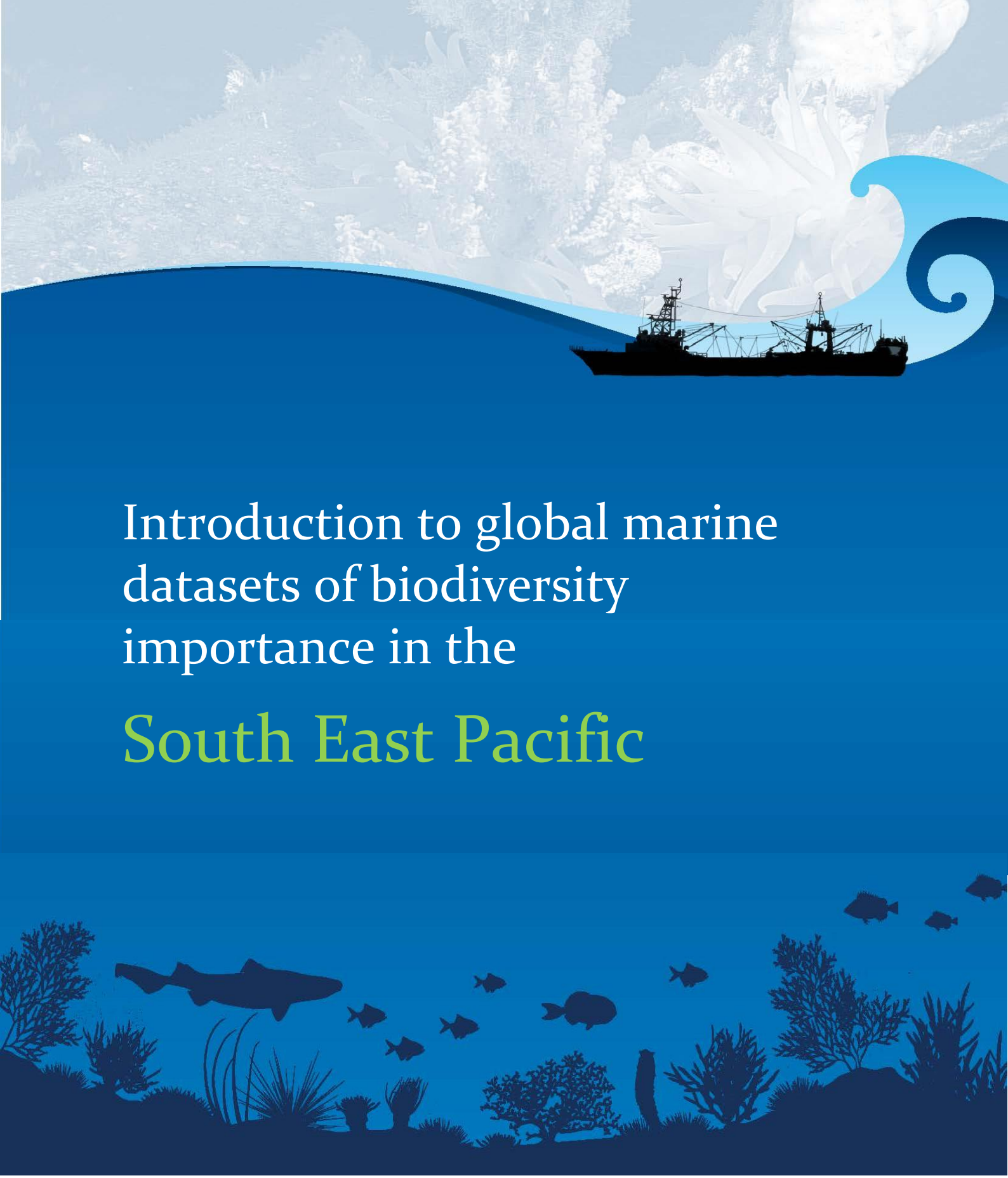

# Introduction to global marine datasets of biodiversity importance in the

# South East Pacific

UNEP

COMMON OCEANS

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# Introduction to marine datasets of biodiversity importance in the South East Pacific


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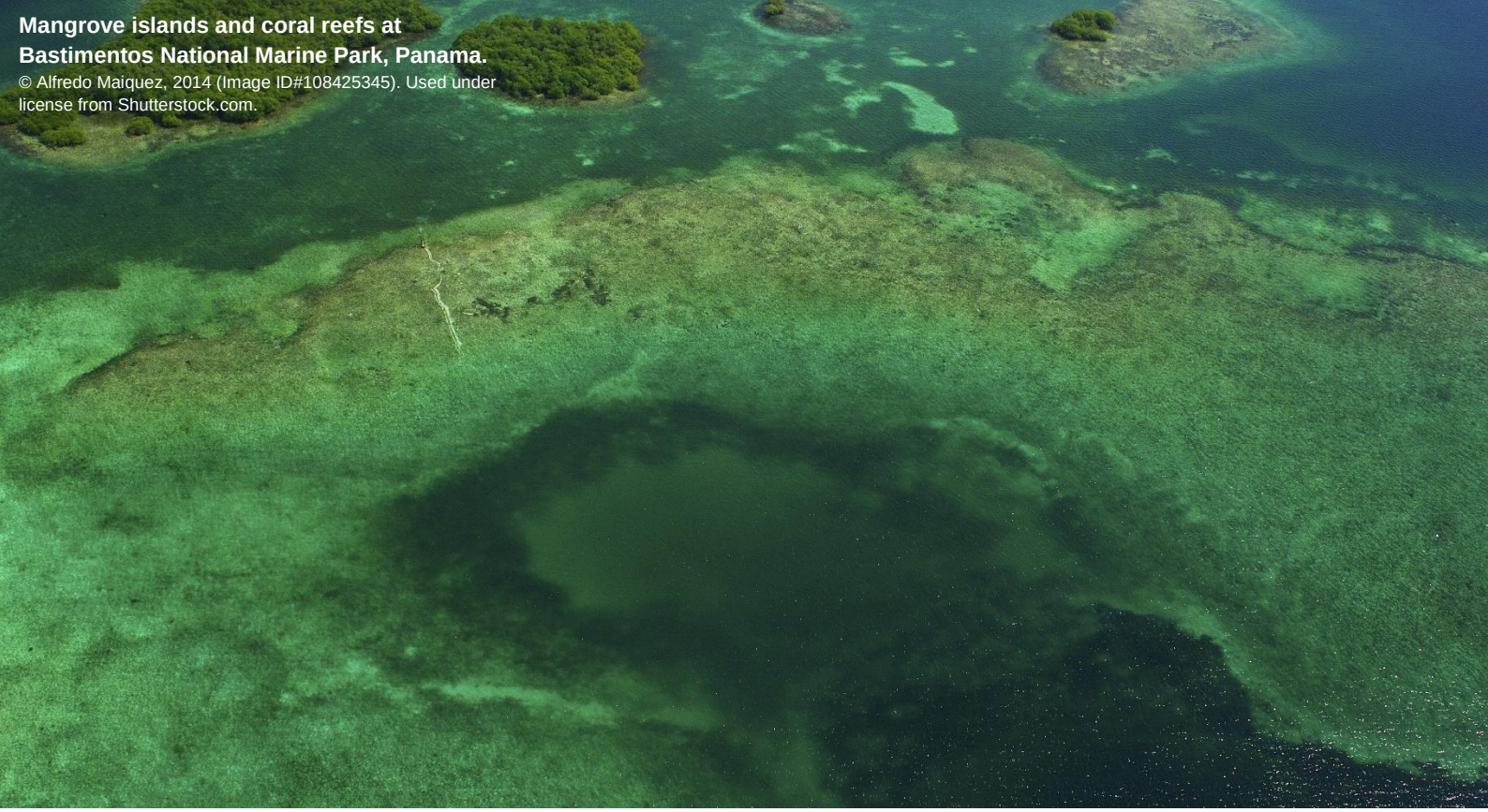
UNEP WCMC



The United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) is the specialist biodiversity assessment centre of the United Nations Environment Programme (UN Environment), the world's foremost intergovernmental environmental organisation. The Centre has been in operation for over 30 years, combining scientific research with practical policy advice.

# Contents





**Mangrove islands and coral reefs at Bastimentos National Marine Park, Panama.**


# 1. Introduction

## ABNJ Deep Seas Project

This work has been done as part of a 5-year GEF funded project jointly managed by FAO and UN Environment, entitled "*Sustainable fisheries management and biodiversity conservation of deep-sea living marine resources and ecosystems in the Areas Beyond National Jurisdiction (ABNJ).*" UNEP-WCMC is executing component 4 of this project, which focuses on the development and testing of a methodology for area-based planning in ABNJ deep sea areas[1].

The South East Pacific is one two pilot regions for the testing of area-based planning within the ABNJ Deep Seas Project. UNEP-WCMC is working with La Comisión Permanente del Pacífico Sur[2] (CPPS) and other project partners in the South East Pacific pilot region.

Data are required to inform decision-making. However, knowledge of marine datasets tends to be fragmented and difficult to access, particularly in ABNJ. As a first step within this project, global datasets relevant to the pilot region have been identified and presented in this regional data manual. This non-exhaustive review will be used as a foundation on which to build further understanding of global and regional data that are relevant to the project's objectives.

## Introduction to the South East Pacific

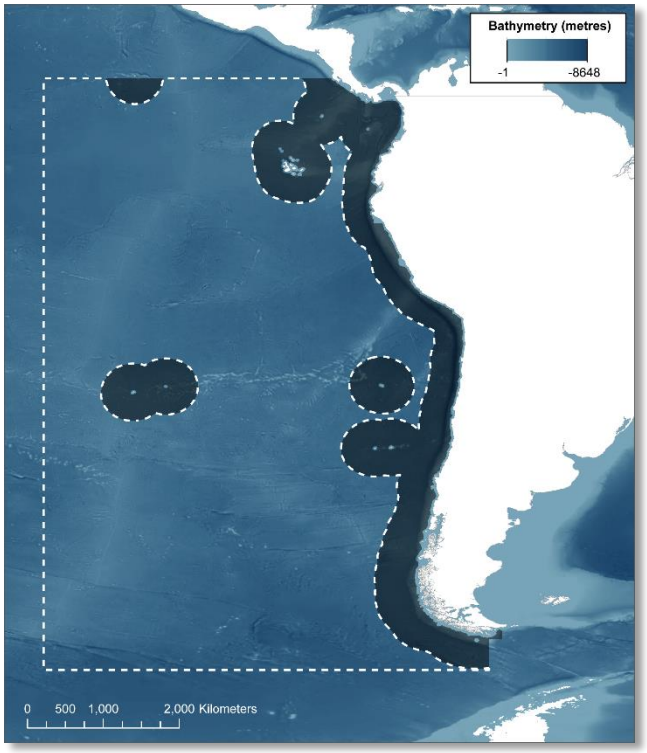
The South East Pacific, spanning the Pacific coast of South America from Panama to Cape Horn, encompasses a diverse range of ecologically and nutritionally rich ecosystems such as cold corals and seamounts, with depths of up to 8,648 metres. Ecologically or Biologically

[1] For more information, please visit the 'Common Oceans' website (http://www.commonoceans.org/deep-seas-biodiversity/en/).
[2] Permanent Commission for the South Pacific

Significant Marine Areas (EBSAs) have been identified in this region, centred primarily on the submarine Sala y Gómez and Nazca Ridges that fall at approximately 15° to 30°S, and the Equatorial High-Productivity Zone which spans the equator and supports local biological productivity. Two large marine protected areas are located in the surrounding waters of the Galápagos Islands and the Motu Motiro Hiva Marine Park off the coast of Chile. Five 'Global 200' sites are situated in this region, including the Panama Bight ecoregion and the nutrient-rich Humboldt Current, which together span the territorial waters of Panama, Colombia, Ecuador, Peru, and Chile. Key Biodiversity Areas (KBAs) and Important Bird Areas (IBAs) have also been identified in French Polynesian waters (i.e., Clipperton Marine) and in the waters between the Galápagos and Peru's Exclusive Economic Zone. These sites are represented in Figure 2.

# 2. Aim and scope of this manual

This technical document identifies global datasets that contain regional features within the South East Pacific project pilot region (Figure 1), offering a high-level introduction to datasets of relevance to Areas Beyond National Jurisdiction in this location. This non-exhaustive review identifies 102 global datasets that reflect various characteristics of biodiversity within this pilot region, which are listed in Annex 1. Interactive maps are also available for selected dataset categories to facilitate exploration of some of these layers (Annex 2). The document is also accompanied by standardised 'metadata' sheets for 50 of these datasets (Annex 3). These metadata sheets contain all relevant information concerning a given dataset, including what the data represent, how they are distributed, the data's intended use and use restrictions, their source and resolution.




The boundaries and names shown, and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

*Figure 1.* South East Pacific project pilot region (dashed line), falling within Areas Beyond National Jurisdiction. This represents an indicative boundary of the area that the project will examine, and is not reflective of existing mandates.

This inventory will be expanded further in subsequent efforts to identify regional datasets of relevance to the region, and also highlight gaps in knowledge. It is estimated that 95% of the ocean remains unexplored, with a strong bias in sampling effort and data availability towards temperate regions in the Northern hemisphere and within exclusive economic zones (Mora et al. 2008).

**Sardines flow across a shallow coral reef.**


Data availability within geographic regions varies considerably depending on the location considered. For example, while many records have been collected from the continental shelves and coastal waters due to better accessibility, the deep sea and Areas Beyond National Jurisdiction remain comparatively unexplored due to logistical challenges and costs associated with sampling remote areas (Mora et al. 2008). In particular, deep sea habitats such as hydrothermal vents and cold seeps are presently under-studied, as are the plethora of endemic species currently unknown to science that these habitats host (Mora et al. 2008).

Another consideration regarding data accuracy and uncertainty is consistency across temporal and spatial scales. Data must be available at an appropriate scale to answer a particular question, as patterns observed at one scale (e.g., global, monthly) may not be detectable at another (e.g., local, annual). Although global datasets such as those identified in this manual can provide useful information and insight into large-scale trends and features, regional or local datasets are often necessary to make better informed, site-level decisions. For more information regarding data limitations within the marine environment, please see Weatherdon et al. (2015)[3].

[3] Available at http://wcmc.io/marinedatamanual.

# 3. Key marine and coastal datasets

## Biogenic habitats

'Biogenic' habitats are those created by plants or animals, and that grow to provide a unique environment and physical structure for other organisms to live (Tyrrell 2005). Examples of marine and coastal biogenic habitats include warm- and cold-water corals, mangroves, saltmarshes, seagrass meadows, and kelp beds. While many of these habitats fall within Exclusive Economic Zones (EEZs), they offer environments that support the migration, spawning, and other life history stages of economically, culturally, or nutritionally important species that are found in Areas Beyond National Jurisdiction (table 1).

*Table 1: Marine biogenic habitat datasets, that have features in the South-East Pacific, and their source. Tick marks indicate that UNEP-WCMC has metadata sheets of a given dataset.*

| RESOURCE | SOURCE | METADATA |
|---|---|---|
| Global Distribution of Coral Reefs (2010) | UNEP-WCMC et al. (2010) | ✓ |
| Global Distribution of Cold-water Corals | Freiwald et al. (2005) | ✓ |
| Global Distribution of Habitat Suitability for Stony Corals on Seamounts (2009) | Tittensor et al. (2009) | |
| Global Distributions of Habitat Suitability for Cold-Water Octocorals (2012) | Yesson et al. (2012) | ✓ |
| Global Distribution of Mangroves USGS (2011) | Giri et al. (2011) | ✓ |
| Global Spatiotemporal Database of Mangrove Forest Cover (2014) | Hamilton and Casey (2016) | |
| Global Distribution of Modelled Mangrove Biomass (2014) | Hutchison et al. (2014) | ✓ |
| World Atlas of Mangroves (2010) | Spalding et al. (2010) | ✓ |
| World Mangrove Atlas (1997) | Spalding et al. (1997) | ✓ |
| Global Distribution of Saltmarsh (2013) | UNEP-WCMC | ✓ |

## Species habitat

The Convention on Biological Diversity (UN, 1992) defines habitat as the place or type of site where an organism or population naturally occurs. In this document, the term habitat is understood in the sense of 'biotope,' which comprises the abiotic[4] characteristics of a site and the associated biological community. In simple terms, a habitat is where an animal or plant species lives (including migratory routes), feeds (e.g., foraging sites) and reproduces (e.g., breeding, spawning, nesting and nursery sites). The habitat of a species may change throughout its life cycle: for instance, fish eggs and larvae are found in very different habitats to juvenile and adult fish. Similarly, female marine turtles lay eggs on nesting beaches, but spend the rest of their lives (e.g., foraging, migrating) at sea. Marine species habitat datasets that have features in the South-East Pacific are listed in table 2.

[4] i.e., non-living, applied to the physical and chemical aspects of an organism's environment (http://terms.biodiversitya-z.org/terms/5).

*Table 2: Marine species habitat datasets, that have features in the South-East Pacific, and their source. Tick marks indicate that UNEP-WCMC has metadata sheets of a given dataset.*

| RESOURCE | SOURCE | METADATA |
|---|---|---|
| Global Distributions of Habitat Suitability for Sea Turtle Nesting Sites (2012) | State of the World's Sea Turtles (SWOT) and Kot et al. (2012) | |
| Global Distribution of Sea Turtle Nesting Sites (1999) | Ocean Data Viewer | ✓ |
| Global Spawning Aggregations Database | Science and Conservation of Fish Aggregations (SCRFA Database) | |

## Species distributions

The distribution of species is defined here as the geographical spaces where a species may be found. Species distributions may be obtained through records of occurrence, expert-derived or predicted by numerical models, the latter often providing information on the relative probability of occurrence at given locations. The Extent of Occurrence is defined as "the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy", whereas the Area of Occupancy is defined as "the area within its 'extent of occurrence' which is occupied by a ta*xon, excluding cases of vagrancy*" according to the IUCN Red List Categories and Criteria (IUCN, 2012). Resources for occurrence data globally include the Global Biodiversity Information Facility (GBIF, 2017), the Ocean Biogeographic Information System (OBIS) (Intergovernmental Oceanographic Commission (IOC) of UNESCO, 2014), and the distributions that accompany the IUCN Red List of Threatened Species (IUCN, 2014). For specific taxa, there is the Global Shark Distribution Database and modelling initiatives, such as AquaMaps (Kaschner et al., 2014), which provide predicted range maps for aquatic species. Increasingly, tagging efforts have yielded databases on the movement of marine taxa (e.g., Marine Animal Tracking; Movebank; Tagging of Pacific Predators in the Pacific Ocean) (table 3).

*Table 3: Species distribution datasets, that have features in the South-East Pacific, and their source. Tick marks indicate that UNEP-WCMC has metadata sheets of a given dataset.*

| RESOURCE | SOURCE | METADATA |
|---|---|---|
| Data Portal of the Global Biodiversity Information Facility | Global Biodiversity Information Facility | |
| Ocean Biogeographic Information System (OBIS) | OBIS Secretariat, Intergovernmental Oceanographic Commission (UNESCO) | ✓ |
| Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations | Marine Geospatial Ecology Lab, Duke University (OBIS-SEAMAP) | |
| Spatial Data for the Red List of Threatened Species | International Union for Conservation of Nature (IUCN) | |
| Corrected and Refined Mangrove Species Ranges | UNEP-WCMC (2014) | ✓ |
| Global Register of Migratory Species (GROMS) | Zoologisches Forschungsinstitut und Museum Alexander Koenig (GROMS) | |
| AquaMaps: Predicted Range Maps for Aquatic Species (2013) | AquaMaps, a joint project of FishBase and SeaLifeBase | ✓ |

| RESOURCE | SOURCE | METADATA |
|---|---|---|
| Global Distribution of Sperm Whales (2013) | Albert-Ludwigs-University of Freiburg (Contact UNEP-WCMC) | ✓ |
| Global Distribution of Sei Whales (2013) | Albert-Ludwigs-University of Freiburg (Contact UNEP-WCMC) | ✓ |
| Global Distribution of Melon-headed Whales (2013) | Albert-Ludwigs-University of Freiburg (Contact UNEP-WCMC) | ✓ |
| Global Shark Distribution Database | Lucifora et al. (2011) | |
| Ocean Tracking Network | Dalhousie University | |
| Wildlife Tracking | www.wildlifetracking.org | |
| Movebank | Max Planck Institute for Ornithology (Movebank) | |
| Tagging of Pacific Predators in the Pacific Ocean | Hopkins Marine Station (TOPP) | |

## Biodiversity areas

Areas relevant to biodiversity include a range of nationally and internationally protected areas as well as areas described according to their biodiversity conservation interest (e.g., Key Biodiversity Areas, Ecologically or Biologically Significant Marine Areas, and Critical Habitat, as per the International Finance Corporation's Performance Standard 6 criteria). In the South East Pacific, these encompass areas such as the Galapagos Islands, the Humboldt Current, areas of high primary productivity (e.g., Equatorial High-Productivity Zone), and seamount ridges (for examples, please see Table 4 and Figure 2).

*Table 4: Marine biodiversity area datasets that have features in the South-East Pacific and their source. Tick marks indicate that UNEP-WCMC has metadata sheets of a given dataset.*

| RESOURCE | SOURCE | METADATA |
|---|---|---|
| World Database on Protected Areas | IUCN and UNEP-WCMC (2016) | ✓ |
| Global Distribution of KBAs, IBAs, and AZEs | BirdLife International (2016) | ✓ |
| Ecologically or Biologically Significant Marine Areas | Secretariat of the Convention on Biological Diversity (2015) | |
| Global Diversity Hotspots and Conservation Priorities for Sharks | Lucifora et al. (2011) | |
| Global Distribution of Particularly Sensitive Sea Areas | International Maritime Organization (2014) | ✓ |
| The Global 200 Ecoregions | Olson and Dinerstein (2002) | |
| Global Map of Marine Critical Habitat (2015) | Martin et al. (2015) | ✓ |

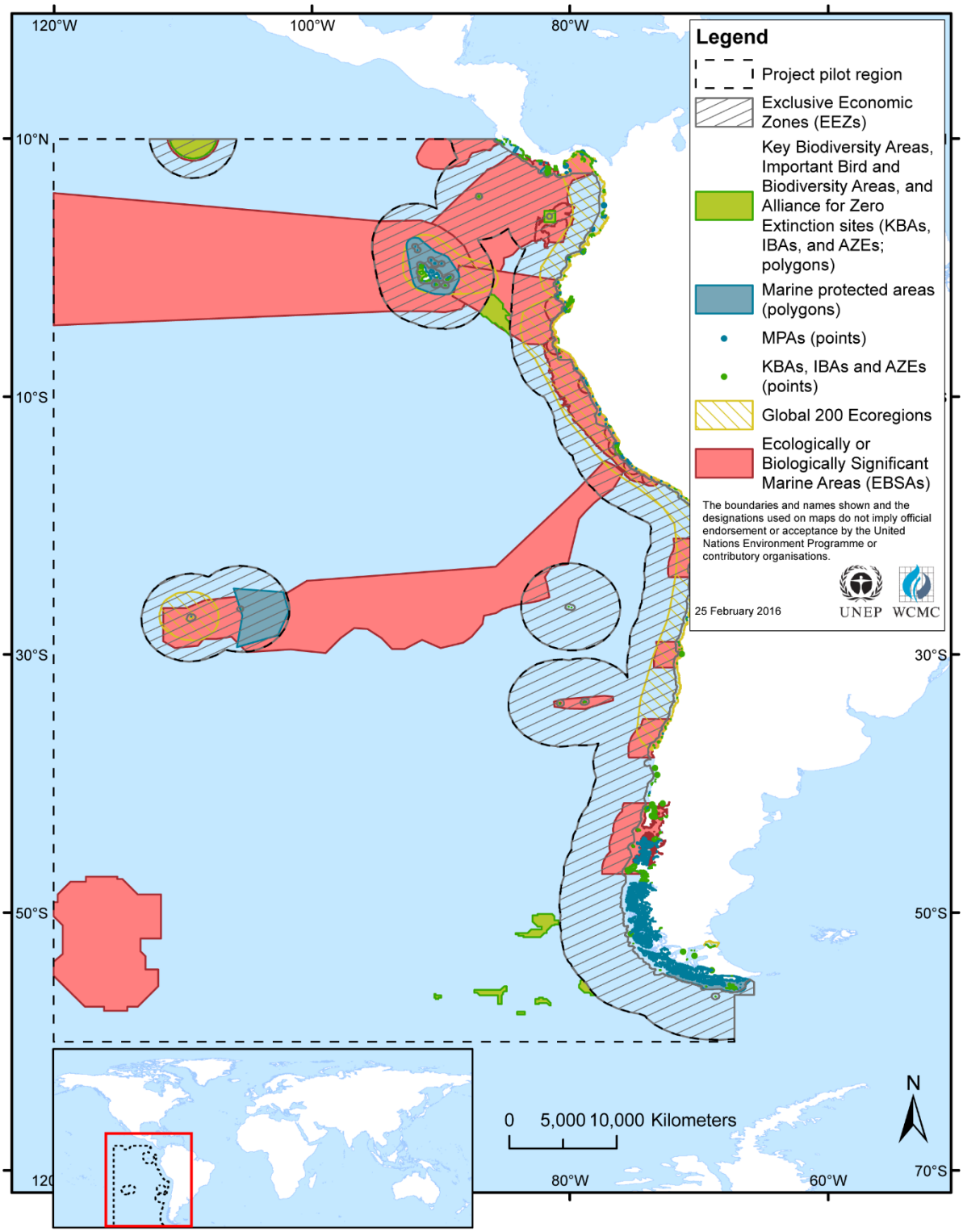



*Figure 2.* Examples of sites in the South East Pacific pilot region, including Ecologically or Biologically Significant Marine Areas (EBSAs; Secretariat of the Convention on Biological Diversity, 2015), Key Biodiversity Areas, Important Bird and Biodiversity Areas, and Alliance for Zero Extinction (AZE) sites (KBAs, IBAs, and AZEs; BirdLife International and Conservation International, 2016), Global 200 Ecoregions (Olson DM and Dinerstein E, 2002), and marine protected areas (MPAs: IUCN and UNEP-WCMC, 2016). For an interactive PDF of features, see Annex 2.

## Biogeographic classification

Biogeographic classifications are used to understand how and where species are distributed, and to mark the boundaries between oceanographic regimes. They help to assess which habitats, communities and species could be subject to disproportionate impact due to concentration of human activities, rarity or limited extent of distribution.
In the South East Pacific, key biogeographic classifications include hydrothermal vents fields and seamounts and knolls, such as those forming the Sala y Gómez and Nazca Ridges (see Figure 3). The fauna found in these locations exhibit high rates of endemism, belonging exclusively to this region[5]. The Panama Bight, Galapagos, Humboldt Current, Rapa Nui, and Patagonian Southwest Atlantic ecoregions are also located in this region, each forming important a biogeographic region (table 5).

*Table 5: Marine biogeographic classification datasets, that have features in the South-East Pacific, and their source. Tick marks indicate that UNEP-WCMC has metadata sheets of a given dataset.*

| RESOURCE | SOURCE | METADATA |
|---|---|---|
| Marine Ecoregions and Pelagic Provinces of the World (2007; 2012) | The Nature Conservancy | ✓ |
| A Proposed Biogeography of the Deep Oceans (2013) | Watling et al. (2013) | |
| Coral Ecoregions of the World | Veron et al. (2009) | ✓ |
| Large Marine Ecosystems (LMEs) of the World (2013) | NOAA's LME Portal | ✓ |
| Geomorphology of the Oceans (2014) | Harris et al. (2014) | |
| Global Distribution of Seamounts and Knolls | Yesson et al. (2011) | ✓ |
| Global Seamount Database | Kim and Wessel (2011) | |
| Global Distribution of Hydrothermal Vents | Baker et al. (2010) | ✓ |
| Global Distribution of Hydrothermal Vent Fields | Beaulieu (2013) | ✓ |
| Global Distribution of Cold Seeps | Baker et al. (2010) | ✓ |
| Global Estuary Database | Alder (2003), Sea Around Us | ✓ |

[5] Galvez, M. (2009). Applying the CBD 'EBSA' criteria for identifying ecologically or biologically significant marine areas in need of protection (CBD COP IX Resolution IX/20) to the Nazca and Salas y Gomez submarine ridges. World Wildlife Fund Chile. URL: https://www.cbd.int/doc/meetings/mar/ebsa-ettp-01/other/ebsa-ettp-01-wwfchile-01-en.pdf.

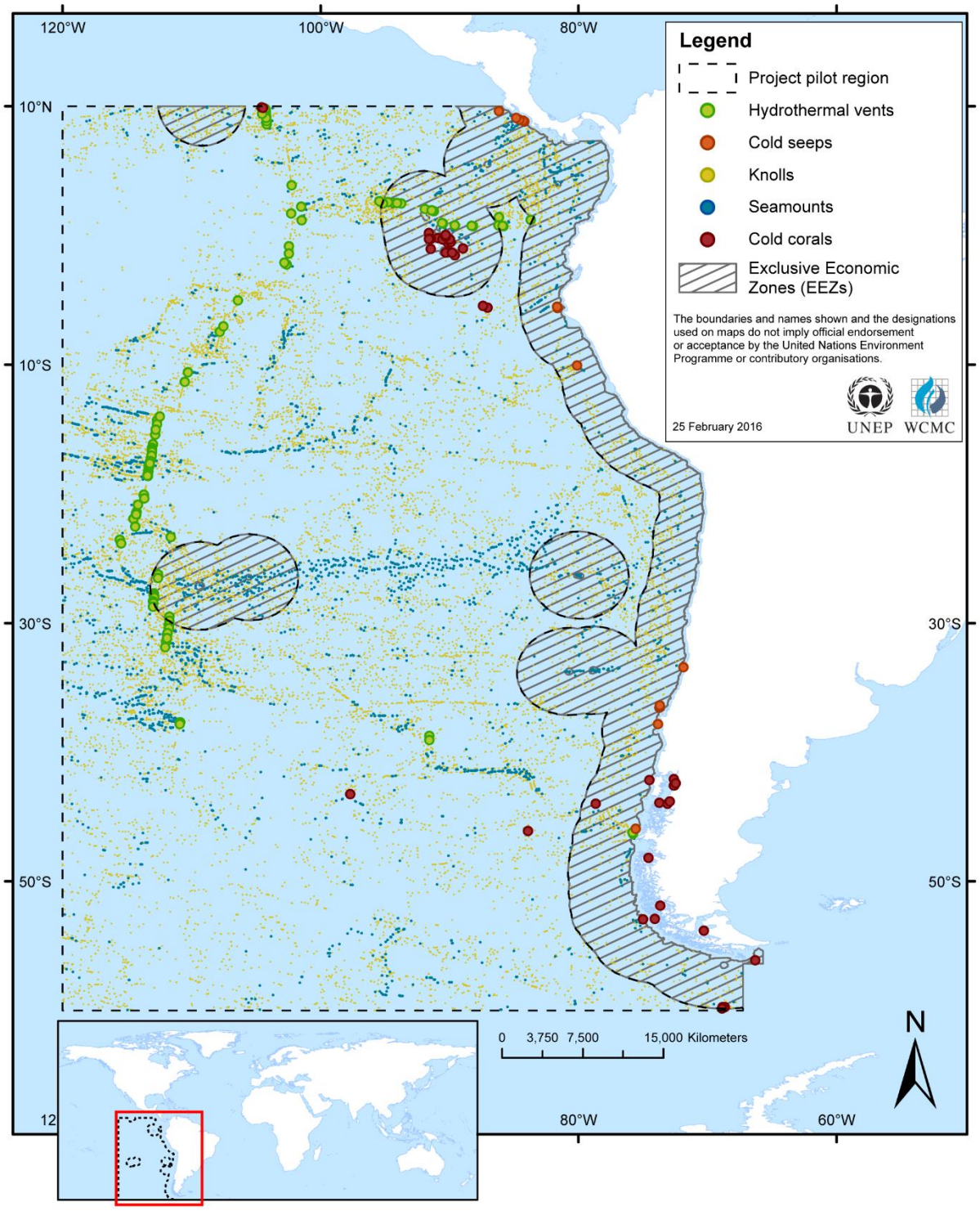



*Figure 3.* Examples of biogeographic classifications (hydrothermal vents, Beaulieu et al., 2013; cold seeps, Baker et al., 2010; seamounts and knolls, Yesson et al., 2011) and biogenic habitats (cold corals, Freiwald et al., 2005) in the South East Pacific. For an interactive PDF of features, see Annex 2.

## Environmental descriptors

Environmental descriptors are defined here as variables that can be used to depict the environment. These include physical (e.g., bathymetry, seabed sediment type) and environmental (e.g., temperature, salinity) variables, as well as biological variables such as

productivity. Environmental descriptors can be used to monitor environmental changes through space and time, and as predictors for use in species distribution modelling. Within the South East Pacific, these include variables such as chlorophyll-a concentration, which is linked to an ecosystem's level of primary productivity, particularly in regions of high upwelling such as those along the west coast of South America and along the Equatorial High-Productivity Zone (table 6).

*Table 6: Marine environmental descriptor datasets, that have features in the South-East Pacific, and their source. Tick marks indicate that UNEP-WCMC has metadata sheets of a given dataset.*

| RESOURCE | SOURCE | METADATA |
|---|---|---|
| General Bathymetric Chart of the Oceans | British Oceanographic Data Centre | |
| International Bathymetric Chart of the South East Pacific (IBCSEP) | NOAA's National Centers for Environmental Information (NCEI) | |
| Global Sediment Map (marine realm) | Service Hydrographique et Océanographique de la Marine | |
| Global Marine Environmental Dataset | Institute of Marine Science, University of Auckland | |
| Bio-ORACLE: a Global Environmental Dataset for Marine Species Distribution Modelling, Tyberghein et al. (2012) | Phycology Research Group, Ghent University | |
| Mean Sea Surface Productivity in June and December 2003-2007 (2008) | Ocean Data Viewer | ✓ |
| Mean Annual Sea Surface Chlorophyll-a Concentration 2009-2013 (2015) | Ocean Data Viewer | ✓ |
| Mean Annual Sea Surface Temperature 2003-2007 (2008) | Ocean Data Viewer | ✓ |
| Mean Annual Sea Surface Temperature 2009-2013 (2015) | Ocean Data Viewer | ✓ |

## Ecosystem services and natural capital

Ecosystem services are the benefits people obtain from ecosystems. These include *provisioning services* such as food and water, *regulating services* such as regulations of floods, drought, land degradation, and disease, *supporting services* such as soil formation and nutrient cycling, and *cultural services* such as recreational, spiritual, religious, and other non-material benefits (DEFRA 2007). Global datasets of ecosystem services and natural capital are listed in Table 7.

*Table 7: Ecosystem services and natural capital datasets, that have features in the South-East Pacific, and their source. Tick marks indicate that UNEP-WCMC has metadata sheets of a given dataset.*

| RESOURCE | SOURCE | METADATA |
|---|---|---|
| Mapping Ocean Wealth | The Nature Conservancy | ✓ |
| A Global Map of Natural Capital | Dickson et al. (2014) | ✓ |
| Marine Ecosystem Services Partnership | Nicholas Institute for Environmental Policy Solutions, Duke University | ✓ |
| A Global Map of Coastal Recreation Values | Ghermandi and Nunes 2013 | |
| Sea Around Us | Sea Around Us, University of British Columbia | ✓ |
| Ocean Past Initiative | Maritime Historical Studies Centre, University of Hull | |

## Ecological status and impact

Ecological status describes the degree to which human uses of the environment have altered the structure and functioning of plant and animal communities. A geographical area can be assigned an ecological status class (e.g., high, good, moderate, poor or bad) depending on the degree of alteration to the environment in that location. For instance, a *high* ecological status corresponds to areas relatively undisturbed by man, and *good* ecological status to areas where human activities have had only slight impacts on the ecological characteristics of local plants and animals communities. Impact here is understood in the broadest sense of the term, encompassing disease affecting ecosystems to human impact through diving. Indicators created from measurements of these impacts are used to track changes in ecological status over time. Datasets capturing this kind of information are listed in Table 8.

*Table 8: Ecological status and impact datasets that have features in the South-East Pacific and their source. Tick marks indicate that UNEP-WCMC has metadata sheets of a given dataset.*

| RESOURCE | SOURCE | METADATA |
|---|---|---|
| A Global Map of Human Impacts to Marine Ecosystems | Halpern et al. (2008) | |
| Spatial and temporal changes in cumulative human impacts on the world's ocean | Halpern et al. (2015) | |
| Global Data for the Ocean Health Index | Ocean Health Index (2015) | |
| Environmental Performance Index | Hsu et al. (2016) | ✓ |
| Living Planet Index | Zoological Society of London and WWF (2014) | ✓ |
| Reefs at Risk | Burke et al. (1998) | |
| Reefs at Risk Revisited | Burke et al. (2011) | |
| Coral Reef Watch | NOAA Coral Reef Watch (2013) | |
| Global Coral Disease Database | UNEP-WCMC and NOAA (2010) | |
| Fishing Gear Associated with Global Marine Catches | Watson et al. (2004) | |
| Global and Regional Assessments of the Marine Environment Database (GRAMED) | UNEP-WCMC (2008) | |
| Plastic Debris in the Open Ocean | Cózar et al. (2014) | |
| Global Restoration Network Database | Society for Ecological Restoration (2017) | |
| Submarine Cables | ICPC (2014) | |

## Databases and data portals

The databases and data portals listed here offer collections of available data and tools that are relevant to marine and coastal biodiversity globally, but cover regional features within the South East Pacific. These include taxonomic databases that curate classifications and nomenclature for marine and coastal species, and thereby support awareness and management of global marine biodiversity (Table 9).

*Table 9: Databases and data portals, that have features in the South-East Pacific, and their source. Tick marks indicate that UNEP-WCMC has metadata sheets of a given dataset.*

| RESOURCE | SOURCE | METADATA |
|---|---|---|
| Ocean Data Viewer | UNEP-WCMC (2017) | ✓ |
| Knowledge Network for Biocomplexity (KNB) | NCEAS, University of California | ✓ |
| PANGAEA | Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research | ✓ |
| FishBase | FishBase Consortium | ✓ |
| ReefBase | The WorldFish Center | |
| Map of Life | Yale University | |
| Global Distribution of Sea Turtles | Kot et al. (2015) (State of the World's Sea Turtles, SWOT) | |
| Environmental Data Explorer | United Nations Environment Programme (2016) | |
| UNEP Live | United Nations Environment Programme (2017) | |
| Atlas of Global Conservation | Hoekstra et al. (2010) | ✓ |
| Catalogue of Life | Species 2000 Secretariat, Naturalis Biodiversity Center and Roskov et al. (2015) | ✓ |
| World Porifera Database (sponges) | Van Soest et al. (2017) | |
| Mangrove Reference Database and Herbarium | Massó i Alemán et al. (2010) | |
| Species+ | UNEP-WCMC (2015) | |

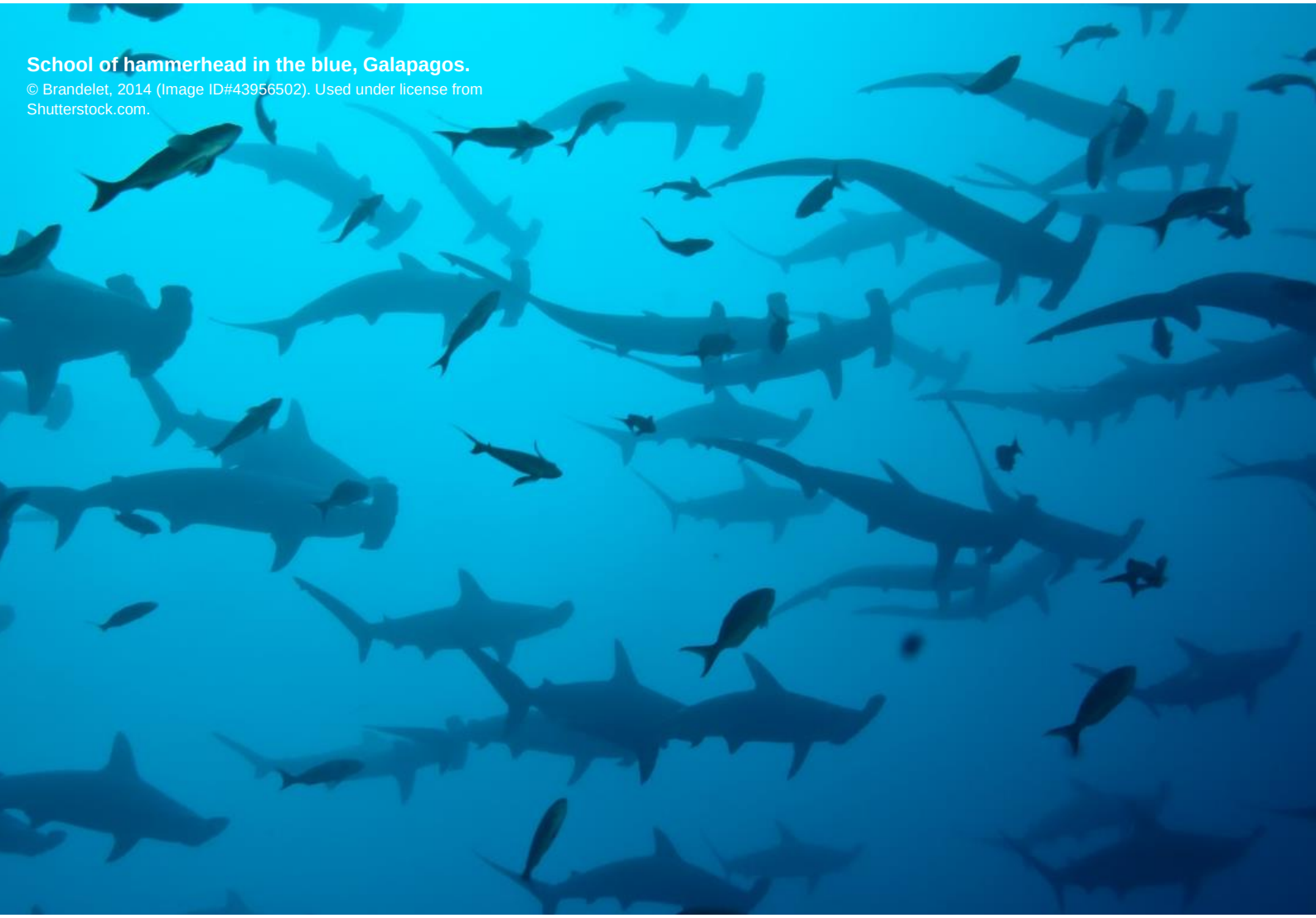
## Administrative regions

Administrative datasets are essential tools to support spatial analyses of marine and coastal biodiversity, whether for impact assessment, research, or conservation. The following datasets are global in breadth, but include data coverage for the South East Pacific pilot region. Figure 4 and Table 10 provides examples of these datasets.

*Table 10: Marine administrative region datasets, that have features in the South-East Pacific, and their source. Tick marks indicate that UNEP-WCMC has metadata sheets of a given dataset.*

| RESOURCE | SOURCE | METADATA |
|---|---|---|
| Global Self-consistent, Hierarchical, High-resolution Geography Database | School of Ocean and Earth Science and Technology, University of Hawaii | ✓ |
| Global Maritime Boundaries Database | General Dynamics Advanced Information Systems, Inc. (2008) | |
| Global Administrative Areas | Global Administrative Areas (2015) | |

| | | |
|---|---|---|
| Global Distribution of Islands IBPoW | UNEP-WCMC (2010) | ✓ |
| Global Distribution of Islands OSM | UNEP-WCMC (2015) | ✓ |
| Marine Regions Data Portal | Claus et al. (2017) | |
| Exclusive Economic Zone Boundaries | Claus et al. (2017) | ✓ |
| Boundaries of the Global International Waters Assessment | Division of Early Warning and Assessment, United Nations Environment Programme | ✓ |
| Global Distribution of Regional Fishery Bodies (2010) | FAO GeoNetwork | ✓ |
| Statistical Areas for Fishery Purposes (2016) | FAO GeoNetwork | |
| Global Distribution of Dive Centres (2001) | Ocean Data Viewer | ✓ |
| Global Distribution of Ports: World Port Index (2011) | National Geospatial - Intelligence Agency | |
| Continental Shelf Programme (2014) | GRID-Arendal | |



**School of hammerhead in the blue, Galapagos.**

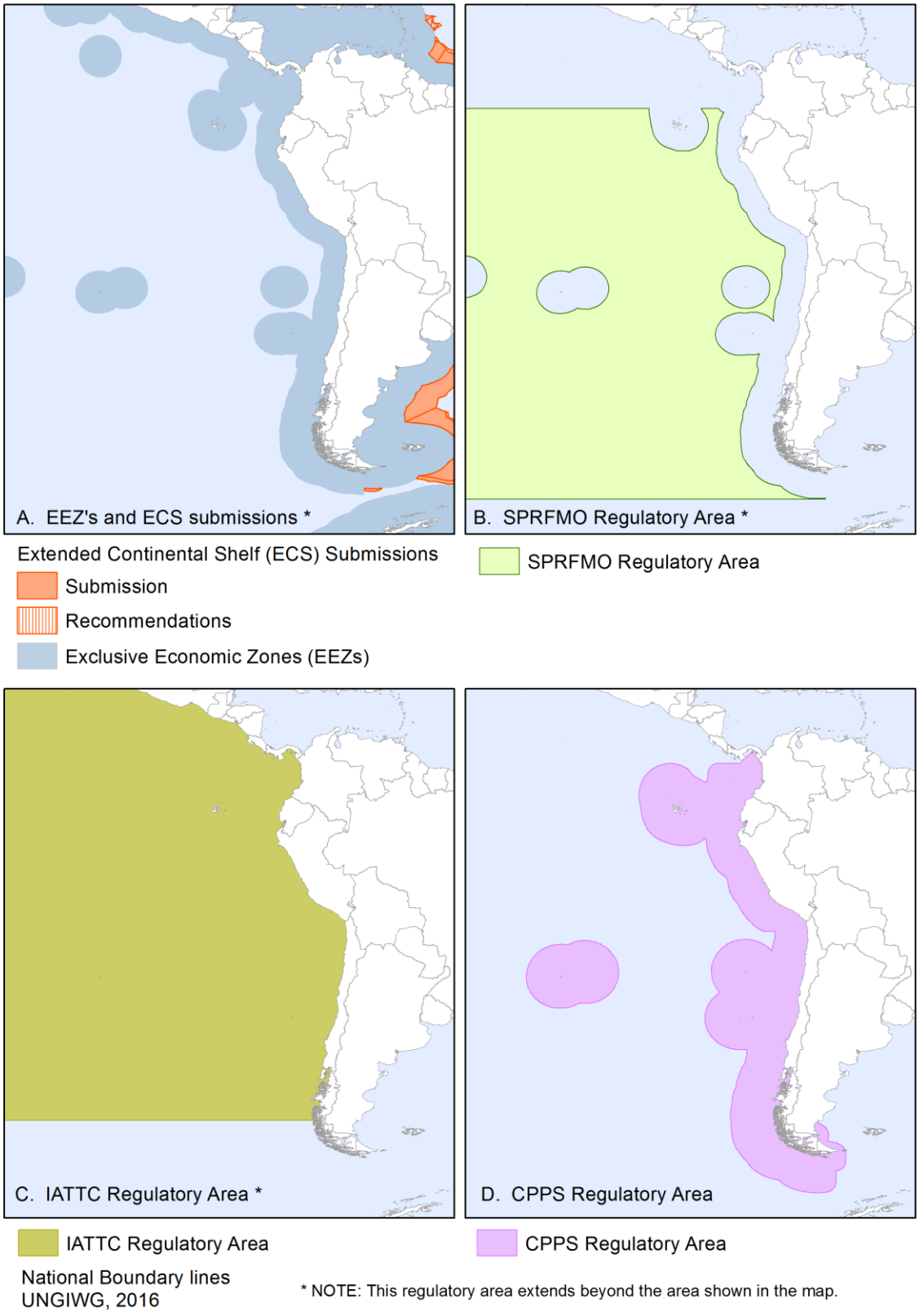



*Figure 4*. Examples of Administrative Regions in the South East Pacific , including A) Extended Continental Shelf submissions (ECS; VLIZ, 2014), and the administrative and coordinating areas of B) the South Pacific Regional Fisheries Management Organisation, C) Inter-American Tropical Tuna Commission and D) the Permanent Commission for the South Pacific (SPRFMO, IATTC, CPPS; FAO, 2010).

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# Annex 1. Dataset summary table

This annex lists global datasets of relevance to the South East Pacific, identifying 102 datasets, databases, and data portals. Detailed metadata are available for 50 of these records (compiled in Annex 3). Coloured shading in the table below are used to indicate that:

- the dataset can be viewed and/or downloaded from UNEP-WCMC's *Ocean Data Viewer*[6],
- more information about dataset access can be sought directly from UNEP-WCMC[7].

For all other datasets, information about data layer access can be found in the metadata (if available) or should be sought from the named contact organisation. **UNEP-WCMC does not distribute these datasets and, as conditions may change over time, makes no warranty regarding the accuracy of the information provided in this document.**

| Category | Dataset title | Version | Contact organisation | ID[8] | Metadata[9] | Access |
|---|---|---|---|---|---|---|
| Biogenic habitats | Global Distribution of Coral Reefs | 1.3 (2010) | UNEP-WCMC | WCMC-008 | ✓ | Ocean Data Viewer |
| | Global Distribution of Cold-water Corals | 2.0 (2005) | UNEP-WCMC | WCMC-001 | ✓ | Ocean Data Viewer |
| | Global Distribution of Habitat Suitability for Stony Corals on Seamounts (2009) | -- | UNEP-WCMC | WCMC-024 | | Contact UNEP-WCMC |
| | Global Distributions of Habitat Suitability for Cold-Water Octocorals (2012) | 1.0 (2012) | Institute of Zoology, Zoological Society of London | ZSL-001 | ✓ | Ocean Data Viewer |
| | Global Spatiotemporal Database of Mangrove Forest Cover (2014) | -- | Salisbury University | UniSal-001 | | Hamilton and Casey (2014) |

[6] http://data.unep-wcmc.org. For commercial use of these datasets, please contact business-support@unep-wcmc.org.
[7] For non-commercial use, please contact marine@unep-wcmc.org; for commercial use, contact business-support@unep-wcmc.org.
[8] Internal UNEP-WCMC numbering system within our metadata catalogue.
[9] Metadata available in Annex 3.

| Category | Dataset title | Version | Contact organisation | ID[8] | Metadata[9] | Access |
|---|---|---|---|---|---|---|
| Biogenic habitats | Global Distribution of Modelled Mangrove Biomass | 2014 | The Nature Conservancy | TNC-001 | ✓ | Ocean Data Viewer |
| | Global Distribution of Mangroves USGS (2011) | 1.3 | UNEP-WCMC | WCMC-010 | ✓ | Ocean Data Viewer |
| | World Atlas of Mangroves (2010) | 1.0 | Spalding et al. (2010) | WCMC-011 | ✓ | Ocean Data Viewer |
| | World Mangrove Atlas (1997) | 1.0 | UNEP-WCMC | WCMC-012 | ✓ | Ocean Data Viewer |
| | Global Distribution of Saltmarsh (unpublished) | 1.0 (Nov. 2013) | UNEP-WCMC | WCMC-027 | ✓ | Contact UNEP-WCMC |
| Species habitat | Global Distributions of Habitat Suitability for Sea Turtle Nesting Sites (2012) | -- | State of the World's Sea Turtles | SWOT-002 | | Sea Turtle Status |
| | Global Distribution of Sea Turtle Nesting Sites (1999) | 1.1 (May 2015) | UNEP-WCMC | WCMC-007 | ✓ | Ocean Data Viewer |
| | Global Spawning Aggregations Database | -- | Science and Conservation of Fish Aggregations | SCRFA-001 | | Global Spawning Aggregations Database |
| Species distributions | Data Portal of the Global Biodiversity Information Facility | -- | Global Biodiversity Information Facility | GBIF-001 | | GBIF |
| | Ocean Biogeographic Information System (OBIS) | -- | OBIS Secretariat, Intergovernmental Oceanographic Commission (UNESCO) | OBIS-003 | ✓ | OBIS |
| | Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations | -- | Marine Geospatial Ecology Lab, Duke University | OBIS-004 | | OBIS-SEAMAP |
| | Spatial Data for the Red List of Threatened Species | May 2015 | International Union for Conservation of Nature | IUCN-001 | | IUCN Red List |
| | Corrected and Refined Mangrove Species Ranges (2014) | 1.0 (Dec. 2014) | UNEP-WCMC | IUCN-002 | ✓ | Contact UNEP-WCMC |
| | Global Register of Migratory Species (GROMS) | 2004 | Zoologisches Forschungsinstitut und Museum Alexander Koenig | GROMS-001 | | GROMS |

| Category | Dataset title | Version | Contact organisation | ID[8] | Metadata[9] | Access |
|---|---|---|---|---|---|---|
| Species distributions | AquaMaps: Predicted Range Maps for Aquatic Species (2013) | -- | AquaMaps, a joint project of FishBase and SeaLifeBase | AquaMaps-001 | | Contact UNEP-WCMC |
| | Global Distribution of Sperm Whales (2013) | 1.0 (August 2013) | Albert-Ludwigs-University of Freiburg | Kaschner-006 | ✓ | Contact UNEP-WCMC |
| | Global Distribution of Sei Whales (2013) | 1.0 (August 2013) | Albert-Ludwigs-University of Freiburg | Kaschner-009 | ✓ | Contact UNEP-WCMC |
| | Global Distribution of Melon-Headed Whales (2013) | 1.0 (August 2013) | Albert-Ludwigs-University of Freiburg | Kaschner-012 | ✓ | Contact UNEP-WCMC |
| | Global Shark Distribution Database | 2009 | Dalhousie University | UniDalh-002 | | Global Shark Distribution Database |
| | Ocean Tracking Network | -- | Dalhousie University | UniDalh-001 | | Ocean Tracking Network |
| | Wildlife Tracking | -- | | SeaTur-001 | | Wildlife Tracking |
| | Movebank | -- | Max Planck Institute for Ornithology | MovBnk-001 | | Movebank |
| | Tagging of Pacific Predators in the Pacific Ocean | -- | Hopkins Marine Station | TOPP-001 | | TOPP |
| Biodiversity sites | Global Distribution of KBAs, IBAs and AZEs | Released several times per year | Birdlife International | Birdlife-001 | ✓ | Contact UNEP-WCMC |
| | Global Distribution of Ecologically or Biologically Significant Marine Areas | -- | Secretariat for the Convention on Biological Diversity (CBD) | CBD-001 | | Ecologically or Biologically Significant Marine Areas |
| | Global Distribution of Particularly Sensitive Sea Areas | 1.0 (2014) | Claymoreclan Design | IMO-001 | ✓ | International Maritime Organization |
| | Global 200 Ecoregions | 2002 | World Wildlife Fund | WWF-001 | | Global 200 |
| | A Global Map of Critical Habitat (2015) as per IFC PS6 | 1.0 (August 2013) | UNEP-WCMC | WCMC-029 | ✓ | Contact UNEP-WCMC |

| Category | Dataset title | Version | Contact organisation | ID[8] | Metadata[9] | Access |
|---|---|---|---|---|---|---|
| Biodiversity sites | Global Diversity Hotspots and Conservation Priorities for Sharks | 2011 | Dalhousie University | Uni-Dahl-003 | | Lucifora et al. 2011 |
| | World Database on Protected Areas | Released monthly | UNEP-WCMC | WCMC-016 | ✓ | Protected Planet |
| Biogeographic classification | Marine Ecoregions and Pelagic Provinces of the World (2007; 2012) | 1.0 (May 2015) | The Nature Conservancy | WCMC-036 | ✓ | Ocean Data Viewer |
| | A Proposed Biogeography of the Deep Oceans | 2013 | University of Hawai'i | UniHaw-002 | | Contact watling@hawaii.edu |
| | Global Estuary Database | 2003 | Sea Around Us | UBC-003 | ✓ | Ocean Data Viewer |
| | Coral Ecoregions of the World | 1.0 (2009) | The Nature Conservancy | TNC-003 | ✓ | Contact j.veron@coralreefresearch.com |
| | Large Marine Ecosystems of the World | July 2013 | Large Marine Ecosystem Program, National Oceanic and Atmospheric Administration - Fisheries | NOAA-001 | ✓ | NOAA's LME Portal |
| | Longhurst Biogeographical Provinces | 2006 | Flanders Marine Institute | VLIZ-002 | | Marine Regions |
| | Geomorphology of the oceans | 2014 | GRID-Arendal | GridA-001 | | Blue Habitats |
| | Global Distribution of Seamounts and Knolls | 1.0 (2011) | Institute of Zoology, Zoological Society of London | ZSL-002 | ✓ | Ocean Data Viewer |
| | Global Seamount Database | 2011 | School of Ocean and Earth Science and Technology, University of Hawai'i | UniHaw-003 | | Global Seamount Database |
| | Global Distribution of Hydrothermal Vents | 3.0 (2010) | University of Southampton, National Oceanography Centre | ChEssBase-002 | ✓ | ChEss Database |
| | Global Distribution of Hydrothermal Vent Fields | 3.3 (Oct. 2015) | Woods Hole Oceanographic Institution | IntRid-001 | ✓ | InterRidge Vents Database |
| | Global Distribution of Cold Seeps | 3.0 (2010) | University of Southampton, National Oceanography Centre | ChEssBase-001 | ✓ | ChEssBase |
| Environmental descriptor | General Bathymetric Chart of the Oceans | 2008 | British Oceanographic Data Centre | GEBCO-001 | | GEBCO |

| Category | Dataset title | Version | Contact organisation | ID[8] | Metadata[9] | Access |
|---|---|---|---|---|---|---|
| Environmental descriptor | International Bathymetric Chart of the South East Pacific (IBCSEP) | -- | NOAA's National Centers for Environmental Information (NCEI) | NOAA-003 | | IBCSEP |
| | Global Sediment Map (marine realm) | 7.1 | Service Hydrographique et Océanographique de la Marine | SHOM-001 | | SHOM |
| | Global Marine Environmental Dataset | 2014 | Institute of Marine Science, University of Auckland | GMED-001 | | GMED |
| | Bio-ORACLE: a Global Environmental Dataset for Marine Species Distribution Modelling | 2012 | Phycology Research Group, Ghent University | Ghent-001 | | Bio-ORACLE |
| | Mean Sea Surface Productivity in June and December 2003-2007 (2008) | -- | UNEP-WCMC | WCMC-020-021 | ✓ | Ocean Data Viewer |
| | Mean Annual Sea Surface Chlorophyll-a Concentration 2009-2013 (2015) | 1.0 (April 2015) | UNEP-WCMC | WCMC-034 | ✓ | Ocean Data Viewer |
| | Mean Annual Sea Surface Temperature 2003-2007 (2008) | -- | UNEP-WCMC | WCMC-022 | ✓ | Ocean Data Viewer |
| | Mean Annual Sea Surface Temperature 2009-2013 (2015) | 1.0 (May 2015) | UNEP-WCMC | WCMC-035 | ✓ | Ocean Data Viewer |
| Ecosystem services and natural capital | Mapping Ocean Wealth | -- | The Nature Conservancy | TNC-004 | ✓ | Mapping Ocean Wealth |
| | A Global Map of Natural Capital | 1.0 (2014) | UNEP-WCMC | WCMC-032 | ✓ | UNEP-WCMC |
| | Marine Ecosystem Services Partnership | -- | Nicholas Institute for Environmental Policy Solutions, Duke University | UniDuke-001 | ✓ | MESP |
| | A Global Map of Coastal Recreation Values | 2013 | University of Haifa | UniHaif-001 | | Ghermandi and Nunes 2013 |
| | Sea Around Us | -- | Sea Around Us, University of British Columbia | UBC-009 | ✓ | Sea Around Us |
| | Ocean Past Initiative | -- | Maritime Historical Studies Centre, University of Hull | HMAP-001 | | HMAP |
| Ecological status and impact | A Global Map of Human Impacts to Marine Ecosystems | 2008 | NCEAS, University of California | NCEAS-001 | | NCEAS |

| Category | Dataset title | Version | Contact organisation | ID[8] | Metadata[9] | Access |
|---|---|---|---|---|---|---|
| Ecological status and impact | Spatial and temporal changes in cumulative human impacts on the world's ocean | 2015 | NCEAS, University of California | NCEAS-003 | | Halpern et al. 2015 |
| | Global Data for the Ocean Health Index | 2012 | NCEAS, University of California | NCEAS-002 | | Ocean Health Index |
| | Environmental Performance Index | 2014 | Yale University | Yale-002 | | EPI |
| | Living Planet Index | 2014 | Indicators and Assessments Unit, Zoological Society of London; World Wildlife Fund | WWF-002 | ✓ | LPI Data Portal |
| | Reefs at Risk | 1998 | World Resources Institute | WRI-001 | | Reefs at Risk |
| | Reefs at Risk Revisited | 2011 | World Resources Institute | WRI-002 | | Reefs at Risk Revisited |
| | Coral Reef Watch | -- | National Oceanic and Atmospheric Administration – Fisheries | NOAA-002 | ✓ | Coral Reef Watch |
| | Global Coral Disease Database | 1.0 (2010) | UNEP-WCMC | WCMC-004 | | Contact UNEP-WCMC |
| | Fishing Gear Associated with Global Marine Catches | 2008 | Sea Around Us, University of British Columbia | UBC-008 | | Sea Around Us |
| | Global and Regional Assessments of the Marine Environment Database | -- | UNEP-WCMC | WCMC-038 | | GRAMED |
| | Plastic Debris in the Open Ocean | 2014 | University of Cadiz | UniCadiz-001 | | Cózar et al. 2014 |
| | Global Restoration Network Database | -- | Society for Ecological Restoration | SER-001 | | GRN Database |
| | Undersea Cables | -- | International Cable Protection Committee (ICPC) | ICPC-001 | | Interactive submarine cable map |
| Databases and data portals | Ocean Data Viewer | 2015 | UNEP-WCMC | WCMC-039 | ✓ | Ocean Data Viewer |
| | Knowledge Network for Biocomplexity (KNB) | -- | NCEAS, University of California | NCEAS-004 | ✓ | KNB |

| Category | Dataset title | Version | Contact organisation | ID[8] | Metadata[9] | Access |
|---|---|---|---|---|---|---|
| Databases and data portals | PANGAEA | -- | Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research | AWI-001 | ✓ | PANGAEA |
| | FishBase | 04/2015 | FishBase Consortium | FishBase-001 | ✓ | FishBase |
| | ReefBase | | The WorldFish Center | WorldFish-001 | | ReefBase |
| | Map of Life | -- | Yale University | Yale-001 | | MOL |
| | Global Distribution of Sea Turtles (2010) | -- | State of the World's Sea Turtles | SWOT-003 | | SWOT |
| | Environmental Data Explorer | -- | United Nations Environment Programme | UNEP-003 | | Environmental Data Explorer |
| | UNEP Live | -- | United Nations Environment Programme | UNEP-004 | | UNEP Live |
| | Atlas of Global Conservation | 2014 | The Nature Conservancy | TNC-002 | ✓ | Atlas of Global Conservation |
| | Catalogue of Life | -- | Species 2000 Secretariat, Naturalis Biodiversity Center | CoL-001 | ✓ | Catalogue of Life |
| | World Porifera Database (sponges) | -- | Flanders Marine Institute | VLIZ-006 | | World Porifera Database |
| | Mangrove Reference Database and Herbarium | -- | Flanders Marine Institute | VLIZ-005 | | Mangrove Reference Database and Herbarium |
| | Species+ | -- | UNEP-WCMC | WCMC-037 | | Species+ |
| Administration | Global Self-consistent, Hierarchical, High-resolution Geography Database | 2.3.4 (March 2015) | School of Ocean and Earth Science and Technology, University of Hawaii | UniHaw-001 | ✓ | University of Hawai'i |
| | Global Maritime Boundaries Database | 2008 | General Dynamics Advanced Information Systems, Inc. | GMBD-001 | | Global GIS Data Services |
| | Global Administrative Areas | 2.0 (Jan. 2012) | Global Administrative Areas | GADM-001 | | GADM |
| | Global Distribution of Islands IBPoW (2010) | 1.0 | UNEP-WCMC | WCMC-005 | ✓ | Contact UNEP-WCMC |

| Category | Dataset title | Version | Contact organisation | ID[8] | Metadata[9] | Access |
|---|---|---|---|---|---|---|
| Administration | Global Distribution of Islands OSM (2013) | 2.0 (2013) | UNEP-WCMC | WCMC-031 | ✓ | Contact UNEP-WCMC |
| | Marine Regions Data Portal | -- | Flanders Marine Institute | VLIZ-003 | | Marine Regions |
| | Exclusive Economic Zone Boundaries | 8.0 (2014) | Flanders Marine Institute | VLIZ-001 | ✓ | Marine Regions |
| | Boundaries of the Global International Waters Assessment | 2003 | Division of Early Warning and Assessment, United Nations Environment Programme | UNEP-001 | ✓ | GIWA |
| | Global Distribution of Regional Fishery Bodies (2010) | 2010 | Food and Agriculture Organization of the United Nations | FAO-001 | ✓ | FAO GeoNetwork |
| | Statistical Areas for Fishery Purposes | 2008 | Food and Agriculture Organization of the United Nations | FAO-003 | | FAO GeoNetwork |
| | Global Distribution of Dive Centres (2001) | 1.2 (June 2015) | UNEP-WCMC | WCMC-030 | ✓ | Ocean Data Viewer |
| | Global Distribution of Ports: World Port Index (2011) | -- | National Geospatial - Intelligence Agency | NG-AI-001 | | National Geospatial - Intelligence Agency |

# Annex 2. Interactive maps

This annex (distributed separately and previewed in Figure 4) displays interactive, regional maps in PDF format, enabling users to toggle (turn on/off) the map's layers.

These regional maps, focused on the South East Pacific project pilot region, are illustrative of a selection of datasets identified in this manual, including biodiversity sites (e.g., Key Biodiversity Areas, Important Bird and Biodiversity Areas, Alliance for Zero Extinction Sites, Ecologically or Biologically Significant Marine Areas, etc.), biogenic habitats (e.g., warm-water corals, mangroves), and biogeographic classifications (e.g., seamounts, knolls, hydrothermal vents).

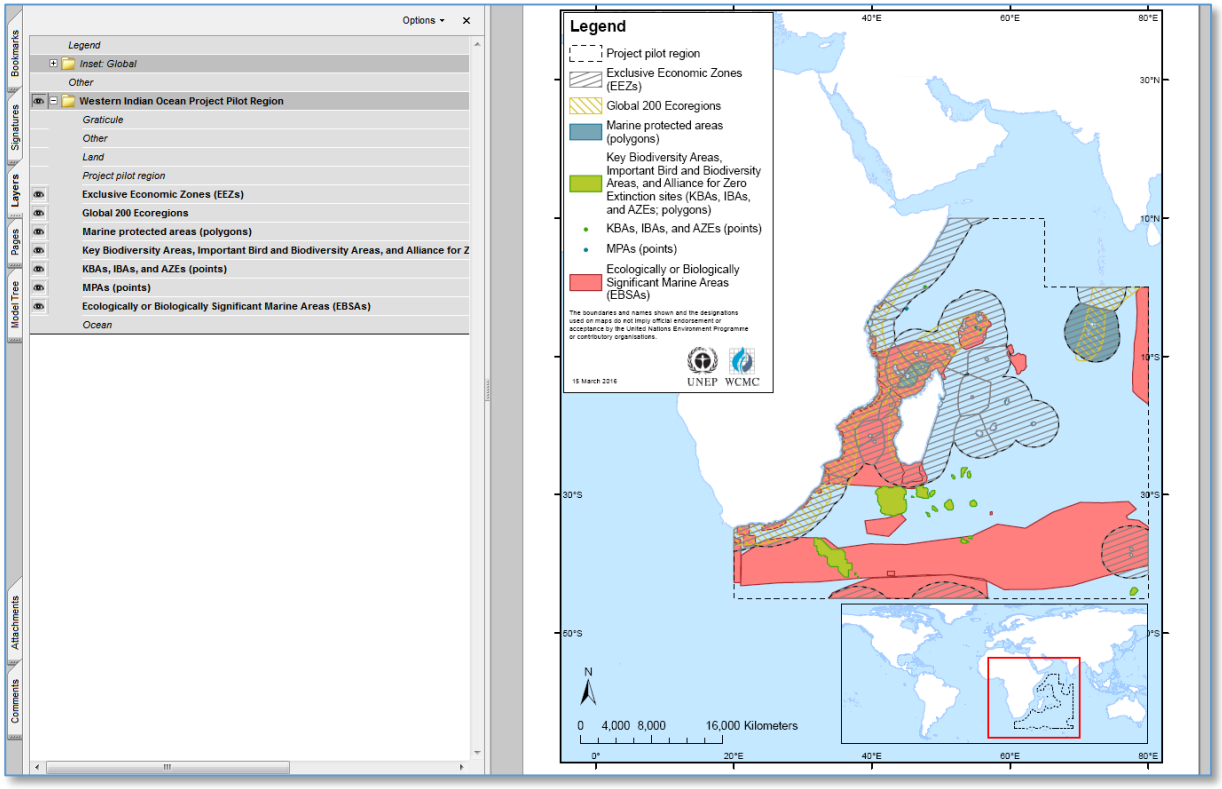


*Figure 4.* Preview of the separately-distributed Annex 2, which displays interactive maps that allow users to toggle on/off the map layer components.

# Annex 3. Detailed dataset-specific metadata

This annex (distributed separately and previewed in Figure 5) compiles the metadata sheets available for 50 of the datasets identified in this manual. Page numbers within Annex 3 are given overleaf.

The metadata format is based on the metadata database used by the British Geological Survey to meet international spatial metadata standards such as the European INSPIRE Directive or ISO 19115[10].

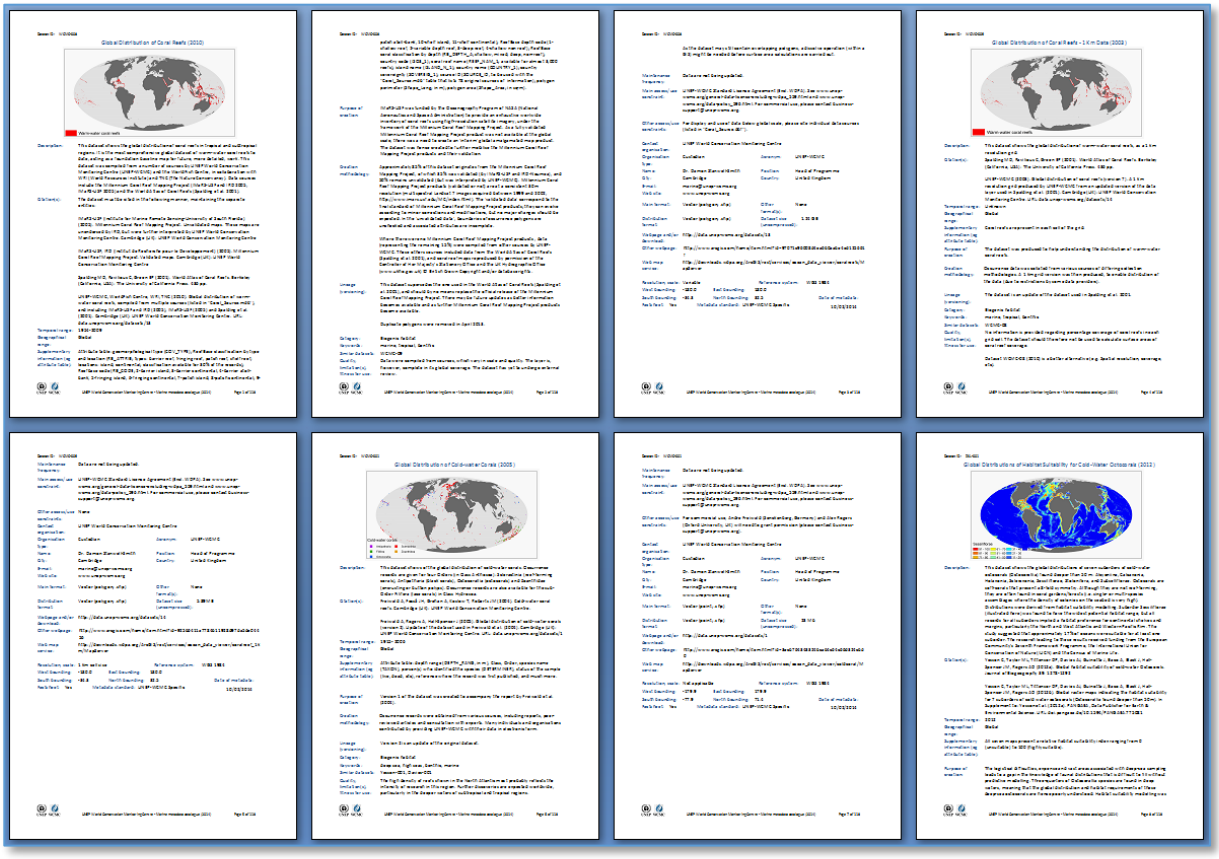

*Figure 5.* Preview of the separately-distributed Annex 3, which compiles all the dataset-specific metadata available for 50 of the datasets listed within this manual.

[10] For further details, see http://www.bgs.ac.uk/downloads/start.cfm?id=2880.

[11] Internal UNEP-WCMC numbering system as part of our metadata cataloguing.

| RESOURCE | ID[11] | PAGE |
|---|---|---|
| Global Distribution of Islands "IBPoW" (2010) | WCMC-005 | 117 |
| Global Distribution of Islands "OSM" (2015) | WCMC-031 | 120 |
| Exclusive Economic Zone Boundaries | VLIZ-001 | 123 |
| Regional Seas Boundaries (unofficial) | UNEP-002 | 126 |
| Boundaries of the Global International Waters Assessment (2003) | UNEP-001 | 128 |
| Global Distribution of Regional Fishery Bodies (2010) | FAO-001 | 130 |
| Global Distribution of Dive Centres (2001) | WCMC-030 | 133 |
| Global Marine Aquarium Database (2003) | WCMC-023 | 135 |

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