a large part of the western Mediterranean, between Tuscany, the continental French coast (Cote d'Azur) and northern Sardinia.	To protect whales and dolphins in prime cetacean habitat in the Mediterranean waters of France, Monaco and Italy (Hoyt 2005)	There has been little change in terms of management, but the agreement represents an important step forward towards the effective protection of animals and marine mammals living in the area.

Appendix 8: Proposed site attributes in the new WDPA

Attribute	Field Structure	Field Content
Site Name	Local/English	User defined. Allow any language character set.
Country (includes State, Province)		UN defined country and state level dataset. Drop down selection on online data provider interface
Region		Organization defined regional dataset. Drop down selection on online data provider interface
Designation		Country specific designation list.
Convention/ Criteria		
Status	Status and Site Event	Predefined options complete with definitions
Status Date	Day	Format in numbers e.g. 01, 02. 00 - unknown
	Month	Format in numbers e.g. 01, 02. 00 - unknown
	Year	Format in numbers e.g. 1980, 2000.
Total Area	Documented Total Area	Numbers added but format (whether acres, hectares, meters or kilometres) must be specified. Automatic conversion via online data provider interface into database standard.
	GIS Area	
Marine Area	Documented Total Marine Area	
	GIS Area	
Marine Component		Drop down selection on online data provider interface
MPA Depth Range	Minimum Depth	Numbers added but format (feet or meters) must be specified. Automatic conversion via online data provider interface into database standard.
	Maximum Depth	

Freshwater Area	Documented Total Freshwater Area	Numbers added but format (whether acres, hectares, meters or kilometres) must be specified. Automatic conversion via online data provider interface into database standard.
	GIS Area	
No Take Area	Type	Drop down selection for user
	Documented No Take Area	Numbers added but format (whether acres, hectares, meters or kilometres) must be specified. Automatic conversion via online data provider interface into database standard.
	GIS Area	
MPA Zonation		Drop down selection on online data provider interface
MPA Definition		Users confirm that site fall's under IUCN definition of MPA
Protected Area Definition		Users confirm that site fall's under IUCN definition of PA
CBD Marine and Coastal PA (MCPA)		Users confirm that site fall's under CBD definition of MCPA.
IUCN Management Category	IUCN_cat	Drop down selection on online data provider interface
	IUCN_Certified	Options to search contact list/add contact who certified the category
Location	LAT_DD/DMS	Location stored in database as decimal degrees (DD). Automatic conversion via online data provider interface of Degrees Minutes Seconds (DMS) into decimal degrees.
	LON_DD/DMS	
	Bounding_DD	Bounding coordinates in decimal degrees
	Bounding_ DMS	Bounding coordinates in degrees, minutes, seconds
Site Governance		Drop down selection on online data provider interface
Site Ownership		
Site Type		Predefined options complete with definitions

Appendix 9: Review of current databases and research initiatives regarding areas beyond national jurisdiction

DATABASE	CONTACT	DESCRIPTION	URL
Deep Sea Floor Image Database System	Kiyoshi Othuka Japan Marine Science & Technology Center otsukak@jamstec.go.jp	Japan Marine Science & Technology Center has collected precious image data of deep sea floor over 250,000 what? to investigation of deep sea floor by the manned submersible survey vessels, "Shinkai 2000" and "Shinkai 6500",the remote controlled unmanned exploration system, "Dolphin 3K" and the towed deep sea exploration system "Deep Tow Camera". We expect that the number of precious image data, for example video or photography which this center only obtains will increase at the rate of many thousands. The deep sea floor image database system organizes many precious image data on database and it is possible to enter and search the data by simple operations in this system.	
Ocean Floor databases	Dr Bill Ryan billr@ldeo.columbia.edu Dr Bill Haxby bill@ldeo.columbia.edu Dr Suzanne Carbotte carbotte@ldeo.columbia.edu Suzanne O'Hara Sohara@ldeo.columbia.edu	The Ridge Multibeam Synthesis is a compilation of multibeam bathymetry data, digital elevation models, and shaded relief images of the seafloor from the world's mid-ocean ridges. This effort is funded by the Marine Geology and Geophysics program out of the Ocean Sciences Division of the National Science Foundation. The primary focus of this data synthesis is to provide open access over the Internet to multibeam bathymetry data collected during scientific research expeditions seeking to understand crustal creation in the deep oceans. The morphology of the seabed at spreading centers represents the surficial record of the fundamental processes of magmatic construction and tectonic disruption that contribute to crustal formation. Bathymetry data also provide an essential integrating framework for interdisciplinary research as basemaps for other physical, biological, and chemical oceanographic studies. Many of the datasets within this compilation were acquired with the support of the RIDGE and now RIDGE200/) programs of the NSF.	http://ocean-ridge.ldeo.columbia.edu/

DATABASE	CONTACT	DESCRIPTION	URL
Evaluation of Sub-Sea Physical Environmental Data for the Beaufort Sea OCS and Incorporation into a Geographic Information System (GIS) Database	Chief, Alaska Environmental Studies Section ESS@mms.gov	The contractor will interpret all available geophysical survey data, geologic data sets, and data from site-specific survey reports for the Beaufort Sea OCS and from Liberty and Northstar pipeline survey projects. This information will be incorporated into a GIS database. Data sets will be created for ice gouging, strudel scour, and other surface and sub-bottom features, including a important marine habitat (i.e., the Boulder Patch) and high profile features of archeological importance.	
Gulf of Mexico GLORIA mapping program	vpaskevich@usgs.gov	In the late summer and fall of 1985, the USGS conducted surveys of the US Exclusive Economic Zone (EEZ) in the Gulf of Mexico and around Puerto Rico and the U.S. Virgin Islands. The 1985 survey abutted an area surveyed in 1982 as part of the Outer Continental shelf geohazards work that focused on the Texas-Louisiana continental slope and preliminary work for the Deep Sea Drilling Project in the Mississippi Fan. The collected GLORIA data was processed and digitally mosaicked to produce continuous imagery of the seafloor. The 1982 and 1985 datasets were combined to produce sidescan coverage of the EEZ in the Gulf of Mexico. A total of 16 digital mosaics of a 2degree by 2degree (or smaller) area with a 50meter pixel resolution were completed for the Gulf of Mexico. The individual mosaics were later combined to produce an overview of the Gulf of Mexico. A reduced version of the completed digital mosaic of the Gulf of Mexico is provided here.	http://kai.er.usgs.gov/gloria/gom/index.html
PETDB Petrological Database of the Ocean Floor	Kerstin Lehnert Senior Staff Associate, LDEO Columbia University Tel: (845) 365-8506 Email: lehnert@ldeo.columbia.edu	A searchable petrologic and chemical database for ocean floor basalts	http://petdb.ldeo.columbia.edu/petdb/
GEOROC Geochemistry of Rocks of the Oceans and Continents		Published chemical and isotopic data as well as extensive "metadata" for rocks, minerals and melt/fluid inclusions including igneous rocks from oceanic islands and large igneous provinces (seamounts, oceanic plateaus, submarine ridges, and oceanic and continental flood basalts)	http://georoc.mpch-mainz.gwdg.de/Start.asp

NGDC National Geophysical Data Center	National Geophysical Data Center E/GC 325 Broadway Boulder, Colorado USA 80305-3328 Fax: 303-497-6513 Phone number for general information: 303-497-6826 Email for general information: gdc.info@noaa.gov	NGDC manages all types of data from the ocean floor. Bathymetry, topography, and global relief imagery. Contains: Geophysical data Bathymetry, gravity, magnetics, and sub-bottom profiles (single-channel and multi-channel) collected on thousands of oceanographic surveys covering millions of km from the world's oceans, all searchable online. NGDC also manages sidescan sonar image data. Descriptions and analyses of over one hundred thousand seafloor and lakebed cores, grabs, dredges, and drill samples worldwide. Data include an index to marine and lacustrine geological samples, data from international ocean drilling, a marine minerals bibliography and geochemical database, grain size, gridded total sediment thickness data, and other data files. Bathymetry and topography including marine trackline and multibeam data, gridded global relief and coastal relief models for the US, hydrographic surveys of US waters, bathymetry of the Great Lakes, estimated depths from satellite altimetry, and digital coastlines. NGDC operates the World Data Center for Marine Geology & Geophysics, Boulder, the International Hydrographic Organization Data Center for Digital Bathymetry, and participates in numerous cooperative programs, including multiple international mapping projects	http://www.ngdc.noaa.gov/mgg/mggd.html http://www.ngdc.noaa.gov/mgg/geology/geologydata.html
Vents Programme	Seattle Offices: NOAA Western Regional Center Pacific Marine Environmental Laboratory Bldg. 3 7600 Sand Point Way NE Seattle WA 98115-6349 206-526-6239 Fax : 206-526-6815 Newport Offices:	Contains data and information about acoustic monitoring, chemical oceanography, geology/geohysics, hydrothermal plume studies, modeling and physical oceanography. Has various interactive sub webpages with maps and data.	http://www.pmel.noaa.gov/vents/

	Ocean Environment Research Division Mark O. Hatfield Marine Science Center 2115 Marine Science Drive Newport, OR 97365 Tel: 541-867-0274 Fax: 541-867-3907 Division Leader Steve Hammond Steve.Hammond@noaa.gov		
National Data Buoy Center	Webmaster.ndbc@noaa.gov	Hourly observations from a network of about 60 buoys and 60 C-MAN stations that measure wind speed, direction, and gust; barometric pressure; and air temperature	http://www.ndbc.noaa.gov/
NOAA Center for Operational Oceanographic Products and Services (CO-OPS)	Steve Kempler, GDAAC Manager Steven.J.Kempler@nasa.gov	Historical and real-time observations and predictions of water levels, coastal currents and other meteorological and oceanographic data	http://co-ops.nos.noaa.gov/
National Center for Atmospheric Research Selected Data for Oceanic Research	dssweb@ucar.edu,	COADS Data Set, sea surface temperature, surface wind and wind stress, air-sea heat budgets, ocean depth and land elevation, buoy data, sea ice and remote sensing data	http://dss.ucar.edu/catalogs/oceanlists/ocean_by_category.html

Fleet Numerical Meteorology and Oceanography Center		Automated numerical meteorological and oceanographic (METOC) analyses and predictions.	http://152.80.49.210/
GOOS	GOOS Intergovernmental Oceanographic Commission 1, rue Miollis 75732 Paris Cedex 15 France	GOOS is a permanent global system for observations, modelling and analysis of marine and ocean variables to support operational ocean services worldwide. GOOS will provide accurate descriptions of the present state of the oceans, including living resources; continuous forecasts of the future conditions of the sea for as far ahead as possible; and the basis for forecasts of climate change.	http://ioc.unesco.org/goos/
Array for Real-time Geostrophic Oceanography (Argo)	aic@jcommops.org	Argo is a global array of 3,000 free-drifting profiling floats that will measure the temperature and salinity of the upper 2000 m of the ocean. This will allow continuous monitoring of the climate state of the ocean, with all data being relayed and made publicly available within hours after collection	http://www-argo.ucsd.edu/ http://argo.jcommops.org/

Australian Oceanographic Data Centre	Directorate of Oceanography & Meteorology Maritime Headquarters Wylde Street, Potts Point, NSW 2011 Phone: +61 2 9359 3119 Fax: +61 2 9359 3120 Email: info@aodc.gov.au Data Management: dm@aodc.gov.au	The national data centre for the acquisition, archival and management of physical oceanographic data in Australia	http://www.aodc.gov.au/
British Oceanographic Data Centre	British Oceanographic Data Centre Bidston Observatory	Contains ocean metadata, cruise information and datasets, online dataystems and inventory searches.	http://www.bodc.ac.uk/

	Bidston Hill Prenton Merseyside CH 43 7RA Tel: 0151 653 1510 Fax: 0151 652 3950 Enquiries@bodc.ac.uk		
Canada Marine Environmental Data Service	Marine Environmental Data Service Department of Fisheries and Oceans Canada 12W082 - 200 Kent Street Ottawa, Ontario Canada K1A 0E6 General Inquiries (613) 990-6065 Request Services (613) 990-0243 Fax Number (613) 993-4658 services@meds-sdmm.dfo-mpo.gc.ca	Physical, chemical and biological oceanographic observations reported in daily and historical time frames; national contacts for biological databases within DFO; hyperlinks to regional web sites for satellite data and products within DFO and regional web sites for time series data and products; the National Contaminants Information System; and environmental observations (ex. winds, ice, etc.) from historical offshore oil and gas sites	http://www.meds-sdmm.dfo-mpo.gc.ca/meds/Home_e.htm
TMSI/IDM/SISMER	Centre IFREMER de BREST BP 70 29280 PLOUZANE (FRANCE) Tel +33 (0)2 98 22 49 16 Fax +33 (0)2 98 22 46 44 Email :sismer@ifremer.fr	Related oceanographic information: Catalogues, information and data request forms, and hyperlinks to other data sources	http://www.ifremer.fr/sismer/sommaire_e.html
Marine Information	Marine Information Service (MARIS)	North sea research projects (oceanography, biology, hydrography, geology, chemistry, meteorology) Offshore oil and gas activities, sand and gravel	http://www.maris.nl/frames.asp?databases.htm

Service (MARIS), Netherlands	Dillenburgsingel 69 2263 HW Leidschendam The Netherlands Tel: +31 (0)70-3170960 Fax: +31 (0)70-3903546 E-mail: maris@xs4all.nl	extraction, and a European directory of marine Environmental Data	
Deutsches Ozeanographisches	Datenzentrum, Hamburg Monika Woisin-Michelsen Monika Woisin-Michelsen@bsh.de Tel: +49 40 3190-1015	Marine Environmental Database, North Sea and Baltic Sea by 1° rectangles Atlantic Ocean by 10° rectangles, stations of the Baltic Monitoring Programme, cruise inventories and North Sea oil spill information	http://www.bsh.de/Oceanography/DOD/DOD.htm http://www.bsh.de/en/Toolbox/Help/index.jsp

Japan Oceanographic Data Center	Hydrographic and Oceanographic Department Japan Coast Guard 5-3-1 Tsukiji, Chuo-ku, Tokyo, 104-0045 Japan Tel: +81-3-3541-4295 Fax: +81-3-3545-2885 E-mail: mail@jodc.go.jp	Temperature, salinity, ocean current, tidal and moored current data	http://www.jodc.go.jp/aboutJODC_work_data.html
NASA Physical Oceanography Distributed Active Archive Center	JPL PO.DAAC User Services Office: E-Mail: podaac@podaac.jpl.nasa.gov Phone: (626) 744-5508 FAX: (626) 744-5506	Primarily remote sensing data on atmospheric moisture, heat flux, collections, ocean wind, sea surface height, sea surface temperature, and tide models	http://podaac.jpl.nasa.gov/
SADCO – South African Data		Hydrographic station and surface data from the southern African coastline, as well as the wider Atlantic, Indian and Southern Oceans	

Centre for Oceanography			
United States National Oceanographic Data Center	National Oceanographic Data Center NOAA/NESDIS E/OC SSMC3, 4th Floor 1315 East-West Highway Silver Spring, MD 20910-3282 Phone: 301-713-3277 Fax: 301-713-3302 Email: NODC.Services@noaa.gov	Physical, chemical, and biological oceanographic data collected by U.S. Federal agencies, including the Department of Defense (primarily the U.S. Navy); State, and local government agencies; universities and research institutions; and private industry. Contains many interesting databases such as world ocean database and atlas 2001. See web link for individual datasets. Also contains: Vol.5 Russian Marine Expeditionary Investigations Of The World Ocean Pdf (8.4 Kb) Vol. 3 Hydrochemical Atlas Of The Sea Of Okhotsk Online Data Vol. 2 Biological Atlas Of The Arctic Seas 2000: Plankton Of The Barents And Kara Seas Online Data Vol. 1 Climatic Atlas Of The Barents Sea 199	http://www.nodc.noaa.gov/ Plankton database: http://www.nodc.noaa.gov/OC5/RESEARCH/PLANKTON/plankton.html
The University of Hawaii Sea Level Center (UHSLC)	UH Sea Level Center University of Hawaii 1000 Pope Road, MSB 317 Honolulu, Hawaii 96822-2336 Phone: (808) 956-8083 Fax: (808) 956-2352	In-situ tide gauge data from around the world in support of climate research	http://uhslc.soest.hawaii.edu/uhslc/data.html
ESONET	Oceanlab Newburgh Aberdeenshire Scotland AB41 6AA United Kingdom Tel + 44 1224 274408 Fax + 44 1224 274402 Email.	The objective is to produce a practical plan for long term monitoring of the ocean margin environment around Europe as part of GMES (Global Monitoring for Environment and Security) with capability in geophysics, geotechnics, chemistry, biochemistry oceanography, biology and fisheries. ESONET will be complementary to oceanographic networks such as GOOS, (Global Ocean Observing System) EuroGOOS, DEOS (Dynamics of Earth and Ocean Systems) and will work with industries who are deploying sea floor cable networks. ESONET will be multidisciplinary, with stations monitoring the rocks, sediments, bottom water, biology and events in the water column. Both long-term data	http://www.abdn.ac.uk/ecosystem/esonet/index2.htm

	I.e.g.priede@abdn.ac.uk	collection and alarm capability in the event of hazards (e.g. earthquakes) will be considered.	
EUROCORE	Marine Information Service (MARIS) Dillenburgsingel 69 2263 HW Leidschendam The Netherlands Tel: +31 (0)70-3170960 Fax: +31 (0)70-3903546 E-mail: maris@xs4all.nl	Concerted action within the framework of the EC-DGXII Marine Science & Technology Program (MAST). EUROCORE addresses a fundamental problem relating to marine sample data management within Europe and will enable, and streamline, exploitation of an important, existing raw data resource – the very large number of sediment cores collected by, and stored at, European research centres, universities and core repositories. After they have served the primary data requirement for which they were collected, seafloor samples are normally stored in controlled environments for further use	http://www.maris.nl/eurocore.htm www.eu-seased.net
ChEss, Biogeography of Deep-Water Chemosynthetic Ecosystems	Prof Paul A. Tyler Coordinator Southampton Oceanography Center European Way, Empress Dock SO14 3ZH, Southampton United Kingdom Tel. +44 2380 592557 Fax. +44 2380 593642 pat8@soc.soton.ac.uk	One of the aims of ChEss is to create a web-based database (ChEssBase) for all species from deep-water hydrothermal vents and cold seeps. The information will be obtained by both literature research and participation of laboratories/institutions/researchers willing to include their vent and seep data. ChEssBase will be a dynamic relational database. ChEssBase will be geo- and bio-referenced and will be available in the ChEss web site and through OBIS. At the biological level, the database will provide taxonomical, biological, ecological and distributional information, including photographies, video, references, links to specific data (quantitative samples, cruises) and scientific contacts in a user-friendly interphase. At the geographical level, the database will include information on the location of vent and seep sites, general characteristics of the sites, faunal community description and references.	http://www.soc.soton.ac.uk/chess/database.html
SeamountsOnline	San Diego Supercomputer Center University of California San Diego MC 0505 9500 Gilman Drive La Jolla, CA 92093-0505 Tel: 858 534-5009 Fax: 858 822-3631	The SeamountsOnline database is designed to hold records of species of all metazoan types that have been found on seamounts globally. The data held within this system are primarily from published literature, with a few electronic data sets that have been provided by researchers. This is a work in progress, with new data being added periodically – please see the Data Contents page for more information and a description of the current holdings.	http://seamounts.sdsc.edu/

	Email: kstocks@sdsc.edu		

Marine zones	National Weather Service Office of Science and Technology Webmaster: Ira Graffman Ira.graffman@noaa.gov	Database containing shapefiles of offshore and high seas marine zones	http://www.nws.noaa.gov/geodata/catalog/wsom/html/marinezones.htm
High Seas Salmon	Box 355020, Seattle, WA 98195-5020 Street address 1122 NE Boat St, Seattle, WA 98105 Email: frontdesk@fish.washington.edu Tel: 206-543-4270 Fax: 206-685-7471	The High Seas Salmon Research Program has accumulated a number of sets of data. Our data come from US salmon tagging and research cruises in the North Pacific Ocean and Bering Sea, cooperative tagging and research cruises with Canadian, Japanese, and Russian fishery agencies, measurements of salmon scales for stock identification and growth studies, examination of salmon stomach contents carried out aboard Japanese research vessels, and salmon research cruises of the former Bureau of Commercial Fisheries, predecessor to the US National Marine Fisheries Service. We also maintain the high-seas tag release and recovery databases for the NPAFC (these data are jointly controlled by the national sections of NPAFC). We hope to provide some of our data sets through this page in the future.	http://www.fish.washington.edu/research/highseas/research.html#data
Ocean Optics	Principal Investigator Jeffrey H. Smart Johns Hopkins University - Applied Physics Laboratory STF, 8-308 11100 Johns Hopkins Road Laurel, MD 20723-6099 Phone: (240)228-4331 Fax: (240)228-6908 jeff.smart@jhuapl.edu Database Manager Linda Peco Johns Hopkins University -	The Worldwide Ocean Optics Database is a collection of several hundred ocean optics data sets gathered over time that encompass much of the world's oceans. Because WOOD is comprised of so many different data sets, multiple parameters are available, gathered by many different instruments, and possesing varying levels of quality and editing. Because numerical representation of all data in the database is quickest and easiest, all of this "metadata" is stored as numerical codes by the database.	http://wood.jhuapl.edu/

	Applied Physics Laboratory STF, 8-320 11100 Johns Hopkins Road Laurel, MD 20723-6099 Phone: (240)228-6178 linda.peco@jhuapl.edu		
MAR-ECO	Peter Boyle p.r.boyle@abdn.ac.uk For other members of the international steering committee: http://mareco.imr.no/about/organisation/steering.htm	MAR-ECO is one of the ongoing CoML field projects and its overriding aim is to describe and understand the patterns of distribution, abundance and trophic relationships of the organisms inhabiting the mid-oceanic North Atlantic, and identify and model ecological processes that cause variability in these patterns. The project focuses on pelagic, benthopelagic and epibenthic macrofauna, and analyse distribution and abundance patterns in relation to the abiotic and biotic environment, as well as trophic relationships and life history strategies. Fish, crustaceans, cephalopods and gelatinous plankton and nekton have the highest priority in the study.	http://www.efan.no/midatlcensus/
MarLIN	Marine Life Information Network for Britain and Ireland - MarLIN, The Marine Biological Association of the UK, The Laboratory Citadel Hill, Plymouth, PL1 2PB United Kingdom Telephone: +44 (0)1752 633336 Fax: +44 (0)1752 633102 Email: marlin@mba.ac.uk	MarLIN will: * provide a structure for linking available data on marine life around Britain and Ireland. * improve the access, display and interpretation of information in support of environmental management, protection and education. * be the most comprehensive and easily used source of information about marine habitats, communities and species around Britain and Ireland and their sensitivity to natural events and human activities.	http://www.marlin.ac.uk/

CPR	SAHFOS	The Sir Alister Hardy Foundation for Ocean Science (SAHFOS) is an	http://www.sahfos.org/

	The Laboratory, Citadel Hill, Plymouth PL1 2PB. Tel:+44 (0) 1752 600016 Tel:+44 (0) 1752 633271 Fax:+44 (0) 1752 600015 Email: Sahfos@mail.pml.ac.uk	international charity registered in the UK, that operates the Continuous Plankton Recorder (CPR) survey. The Foundation has been collecting data from the North Atlantic and the North Sea on biogeography and ecology of plankton since 1931. The CPR database currently contains information for 185902 samples with 2198052 plankton entries (every second sample analyzed yet all preserved).	
Azores database	Ricardo Serrão Santos ricardo@horta.uac.pt	Most relevant databases are geo-referenced distribution of coastal habitats and species of Nature 2000 sites; mesopelagic fishes of the North-eastern Atlantic Region, based on data from museum collections mining and recent cruises (334 stations); marine mammals, based on annual acoustic and visual census and fisheries observers programs; tuna, based on fisheries observers programs; sea-birds and breeding colonies, based on annual census and fisheries observers programs; sea-turtles based on annual census, fisheries observers programs and standard tagging and satellite tracking; coastal fishes, based on visual census; demersal and seamount fishes, based on fisheries cruises; and sets of images for ocean color and temperature analysis within physics oceanography. Main habitats and ecosystems covered are: open-ocean; seamounts and banks; coastal areas (intertidal and subtidal); hydrothermal vents (both shallow and deep sea).	http://www.horta.uac.pt/
BATS zooplankton	Zooplankton Ecology c/o Deborah Steinberg Virginia Institute of Marine Science P.O. Box 1346, Gloucester Pt., VA 23062-1346, USA Tel: 804-684-7838 Fax: 804-684-7293	We are developing a multi-species inventory of zooplankton and micronekton at the Bermuda Atlantic Time-Series Study (BATS) station, a 13-year, ongoing oceanographic time series situated in the western North Atlantic subtropical gyre, or Sargasso Sea.	http://www.vims.edu/bio/zooplankton/BATS/
CephBase		CephBase is a dynamic relational database-driven web site. The purpose of CephBase is to provide taxonomic data, life history, distribution, images, videos,	http://www.cephbase.utmb.edu/

		references and scientific contact information on all living species of cephalopods (octopus, squid, cuttlefish and nautilus) in an easy to access, user-friendly manner.	
Global Ballast	International Maritime Organization Steve Raaymakers	Global ballast assessment unit of the IMO is currently looking at the impacts of invasive alien species on the marine environment	http://globallast.imo.org
Census on Marine Life	Ron O'Dor Senior Scientist Consortium for Oceanographic Research and Education (CORE) Secretariat, CoML 1755 Massachusetts Avenue, NW, #800 Washington, DC 20036 ph: 202-332-0063, fax: 202-332-9751 e-mail: rodor@COREocean.org	The Census of Marine Life (CoML) is a ten-year international research program with the goal of assessing and explaining the diversity, distribution and abundance of marine organisms throughout the world's oceans. The emphasis of the program is field studies, which are to be conducted in poorly known habitats as well as those assumed to be well known. In both coastal and deep waters, projects will identify new organisms and collect new information on ocean life.	http://www.coreocean.org/

OBIS SEAMAP	Dr. Andy Read DUML BRL 104 Duke University Marine Laboratory 135 Duke Marine Lab Road Beaufort NC 28516 Tel: 202 504 7590 Fax: 252 504 7648 aread@duke.edu	As part of the Ocean Biogeographic Information System (OBIS), a group of investigators, led by Andrew Read of Duke University, will create a digital database of marine mammal, seabird, and sea turtle distribution and abundance. Partners with Duke include UC San Diego, University of Washington, College of the Atlantic, St. Andrews University, British Antarctic Survey, SAHFOS, NMFS Southeast Fisheries Center, and several industries. The web-based system will allow the interactive display, query, and analysis of Digital Archive in conjunction with environmental data. Goals include: ✓ facilitating study of potential impacts on threatened species ✓ enhancing our ability to test hypothesis about biogeographic and biodiversity models ✓ supporting modeling efforts to predict distribution changes in response to environmental change. ✓ develop a strong public outreach component	http://obismap.env.duke.edu/data/
Sea Around Us, 2007.	Fisheries Centre, University British Columbia, Vancouver (British Columbia, Canada).	A global database on marine fisheries and ecosystems.	www.seaaroundus.org
International Cooperation in Ridge Studies		Developed a database regarding known and suspected ocean basin vents as well as taxonomic, ecological, biological, and distribution information about species associated with deep-water chemosynthetic ecosystems	www.interridge.org
FishBase	Froese, R. and D. Pauly. Editors. 2007.FishBase. World Wide Web electronic publication. www.fishbase.org, version (08/2007).	Global information database of nearly all fishes. FishBase was developed at the WorldFish Center in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and many other partners, and with support from the European Commission (EC). Since 2001 FishBase is supported by a consortium of seven research institutions.	www.fishbase.org/home
Sealifebase	2006 UBC Fisheries Centre and WorldFish Center.	Information system for all aquatic living organisms (marine and freshwater for each species included, the biological information necessary to conduct biodiversity and ecosystem studies, taking advantage of lists of species already available on paper and electronically	www.sealifebase.org