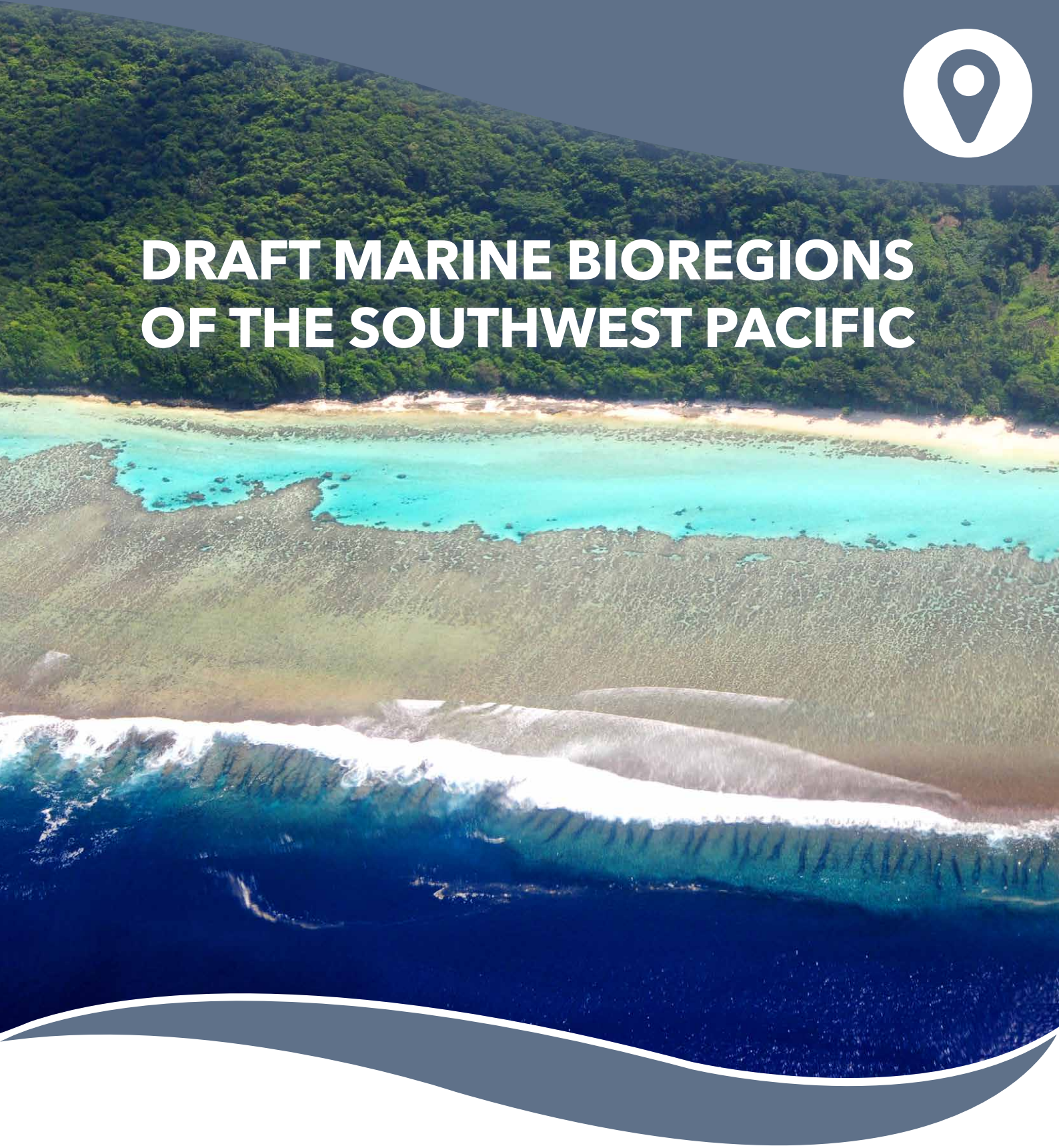

DRAFT MARINE BIOREGIONS OF THE SOUTHWEST PACIFIC

MACBIO

Marine and Coastal Biodiversity Management
in Pacific Island Countries

MARINE SPATIAL PLANNING

Marine Spatial Planning is an integrated and participatory planning process and tool that seeks to balance ecological, economic, and social objectives, aiming for sustainable marine resource use and prosperous blue economies.

The MACBIO project supports partner countries in collecting and analyzing spatial data on different forms of current and future marine resource use, establishing a baseline for national sustainable development planning.

Aiming for integrated ocean management, marine spatial planning facilitates the sustainable use and conservation of marine and coastal ecosystems and habitats.

The report outlines the technical process undertaken to develop draft marine bioregions across the SW Pacific at a scale useful for national planning. These marine bioregions provide a basis for identifying ecologically representative areas to include in national networks of marine protected areas.

For a copy of all reports and communication material please visit **www.macbio-pacific.info**

www.macbio-pacific.info

DRAFT MARINE BIOREGIONS OF THE SOUTHWEST PACIFIC

AUTHORS: Wendt H[1], Beger M[2], Sullivan J[3], LeGrand J[4], Davey K[1], Yakub N[1], Kirmani SN[5], Grice H[6], Mason C[7], Raubani J[8], Lewis A[9], Jupiter S[10], Hughes A[11], Fernandes L[1]

2018

MACBIO
Marine and Coastal Biodiversity Management in Pacific Island Countries

SPREP
Secretariat of the Pacific Regional Environment Programme

IUCN

giz
On behalf of:
Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
of the Federal Republic of Germany

AUTHOR AFFILIATIONS

1 International Union for the Conservation of Nature – Oceania Regional Office (IUCN-ORO)
2 University of Leeds (previously University of Queensland)
3 Geoscience Australia (previously IUCN-ORO)
4 Legacy Property and Investment Group (previously IUCN-ORO)
5 Wildlife Conservation Society (previously IUCN-ORO)
6 University of Leeds
7 University of Queensland
8 Secretariat of the Pacific Community
9 Geoscience Australia
10 Wildlife Conservation Society
11 Coastal Marine Management Ltd and Wildlife Conservation Society

© MACBIO 2018

All MACBIO Project partners including the Secretariat of the Pacific Regional Environment Programme (SPREP), the International Union for Conservation of Nature (IUCN) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) are the inherent copyright owners of this publication. Reproduction of this publication for educational or other non-commercial uses is authorized without prior written permission from the copyright holder(s) provided the source is fully acknowledged. Reproduction of this publication for resale or other commercial purposes is prohibited without prior written permission of the copyright holder(s). The designation of geographical entities in this publication, and the presentation of the material do not imply the expression of any opinion whatsoever on the part of SPREP, IUCN, GIZ or the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) concerning the legal status of any country, territory, or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries. This document has been produced with funds provided by the International Climate Initiative (IKI). BMUB supports this initiative on the basis of a decision adopted by the German Bundestag. The views expressed herein should not be taken, in any way, to reflect the official opinion of the Federal Government of Germany.

The views expressed in this publication do not necessarily reflect those of SPREP/IUCN/GIZ/BMUB.

MACBIO holds the copyright of all photographs, unless otherwise indicated.

Recommended citation: Wendt H, Beger M, Sullivan J, LeGrand J, Davey K, Yakub N, Kirmani S, Grice H, Mason C, Raubani J, Lewis A, Jupiter S, Hughes A, Fernandes L (2018) Draft marine bioregions in the Southwest Pacific. MACBIO (GIZ/IUCN/SPREP): Suva, Fiji. 84 pp.

MACBIO

Marine and Coastal Biodiversity Management in Pacific Island Countries

CONTENTS

TABLES

FIGURES

SUPPLEMENTARY MATERIAL[1]

[1] Available http://macbio-pacific.info/macbio-resources/ under the "Planning" tab

EXECUTIVE SUMMARY

Marine spatial planning is underway now, or starting, in many Pacific Island countries. This planning aims, amongst other things, to achieve the Convention on Biological Diversity's (CBD) Aichi Target 11 which states, in part, that at least 10 per cent of coastal and marine areas are conserved through ecologically representative and well-connected systems of protected areas.

However, means for countries, who have signed on to the CBD, to achieve an ecologically representative system of marine protected areas is missing. There are not perfect data which describe the distribution and abundance of every marine habitat and species in the Pacific. And certainly not at a scale that is useful for national planning in the ocean. Bioregionalisation, or the classification of the marine environment into spatial units that host similar biota, can serve to provide spatially explicit surrogates of biodiversity for marine conservation and management.

Existing marine bioregionalisations however, are at a scale that is too broad for national governments in the Pacific to use. Often whole countries are encompassed in just one or two bioregions (or ecoregions).

This report presents, for the first time, marine bioregions across the Southwest Pacific at a scale, which can be used nationally, as a basis for the systematic identification of an ecologically representative system of marine protected areas.

Bioregions, of course, are just one of the important data layers in indentifying an ecologically representative system of marine protected areas. To be truly ecologically representative and comprehensive, one must also consider all available information about habitats, species and ecological processes. In addition, socio-economic and cultural considerations are vital in the spatial planning process. This report is focussed upon one important, but only one, input to marine spatial planning: the development of marine bioregions.

To take account of differing types and resolution of data, two separate bioregionalisations were developed; firstly, for the deepwater environments and secondly for reef-associated environments. For the deepwater, thirty, mainly physical, environmental variables were assessed to be adequately comprehensive and reliable to be included in the analysis. These data were allocated to over 140 000 grid cells of 20x20 km across the Southwest Pacific. K-means and then hierarchical cluster analyses were then conducted to identify groups of analytical units that contained similar environmental conditions. The number of clusters was determined by examining the dendrogram and setting a similarity value that aligned with a natural break in similarity.

For the second bioregionalisation, reef-associated datasets of more than 200 fish, coral and other invertebrate species were collated from multiple data providers who sampled over 6500 sites. We combined these datasets, which were quality-checked for taxonomic consistency and normalised, resulting in more than 800 species that could be used in further analysis. All these species data and seven independent environmental datasets were then allocated to over 45 000 grid cells of 9x9 km across the SW Pacific. Next, the probability of observing these species was predicted, using the environmental variables, for grid cells within the unsurveyed reef-associated habitats. Hierarchical cluster analysis was then applied to the reef-associated datasets to deliver clusters of grid cells with high similarity.

The final analytical steps, applied to all the outputs, were to refine the resulting clusters using manual spatial processing and to describe each cluster to deliver the draft bioregions. This work resulted in 262 draft deepwater marine bioregions and 102 draft reef-associated bioregions across the SW Pacific.

People's expertise in the Pacific marine environment extends beyond the available datasets. An important, subsequent, non-analytical step, not described in this report, will be to review and refine the resultant draft bioregions with marine experts in the respective Pacific Island countries and territories prior to their use in planning.

By ensuring that each marine bioregion, once revised and finalised, is represented adequately within national networks of marine protected areas, governments can ensure that the network is ecologically representative as per their commitment under the Convention of Biological Diversity. More importantly, they can ensure effective protection of examples of their entire marine environment.

1 INTRODUCTION

Pacific Island countries are moving towards more sustainable management of their marine and coastal resources (e.g. see Pratt and Govan 2011, Pacific Island Country Voluntary Commitments at the United Nations Ocean conference) and many are also party to the Convention on Biological Diversity (CBD))[2]. Although the land area of these countries is small, they have authority over large ocean spaces within their Exclusive Economic Zones (EEZs), with 98% of most countries being ocean.

Pacific Island countries who are signatory to the CBD have committed to an ecologically representative system of Marine Protected Areas (MPAs)(see box below)[3]. In addition, several leaders from the region have made commitments to better protect large parts or all of their EEZs. Many of these commitments were declared internationally and are being implemented nationally. For example, Tonga, Fiji and Micronesian countries who have signed onto the Micronesia Challenge[4] have committed to protect 30% of their marine environment in marine protected areas.

> CBD Aichi Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Kiribati and the Cook Islands have already put in place significant measures to protect their marine environment, creating the Phoenix Islands Protected Area and the Marae Moana Marine Park respectively[5]. Many are also committed to integrating their national networks of MPAs into wider seascapes through national Marine Spatial Plans (e.g. Vanuatu, Tonga and the Solomon Islands[6].

There are a number of initiatives from international, regional, national and local organisations that are assisting Pacific Island countries in achieving their national goals in marine and coastal resource management (e.g. see projects being run by the Secretariat of the Pacific Regional Environment Program, the Pacific Community, the Forum Fisheries Agency, the Office of the Pacific Ocean Commissioner, the International Union for the Conservation of Nature – Oceania Regional Office, the CBD Secretariat[7]). Many Civil Society Organisations and Non-Government Organisations are also well established in the region and have, over the years, supported Pacific Island Countries in the management and protection of their environment both at the local community scale and at national and regional levels (e.g. see projects by the Wildlife Conservation Society, the Locally Managed Marine Area Network, WWF-Pacific, the Coral Triangle, Conservation International[8]).

However, for those countries where marine planning is underway to achieve Aichi targets, there is a lack of an effective way to systematically represent biodiversity. None of the previous work has provided an ocean-wide description of the marine environment at the scales needed for national marine spatial planning, and decisions about locations of ecologically representative MPAs within and across countries.

The Marine and Coastal Biodiversity Management in Pacific Island Countries (MACBIO) is a project funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) through its International Climate Initiative (IKI). The Project is helping the countries to improve management of marine and coastal biodiversity at the national level including to meet their commitments under the CBD Strategic Plan for Biodiversity 2011–2020 such as relevant Aichi Biodiversity Targets. MACBIO is implemented by the Deutsche Gesellschaft für Internationale

2 https://oceanconference.un.org/commitments/, www.cbd.int/information/parties.shtml, www.cbd.int/sp/targets/ accessed 28/9/17

3 www.cbd.int/sp/targets/ accessed 28/9/17

4 https://themicronesiachallenge.blogspot.com.au/p/about.html

5 www.phoenixislands.org, www.maraemoana.gov.ck accessed 28/9/17

6 oceanconference.un.org/ commitments accessed 28/9/17

7 www.sprep.org, www.spc.int, www.ffa.int, www.forumsec.org/pages.cfm/strategic-partnerships- coordination/pacific-oceanscape pacific-ocean-commissioner, www.iucn.org/regions/oceania/our-work/conserving-biodiversity/marine-programme, www.cbd.int/secretariat accessed 28/9/17

8 fiji.wcs.org, lmmanetwork.org, www.wwfpacific.org, thecoraltriangle.com, www.conservation.org/where/Pages/Fiji.aspx accessed 28/9/17

Zusammenarbeit (GIZ) with the countries of Fiji, Kiribati, Solomon Islands, Tonga and Vanuatu. It has technical support from the Oceania Regional Office of the International Union for the Conservation of Nature (IUCN-ORO) and is working closely with the South Pacific Regional Environment Program (SPREP), see www.macbio-pacific.info.

MACBIO's objectives are to help ensure that: (1) The economic value of marine and coastal ecosystem services is considered in national development planning; (2) Exclusive economic zone-wide spatial planning frameworks are used to align national marine and coastal protected area systems with the requirements of ecosystem conservation; and (3) Best practices for managing MPAs, including payments for environmental services, are demonstrated at selected sites.

Under the second objective, the project is assisting governments with their Marine Spatial Planning (MSP) processes to better manage the different uses of marine resources. For the countries that MACBIO is working with, the MSP process is also aiming to include a national ecologically-representative network of marine protected areas (MPAs). In principle, this requires complete and accurate spatial biodiversity data, which are rarely available. Bioregionalisation, or the classification of the marine environment into spatial units that host similar biota, can serve to provide spatially explicit surrogates of biodiversity for marine conservation and management (Fernandes et al. 2005, Last et al. 2010, Fernandes et al. 2012, Terauds et al. 2012, Foster et al. 2013, Rickbeil et al. 2014). Bioregions define areas with relatively similar assemblages of biological and physical characteristics without requiring complete data on all species, habitats and processes (Spalding et al. 2007). This means, for example, that seamounts within a bioregion will be more similar to each other than seamounts in another bioregion. Similarly, for example, seagrasses beds within one bioregion will be more similar to each other than seagrass beds in another bioregion. An ecologically representative system of MPAs can then be built by including examples of every bioregion (and, every habitat, where known) within the system. Defining bioregions across a country mitigates against ignoring those areas about which no or little data are available.

The MACBIO project has built draft marine bioregions across the Southwest Pacific for use by Pacific Island countries in their national marine spatial and marine protected area planning processes. By ensuring that each marine bioregion, once revised and finalised, is represented adequately within national networks of marine protected areas, governments can ensure that the network is ecologically representative as per their commitment under the Convention of Biological Diversity. More importantly, they can ensure effective protection of examples of their entire marine environment.

1.1 AIMS OF THE BIOREGIONALISATION

Our marine bioregionalisation aims to support national planning efforts in the Pacific. This report describes the technical methods used by the MACBIO project to classify the entire marine environment within the MACBIO participating countries to inform, in particular, their national marine spatial and marine protected area planning efforts. The draft outputs are marine bioregions that include reef-associated and deepwater biodiversity assemblages with complete spatial coverage at a scale useful for national planning. Results are in the process of being presented to the marine experts and governments of the five countries for their review. The preliminary marine bioregions, once reviewed by these national experts, will provide a biological and environmental basis for each country's MSP process. Specifically, it allows for the identification of candidate sites for a ecologically-representative system of MPAs in each country.

Spatial planning for marine protected areas, including ecologically representative marine protected areas, requires much more than just holistic description of the marine environment in which one is working. Whilst marine bioregions can form an important biophysical data layer in planning, to be truly ecologically representative and comprehensive, one must also consider all available information about habitats, species and ecological processes (Lewis et al. 2017, Ceccarelli et al. In prep). Marine bioregions are useful because they offer insurance against ignoring parts of the ocean were data are incomplete or, even, absent. In the planning process overall, however, socio-economic and cultural considerations and data are also vital (Lewis et al. 2017). This report is focussed upon one important, but only one, input to marine spatial planning: the development of marine bioregions.

The outputs presented here are also relevant for planning and management applications in other Pacific Island countries, territories and in Areas Beyond National Jurisdiction (ABNJ) since the biological boundaries of the bioregions extend beyond the boundaries of the five countries included in the MACBIO project.

2 RATIONALE

The decline of marine biodiversity and ecosystem services is a worldwide problem and requires better management (Jackson et al. 2001, Worm et al. 2006, Mora 2008, Beger et al. 2015, Klein et al. 2015). This has been recognised at the global level and countries are trying to address the problem through national efforts, multi- and bi-lateral initiatives and other agreements and commitments. For example, over 1400 Voluntary Commitments to improve ocean management were made at the United Nations Ocean Conference in June 2017[9]. This includes at least 130 Pacific-specific targets. In order to achieve these targets, many nations are currently in the process of zoning their marine and coastal areas for better management and greater protection. The placement and effective designation of sites as MPAs within each country requires the full representation of marine biodiversity in conservation and management areas, whilst considering socio-economic and cultural needs.

In data-poor regions, such as the Pacific, representing marine biodiversity based on comprehensive habitat and species information is impossible. Such cases require the use of biological proxies (Sutcliffe et al. 2014, Sutcliffe et al. 2015), such as environmental conditions (Grantham et al., 2010), non-comprehensive data collected at different spatial scales (Mellin et al. 2009), surrogate species (Olds et al. 2014, Beger et al. 2015), marine classifications (Green et al. 2009), expert decision-making (Brewer et al. 2009) or some combination of these (Kerrigan et al. 2011).

Since assemblages of marine species with similar life histories, often respond similarly to environmental conditions (Elith and Leathwick 2009), these species can be grouped for biogeographical predictions or ecological modelling (Treml and Halpin 2012). The probability of occurrence of such species groupings is often determined by the unique combinations of environmental parameters that are likely to drive the distribution of these groups. The classes resulting from unique combinations of environmental parameters can thus serve as surrogates for marine biodiversity that is otherwise unrecorded (Sutcliffe et al. 2015). In the marine realm, marine classification schemes also range from global (Spalding et al. 2007b, Vilhena and Antonelli 2015), regional (Keith et al. 2013, Kulbicki et al. 2013) to “local” scales (Fernandes et al. 2005, Green et al. 2009, Terauds et al. 2012), with many studies including multi-scale hierarchical classes (Spalding et al. 2007).

Many marine classification schemes are often based on specific taxonomic groups or habitats occurring in the target region. These include schemes based on shallow coral reef fishes (Kulbicki et al. 2013), or Scleractinian corals (Keith et al. 2013). Others use a mix of species distributions, environmental parameters, and expert opinion (Spalding et al. 2007b, Kerrigan et al. 2011, Terauds et al. 2012). Most schemes do not explicitly classify offshore or pelagic areas, which have often been seen as largely homogeneous and have been classified into very large scale ecoregions, such as in the Pacific (Longhurst 2006, Sherman et al. 2009, Spalding et al. 2012, Watling and et al. 2013, Sutton et al. 2017).

However, the existing bioregionalisations of marine environments (both coastal and offshore) are too coarse to inform most national planning processes (Figure 1). Often entire countries in the Pacific are classified into just three, two or even one marine region. This is despite known variability within and across the marine environment within Pacific Island countries, often identified by local experts. Reef-associated marine habitats are known to vary within the scale of Pacific Island countries with changing environment and coastal morphology (Chin et al. 2011). Offshore pelagic environments are also highly variable, and are shaped by dynamic oceanographic and biophysical factors (Game et al. 2009, Sutcliffe et al. 2015) that drive pelagic population dynamics.

In offshore environments, large scale environmental dynamics drive the distributions of primary producers such as phytoplankton and consumers such as zooplankton, as well as secondary consumers such as fishes, sea-birds, turtles, jellyfish, tuna, and cetaceans. For example, sea surface temperature (SST) can be the best predictor of species richness for most taxonomic groups (Tittensor et al. 2010). By contrast, species such as pinnipeds, non-oceanic sharks, and coastal fish that are associated with coastal habitats, are predicted by the length of coastline (Tittensor et al. 2010). Furthermore, changes in thermocline characteristics affect the productivity, distribution and abundance of marine fishes (Kitagawa et al. 2007, Schaefer et al. 2007, Devney et al. 2009). For instance, the depth of the 20 degree Celsius thermocline predicts bigeye tuna catches (Howell and Kobayashi 2006). Similarly, the patterns of zooplankton distributions depend on thermoclines; however these patterns are not necessarily associated with changes in productivity (Devney et al. 2009).

[9] oceanconference.un.org/ commitments accessed 28/9/17

Zooplankton further can respond strongly to El Niño–Southern Oscillation (ENSO) patterns (Mackas et al. 2001), whereas phytoplankton abundance is predicted by the photosynthetically available radiation (PAR, i.e. a measure of light) and nitrate concentrations, depending on their functional traits (i.e. light tolerance, temp tolerance, growth rate) (Edwards et al. 2013). It follows that differing PAR and nitrate within a region are likely to support different phytoplankton assemblages. Temperature also predicts phytoplankton size, structure and taxonomic composition (Heather et al. 2003), and in some cases, models might be improved by considering SST and chlorophyll alpha (CHLa) together and to include Nitrate. Changes in diversity of plankton assemblage drives changes in the carbon, nitrogen and phosphorus (C/N/P) ratio (Martiny et al. 2013), and this corresponds to using the N/P ratio (or C/N/P ratio) as a surrogate for plankton diversity. Similarly, harmful algal bloom species (HAB) of plankton are sensitive to (and can be predicted by) temperature, phosphate, and micronutrients from land-runoff (Hallegraeff 2010).

Mega-fauna and shore-birds using the offshore habitats also follow environmental cues in search of food, which is often associated with algal blooms or indicated by changes in sea temperatures. For example, the distribution of cetaceans is predicted by primary productivity (Tittensor et al. 2010), and studies of Dall's porpoise (*Phoecoenoides dalli*) and common dolphins (*Delphinus delphis*) show that they respond to changes in SST (Forney 2000). A metric of SST, the annual SST range, predicts tunas and billfishes, Euphausids, and to a lesser degree corals and mangroves and oceanic sharks (Tittensor et al. 2010). Bluefin tuna (*Thunnus maccoyii)* feeding success is predicted by SST mean, SST variability, and the SS colour anomaly (Bestley et al. 2010). Similarly, the abundance and breeding success of seabirds in the tropics is influenced by environmental conditions (Devney et al. 2009), particularly the variability in productivity with season (expressed as mean annual var CHLa), but also any with upwelling changes. This shows that CHLa is a good surrogate, or a direct measure, of productivity.

Aside from patterns that may be detected in the surface waters of ocean habitats, deepwater ocean habitats can also be characterized in various ways. Firstly, there are topographic features on the sea floor such as seamounts, rises, shelf breaks, canyons, ridges and trenches, as well as oceanographic features such as currents, fronts, eddies and upwelling, which can be mapped (Harris et al. 2014). Secondly, the deep open ocean varies dramatically with depth, in physical (especially light, temperature and pressure), biological and ecological characteristics, across at least five major layers or vertical zones, known as the epipelagic or photic, mesopelagic or mesophotic, bathypelagic, abyssopelagic and hadal zones (Herring 2002).

Thirdly, within each zone there are horizontal patterns that differ in physical and biological characteristics with latitude and longitude, at various spatial scales, which may or may not overlap vertically (Craig et al. 2010, Benoit-Bird et al. 2016).

Fourth, the coupling between surface and deeper waters seems to be increasingly understood to be significant and important. So, primary productivity at the surface can influence the habitat and species that occur at much deeper oceanic layers (Graf 1989, Rex et al. 2006, Ban et al. 2014, Woolley et al. 2016).

Also, offshore species, at least partly because of the above-described features of the open ocean, do not move randomly through either surface or deep oceanic waters. Instead they tend to follow certain pathways and/or aggregate at certain sites (Ban et al. 2014).

2.1 EXISTING CLASSIFICATIONS IN THE MACBIO REGION

There are many existing marine biogeographical regions and even smaller marine regions or provinces described for the oceans of the world (or parts of the oceans of the world) (Lourie and Vincent 2004, Brewer et al. 2009, Kerrigan et al. 2011, Green et al. 2014, Sayre et al. 2017). The countries within the MACBIO region and within the Pacific more generally, are part of some of these existing classifications (Figure 1). We review these with regard to their scale as it pertains to use by Pacific Island countries for national planning purposes and use these works as overarching guides to our current effort.

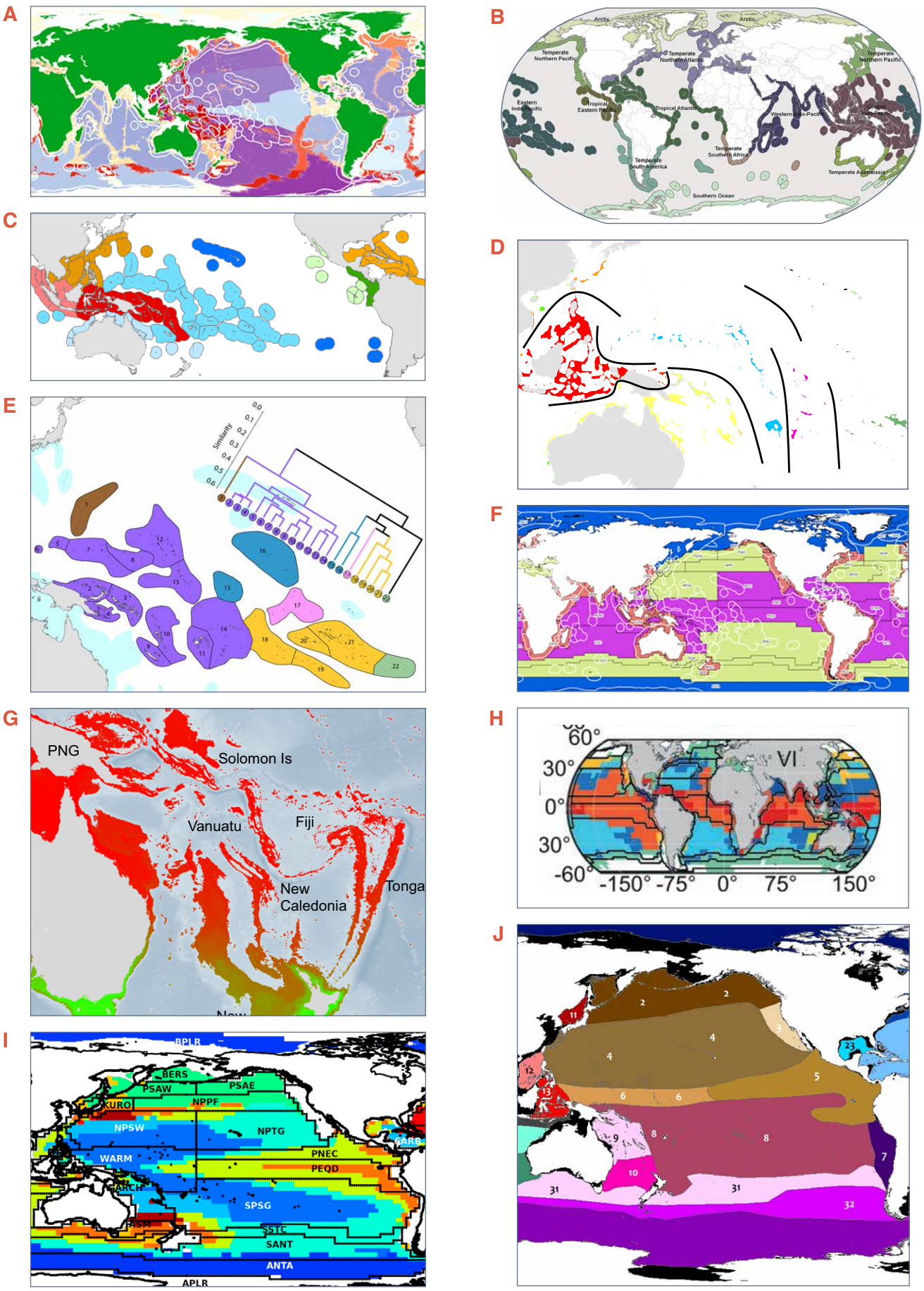

FIGURE 1: Maps of selected existing classification schemes. a) GOODS (UNESCO 2009); b) MEOW (Spalding et al. 2007); c) coral reef fishes (Kulbicki et al. 2013); d) Scleractinian corals (Keith et al. 2013); e) Veron et al (2015); f) Biogeochemical provinces (Longhurst 2006); g) Deepwater ophiurods (O'Hara et al. 2011); h) Tuna and billfish (Reygondeau et al. 2012); i) Mesopelagic bioregions (Proud et al. 2017); j) Sutton et al (2017).

2.1.1 Coastal classifications

Classifications typically assess spatial patterns in generalised environmental characteristics of the benthic and pelagic environments such as structural features of habitat, ecological function and processes, and physical features such as water characteristics and seabed topography to select relatively homogeneous regions with respect to habitat and associated biological community characteristics. These are refined with direct knowledge or inferred understanding of the patterns of species and communities, driven by processes of dispersal, isolation and evolution. Using such data and, often, literature reviews, experts aim to ensure, also, that biologically unique features, found in distinct basins and water bodies, are also captured in the classification. Spalding et al. (2007) applied this approach to inshore and nearshore marine environments, and delineated 232 marine ecoregions globally (Figure 1b). Of these, fifteen applied to the SW Pacific with most Pacific Island archipelagic clusters falling into their own ecoregion.

Kulbicki et al (2013) used 169 checklists of tropical reef fish to conduct four different types of classifications; the various methods were applied to ensure robust findings despite potential limitations in the data (Figure 1c). They found that the four different classification outputs converged into a hierarchy of 14 provinces, within six regions, within three realms (Kulbicki et al. 2013). The Southwest Pacific countries were included in four provinces (Kulbicki et al. 2013). Keith et al (2013) explored the ranges of coral species against a variety of factors to reveal that Indo-Pacific corals are assembled within 11 distinct faunal provinces, four in the SW Pacific (Figure 1d). Veron et al (2015) also used coral data to describe the SW Pacific into 22 ecoregions within six provinces (Figure 1e).

2.1.2 Oceanic classifications

In 1998, Longhurst divided the ocean into pelagic provinces using oceanographic factors and tested and modified them based on a large global database of chlorophyll profiles (Figure 1f). Thus he defined four global provinces (three in Oceania) and 52 sub-provinces (9 in Oceania) (Longhurst 2006).

UNESCO (2009) and Watling et al (2013) used their expertise, guided by the best available data, to divide the ocean beyond the continental shelf into biogeographical provinces based on both environmental variables and, to the extent data are available, their species composition (Figure 1a). The ocean was first stratified into 37 benthic and 30 pelagic zones. In addition, 10 hydrothermal vent provinces were delineated, for a total of 77 large-scale biogeographic provinces of which 4 were in the tropical SW Pacific (UNESCO 2009). Watling et al (2013) then refined the deepwater provinces using higher resolution data into 14 Upper Bathyl (about four in the SW Pacific) and 14 Abyssal provinces (one in the SW Pacific) across the globe.

The biogeography of benthic bathyal fauna can be characterised into latitudinal bands of which three are in the tropical SW Pacific (O'Hara et al. 2011) (Figure 1g). The bathyal ophiuroid fauna recorded by a number of separate expeditions was found to be distributed in three broad latitudinal bands, with adjacent faunas forming transitional ecoclines rather than biogeographical breaks. The spatial patterns were similar to those observed in shallow water, despite the order-of-magnitude reduction in the variability of environmental parameters at bathyal depths.

A bioregionalisation of the ocean's mesopelagic zone (200-1,000m) was also recently developed, using information from the deep scattering layers (a biomass-rich layer of marine animals, found between 300 and 460m deep, thick enough to reflect sound waves), resulting in ten biogeographic provinces (about six in the tropical SW Pacific) (Proud et al. 2017) (Figure 1i). Ecoregions defined with a modified Delphic Method describe the mesophotic zone of the world into 33 ecoregions, of which ten are in the Pacific (Sutton et al. 2017) (Figure 1j).

Horizontal structure within the photic surface layer has been expressed biogeographically using the distribution of tuna and billfish communities (Reygondeau et al. 2012) (Figure 1h). It was found that tuna and billfish species form nine well-defined communities across the global ocean, each inhabiting a region (about four in the SW Pacific) with specific environmental, including biogeochemical, conditions. More recently, environmental data has been used to create three-dimensional maps of the ocean, resulting in a comprehensive set of 37 distinct volumetric region units, called ecological marine units (EMUs), eleven in the tropical SW Pacific (Sayre et al. 2017).

The largely biogeographic and provincial-scale descriptions of the marine environment provided above should be considered in any national-scale marine planning exercise in the nations of the tropical SW Pacific. They also provide a higher-level regionalisation within which more detailed descriptions can be developed. However, it is clear that the level of biophysical differentiation provided by these analyses is too coarse; it is too coarse to inform country decision-makers about where to locate different marine management zones or marine protected areas if aiming for ecological representativeness within their country. Our analysis provides the finer scale description needed to support these decisions.

3 METHODS

Scale-appropriate, comprehensive descriptions of the marine environment of Pacific Island countries and territories remain missing. This impedes the implementation of ecologically representative networks of MPAs. Existing information on habitats and species distributions is also incomplete and not spatially continuous. To fill this gap of classifications at an appropriate spatial scale to support in-country national planning for oceans, the methods here were designed to provide a detailed description of marine biodiversity for Pacific Island countries and territories in the Southwest Pacific. Existing higher-level marine bioregionalisations, as described above, are not sufficiently refined to effectively inform within-country planning.

The methods section comprises two parts: an introduction to the overarching approach of the analysis, and the slightly different but complementary analyses that were applied to develop the deepwater and reef-associated bioregions. To take account of differing types and resolution of data, two separate bioregionalisations were developed; firstly, for the deepwater environments and secondly for reef-associated environments (Figure 2). These bioregions do not overlap in space, rather they are complementary to make use of different data resolutions available and represent different physical and biological features in these two environments.

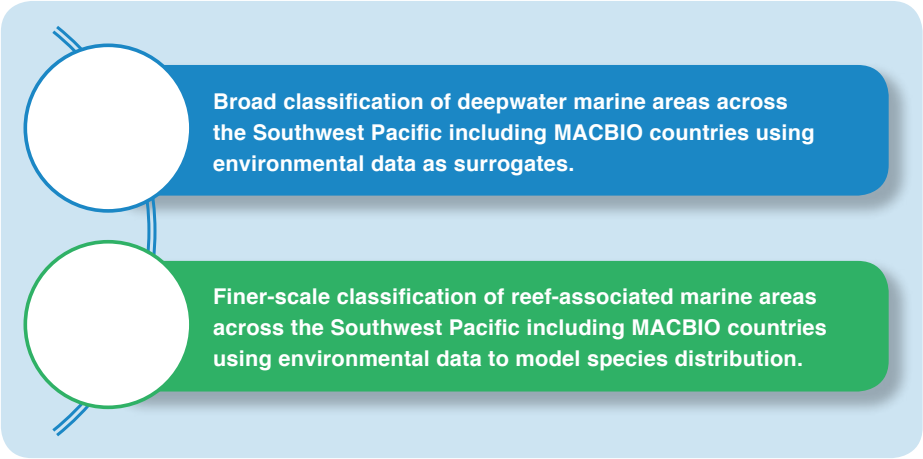

FIGURE 2: MACBIO's two-pronged integrated marine classification approach.

3.1 OVERARCHING APPROACH

As a preliminary step, we firstly defined the Area of Interest (AOI) for the analysis (Figure 3). Recognising, of course, that ecological and biological processes have no regard for jurisdictional boundaries and are operating beyond national boundaries. Therefore, any description of the marine environment within one country would be likely to "flow over" into and be relevant to neighbouring countries. So, whilst the MACBIO project focussed upon Fiji, Kiribati, the Solomon Islands, Tonga and Vanuatu, the marine systems that the project is working upon are not only contained within these country boundaries. Therefore, the AOI for the bioregion analysis was defined to include all the countries that the MACBIO project works within and all adjacent countries in the SW Pacific with the exception of Australia, New Zealand and Papua New Guinea, for which other, existing, marine regionalisations already exist or were in development (Department of the Environment and Heritage 2006, Department of Conservation and Ministry of Fisheries 2011, Green et al. 2014).

The AOI for the bioregion analyses was defined by creating a bounding box outside the EEZs of the MACBIO countries region. It extends across the Southwest Pacific Ocean, from Palau and Federated States of Micronesia to French Polynesia (130°W to 127°E, 34°S to 20°N). Except for Australia, New Zealand and Papua New Guinea (as mentioned above), all other marine areas that were not part of the EEZs of countries participating in the MACBIO project but fall within the AOI were also included in the bioregions analyses.

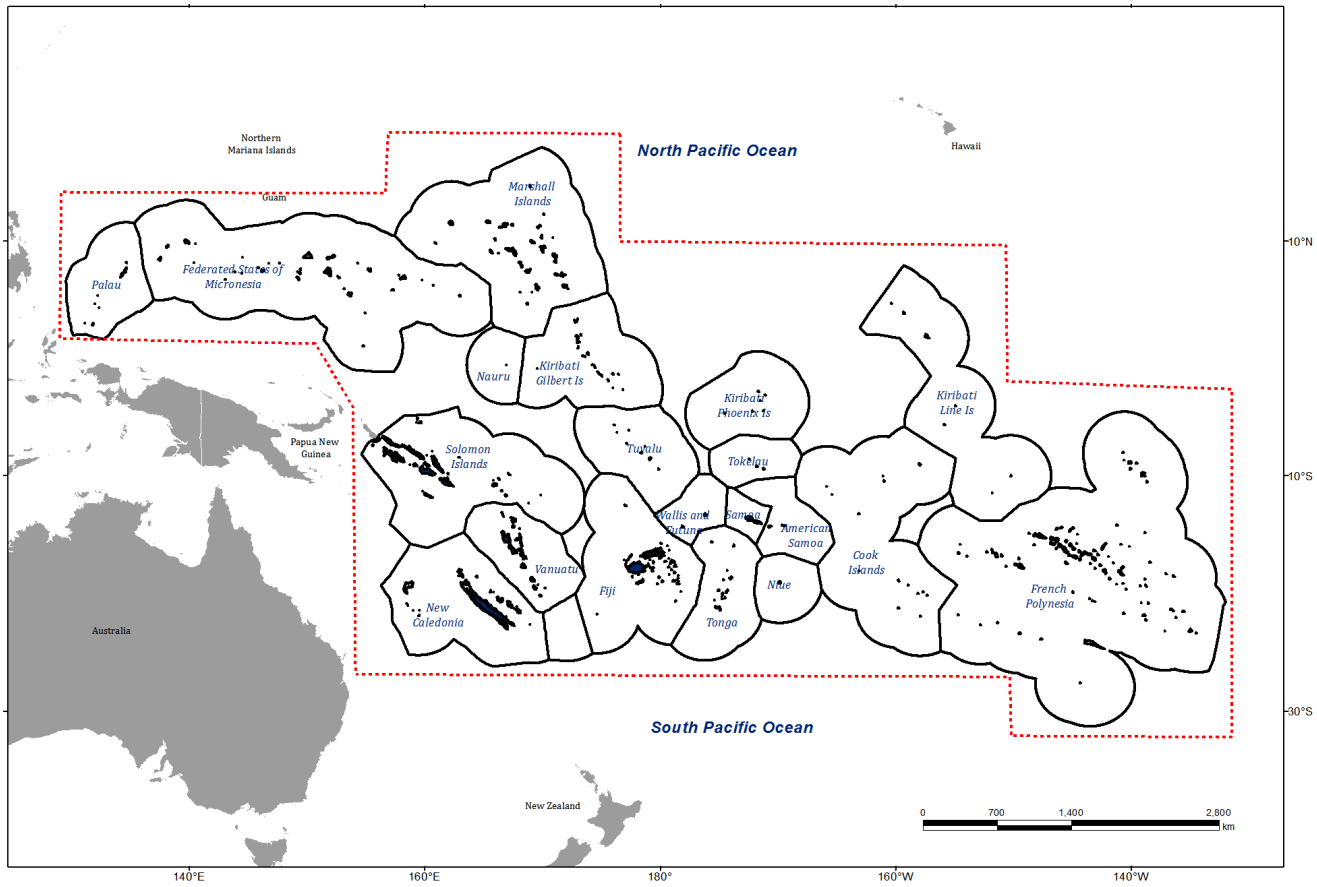

FIGURE 3: Map displaying the Area of Interest (red dotted line) and indicative provisional Exclusive Economic Zones (black solid lines).

Secondly, we chose the boundary between the deepwater versus reef-associated analysis and the size of the smallest analytical unit to be used in each bioregion analyses. Data and ecosystem considerations led to the definition of the boundary of the deepwater analysis as including areas beyond the 200 m depth or 20 km out, whichever was the furthest from land. The reef-associated analysis boundary complemented that: it was those areas within 20 km offshore or shallower than 200 m depth, whichever was furthest from land.

The appropriate resolution of the analytical units for the deepwater and reef-associated analyses was determined based upon the data resolution, purpose and scale of the analysis (i.e. to inform national planning and decision-making) and the influence on the choice of grid size on the computing time. For the deepwater analysis, 140,598 analytical grid units with a 20x20 km resolution were used and for the the shallower reef-associated areas, 45,106 analytical units with a 9x9 km resolution were used. The reef-associated areas were those that included emergent coral reef habitats, sea grasses, mangroves, and other reef-associated habitats such as sand and mudflats out to 20 km offshore or shallower than 200 m depth, whichever was furthest from land.

Third, we collated, and assessed the comprehensiveness and reliability of, environmental and biological data available from open-access sources (Appendix 8.1). Data were determined to be adequately comprehensive if they covered the entire AOI with sufficient resolution to enable within-country distinctions in the parameter of interest. Data were assessed to be adequately reliable if collected using methods accepted within peer reviewed literature. Of hundreds of environmental data sourced, 30 deepwater datasets were deemed adequately comprehensive and reliable for use in this classification process. Reef-associated datasets were collated from multiple data providers, but they were not comprehensive. We combined these datasets to build a comprehensive database for all reef-associated taxa. This database was quality-checked for taxonomic consistency. Then, the probability of observation was predicted to all of the unsurveyed near-shore areas with models using biological and environmental variables (see Section 3.3.3).

Fourth, hierarchical cluster analysis was conducted to identify internally homogenous clusters or groups of analytical units that are either subject to similar environmental conditions or support similar species assemblages. The number of clusters was determined by examining the dendrogram and setting a similarity value to break it up into clusters.

The fifth step was refining the resulting clusters using spatial processing and describing each cluster to deliver draft bioregions.

More detail on each of these analytical steps for the deepwater and reef-associated bioregion analysis is provided, below (Sections 3.2and 3.3).

An important final step, not described in this report, is to review and refine the resultant draft bioregions with marine experts in the Pacific Island Countries. When completed, this step will have been undertaken in Fiji, Tonga, the Solomon Islands and Vanuatu.

After this final review is conducted, in-country reports are prepared, comprising of this report with an additional chapter describing the process of expert review/revision and with a refined map of the country bioregions for use in national planning.

3.2 DEEPWATER BIOREGIONS METHODS

Marine bioregions were developed, firstly, for the deepwater areas across the Southwest Pacific. “Deepwater” for this analysis was defined at the 200 m depth or 20 km out whichever was the furthest from land.

3.2.1 Data used in analysis

The classification groups for the deepwater biological regions were driven by 30 environmental datasets including depth, salinity and sea surface temperature (Table 1) (Tyberghein et al. 2012). A more detailed description and the sources of all the data used can be found in Appendix 8.1. These data were served at various resolutions (see Data Preparation, Appendix 8.3), requiring summary analysis to fit our 20 km resolution (see below). Comprehensive and reliable data were available at depths up to 1000 m. At depths below 1000 m, there were not enough data points in the acquired datasets to be reliable in the deepwater analysis. This was partly due to the sampling design used for the data and partly due to the bathymetry, which meant some places were not deep enough to have data below 1000 m or 2000 m (e.g. temperature at 4000 m[10]).

TABLE 1: Datasets used to derive deepwater bioregions (for more details see Appendix 8.1)

	Dataset name (source)	Parameter
1	Satellite gravimetry & multibeam data (GEBCO)	Depth (m)
2	Aqua-MODIS (BioOracle)	Calcite Concentration (mol/m³)
3	World Ocean Database 2009 (BioOracle)	Dissolved Oxygen Concentration (ml/l)
4	World Ocean Database 2009 (BioOracle)	Nitrate Concentration (µmol/l)
5	SeaWiFS (BioOracle)	Photosynthetically Available Radiation (Einstein/m²/day) (maximum)
6	SeaWiFS (BioOracle)	Photosynthetically Available Radiation (Einstein/m²/day) (mean)
7	World Ocean Database 2009 (BioOracle)	pH (unitless)
8	World Ocean Database 2009 (BioOracle)	Phosphate Concentration (µmol/l)
9	World Ocean Database 2009 (BioOracle)	Salinity (PSS)
10	World Ocean Database 2009 (BioOracle)	Silicate Concentration (µmol/l)
11	Global Administrative Areas (GADM28)	Distance from Land (m)
12	Aqua-MODIS (NASA)	Chlorophyll a Concentration (mg/m³) (maximum)
13	Aqua-MODIS (NASA)	Chlorophyll a Concentration (mg/m³) (mean)
14	Aqua-MODIS (NASA)	Chlorophyll a Concentration (mg/m³) (minimum)
15	Aqua-MODIS (NASA)	Chlorophyll a Concentration (mg/m³) (range)

[10] www.marine.csiro.au/~dunn/cars2009/c09_distrib_4000mA.jpg

	Dataset name (source)	Parameter
16	Aqua-MODIS (NASA)	Sea Surface Temperature (°C) (maximum)
17	Aqua-MODIS (NASA)	Sea Surface Temperature (°C) (mean)
18	Aqua-MODIS (NASA)	Sea Surface Temperature (°C) (minimum)
19	Aqua-MODIS (NASA)	Sea Surface Temperature (°C) (range)
20	Atlas of Regional Seas (CSIRO)	Dynamic height of sea surface with regard to 2000m (m)
21	Atlas of Regional Seas (CSIRO)	Depth of 20 degree isotherm (m)
22	Atlas of Regional Seas (CSIRO)	Mixed Layer Depth (m)
23	Atlas of Regional Seas (CSIRO)	Seawater Temperature (°C) (30m)
24	Atlas of Regional Seas (CSIRO)	Seawater Temperature (°C) (200m)
25	Atlas of Regional Seas (CSIRO)	Seawater Temperature (°C) (1000m)
26	Atlas of Regional Seas (CSIRO)	Nitrate (µmol/l) (1000m)
27	Atlas of Regional Seas (CSIRO)	Dissolved Oxygen Concentration (mg/l) (1000m)
28	Atlas of Regional Seas (CSIRO)	Phosphate Concentration (µmol/l) (1000m)
29	Atlas of Regional Seas (CSIRO)	Salinity (PSS) (1000m)
30	Atlas of Regional Seas (CSIRO)	Silicate Concentration (µmol/l) (1000m)

3.2.2 Data preparation

All raster datasets were projected to a Lambert cylindrical equal-area projection with metre measurement units; this projection allowed us to split the AOI into analysis cells representing equal-sized areas.

The deepwater classification was developed across political borders, reflecting the parameters of the natural environment. For the deepwater analysis, the AOI was divided into 20 km by 20 km vector grid cells (164,430 cells). The 20x20 km cells represented the smallest unit of the deepwater regionalization. All cells that were within 20 km of land or less than 200 m depth were removed (these were classified using higher resolution data to develop reef-associated bioregions, see Section 3.3 below) leaving 140,598 cells of 20x20 km resolution in the deepwater area. The datasets were then assigned to these 20x20 km grid using the QGIS “zonal statistics plugin” algorithm to calculate the mean value of each dataset within each cell. The mean value of each input dataset for each cell were then exported for further processing (see also Appendix 8.3).

3.2.3 Statistical data analysis

3.2.3.1 RAW REGIONS BASED ON CLUSTER ANALYSIS

The environmental data were processed in the R programming language using the core set of packages (www.r-project.org). The code used for this analysis can be found in Appendix 8.2. The data were standardised so that all values were between 0 and 1. Bathymetry is highly influential in determining both benthic ecology/seabed geomorphology as well as benthic: pelagic coupling systems (Sutton et al. 2008, Craig et al. 2010, DeVaney 2016, Vereschchaka et al. 2016). Because of this disproportionate influence of bathymetry upon deepwater habitats and species, the value of the “depth” environmental parameter weighted by a factor of two in the analysis (Dunstan et al. 2012, Brown and Thatje 2014, Piacenza et al. 2015). Due to computing limitations, we reduced the dimensionality of the 140,598 cells representing the deepwater area by clustered them into 5,000 groups using the k-means function implementing the MacQueen algorithm (MacQueen 1967). The k-means algorithm optimises the classification of items into clusters based on an initial set of randomly chosen cluster centres; the effect of this randomness was ameliorated by repeating the analysis 20 times and then using the classification with the minimum total within-cluster sum of squares: the classification with the best fit. This initial classification step reduced the dataset size to make the creation of a distance matrix possible (a distance matrix for the full deepwater environmental parameter dataset would require 80GB of RAM, which was not available).

A distance matrix was calculated using the centre of gravity of each k-means cluster using the *dist f*unction and then

hierarchically clustered using the hclust algorithm with default parameters in the R programming language (www.r-project.org). The hierarchical clustering tree was cut at a height of 0.4 using the *cutree* function, yielding 475 clusters that contained every 20 km by 20 km grid cell. The cutoff height was determined by viewing the relative variability of the clusters as displayed in a dendrogram: a "natural" break in the dendrogram (meaning that there was a greater degree of "distance" between clusters which represented differences in the groupings) (Figure 4).

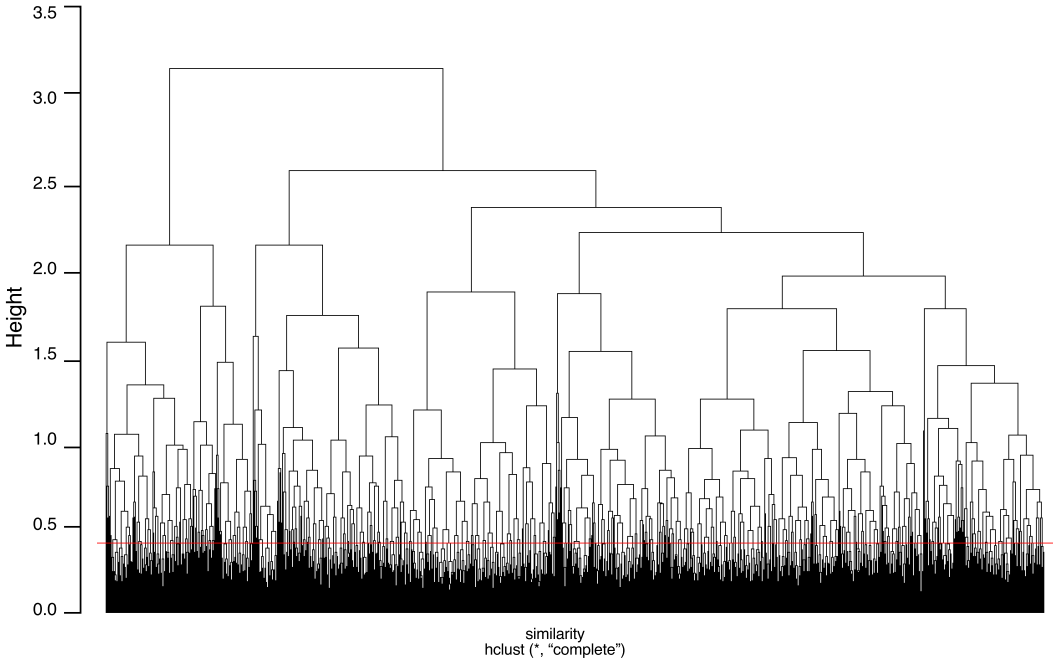

FIGURE 4: Dendrogram for offshore bioregional classification, where the red line shows the cut-off.

When plotted on a map, these clusters described the spatial variability of the SW Pacific. However, due to the necessary use of 20x20 km grid cells in the analyses, the bioregion boundaries had "square" boundaries and, in some instances, isolated irregularities arose where conflicting and intersecting data points occurred within one grid cell (e.g. at bioregion boundaries). To address these issues, a spatial smoothing and quality control step were applied.

3.2.3.2 SMOOTHING AND QUALITY CONTROL

The cluster grid had areas smaller than 4 adjacent cells which were removed using the GDAL sieve algorithm[11]. The clusters were smoothed using the GRASS generalize algorithm[12] "snakes" method with default parameters (Figure 5).

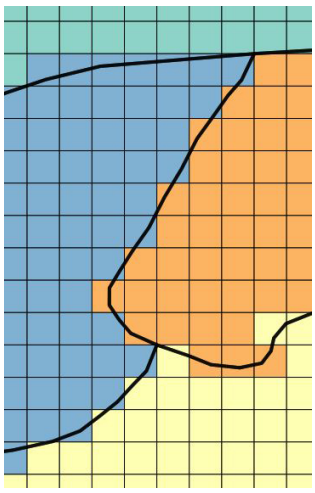

FIGURE 5: Graphic showing the 20km resolution analysis units (coloured) and the smoothed boundaries (heavy black line).

[11] www.gdal.org/gdal_sieve

[12] grass.osgeo.org/grass73/manuals/v.generalize

Where the analysis identified a non-contiguous bioregion with parts that were separated by up to 1000 km, these multi-part bioregions were manually inspected to determine if their geographic locations could be explained by biological connectivity or environmental homogeneity. For example, the environmental conditions described by region 69 occurred in two locations east and west of Fiji. If the geographic locations could be explained by biological connectivity or environmental homogeneity, then the bioregion was retained as a non-contiguous bioregion; if not they were separated into distinct bioregions as was the case for Bioregion 69 (Figure 6).

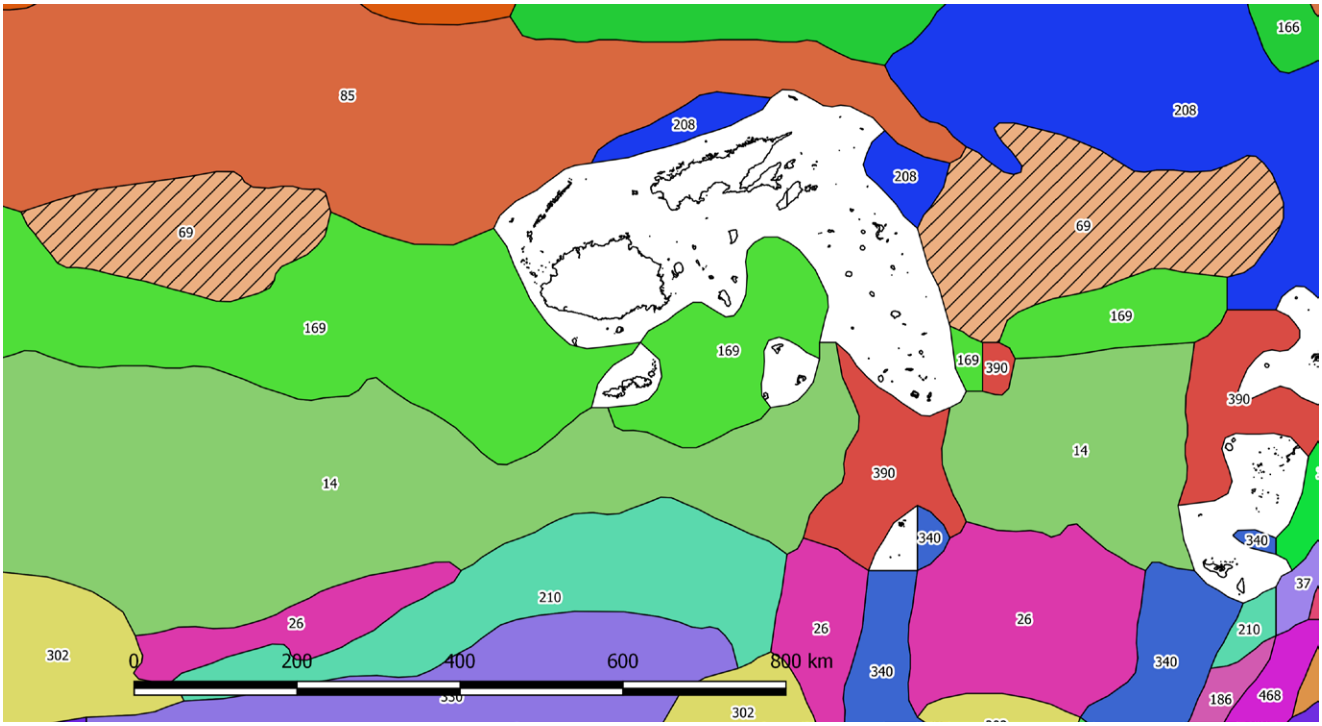

FIGURE 6: Example of post-processing decision making for non-contiguous bioregions.

3.3 REEF-ASSOCIATED BIOREGIONS METHODS

Reef-associated bioregions include shallow coral reef habitats, sea grasses, mangroves, and other reef-associated habitats such as sand and mudflats out to 20 km offshore or shallower than 200 m depth, whichever was furthest from land.

The total biodiversity in these ecosystems remains largely undersampled, as in, data for reef-associated ecosystems do not exist everywhere. None-the-less, each MACBIO country, and some other Pacific Island countries, had species occurrence data, as well as environmental data, available for their reef systems. Thus, a finer-scale classification of reef-associated areas was possible in these shallower areas where both biological and environmental data were used. There were sampling sites in all MACBIO and other Pacific countries and territories, but their distribution lacked the spatial comprehensiveness and consistency needed for spatial planning (Wilson et al. 2009). Thus, survey records from these sites needed to be extrapolated in space. To provide a spatially contiguous and comprehensive coverage, the survey records were spatially modelled, producing grids of the probabilities of observation. These probability grids were then used to produce the marine coastal classification.

3.3.1 Biological data collation and standardisation

We collated biodiversity records across the study area from a variety of shallow reef-associated habitat surveys and monitoring programmes (4804 fish sampling sites of which 863 sites had hard and soft coral data and 1702 sites had (other) invertebrate data). The sampling methods and species targeted often differed depending on the focus of the intended research or project. Thus, the data across the studies needed to be standardised. All samples were collated to include species data, methods used by data providers, and differences in the type of data provided, for example, whether mean fish species' densities for a standardised area (250 m2) or presence/absence records. All records were standardised by conversion to presence-absence records for all taxa, which was the most common level from all providers (Table 2).

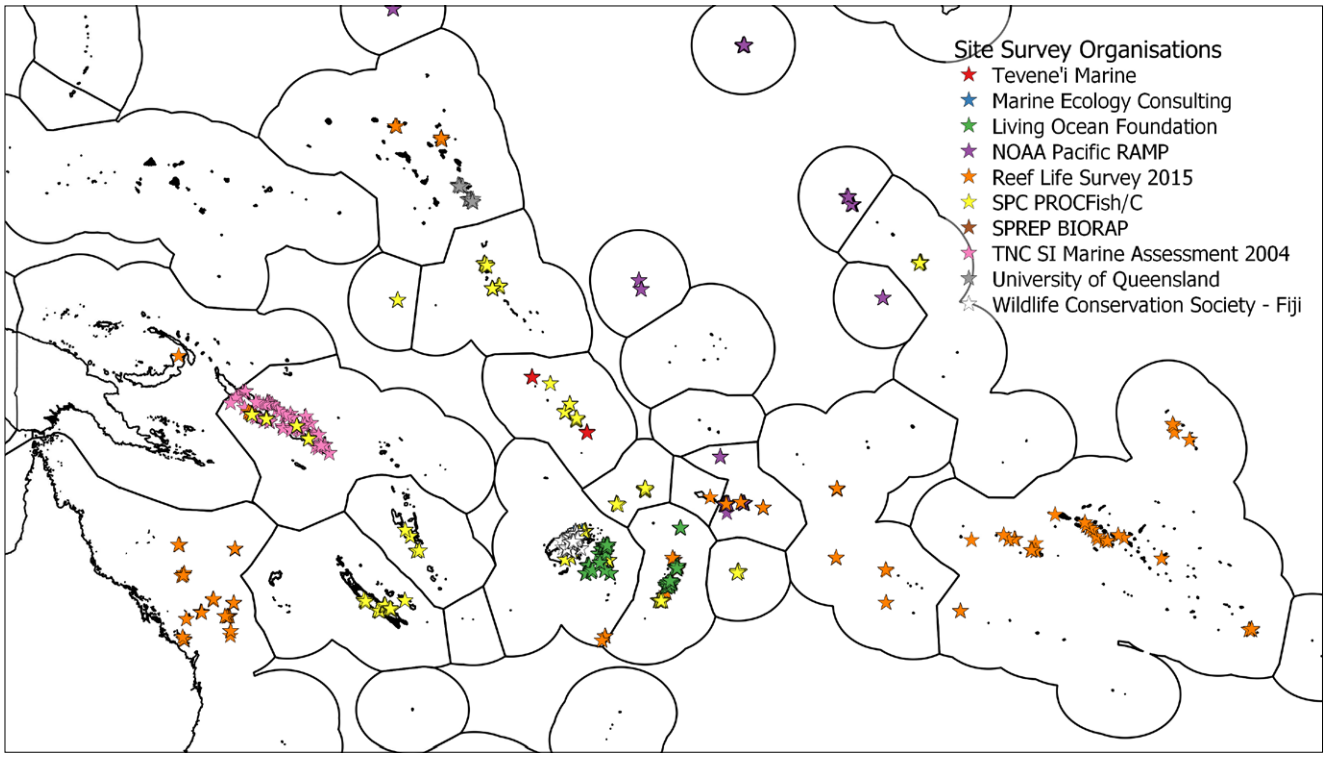

FIGURE 7: Map showing locations of fish, coral and other invertebrate surveys used.

Different numbers of species were included in the database for the three taxa. For fishes, georeferenced reef survey data for 4804 sites were collated for 1405 species (Supplementary Material 1). Most species in the dataset are only recorded a few times (Figure 8).

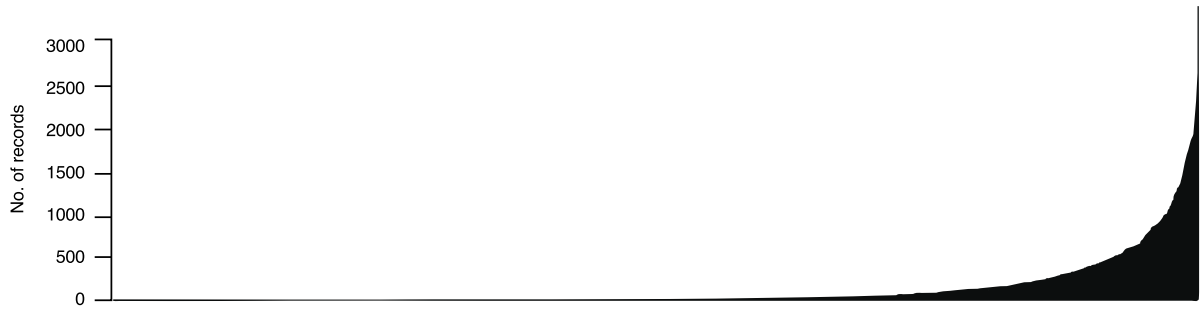

FIGURE 8: Ordered frequency distribution of fish species observations in the dataset, where each column represents one of the 1405 species.

For invertebrates, the database contained 300 mobile species from 1702 sites, and 321 hard coral species and soft coral taxa (genus level) from 863 sites (for species list see Supplementary Material 1).

The database for fishes contained survey data from a mix of providers (Table 2), which targeted different suites of species in their work. We subset the species data into: a) species covered by all data providers with high confidence in identification (e.g. surgeon fishes); b) species covered by some data providers, but not surveyed by others; and c) species that were encountered only opportunistically by all because they are rare, cryptic, or difficult to identify. We discarded species in (c) because they are known to be difficult to identify with low numbers of sightings and/or there were inconsistencies in the sampling (either with regard to the use of less reliable-that is, not peer reviewed-or variable methods, or observers) which would lead to model uncertainty. The revised fish database contained only the species data for which we had high confidence in their correct identification and in the sampling method. This amounted to 1014 species (Supplementary Material 1).

Coral and invertebrate data were all collected using reliable methods and observers. All coral and invertebrate data were either collected as presence-absence data or converted to that from abundance records, using all available records.

3.3.2 Treatment of rare species

Within the list of consistently sampled fish species, after their treatment as described above, there were still many species that were only sighted a few times. This is likely to have two main reasons: 1) they are cryptic everywhere and thus rarely recorded; or 2) they are endemic species that only occur in a limited part of the project area (and few sites were sampled within their distribution). Fish species with low numbers of records (n< 30) that might fit into these categories were listed so that the endemics amongst them can receive special consideration during the spatial planning process. Therefore, species with fewer records than 30 were not modelled, following standard procedure (Elith 2000). For hard corals and invertebrates which were undersampled across the region, we excluded species with fewer than 30 occurrences from modelling, and kept the data for selected undersampled species, again for use in the planning process but not the classification process, as *per* the fish data. After this treatment of the rare, endemic, cryptic or undersampled corals and invertebrates (as described in Sections 3.3.1 and 3.3.2 above), adequate presence/absence data for the modelling remained for 435 fishes, 258 species of hard and soft corals, and 114 invertebrate taxa (see species list in Supplementary Material 2).

TABLE 2: Datasets used to derive reef-associated bioregions (for more details see Supplementary Material 1)

	Parameter	Source	Countries
1	Reef fish	Khaled bin Sultan Living Oceans Foundation	Fiji, Tonga
2	Reef fish	Marine Ecology Consulting (Ms Helen Sykes)	Fiji
3	Reef fish	National Oceanic and Atmospheric Administration	Pacific Remote Island Areas (PRIAs), Samoa
4	Reef fish	Reef Life Survey	Tonga, Cook Islands, Niue, French Polynesia, American Samoa, Solomon Islands, Pitcairn, Vanuatu, Marshall Islands
5	Reef fish	Secretariat of the Pacific Community	Fiji, Kiribati, Nauru, New Caledonia, Niue, Solomon Islands, Tonga, Tuvalu, Vanuatu, Wallis And Futuna
6	Reef fish	South Pacific Regional Environment Programme	Tonga, Nauru
7	Reef fish	The Nature Conservancy	Solomon Islands
8	Reef fish	University of Queensland (Dr Maria Beger)	Marshall Islands, Papua New Guinea
9	Reef fish	Dr Daniela Ceccarelli	Tuvalu
10	Reef fish	Dr Daniela Ceccarelli, Ms Karen Stone	Tonga
11	Reef fish	PIPA (Dr Stuart Sandin, Dr Randi Rotjan)	Kiribati
12	Reef fish	WCS	Fiji
13	Coral	University of Queensland, Australia (Dr Doug Fenner)	Marshall Islands
14	Coral	Dr Doug Fenner	Tonga, Nauru
15	Coral	PIPA (Dr Randi Rotjan, Dr Sangeeta Mangubhai)	Kiribati
16	Coral	University of Queensland, Australia (Dr Emre Turak, Dr Andrew Philips, Dr Zoe Richards)	Papua New Guinea
17	Coral	Dr Doug Fenner	American Samoa
18	Coral	TNC Rapid Ecological Assessment (Dr Peter Houk)	Micronesia (Chuuk)
19	Coral	The Nature Conservancy	Solomon Islands
20	Coral	University of British Columbia (Dr Simon Donner)	Kiribati
21	Coral	WCS	Fiji
22	Coral	Museum of Tropical Queensland (Dr Paul Muir)	New Caledonia
23	Invertebrate	Secretariat of the Pacific Community	Fiji, Kiribati, Nauru, New Caledonia, Niue, Solomon Islands, Tonga, Tuvalu, Vanuatu, Wallis And Futuna
24	Invertebrates	Marine Ecology Consulting (Dr Helen Sykes)	Fiji
25	Coral reefs	UNEP-WCMC, (2010).	Global distribution
26	Mangroves	Giri C, et al. (2011).	Global distribution

3.3.3 Predicting probabilities of observation for each species

All the environmental variables across the AOI available from the Bio-Oracle database were initially considered[13] (Tyberghein et al. 2012) at a resolution of 9x9 km. Data were sourced from Bio-Oracle because they were reliable and consistent throughout our AOI (Tyberghein et al. 2012). The variables available represent the four broad dimensions thought to influence the distribution of shallow-water marine organisms: (1) nutrients and dissolved oxygen, (2) cloud cover and (3) temperature and light resources associated with latitudinal patterns (www.oracle.ugent.be, Tyberghein et al. 2012). Some of these parameters co-vary, so to avoid over-parameterization and multicollinearity, we tested all pairs of variables for correlation. For highly correlated predictors ($r > 0.6$), one of the paired variables was excluded based by judging their ecological relevance for coral reef-related organisms. The final predictor set consisted of: calcite, mean chlorophyll alpha concentrations, mean sea surface temperature (SST), pH, maximum photosynthetically available radiation (PAR), mean PAR, and nitrate.

We applied generalised additive modelling (GAM) to create models that use major environmental predictors of species observations to generate spatial predictions of the probabilities to observe species across the entire region (see Supplementary Material 3, 4 and 5 for model information). For sites with no species data, these models predict the probability of observing the species using environmental factors thought to influence the suitability of an area for a species (Elith et al. 2006). Using 9x9 km analytical spatial units, we modelled species with a binomial distribution and the best model identified, and predicted species probability for all coastal analytical units, including un-surveyed ones. This analysis used the *gam* function in the "mgcv" package in "MuMIn" in R v.3.2.5. These models were created for 807 species in total, with 435 fishes, 258 hard and soft corals, and 114 invertebrates (see Supplementary Material 2 for list of species used in modelling and Supplementary Materials 3, 4 and 5 for model information).

3.3.4 Clustering to create reef-associated bioregions

For all the shallow water sites, we took the species observation probabilities from the models and used hierarchical clustering with Ward (Clarke 1993) to identify clusters of sites with similar assemblages as raw reef-associated bioregions (Figure 8). Cells consisted of a 9 km by 9 km vector grid within 20 km from shore or shallower than 200 m depth, whichever was furthest from land.

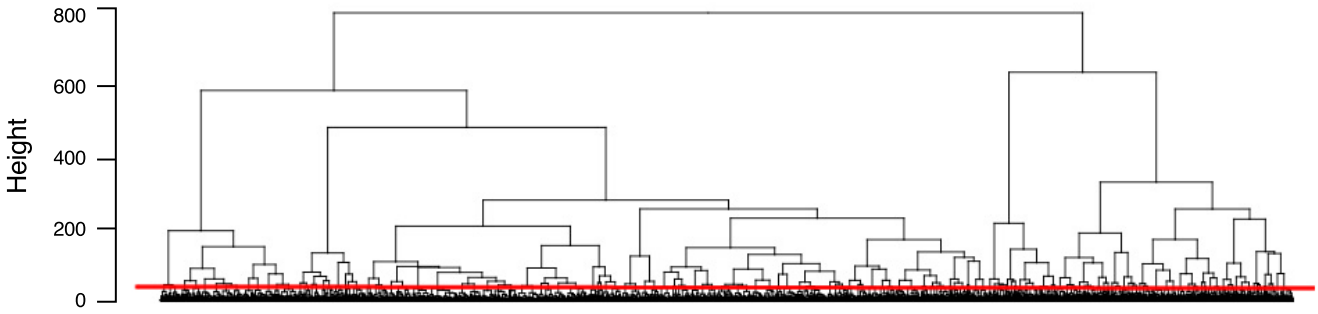

FIGURE 9: Dendrogram for reef-associated bioregional classification

3.3.5 Smoothing and categorising reef-associated bioregions

As in deepwater bioregions, the raw regions derived from clustering were smoothed using the GRASS generalized algorithm "snakes" method with default parameters[14]. Further manual editing was conducted to finalise the smoothing in areas where bioregion boundaries were not adequately smoothed through automated processing.

[13] www.oracle.ugent.be

[14] grass.osgeo.org/grass73/manuals/v.generalize.html

3.4 BIOREGION NAMES AND DESCRIPTIONS

Finally, the resulting draft bioregions were assigned unique code identifiers, draft names and initial descriptions. Whilst codes and names were assigned to bioregions across the AOI, descriptions were only provided for deepwater bioregions since knowledge of these offshore environments is less well known. Descriptions for the less-well-understood deepwater bioregions were provided to draw attention to habitats and environmental variables that influenced the delineation of each bioregion. These bioregions are now ready to be reviewed and, as necessary, revised based upon in-country marine expert input.

The draft naming system for the bioregions was created based on the following factors: 1) existing geographic place names; 2) geomorphic feature types within each cluster; 3) environmental variables that influence the delineation of each cluster; and 4) notable key underwater features. Careful consideration was given when assigning names to the deepwater bioregions since most boundaries extend beyond the EEZs of countries.

4 RESULTS

4.1 DRAFT MARINE BIOREGIONS ACROSS THE SOUTHWEST PACIFIC

The technical bioregionalisation analysis resulted in the division of the entire AOI into draft deepwater and reef-associated bioregions across the Southwest Pacific including the MACBIO project countries. A total of 262 deepwater bioregions and 102 reef-associated bioregions were defined.(download spatial data for these at: http://macbio-pacific.info/macbio-resources/ under the "Planning" tab). Most were contiguous but some had multiple, non-contiguous parts. Many deepwater bioregion boundaries extended beyond countries' EEZs and also into areas beyond national jurisdiction. A majority of the deepwater bioregions share boundaries with neighbouring countries as did many reef-associated bioregions. Names and descriptions of bioregions are provided in Appendices 8.4 and 8.5. Note that whilst in-country knowledge of reef systems is relatively high, knowledge of the deep-sea environments is lower. For this reason, we have offered some information about each deepwater bioregion (Appendix 8.4).

Final numbers of bioregions, per country, is provided in Table 3. Because many bioregions cut across national boundaries they are listed in more than one country. The numbers of bioregions in the table reflect the technical results before in-country expertise is used to refine and revise the bioregions.

TABLE 3: Number of draft deepwater and reef-associated bioregions described per country as an output of this analysis.

Country name	Number of deepwater bioregions	Number of shared deepwater bioregions	Number of reef-associated bioregions	Number of shared reef-associated bioregions
American Samoa	9	9	2	2
Cook Islands	30	27	6	4
Fiji	23	23	12	3
French Polynesia	52	23	16	5
Kiribati	54	47	11	2
Marshall Islands	34	19	9	2
Micronesia	41	32	19	4
Nauru	6	6	1	1
New Caledonia	31	24	8	1
Niue	6	6	2	2
Palau	19	18	4	0
Samoa	6	6	1	1
Solomon Islands	33	26	19	6
Tokelau	8	8	2	2
Tonga	35	27	4	3
Tuvalu	13	13	4	3
Vanuatu	20	18	7	3
Wallis and Futuna	9	9	3	3

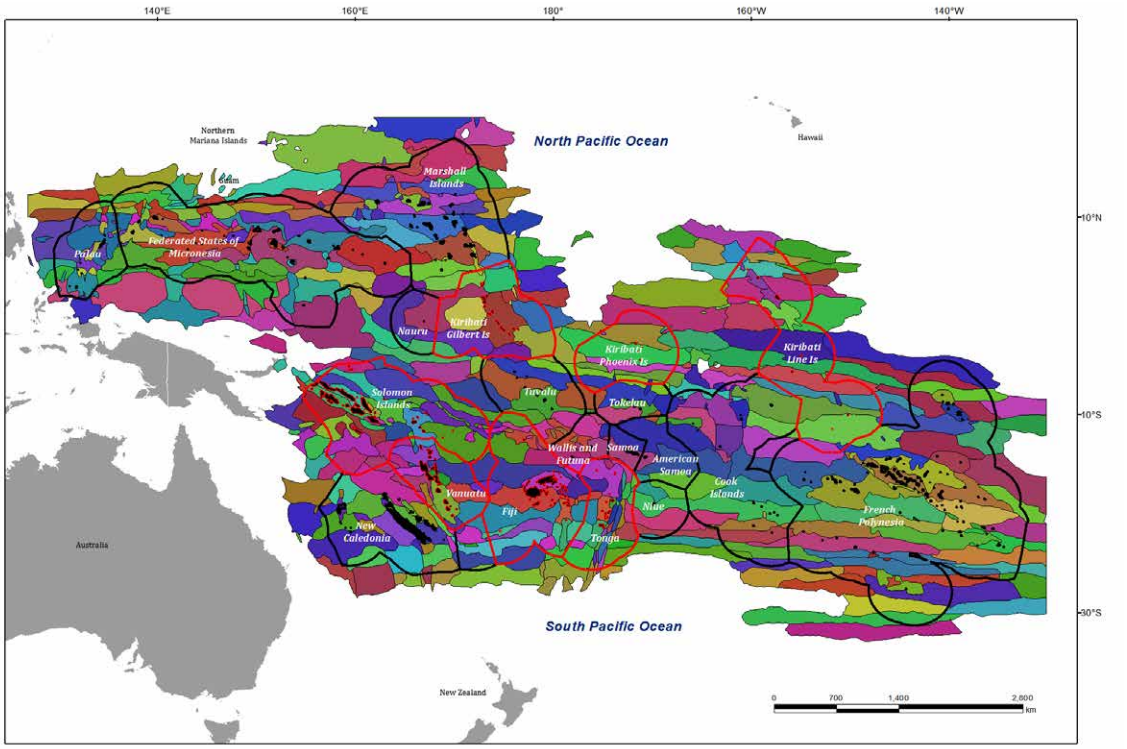

FIGURE 10: Draft deepwater bioregions for the Southwest Pacific including MACBIO countries (red solid line). The different coloured areas represent different bioregions. Because the colour palette available to us was not sufficient, some different bioregions may appear to be the same colour.

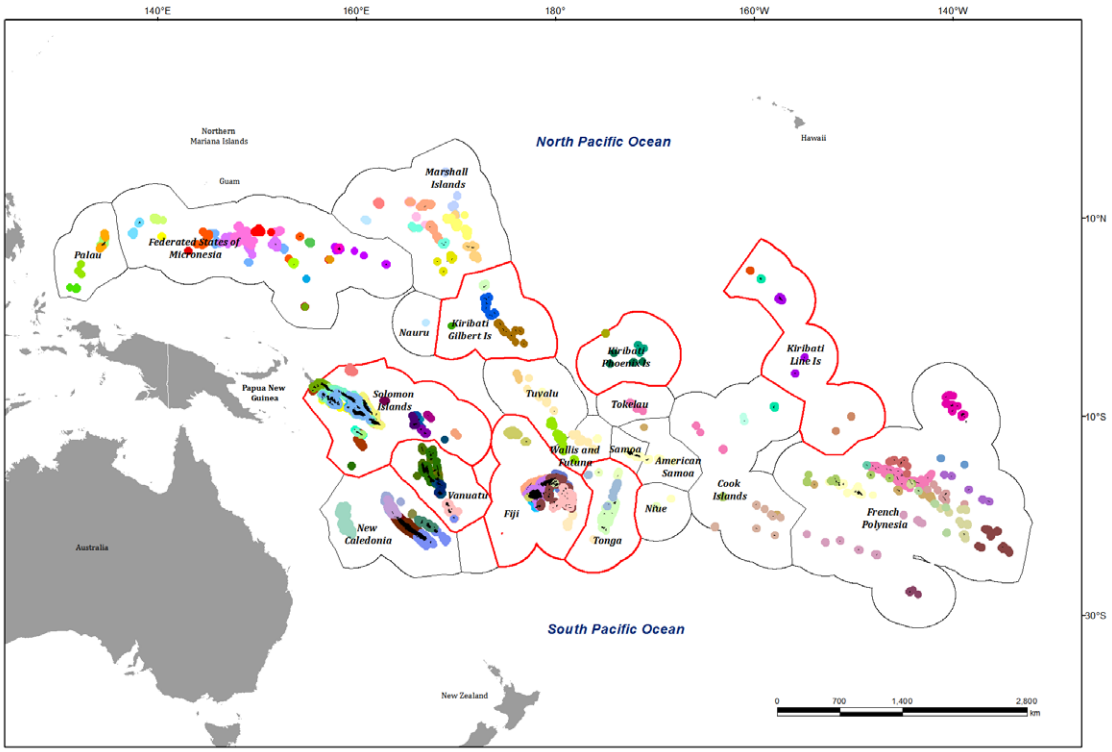

FIGURE 11: Draft reef-associated bioregions for the Southwest Pacific including MACBIO countries (red solid line). Reef areas are exaggerated in this Figure for ease of viewing. The different coloured areas represent different bioregions. Because the colour palette available to us was not sufficient, some different bioregions may appear to be the same colour.

5 DISCUSSION

This work was done to support national marine planning efforts in Pacific Island countries and territories. It provides value-neutral, sub-national descriptions of the marine diversity within Pacific Island countries and territories. Whilst country spatial planning for ecologically representative marine protected areas requires much more than this, our marine bioregions form an important biophysical data layer in the process (Lewis et al. 2017). However, true ecological representativeness also requires using the information you have about habitats, species and ecological processes (Lewis et al. 2017). Additionally, most natural resource managers have social, economic and cultural objectives they wish to achieve so consideration of human uses and values is pivotal to achieving these multiple objectives (Lewis et al. 2017).

Big ocean states in the Pacific, including Fiji, Kiribati, the Solomon Islands, Tonga and Vanuatu, are aiming to do better, in terms of protecting their ocean (e.g. United Nations Ocean Conference Voluntary Commitments[15]). Many Pacific Island Countries, including these five, are party to the Convention on Biological Diversity and committed to meeting the CBD goals in implementing an ecologically representative network of marine protected areas[16]. Until now, a mechanism to systematically implement ecologically representative networks of Marine Protected Areas at national scales, within Pacific Island countries, had not been available.

The bioregions resulting from this technical analysis provides, for the first time, marine bioregions across the Southwest Pacific at a scale, which can be used as a basis for comprehensive, in-country consideration of what a representative network of Marine Protected Areas could look like. The methodology is repeatable, statistically robust and based on many sets of comprehensive and reliable data available across the Southwest Pacific.

Even so, the marine bioregions presented here are termed “draft” bioregions because they still require expert in-country input. Local marine experts, can, review and revise (as appropriate) the bioregion names, boundaries and descriptions to better reflect their local knowledge of their marine ecosystems. This coupling of technical analysis and expert input ensures a solid basis for future marine planning at a national scale and is a relatively unique approach to the creation of bioregions which normally rely on either one approach or the other – albeit always informed by spatial data (Longhurst 2006, Spalding et al. 2007, UNESCO 2009, O’Hara et al. 2011, Reygondeau et al. 2012, Keith et al. 2013, Kulbicki et al. 2013, Green et al. 2014, Proud et al. 2017).

Even after expert review, the authors acknowledge that the analysis and methods upon which the bioregions are based will still not be perfect, because they are based upon available information, which is incomplete. As more information comes to light the bioregions presented here can be improved and refined.

In particular, it is acknowledged that the epiphotic (or photic), mesophotic, bathyl, abyssal, hadal and benthic ocean zones host asssemblages of organisms that may not vertically align. Sayre et al. (2017), for example, used environmental data to create three-dimensional maps of the ocean, resulting in a comprehensive set of 37 distinct volumetric region units, called ecological marine units (EMUs) at various depths in the oceans, globally. Eleven of these are in the tropical SW Pacific (Sayre et al. 2017); this differentiation in the Pacific is not sufficient to support national planning processes. Thus, in an ideal world, one would describe marine bioregions within each vertical ocean “zone” at a scale useful for national management; however, this was not possible given the data constraints at the time of this work. It is also conceptionally difficult to establish protected zones for different depth zones (Venegas-Li et al. 2017), and the scope of current marine spatial planning work in the region does not include such an approach.

Alternatively, different methods can be used to describe bioregions (see Section 2.1 above). For example, Last et al. (2010) present a framework of ten hierarchical layers of “regions” that describe the seabed only, but at different scales from the ocean basin-scale (biogeographic) to the genetic level. Its in-country utility for national-planning purposes in the Pacific has yet to be explored. The clustering of the reef-associated species data could also have been conducted with other methods, for example where species assemblages are tracked together probabilistically (e.g. Foster et al. 2013), or with a network approach (Vilhena and Antonelli 2015). Each of the many types of methods available has pros and cons; we chose approaches that we considered would best match Pacific Island ocean planning requirements and data constraints.

[15] oceanconference.un.org/commitments, accessed 28/9/17

[16] www.cbd.int/information/parties.shtml, accessed 28/9/17

For some of the countries within of the MACBIO project (Fiji the Solomon Islands, Tonga and Vanuatu), the draft bioregions have already benefitted from in-country expert review. For these countries, “Country reports” are being prepared which will comprise this report but appended for the methods applied during, and results arising from, in-country expert workshops. For countries outside of the MACBIO project, the next stage of expert input is also recommended.

In national planning, of course, many other considerations and data should inform decisions about where to locate marine protected areas – both biophysical and socio-economic. For example, at the finer scale, habitat and species distribution information within bioregions, where available, should be used to complement bioregions to ensure networks of MPAs that represent the entire range of biodiversity within countries (see Ceccarelli et al. In prep). Further, social, economic and cultural management objectives will obviously require consideration of human uses and values as well as biophysical data in decision-making (Lewis et al. 2017).

The marine environment and the organisms that live in the ocean do not respect national boundaries. As such, the data used in these analyses and the resulting draft marine bioregions extend beyond national boundaries (ABNJ) and can contribute, also, to management of the high seas should an ecologically representative approach to planning be desired.

Overall, our results provide a first, unique and essential step to supporting Pacific Island countries and territories, and beyond, to deliver national, ecologically representative networks of marine protected areas.

6 ACKNOWLEDGEMENTS

This project was supported and embraced by the country partners of the MACBIO project. Significant assistance, particularly with data provision, was rendered by the following people and institutions: Daniela Ceccarelli; David Feary; Doug Fenner; Peter Houk; Khaled bin Sultan Living Oceans Foundation (Kate Fraser, BR Samaniego, J Eyre); Marine Ecology Consulting (Helen Sykes); Marine Conservation Consulting (Maël Imirizaldu), Museum of Tropical Queensland (Paul Muir); National Oceanic and Atmospheric Administration; Phoenix Islands Protected Area (Stuart Sandin, Randi Rotjan, Sangeeta Mangubhai); Reef Life Survey; Secretariat of the Pacific Community (SPC); Secretariat of the Pacific Regional Environment Programme (SPREP); Vava'u Environmental Protection Association (Karen Stone); The Nature Conservancy (TNC); UNEP-WCMC; University of British Columbia (Simon Donner); WCS (Fiji); WorldFish Centre; World Resources Institute (WRI). We also benefited from advice from Sangeeta Mangubhai and Helen Sykes. We are further grateful to the University of Queensland for assistance with contract administration, to Geoscience Australia for releasing Mr Sullivan for this project and to Oceans 5 for some funding support. The report benefitted from the input of Mark Spalding and Piers Dunstan.

The Marine and Coastal Biodiversity Management in Pacific Island Countries (MACBIO) project was the main source of funding for this work. MACBIO is funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety's (BMUB) International Climate Initiative (IKI). It is being implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) with the countries of Fiji, Kiribati, Solomon Islands, Tonga and Vanuatu. It has technical support from the Oceania Regional Office of the International Union for the Conservation of Nature (IUCN) and is working in close collaboration with the Pacific Regional Environment Program (SPREP).

7 REFERENCES

Ban, N. C., S. M. Maxwell, D. C. Dunn, A. J. Hobday, N. J. Bax, J. Ardron, K. M. Gjerde, E. T. Game, R. Devillers, D. M. Kaplan, P. K. Dunstan, P. N. Halpin, and R. L. Pressey. 2014. Better integration of sectoral planning and management approaches for the interlinked ecology of the open oceans. Marine Policy 49:127-136.

Beger, M., J. McGowan, E. A. Treml, A. L. Green, A. T. White, N. H. Wolff, C. J. Klein, P. J. Mumby, and H. P. Possingham. 2015. Integrating regional conservation priorities for multiple objectives into national policy. Nature Communications 6:8208. doi: 8210.1038/ncomms9208

Benoit-Bird, K. J., B. L. Southall, and M. A. Moline. 2016. Predator-guided sampling reveals biotic structure in the bathypelagic. Proceedings of the Royal Society B: Biological Sciences 283:20152457. doi: 10.1098/rspb.2015.2457.

Bestley, S., T. A. Patterson, M. A. Hindell, and J. S. Gunn. 2010. Predicting feeding success in a migratory predator: integrating telemetry, environment, and modeling techniques. Ecology 91:2373-2384.

Brewer, T. D., J. E. Cinner, A. Green, and J. M. Pandolfi. 2009. Thresholds and multiple scale interaction of environment, resource use, and market proximity on reef fishery resources in the Solomon Islands. Biological Conservation 142:1797-1807.

Brown, A., and S. Thatje. 2014. Explaining bathymetric diversity patterns in marine benthic invertebrates and demersal fishes: physiological contributions to adaptation of life at depth. Biological Reviews of the Cambridge Philosophical Society 89:406-426.

Ceccarelli, D., V. Matoto, J. Raubani, G. Jones and L. Fernandes. in prep. Biophysical placement guidelines for the design of offshore networks of no-take marine protected areas. MACBIO project. GIZ, IUCN, SPREP, Suva, Fiji.

Chin, A., T. Lison de Loma, K. Reytar, S. Planes, K. Gerhardt, E. Clua, L. Burke, and C. Wilkinson. 2011. Status of coral reefs of the Pacific and outlook: 2011. Global Coral Reef Monitoring Network., Townsville, Australia.

Clarke, K. R. 1993. Non-parametric multivariate analyses of changes in community structure. Australian Journal of Ecology 18:117-143.

Craig, J., A. J. Jamieson, R. Hutson, A. F. Zuur, and I. G. Priede. 2010. Factors influencing the abundance of deep pelagic bioluminescent zooplankton in the Mediterranean Sea. Deep Sea Research Part I: Oceanographic Research Papers 57:1474–1484.

Department of Conservation, and Ministry of Fisheries. 2011. Coastal marine habitats and marine protected areas in the New Zealand Territorial Sea: a broad scale gap analysis. Department of Conservation, Ministry of Fisheries, Wellington, New Zealand.

Department of the Environment and Heritage. 2006. A guide to the integrated marine and coastal regionalisation of Australia: IMCRA Version 4.0. Australian Government, Department of the Environment and Heritage, Canberra, A.C.T.

DeVaney, S. C. 2016. Species distribution modelling of deep pelagic eels. Integrative and Comparative Biology 56:524–530.

Devney, C. A., M. Short, and B. C. Congdon. 2009. Sensitivity of tropical seabirds to El Niño precursors. Ecology 90:1175-1183.

Dunstan, P. K., F. Althaus, A. Williams, and N. J. Bax. 2012. Characterising and predicting benthic biodiversity for conservation planning in deepwater environments. PloS ONE 7:e36558.

Edwards, K. F., E. Litchman, and C. A. Klausmeier. 2013. Functional traits explain phytoplankton community structure and seasonal dynamics in a marine ecosystem. Ecology Letters 16:56-63.

Elith, J. 2000. Quantitative methods for modeling species habitat: comparative performance and application to Australian plants. Pages 33-58 *in* S. Ferson and M. Burgman, editors. Quantitative methods for conservation biology. Springer-Verlag, New York.

Elith, J., C. H. Graham, R. P. Anderson, M. Dudik, S. Ferrier, A. Guisan, R. J. Hijmans, F. Huettmann, J. R. Leathwick, A. Lehmann, J. Li, L. G. Lohmann, B. A. Loiselle, G. Manion, C. Moritz, M. Nakamura, Y. Nakazawa, J. M. M. Overton, A. T. Peterson, S. J. Phillips, K. Richardson, R. Scachetti-Pereira, R. E. Schapire, J. Soberon, S. Williams, M. S. Wisz, and N. E. Zimmermann. 2006. Novel methods improve prediction of species' distributions from occurrence data. Ecography 29:129-151.

Elith, J., and J. R. Leathwick. 2009. Species distribution models: ecological explanation and prediction across space and time. Annual Review of Ecology Evolution and Systematics 40:677-697.

Fernandes, L., J. Day, A. Lewis, S. Slegers, B. Kerrigan, D. Breen, D. Cameron, B. Jago, J. Hall, D. Lowe, J. Innes, J. Tanzer, V. Chadwick, L. Thompson, K. Gorman, M. Simmons, B. Barnett, K. Sampson, G. De'ath, B. Mapstone, H. Marsh, H. Possingham, I. Ball, T. Ward, K. Dobbs, J. Aumend, D. Slater, and K. Stapleton. 2005. Establishing representative no-take areas in the Great Barrier Reef: Large-scale implementation of theory on marine protected areas. Conservation Biology 19:1733-1744.

Fernandes, L., A. Green, J. Tanzer, A. White, P. M. Alino, J. Jompa, P. Lokani, A. Soemodinoto, M. Knight, B. Pomeroy, H. P. Possingham, and B. Pressey. 2012. Biophysical principles for designing resilient networks of marine protected areas to integrate fisheries, biodiversity and climate change objectives in the Coral Triangle. Coral Triangle Support Partnership.

Forney, K. A. 2000. Environmental models of cetacean abundance: reducing uncertainty in population trends. Conservation Biology 14 (5): 1271-1286.

Foster, S. D., G. H. Givens, G. J. Dornan, P. K. Dunstan, and R. Darnell. 2013. Modelling biological regions from multi-species and environmental data. Environmetrics 24:489-499.

Game, E. T., H. S. Grantham, A. J. Hobday, R. L. Pressey, A. T. Lombard, L. E. Beckley, K. Gjerde, R. Bustamante, H. P. Possingham, and A. J. Richardson. 2009. Pelagic protected areas: the missing dimension in ocean conservation. Trends in Ecology & Evolution 24:360-369.

Graf, G. 1989. Benthic-pelagic coupling in a deep-sea benthic community. Nature 341:437-439.

Green, A., S. E. Smith, G. Lipsett-Moore, C. Groves, N. Peterson, S. Sheppard, P. Lokani, R. Hamilton, J. Almany, J. Aitsi, and L. Bualia. 2009. Designing a resilient network of marine protected areas for Kimbe Bay, Papua New Guinea. Oryx 43:1-11.

Green, A. L., L. Fernandes, G. Almany, R. Abesamis, E. McLeod, P. M. Alino, A. T. White, R. Salm, J. Tanzer, and R. L. Pressey. 2014. Designing marine reserves for fisheries management, biodiversity conservation, and climate change adaptation. coastal management 42:143-159.

Hallegraeff, G. M. 2010. Ocean climate change, phytoplankton community responses, and harmful algal blooms: a formidable predictive challenge. Journal of Phycology 46:220-235.

Harris, P. T., M. Macmillan-Lawler, J. Rupp, and E. K. Baker. 2014. Geomorphology of the oceans. Marine Geology 352:4–24.

Heather, A. B., P. Trevor, S. Shubha, K. W. L. William, S. Venetia, F.-Y. Cesar, M. Heidi, P. W. H. Edward, U. Osvaldo, L. Vivian, and K. Margareth. 2003. Temperature as indicator of optical properties and community structure of marine phytoplankton: implications for remote sensing. Marine Ecology Progress Series 258:19-30.

Herring, P. J. 2002. The biology of the deep ocean. Oxford University Press, Oxford.

Howell, E. A., and D. R. Kobayashi. 2006. El Niño effects in the Palmyra Atoll region: oceanographic changes and bigeye tuna (*Thunnus obesus*) catch rate variability. Fisheries Oceanography 15:477–489.

Jackson, J. B. C., M. X. Kirby, W. H. Berger, K. A. Bjorndal, L. W. Botsford, B. J. Bourque, R. H. Bradbury, R. Cooke, J. Erlandson, J. A. Estes, T. P. Hughes, S. Kidwell, C. B. Lange, H. S. Lenihan, J. M. Pandolfi, C. H. Peterson, R. S. Steneck, M. J. Tegner, and R. R. Warner. 2001. Historical overfishing and the recent collapse of coastal ecosystems. Science 293:629-638.

Keith, S. A., A. H. Baird, T. P. Hughes, J. S. Madin, and S. R. Connolly. 2013. Faunal breaks and species composition of Indo-Pacific corals: the role of plate tectonics, environment and habitat distribution. Proceedings of the Royal Society B: Biological Sciences 280 (1763): doi: 10.1098/rspb.2013.0818

Kerrigan, B., D. Breen, G. De'ath, J. Day, L. Fernandes, R. Partridge, and K. Dobbs. 2011. Classifying the biodiversity of the Great Barrier Reef World Heritage Area. Technical report on the classification phase of the Representative Areas Program. Great Barrier Reef Marine Park Authority, Townsville, Australia.

Kitagawa, T., A. M. Boustany, C. J. Farwell, T. D. Williams, M. R. Castleton, and B. A. Block. 2007. Horizontal and vertical movements of juvenile bluefin tuna (*Thunnus orientalis*) in relation to seasons and oceanographic conditions in the eastern Pacific Ocean. Fisheries Oceanography 16:409-421.

Klein, C. J., C. J. Brown, B. S. Halpern, D. B. Segan, J. McGowan, M. Beger, and J. E. M. Watson. 2015. Shortfalls in the global protected area network at representing marine biodiversity. Nature, Scientific Reports 5:17539. doi:10.1038/srep17539

Kulbicki, M., V. Parravicini, D. R. Bellwood, E. Arias-Gonzalez, P. Chabanet, S. R. Floeter, A. Friedlander, J. McPherson, R. E. Myers, L. Vigliola, and D. Mouillot. 2013. Global biogeography of reef fishes: A hierarchical quantitative delineation of regions. PLoS ONE 8(12): e81847. https://doi.org/10.1371/journal.pone.0081847

Last, P. R., V. D. Lyne, A. Williams, C. R. Davies, A. J. Butler, and G. K. Yearsley. 2010. A hierarchical framework for classifying seabed biodiversity with application to planning and managing Australia's marine biological resources. Biological Conservation 143:1675-1686.

Lewis, N. a., J. Day, D. Wagner, C. Gaymer, A. Friedlander, J. Parks, A. Wilhelm, S. White, C. Sheppard, M. Spalding, G. San Martin, A. Skeat, S. Taei, T. Teroroko, and J. Evans. 2017. Guidelines for the design and management of large-scale Marine Protected Areas. IUCN, Gland, Switzerland.

Longhurst, A. R. 2006. Ecological geography of the sea. 2nd edition. Academic Press, San Diego.

Lourie, S. A., and A. C. J. Vincent. 2004. A marine fish follows Wallace's Line: the phylogeography of the three-spot seahorse (*Hippocampus trimaculatus*, Syngnathidae, Teleostei) in Southeast Asia. Journal of Biogeography 31:1975-1985.

Mackas, D. L., R. E. Thomson, and M. Galbraith. 2001. Changes in the zooplankton community of the British Columbia continental margin, 1985-1999, and their covariation with oceanographic conditions. Canadian Journal of Fisheries and Aquatic Sciences 58:685-702.

MacQueen, J. 1967. Some methods for classification and analysis of multivariate observations. Pages 281–297 *in* Fifth Berkeley Symposium on Mathematical Statistics and Probability. University of California Press, Berkeley, CA.

Martiny, A. C., C. T. A. Pham, F. W. Primeau, J. A. Vrugt, J. K. Moore, S. A. Levin, and M. W. Lomas. 2013. Strong latitudinal patterns in the elemental ratios of marine plankton and organic matter. Nature Geoscience 6:279-283.

Mellin, C., S. Andrefouet, M. Kulbicki, M. Dalleau, and L. Vigliola. 2009. Remote sensing and fish-habitat relationships in coral reef ecosystems: Review and pathways for systematic multi-scale hierarchical research. Marine Pollution Bulletin 58:11-19.

Mora, C. 2008. A clear human footprint in the coral reefs of the Caribbean. Proceedings of the Royal Society B-Biological Sciences 275:767-773.

O'Hara, T. D., A. A. Rowden, and N. J. Bax. 2011. A southern hemisphere bathyal fauna is distributed in latitudinal bands. Current Biology 21:226–230.

Olds, A. D., R. M. Connolly, K. A. Pitt, P. S. Maxwell, S. Aswani, and S. Albert. 2014. Incorporating surrogate species and seascape connectivity to improve marine conservation outcomes. Conservation Biology 28:982-991.

Piacenza, S. E., A. K. Barner, C. E. Benkwitt, K. S. Boersma, E. B. Cerny-Chipman, K. E. Ingeman, T. L. Kindinger, J. D. Lee, A. J. Lindsley, J. N. Reimer, and J. C. Rowe. 2015. Patterns and Variation in Benthic Biodiversity in a Large Marine Ecosystem. PLoS ONE 10:e0135135.

Pratt, C., and H. Govan. 2011. Framework for a Pacific Oceanscape: a catalyst for mplementation of ocean policy. Suva, Fiji.

Proud, R., M. J. Cox, and A. S. Brierley. 2017. Biogeography of the global ocean's mesopelagic zone. Current Biology 27:113–119.

Rex, M. A., R. J. Etter, J. S. Morris, J. Crouse, C. R. McClain, N. A. Johnson, C. T. Stuart, J. W. Deming, R. Thies, and R. Avery. 2006. Global bathymetric patterns of standing stock and body size in the deep-sea benthos. Marine Ecology Progress Series 317:1–8.

Reygondeau, G., O. Maury, G. Beaugrand, J. M. Fromentin, A. Fonteneau, and P. Cury. 2012. Biogeography of tuna and billfish communities. Journal of Biogeography 39:114–129.

Rickbeil, G. J. M., N. C. Coops, M. E. Andrew, D. K. Bolton, N. Mahony, and T. A. Nelson. 2014. Assessing conservation regionalization schemes: employing a beta diversity metric to test the environmental surrogacy approach. Diversity and Distributions 20:503-514.

Sayre, R. G., D. J. Wright, S. P. Breyer, K. A. Butler, K. Van Graafeiland, M. J. Costello, P. T. Harris, K. L. Goodin, J. M. Guinotte, Z. Basher, M. T. Kavanaugh, P. N. Halpin, M. E. Monaco, N. Cressie, P. Aniello, C. E. Frye, and D. Stephens. 2017. A three-dimensional mapping of the ocean based on environmental data. Oceanography 30:90–103.

Schaefer, K. M., D. W. Fuller, and B. A. Block. 2007. Movements, behavior, and habitat utilization of yellowfin tuna (*Thunnus albacares*) in the northeastern Pacific Ocean, ascertained through archival tag data. Marine Biology 152:503-525.

Sherman, K., M.-C. Aquarone, and S. Adams. 2009. Sustaining the world's large marine ecosystems. IUCN, the World Conservation Union.

Spalding, M. D., V. N. Agostini, J. Rice, and S. M. Grant. 2012. Pelagic provinces of the world: A biogeographic classification of the world's surface pelagic waters. Ocean & Coastal Management 60:19-30.

Spalding, M. D., H. E. Fox, B. S. Halpern, M. A. McManus, J. Molnar, G. R. Allen, N. Davidson, Z. A. Jorge, A. L. Lombana, S. A. Lourie, K. D. Martin, E. McManus, J. Molnar, C. A. Recchia, and J. Robertson. 2007. Marine ecoregions of the world: A bioregionalization of coastal and shelf areas. Bioscience 57:573-583.

Sutcliffe, P. R., C. J. Klein, C. R. Pitcher, and H. P. Possingham. 2015. The effectiveness of marine reserve systems constructed using different surrogates of biodiversity. Conservation Biology 29:657-667.

Sutcliffe, P. R., C. Mellin, C. R. Pitcher, H. P. Possingham, and M. J. Caley. 2014. Regional-scale patterns and predictors of species richness and abundance across twelve major tropical inter-reef taxa. Ecography 37: 162-171.

Sutton, T., F. Porteiro, M. Heino, I. Byrkjedal, G. Langhelle, C. Anderson, J. Home, H. Soiland, T. Falkenhaug, O. R. Godo, and O. A. Bergstad. 2008. Vertical structure, biomass and topographic association of deep-pelagic fishes in relation to a mid-ocean ridge system. Deep Sea Research Part II: Topic Studies in Oceanography 55:161–184.

Sutton, T. T., M. R. Clark, D. C. Dunn, P. N. Halpin, A. D. Rogers, J. Guinotte, S. J. Bograd, M. V. Angel, J. A. A. Perez, K. Wishner, R. L. Haedrich, D. J. Lindsay, J. C. Drazen, A. Vereshchaka, U. Piatkowski, T. Morato, K. Błachowiak-Samołyk, B. H. Robison, K. M. Gjerde, A. Pierrot-Bults, P. Bernal, G. Reygondeau, and M. Heino. 2017. A global biogeographic classification of the mesopelagic zone. Deep Sea Research Part I: Oceanographic Research Papers 126:85-102.

Terauds, A., S. L. Chown, F. Morgan, H. J. Peat, D. J. Watts, H. Keys, P. Convey, and D. M. Bergstrom. 2012. Conservation biogeography of the Antarctic. Diversity and Distributions 18:726-741.

Tittensor, D. P., C. Mora, W. Jetz, H. K. Lotze, D. Ricard, E. Vanden Berghe, and B. Worm. 2010. Global patterns and predictors of marine biodiversity across taxa. Nature 466:1098-U1107.

Treml, E. A., and P. N. Halpin. 2012. Marine population connectivity identifies ecological neighbors for conservation planning in the Coral Triangle. Conservation Letters 5:441–449.

Tyberghein, L., H. Verbruggen, K. Pauly, C. Troupin, F. Mineur, and O. De Clerck. 2012. Bio-ORACLE: a global environmental dataset for marine species distribution modelling. Global Ecology and Biogeography 21:272-281.

UNESCO. 2009. Global Open Oceans and Deep Seabed (GOODS) – Biogeographic Classification. UNESCO, Paris.

Venegas-Li, R., N. Levin, H. Possingham, and S. Kark. 2017. 3D spatial conservation prioritisation: Accounting for depth in marine environments. Methods in Ecology and Evolution 9(3):733-784.

Vereschchaka, A., G. Abyzova, A. Lunina, E. Musaeva, and T. Sutton. 2016. A novel approach reveals high zooplankton standing stock deep in the sea. Biogeosciences 13:6261–6271.

Veron, J., M. Stafford-Smith, L. DeVantier, and E. Turak. 2015. Overview of distribution patterns of zooxanthellate Scleractinia. Frontiers in Marine Science 1: doi/10.3389/fmars.2014.00081

Vilhena, D. A., and A. Antonelli. 2015. A network approach for identifying and delimiting biogeographical regions. Nature Communications 6: doi:10.1038/ncomms7848

Watling, L., and et al. 2013. A proposed biogeography of the deep ocean floor. Progress in Oceanography 111:91-112.

Wilson, K. A., M. Cabeza, and C. J. Klein. 2009. Fundamental concepts of spatial conservation prioritization. Pages 16–27 *in* A. Moilanen, K. A. Wilson, and H. P. Possingham, editors. Spatial conservation prioritisation: Quantitative methods and computational tools. Oxford University Press, Oxford, UK.

Woolley, S. N. C., D. P. Tittensor, P. K. Dunstan, G. Guillera-Arroita, J. J. Lahoz-Monfort, B. A. Wintle, B. Worm, and T. D. O'Hara. 2016. Deep-sea diversity patterns are shaped by energy availability. Nature 533:393–396.

Worm, B., E. B. Barbier, N. Beaumont, J. E. Duffy, C. Folke, B. S. Halpern, J. B. C. Jackson, H. K. Lotze, F. Micheli, S. R. Palumbi, E. Sala, K. A. Selkoe, J. J. Stachowicz, and R. Watson. 2006. Impacts of biodiversity loss on ocean ecosystem services. Science 314:787-790.

8 APPENDICES

8.1 ENVIRONMENTAL AND BIOLOGICAL INFORMATION: SOURCES AND PATTERNS

THE GENERAL BATHYMETRIC CHART OF THE OCEANS (GEBCO)

www.gebco.net/

The General Bathymetric Chart of the Oceans (GEBCO) consists of an international group of experts who work on the development of a range of bathymetric data sets and data products, including gridded bathymetric data sets, the GEBCO Digital Atlas, the GEBCO world map and the GEBCO Gazetteer of Undersea Feature Names.

The General Bathymetric Chart of the Oceans (GEBCO) raster dataset represents global terrain models for ocean and land and gives an indication of the depth of our ocean floor. This dataset was delivered as a single global grid with 30 arc second resolution (≈950m). The dataset was generated by combining quality-controlled ship depth soundings with interpolation between sounding points guided by satellite-derived gravity data. The version used was The GEBCO_2014 Grid, version 20150318 (www.gebco.net/data_and_products/gridded_bathymetry_data/gebco_30_second_grid/).

BIO-ORACLE: A GLOBAL ENVIRONMENTAL DATASET FOR MARINE SPECIES DISTRIBUTION MODELLING

www.oracle.ugent.be/

The oceans harbour a great diversity of organisms whose distribution and ecological preferences are often poorly understood. Species distribution modelling (SDM) could improve our knowledge and inform marine ecosystem management and conservation. Although marine environmental data are available from various sources, there are currently no user-friendly, high-resolution global datasets designed for SDM applications. This study aims to fill this gap by assembling a comprehensive, uniform, high-resolution and readily usable package of global environmental rasters.

The Bio-Oracle GIS raster datasets were delivered as a single collection with 5 arc minute resolution (≈9km). Each raster dataset is an extract of remotely sensed data from SeaWiFS or Aqua MODIS satellites or in-situ observations from the World Ocean Database (2009). All remotely-sensed datasets were resampled to 5 arc minute resolution (approximately 9km), all in-situ datasets were interpolated with DIVA (data interpolating variational analysis) using the variational inverse method. Finally a uniform land mask was applied. The version we used is 70°N-70°S Real Values (www.oracle.ugent.be/DATA/70_70_RV/BioOracle_7070RV.rar).

CSIRO ATLAS OF REGIONAL SEAS (CARS)

www.marine.csiro.au/~dunn/cars2009/

CARS is a digital climatology, or atlas of seasonal ocean water properties. It comprises gridded fields of mean ocean properties over the period of modern ocean measurement, and average seasonal cycles for that period. It is derived from a quality-controlled archive of all available historical subsurface ocean property measurements - primarily research vessel instrument profiles and autonomous profiling buoys. As data availability has enormously increased in recent years, the CARS mean values are inevitably biased towards the recent ocean state.

A number of global ocean climatologies are presently available, such as NODC's World Ocean Atlas. CARS is different as it employs extra stages of in-house quality control of input data, and uses an adaptive-lengthscale loess mapper to maximise resolution in data-rich regions, and the mapper's "BAR" algorithm takes account of topographic barriers. The result is excellent definition of oceanic structures and accuracy of point values.

The CSIRO Atlas of Regional Seas (CARS) rasters were delivered as collections in NetCDF format with 0.25 degree resolution (≈55km). Each dataset is an extraction from the World Ocean Database (2008). Datasets were first quality

controlled, then interpolated using an adaptive-lengthscale loess mapper to maximise resolution in data-rich regions, and the mapper's "BAR" algorithm takes account of topographic barriers. The NetCDF files contain data at 79 depths, we used 30m, 200m, and 1000m. The depth of 20°C isotherm was calculated using the seawater temperature depth series along with the NumPy linear interpolation algorithm (numpy.interp). The 1000m seawater temperature, depth of 20°C isotherm, and Dynamic Height with regard to 2000m did not have complete coverage so they were filled using the GDAL fillnodata interpolation algorithm (www.gdal.org/gdal_fillnodata.html) with default settings. The version of CARS that was used was 2009 (www.marine.csiro.au/~dunn/cars2009/).

OCEANCOLOR WEB MODIS AQUA PRODUCTS

http://oceandata.sci.gsfc.nasa.gov/

MODIS (or Moderate Resolution Imaging Spectroradiometer) is a key instrument aboard the Aqua (originally known as EOS PM-1) satellite. Aqua's orbit around the Earth is timed so that it passes from north to south across the equator in the afternoon. Aqua MODIS are viewing the entire Earth's surface every 1 to 2 days, acquiring data in 36 spectral bands, or groups of wavelengths. These data will improve our understanding of global dynamics and processes occurring on the land, in the oceans, and in the lower atmosphere. MODIS is playing a vital role in the development of validated, global, interactive Earth system models able to predict global change accurately enough to assist policy makers in making sound decisions concerning the protection of our environment.

Data is gridded to 4km resolution.

Chlorophyll-a Concentration (Monthly/Annual)
http://oceancolor.gsfc.nasa.gov/cms/atbd/chlor_a

Sea Surface Temperature (Monthly/Annual)
http://oceancolor.gsfc.nasa.gov/cms/atbd/sst4

Absorption due to phytoplankton at 443nm, GIOP model (Annual)
http://oceancolor.gsfc.nasa.gov/cms/atbd/giop

Particulate Inorganic Carbon (Annual)
http://oceancolor.gsfc.nasa.gov/cms/atbd/pic

Particulate Organic Carbon (Annual)
http://oceancolor.gsfc.nasa.gov/cms/atbd/poc

Photosynthetically Available Radiation (Annual)
http://oceancolor.gsfc.nasa.gov/cms/atbd/par

These raster datasets were delivered as collections of monthly mapped datasets with 5 arc minute resolution (≈9km). The level 3 (derived geophysical variables that have been aggregated/projected onto a well-defined spatial grid over a well-defined time period) mapped (The Level 3 Standard Mapped Image (SMI) products are created from the corresponding Level 3 binned products. Each SMI file contains a Plate Carrée, pixel-registered grid of floating-point values (or scaled integer representations of the values) for a single geophysical parameter) datasets were used. Summary statistics from July 2002 to April 2016 were calculated (maximum, mean, minimum, and range).

The version of chlorophyll concentration used was Aqua MODIS Chlorophyll Concentration, OCI Algorithm (http://oceandata.sci.gsfc.nasa.gov/MODIS-Aqua/Mapped/Monthly/4km/chlor_a), the version of sea surface temperature was Aqua MODIS Sea Surface Temperature 4μ night time (http://oceandata.sci.gsfc.nasa.gov/MODIS-Aqua/Mapped/Monthly/4km/sst4).

SHORELINE DATA

Shoreline data is a measure of distance from Land in meters. This vector dataset, World Vector Shorelines, represents the mean high water shoreline based on Digital Landmass Blanking data created by the US Defence Mapping Agency.

The version used was included in the Global Self-consistent, Hierarchical, High-resolution Geography Database version 2.3.6 (https://www.soest.hawaii.edu/pwessel/gshhg/).

EXCLUSIVE ECONOMIC ZONES (EEZS)

www.marineregions.org/eez.php

Maritime Boundaries are important for many applications. In biogeography for example, a layer of EEZ-polygons could be used for the creation of species distribution lists per country.

Up to now, there is no global public domain cover available. Therefore, the Flanders Marine Institute decided to develop an own database. The database includes two global GIS-layers: one contains polylines that represent the maritime boundaries of the world countries, the other one is a polygon layer representing the Exclusive Economic Zone of countries. The database also contains digital information about treaties.

As the information, on which the database is based, is in most cases freely available over the internet, we are not planning to charge any money for the distribution of the data and are considering the database as an Open-Source project. Since Maritime Boundaries are a relatively new concept, there are still a lot of countries that didn't agree with their neighbours about their maritime boundaries; new treaties will be negotiated in the next years. Therefore, we hope that users will contribute to this database and keep us up to date of new developments of their country's boundary or other countries that they are aware of.

8.2 R CLUSTERING CODE

```
#load data
Grid.4km = read.csv("C:/data.csv", header = T)

# convert NA to 0
Grid.20km[is.na(Grid.20km)] <- 0

#scale the grid [0,1]
Grid.20km.scaled = apply(Grid.20km, MARGIN = 2, FUN = function(X) (X - min(X))/diff(range(X)))

# double the importance of depth
Grid.20km.scaled[,'depth'] = Grid.20km.scaled[,'depth'] * 2

# create data frame to write to
ID = data.frame(attr(Grid.20km, "row.names")-1)
colnames(ID) = c("cell_id")
Grid.means = ID
Grid.20km$ID = NULL

# kmeans clustering
# set number of clusters to use with kmeans
k = 5000
# do kmeans clustering
means = kmeans(Grid.20km.scaled, k, nstart = 20, iter.max = 1000, algorithm = "MacQueen")
Grid.means = cbind(Grid.means, data.frame(means$cluster))
colnames(Grid.means) = c("CellID","kmeans")

# do heirarchical clustering using kmeans cluster centers
# create of distance matrix
similarity = dist(means$centers)
# hclust analysis
compare = hclust(similarity)
groups = data.frame(cutree(compare, h = .4))
colnames(groups) = c("h_4")

# create lookup table to assign hclust clusters to kmeans clusters
Grid.hclust = cbind(groups)
hclustOutput = as.data.frame((seq(1,nrow(groups))))
hclustOutput = cbind(hclustOutput, groups)
colnames(hclustOutput) = c("kmeans","h_4")

# assign hclust clusters to each CellID
Grid.means = merge(Grid.means, hclustOutput, by = "kmeans")

# save output
write.csv(Grid.means, "C:/Grid20km_kmeans_5000_h4.csv")
```

8.3 DATA DOWNLOAD AND PRE-PROCESSING INFORMATION

Name	Parameter	Link	Resolution
General Bathymetric Chart (GEBCO)	Bathymetry	www.gebco.net/	.00833333 degrees (~.9km)
OceanColor Aqua MODIS Products	▪ Surface Monthly Chlorophyll-a Concentration ▪ maximum ▪ mean ▪ minimum ▪ range ▪ Surface Monthly Sea Surface Temperature ▪ maximum ▪ mean ▪ minimum ▪ range	http://oceancolor.gsfc.nasa.gov/	.04166666 degrees (~4km)
Bio-ORACLE	▪ Surface Calcite Concentration ▪ Surface Dissolved Oxygen Concentration ▪ Surface Nitrate Concentration ▪ Photosynthetically Available Radiation ▪ maximum ▪ mean ▪ Surface pH ▪ Surface Phosphorus Concentration ▪ Surface Salinity ▪ Surface Silicate Concentration	www.bio-oracle.org/	.08333333 degrees (~9km)
CSIRO Atlas of Regional Seas (CARS)	▪ Depth of 20 degree isotherm ▪ Dynamic Height with regard to 2000m ▪ Mixed layer depth ▪ Nitrate concentration at 1000m depth ▪ Oxygen concentration at 1000m depth ▪ Phospate Concentration at 1000m depth ▪ Salinity at 1000m depth ▪ Silicate Concentration at 1000m depth ▪ Temperature ▪ 30m depth ▪ 200m depth ▪ 1000m depth	www.marine.csiro.au/~dunn/cars2009	0.5 degrees (~55km)
GADM database of Global Administrative Areas	Distance from land	www.gadm.org/	.00833333 degrees (~.9km)

8.4 NAMES AND DESCRIPTION OF DEEPWATER BIOREGIONS ACROSS THE SOUTHWESTERN PACIFIC REGION

Code	Name	Countries	Summary description
0	Gilbert Ridge	KIR	Comprised mostly of abyssal plains and hills cutting across ridges and seamounts. Sea surface temperature is moderate and variable, while temperature at 1000m is high for Fiji. Chlorophyll-a concentrations are high, with even higher levels around islands. 20 degree isotherm and hgt2000 are middling. Mixed layer depth is shallow. Silicate, phosphorous and nitrate levels are moderate. Dissolved oxygen is low but increases moving west. Calcite levels are low except around Tarawa and Maiana Atolls, which have high concentrations. Solar irradiance is high. Contains 1 seamount type 3 (intermediate size, large tall and deep), 1 seamount type 2 (small with deep peak, most common type); intersect 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth) and 1 seamount type 3. Include 5 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 4000m and the lower depth is 4500m.
1	Guam Micronesia & Mariana High Seas	GUM, FSM, MNP	Very large bioregion, elongated shape cutting through a number of large seamounts both on eastern and western side of the bioregion with middle section consisting of mainly basins with underlying Hadal base. Sea surface temperature moderate and stable. Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is medium, 20°C isotherm is deep, and MLD is moderate. Solar irradiance is moderate; PH, silicate, phosphate, nitrate and calcite are low. Contains 3 seamount type 2 (small with deep peak, most common type); 7 seamount type 3 (intermediate size, large tall and deep); intersect 3 seamount type 6 (very large and tall with low escarpment); 1 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 3 seamount type 9 (Large and tall with shallow peak, larger); 4 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5500m and the lower depth is 6000m.
3	North Micronesia-Marshall Island Abyssal Range	MHL, FSM	Seamounts concentrated along the eastern side of the bioregion with a deeper western basin with underlying Hadal section. SST high and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is medium, 20°C isotherm is deep, and MLD is moderate. Solar irradiance is moderate; PH, silicate, phosphate, nitrate and calcite are low. Contains 2 seamount type 2 (small with deep peak, most common type); 2 seamount type 6 (very large and tall with low escarpment); 1 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 8 (small and short with very deep peaks, deepest type); 3 seamount type 9 (Large and tall with shallow peak, larger); 4 seamount type 10 (large and tall with shallow peak: shallow); Includes 10 Blind canyon type and 4 Shelf incising canyon type. The upper depth is 5500m and the lower depth is 6000m.
4	Solomon, Tuvalu Seamounts	SLB, TUV	Bioregion consists of chain of deeper and larger seamounts formed on abyssal mountains and sloping abyssal hills and underlying abyssal plains. SST high and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is shallow, 20°C isotherm is deep, MLD is low and pH is high. Solar irradiance is moderate, silicate, phosphate, nitrate and calcite are low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 4 seamount type 2 (small with deep peak, most common type); 4 seamount type 7 (small and short with very deep peaks, shortest); 17 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.
6	Marshall & Wake Island High Seas	MHL, UMI	Contains large, medium and small size seamounts formed on abyssal hills and mountains. Deep basin and Hadal covers most of the middle section of the bioregion. SST moderate and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is moderate, 20°C isotherm is deep, and MLD is moderate. Solar irradiance, pH, silicate, phosphate, nitrate and calcite are low. Contains 11 seamount type 2 (small with deep peak, most common type);13 seamount type 3 (intermediate size, large tall and deep); 7 seamount type 6 (very large and tall with low escarpment); 2 seamount type 7 (small and short with very deep peaks, shortest); 10 seamount type 8 (small and short with very deep peaks, deepest type); 10 seamount type 9 (Large and tall with shallow peak, larger); 6 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5000m and the lower depth is 6000m.

Code	Name	Countries	Summary description
7	Cape Johnson & Solomon Trench	SLB	Deep bioregion that contains the Solomon Trench and Cape Johnson Trough. Underlying basin, abyssal hills and mountains and deep seamounts ridges. Canyons also on the north western side. SST moderate and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is moderate, 20°C isotherm, pH, and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Contains 9 Blind canyon type. Contains 1 active, confirmed and 2 active, inferred hydrothermal vents. The upper depth is 2500m and the lower depth is 4500m.
9	Palau Abyssal Range	FSM, PLW	Contains mostly abyssal hills and mountains. Basins formed on abyssal plains are also included. SST high and stable, Chlorophyll-a, Salinity and dissolved oxygen are low. Temperature at 1000m is moderate. 20°C isotherm, pH, and Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains NO Seamounts. The upper depth is 5500m and the lower depth is 6000m.
10	Nauru Marshal Islands Basin	MHL, FSM, NRU	Contains three seamounts and large basin on abyssal plains. SST moderate and stable. Chlorophyll-a concentrations are low. Salinity and dissolved oxygen are low and variable. Temperature at 1000m and 20°C isotherm are moderate. Solar irradiance is high and MLD is shallow. pH, Silicate, phosphate, nitrate and Calcite are low. Contains 1 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 4500m.
11	Marshall Islands Abyssal Range & Ratak Ridges	MHL	Non-contiguous with deep seamounts scattered across the bioregion. Abyssal mountains form the base of the seamounts, canyons on the eastern side, and the Ratak ridges that form the base of the Marshall Islands and slopes into the deep. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are moderate and variable. Temperature at 1000m is moderate. 20°C isotherm is shallow, MLD and solar irradiance are moderate and pH is high. Silicate, phosphate, nitrate and calcite are moderate. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 2 (small with deep peak, most common type); 3 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 3 seamount type 7 (small and short with very deep peaks, shortest); 6 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Contains 10 Blind canyon type and 4 Shelf incising canyon type. The upper depth is 2000m and the lower depth is 5000m.
13	Fiji-Tonga-Vanuatu Plateau and Basins including Moore Ridge	FJI, TON, VUT	Bioregion dominated by plateau and basins with spreading ridges and rift valleys. Southern end of bioregion consist of one seamount. Area includes large abyssal hills, large plateau towards the east and isolated pockets of seamounts, spreading ridges and Moore Ridge. Sea surface temperature very unstable, low. Chlorophyll-a concentrations are high with a large bloom in the NW corner, extending into bioregion 165. Salinity and dissolved oxygen are high. Temperature at 200m is low. Deepwater temperatures are high. MLD quite low in NW part. Silicate and phosphorous levels are high. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 4 seamount type 4 (small with deep peak, most isolated type); 3 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); Contains 11 Blind canyon type. Contains 4 active, confirmed and 10 active, inferred hydrothermal vents. The upper depth is 2000m and the lower depth is 3500m.
14	American Samoa - Cook Islands Abyssal Mountains	ASM, COK, WSM, TON	Forms on the northern tip of the Tonga EEZ on a basin and abyssal mountain. Sea surface temperature is high; chlorophyll-concentrations, 20°C Isotherm and the deep water temperature are low. Mixed layer depth, salinity and pH levels, nitrate and solar irradiance are moderate. Calcite is low and variable and dissolved oxygen concentrations are low and stable. Strong sea surface currents generally from the Northeast. Contains 5 seamount type 2 (small with deep peak, most common type); 5 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 7 (small and short with very deep peaks, shortest); 5 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 10 (large and tall with shallow peak: shallow); Contains 1 active, confirmed hydrothermal vent. The upper depth is 5000m and the lower depth is 5500m.

Code	Name	Countries	Summary description
19	Southern Fiji Flats	NCL, FJI, VUT	Deep bioregion with a mostly flat seafloor, a few small isolated seamounts and spreading ridges. SST is low, CHL low and stable, Salinity is high and variable, Dissolved Oxygen is moderate and stable, Deepwater temp is moderate, 20°C isotherm is shallow, mixed layer depth is shallow, Solar irradiance is low, pH level is low, silicate level is low, phosphate level is low, nitrate level is moderate, Calcite is low. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 4 (small with deep peak, most isolated type); 2 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 5 seamount type 10 (large and tall with shallow peak: shallow); 6 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Contains 2 Blind canyon type. The upper depth is 3500m and the lower depth is 4500m.
20	Kiribati - High Seas Line Island Group & Menard Ridge	KIR, UMI	Consist lots of seamounts in the eastern side, deep abyssal plains, hills and mountains, few escarpments features and cuts through a number of ridges including the Menard ridge in the Line Island Group of Kiribati. Sea surface temperature is low and variable. Chlorophyll-a concentrations are high and variable. Dissolved oxygen, silicate, and pH levels are low. Salinity, phosphorous, solar irradiance, and nitrate levels are high. Temperature at depth is high but variable. 20 degree isotherm is deep. Mixed layer depth is shallow but variable. Contains 6 seamount type 1 (small with deep peak, short with moderately deep peak); 4 seamount type 2 (small with deep peak, most common type); 3 seamount type 3 (intermediate size, large tall and deep); 6 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 8 (small and short with very deep peaks, deepest type); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 5000m.
22	Marshall Islands Jaluit & Ailinglaplap Ridges	MHL	Cuts through large seamounts in the north and eastern side of bioregion. Majority consist of abyssal plains, hills and mountains that form the base of seamounts, the large ridges where the Jaluit and Ailinglaplap Atoll islands of Marshall Islands are also included. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Calcite and dissolved oxygen levels are low. PH, silicate, phosphorous, salinity, and nitrate levels are moderate. Solar irradiance is low. Mixed layer depth is shallow. Temperature at 1000m is high. Contains 3 seamount type 2 (small with deep peak, most common type); 6 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 3 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 10 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 3000m and the lower depth is 5000m.
24	Fiji - Tonga Chains	FJI, TON, VUT	Dominated by plateau with a combination of features. Chain of seamounts on the northern part forming on ridges. Rift valleys on spreading ridges. SST is low and stable, CHL low and variable, Salinity is moderate and variable, Dissolved Oxygen is low and stable, Deepwater temp is moderate, 20°C isotherm is moderate, mixed layer depth is generally shallow but deep in the east towards Tonga, Solar irradiance is low, pH level is moderate, silicate level is moderate to high towards east (within Fiji and Tongan waters), phosphate level is low, nitrate level is moderate, Calcite is low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 8 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 10 (large and tall with shallow peak: shallow); Includes 8 Blind canyon type. Contains 9 active, confirmed and 12 active, inferred hydrothermal vents. The upper depth is 1500m and the lower depth is 3000m.
25	FSM - Palau Sea Mount Range	GUM, FSM, PLW	FOUR non-contiguous parts of bioregion. Western part contains 1 large seamount, the most eastern part cuts through two big deep seamounts formed on abyssal mountains. The two parts in the center includes large ridges, abyssal mountains and includes part of the Mariana Trench and Challenger Deep. SST moderate and stable, Chlorophyll-a concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contains 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Intersect1 Blind canyon type. The upper depth is 2500m and the lower depth is 5000m.

Code	Name	Countries	Summary description
29	New Caledonia Flats	NCL	Small non-contiguous bioregion consisting of mostly plateau with canyons and ridges. SST moderate and stable, Chlorophyll-a concentrations are high to moderate. Deepwater temperature is moderate. Solar irradiance and MLD are moderate. Silicate, pH, Calcite and phosphorous levels are low. Intersect 1 seamount type 9 (Large and tall with shallow peak, larger) and 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 9 Blind canyon type and 2 Shelf incising canyon type. The upper depth is 500m and the lower depth is 1500m.
30	New Caledonia Southern Plateaus	NCL	Mostly plateau with two seamounts and ridges and few canyons. SST moderate and stable, Chlorophyll-a concentrations are low. Salinity is high, DO is moderate, Deepwater temperature is shallow, 20 Degree Isotherm is shallow, Solar irradiance is low and MLD is shallow. Silicate, pH, Calcite, Nitrate and phosphorous levels are low. Contains 2 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 7 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 1000m and the lower depth is 2000m.
32	Northern Marshall Islands - High Seas Range	MHL, UMI	This bioregion consists of a lot of large deeper water seamounts formed on top of abyssal mountains. Other features include abyssal hills, plains, escarpments and Deepwater basin. SST moderate and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD, PH, moderate and Solar irradiance are moderate. silicate, phosphate, nitrate and calcite are low. Contains 7 seamount type 2 (small with deep peak, most common type); 8 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 6 (very large and tall with low escarpment); 3 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 8 (small and short with very deep peaks, deepest type); 9 seamount type 9 (Large and tall with shallow peak, larger); 9 seamount type 10 (large and tall with shallow peak: shallow); 5 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 2 Blind canyon type. The upper depth is 4000m and the lower depth is 5500m.
35	South Polynesian Range	COK, PYF, TON, NIU	Dominated by slope from ridges, and plateaus with sloping towards the trench. Sea surface temperature is moderate. Chlorophyll-a concentrations, 20°C Isotherm and the deep water temperature are low. Salinity, pH levels, nitrate and solar irradiance are moderate. Mixed layer depth is moderate. Calcite is low and variable and dissolved oxygen concentrations are low and stable. Strong sea surface currents generally from the North. Contains 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 6 (very large and tall with low escarpment); 2 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 3 Blind canyon type. The upper depth is 4500m and the lower depth is 5500m.
36	Southern Marshall Island Abyssal Range	MHL, FSM, KIR	Mostly dominated by abyssal plains, hills, mountains and seamounts. Other minor features escarpments and basin. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are low. Calcite and dissolved oxygen levels are low. PH, silicate, phosphorous, salinity, and nitrate levels are moderate. Solar irradiance is low. Mixed layer depth is shallow. Temperature at 1000m is high, moderate at 200m. Contains 2 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); 3 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 2 Blind canyon type. The upper depth is 4000m and the lower depth is 5000m.
38	Southern French Polynesia High Seas	PYF	Deep bioregion abyssal plains, hills and mountains with few seamounts and ridges, SST and Chlorophyll-a concentrations are very low. Salinity is moderate and dissolved oxygen is very high. Temperature at 1000m and MLD are moderate, 20°C isotherm is shallow, and PH, Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains 6 seamount type 2 (small with deep peak, most common type); 1 seamount type 4 (small with deep peak, most isolated type); 1 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.

Code	Name	Countries	Summary description
39	Kiribati - Howard and Baker Island Abyssal Range	KIR, UMI	Bioregion runs through Kiribati and Howard and Baker Islands EEZ. Mostly consist of abyssal plains, hills and mountains and Basin Features. Cuts across few medium size seamounts. Sea surface temperature is low and variable. Chlorophyll-a concentrations are high, variable. Mixed layer depth is deep in the north and shallow in the south. Temperature at 1000m and 200m is moderate. 20 degree isotherm is average depth. Solar irradiation is high; pH, nitrate, and silicate levels are moderate. Phosphorous and salinity are high. Dissolved oxygen and calcite levels are low, but calcite is highly concentrated around islands. Contains 4 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 1 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 10 (large and tall with shallow peak: shallow); The upper depth is 5000m and the lower depth is 5500m.
42	North Micronesian Sea Mount Range	MHL, FSM	Long thin bioregion north of Micronesia. Dominated by seamounts on both the eastern and western ends of the bioregion. Other features includes ridge and slopes, and abyssal features (hills, plains and mountains) SST high and stable, CHL is low and variable, Salinity is low, Dissolved Oxygen is low and stable, Deepwater temp is moderate, 20°C isotherm is moderate, mixed layer depth is moderate, Solar irradiance is moderate, pH level is low, silicate level is low, phosphate level is low, nitrate level is moderate, Calcite is low and variable. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 4 seamount type 2 (small with deep peak, most common type); 5 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 5 seamount type 9 (Large and tall with shallow peak, larger); 4 seamount type 10 (large and tall with shallow peak: shallow); 5 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type. The upper depth is 3000m and the lower depth is 5000m.
43	Cook Island - Tokelau Sea Mounts	WLF, ASM, COK, TKL	Bioregion falls mostly within Tokelau and the Cook Islands. Dominant feature are seamounts. Other features includes abyssal features (hills, plains and mountains). SST high and stable, CHL is low and variable, Salinity is low, Dissolved Oxygen is low and stable, Deepwater temp is moderate, 20°C isotherm is moderate, mixed layer depth is moderate, Solar irradiance is moderate, pH level is low, silicate level is low, phosphate level is low, nitrate level is moderate, Calcite is low variable. Contains 4 seamount type 1 (small with deep peak, short with moderately deep peak); 12 seamount type 2 (small with deep peak, most common type); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 10 (large and tall with shallow peak: shallow); 4 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3500m and the lower depth is 4500m.
44	Cook Island - Kiribati Abyssal Range	COK, KIR	Thin and pointed bioregion that falls mainly within the Phoenix and Line islands (Kiribati) and the Cooks. Dominated by abyssal hills with seamounts formed on top of abyssal mountains. Other features include Trough, ridges and escarpments. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low to moderate. Dissolved oxygen, phosphorous, solar irradiation, pH, nitrate levels are moderate. Salinity levels are high, and silicate and calcite levels are low. Temperatures at depth are quite high. Mixed layer and 20 degree isotherm are deep. Contains 10 seamount type 2 (small with deep peak, most common type); 6 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 7 (small and short with very deep peaks, shortest); 10 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 9 (Large and tall with shallow peak, larger); 9 seamount type 10 (large and tall with shallow peak: shallow); 4 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.
45	FSM Abyssal Range	FSM	Non-contiguous 3 parts bioregion that falls within the FSM. Mostly contains large ridges and abyssal hills and mountains with escarpments. SST high and stable, Chlorophyll-a concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contains 1 seamount type 2 (small with deep peak, most common type); 2 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); Includes 1 Blind canyon type. The upper depth is 1500m and the lower depth is 3000m.

Code	Name	Countries	Summary description
47	Cook Islands, Tokelau - High Seas Sea Mounts	COK, TKL	Bioregion falls mostly in the high seas but cuts through Tokelau and Cook Islands EEZ. Mostly dominated by seamounts and abyssal hills and mountains. Other features include plateau, trough, ridge and escarpments. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are low. Very deep mixed layer and a more shallow 20 degree isotherm. 1000m temperature is low. Temperature at 200m is high and stable. Silicate, nitrate, dissolved oxygen, calcite, and phosphorous levels are low. Salinity is high. Solar irradiation and pH are high to moderate. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 8 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 3 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3500m and the lower depth is 5000m.
48	Marshall Islands Sea Mounts	MHL	Marshall islands bioregions. Mostly dominated by seamounts (medium and large) with abyssal features (hills and mountains). SST moderate and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD, PH, moderate and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 2 (small with deep peak, most common type); 3 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 6 (very large and tall with low escarpment); 1 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 4 seamount type 9 (Large and tall with shallow peak, larger); 7 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.
50	French Polynesia & Cook Islands - High Seas Abyssal Range	COK, PYF	Most of the bioregion falls within the French Polynesia EEZ but also cuts through Cooks and the high seas. Dominant feature are abyssal hills and mountains with seamounts. Other features include basin, escarpment, plateau and ridge. SST moderate and stable, Chlorophyll-a concentrations are low. Calcite, solar irradiance, phosphorous, silicate, and nitrate levels are low. Dissolved oxygen, salinity, and pH levels are high. Temperature at 200m is high, while at 1000m it is moderate and variable. Mixed layer is deep; 20 degree isotherm is shallow and variable. Contains 4 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 2 (small with deep peak, most common type); 5 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 3 seamount type 7 (small and short with very deep peaks, shortest); 5 seamount type 8 (small and short with very deep peaks, deepest type); 7 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 2 Blind canyon type. The upper depth is 4000m and the lower depth is 5000m.
51	New Caledonia Trough	NCL	Bioregion falls within New Caledonia. Mostly consist of the New Caledonia Trough. Other minor features include canyons, plateau. SST low and stable, Chlorophyll-a concentrations are high to moderate. Deepwater temperature is moderate. Solar irradiance and MLD are moderate. Silicate, pH, Calcite and phosphorous levels are low. Contains no seamounts. Includes 7 Blind canyon type and 9 Shelf incising canyon type. The upper depth is 0m and the lower depth is 3500m.
52	Nauru Marshall and Gilbert Abyssal	MHL, NRU, KIR	Bioregion cuts through Nauru, Marshall Islands, and Kiribati EEZ. Mostly abyssal plain. Sea surface temperature is low to moderate and stable. Chlorophyll-a concentrations are low, with blooms around islands. Deepwater temperatures are moderate. Mixed layer depth is low and variable. Solar irradiance is high. PH, silicate, phosphorous, salinity, and nitrate levels are moderate. Dissolved oxygen levels are low to moderate. Calcite is low with high levels around Abailang. Contains 1 seamount type 3 (intermediate size, large tall and deep); Includes 4 Blind canyon type and 2 Shelf incising canyon type. The upper depth is 4000m and the lower depth is 4500m.

Code	Name	Countries	Summary description
53	Starbuck and high seas	COK, KIR	Falls within the Line Islands Group EEZ (Kiribati) and the high seas. Mostly abyssal features (Hills, plains and mountains) including seamounts. Other minor features: Basin, Ridge and escarpment. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are moderate. Shallow 20 degree isotherm and deep mixed layer. Moderate 1000m temperature and high 200m temperature. Salinity, solar irradiance, nitrate, dissolved oxygen, and phosphorous levels are high. PH, silicate, and calcite levels are low. Contains 4 seamount type 2 (small with deep peak, most common type); 3 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 6 (very large and tall with low escarpment); 2 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 3 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.
55	Mussau Trench, Ayu Seamounts and associated trough and abyss	FSM, PLW	Non-contiguous bioregion. One western part falls within Palau and dominated by seamounts and abyssal mountains. Other features include ridges, spreading ridges, and basin. Others parts include mostly abyssal plain and hills. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD, pH and solar irradiance are low. Silicate, phosphate, and nitrate are low. Calcite is moderate. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 4 seamount type 2 (small with deep peak, most common type); 3 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 10 (large and tall with shallow peak: shallow); 6 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 7 Blind canyon types. The upper depth is 3000m and the lower depth is 4000m.
57	Hammondsport seamount and basin	SLB	Solomon Islands bioregion just north east of Rennell and Bellona. Includes Hammondsport seamount and part of the San Cristobal Trench with abyssal plain, hill, ridge, a seamount and basin. SST moderate and stable, Chlorophyll-a concentrations, DO and Salinity are low. Temperature at 1000m is deep, 20°C isotherm is deep, MLD is shallow, and PH is low. Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type. The upper depth is 3500m and the lower depth is 5000m.
58	Pitcairn Deep	PYF	Contains chain of seamounts and deep abyssal plains, hills and mountains across the Pitcairn and French Polynesia EEZ. SST moderate and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 7 seamount type 1 (small with deep peak, short with moderately deep peak); 4 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 10 (large and tall with shallow peak: shallow); The upper depth is 4000m and the lower depth is 4500m.
59	Central Gilbert	KIR	Includes a number of islands in the Gilbert Group. Geomorphology dominated by seamounts on abyssal mountains and ridges which form the base of the islands. Canyons and escarpments also overlap with the ridges. Sea surface temperature is low and variable. Chlorophyll-a concentrations are high, with even higher levels around islands. Mixed layer depth is deep in the north and shallow in the south. Temperature at 1000m and 200m is moderate. 20 degree isotherm is average depth. Solar irradiation is high; pH, nitrate, and silicate levels are moderate. Phosphorous and salinity are high. Dissolved oxygen and calcite levels are low, but calcite is highly concentrated around islands. Contains 1 seamount type 2 (small with deep peak, most common type); 7 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 10 (large and tall with shallow peak: shallow); 4 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3500m and the lower depth is 5000m.
61	South Solomon Trench	SLB, VUT	Includes the South Solomon Trench which is the dominant feature. Also includes ridges, canyons and abyssal features. SST moderate and stable, Chlorophyll-a concentrations, DO and Salinity are low. Temperature at 1000m is deep, 20°C isotherm is deep, MLD is shallow, and PH is low. Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains NO Seamounts. Includes 7 Blind canyon type. The upper depth is 1500m and the lower depth is 6000m.

Code	Name	Countries	Summary description
63	West Caroline and South Sorol Trough	FSM, PLW	Falls mostly within the Palau and Micronesia EEZ and non-contiguous. Western part of bioregion contains mostly spreading ridges and rift valleys. The Eastern part contains mostly seamounts and abyssal features. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m, MLD and 20°C isotherm are shallow, pH and solar irradiance are low. Silicate, phosphate, nitrate and calcite are low. Contains 2 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 4 (small with deep peak, most isolated type); 2 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 10 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 5000m.
65	East Line Islands and French Polynesia Northern Tip	PYF, KIR	Contains mostly abyssal hills and plains. Bioregion includes part of the Line Islands Group EEZ (Kiribati) and French Polynesia EEZ. Sea surface temperature is moderate and variable. Chlorophyll-a concentrations are moderate and variable. Shallow 20 degree isotherm and deep mixed layer. Moderate 1000m temperature and low 200m temperature. Silicate, salinity, solar irradiance, nitrate, dissolved oxygen, and phosphorous levels are high. PH and calcite levels are low. Contains 1 seamount type 4 (small with deep peak, most isolated type); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5000m.
66	Kingsman Basin and Magellan Rise	KIR, UMI	Non-contiguous bioregion and includes the Line Group EEZ (Kiribati). Western part contains mainly plateau whereas the middle and eastern parts are dominated by abyssal hills and plains. Sea surface temperature is moderate and variable. Chlorophyll-a concentrations are low. Shallow 20 degree isotherm and mixed layer depth. Temperature is high at 1000m and low at 200m. Silicate, phosphorous, calcite, nitrate, solar irradiance, and salinity levels are low. PH levels are high. Dissolved oxygen is high to moderate. Contains 4 seamount type 2 (small with deep peak, most common type); 1 seamount type 4 (small with deep peak, most isolated type); 2 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.
67	American Samoa Basin and North Tonga Trench	ASM, COK, WSM, TON, NIU	Contains Tonga trench and abyssal hills and cuts through Tonga, Niue and American Samoa. Sea surface temperature is high, chlorophyll-a concentrations, 20°C Isotherm and the deep water temperature are low. Mixed layer depth, salinity and pH levels, nitrate and solar irradiance are moderate. Calcite is low and variable and dissolved oxygen concentrations are low and stable. Strong sea surface currents generally from the Northeast. Contains 8 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 3 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5000m and the lower depth is 5500m.
69	East Nelson Reef and South French Polynesia	PYF	Contains deep seamounts on abyssal habitats in French Polynesia's low and stable, Chlorophyll-a concentrations are very low. Salinity is moderate and dissolved oxygen is high. Temperature at 1000m and MLD are moderate, 20°C isotherm is shallow, and PH, Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains 4 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 2 (small with deep peak, most common type); 4 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 4 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3500m and the lower depth is 4500m.

Code	Name	Countries	Summary description
70	Malden and Schlanger	KIR, UMI	Contains deep basins on abyssal plains, hills and Schlanger seamounts on abyssal mountains. Includes the Line Group EEZ of Kiribati. Sea surface temperature is moderate and variable. Chlorophyll-a concentrations are low with high concentrations in the NE corner. Shallow 20 degree isotherm and deep mixed layer. Moderate 1000m temperature and low 200m temperature. Silicate, salinity, solar irradiance, nitrate, dissolved oxygen, and phosphorous levels are high. PH and calcite levels are low. Contains 2 seamount type 2 (small with deep peak, most common type); 8 seamount type 3 (intermediate size, large tall and deep); 4 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 10 (large and tall with shallow peak: shallow); The upper depth is 4500m and the lower depth is 5500m.
71	Utarik Deep	MHL	Large bioregion within Marshall Islands medium to large size seamounts on abyssal mountains. Cuts across a number of ridges with underlying abyssal hills and plains. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are moderate and variable. Temperature at 1000m is moderate. 20°C isotherm is shallow, MLD and solar irradiance are moderate and pH is high. Silicate, phosphate, nitrate and calcite are moderate. Contains 4 seamount type 2 (small with deep peak, most common type); 4 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 6 (very large and tall with low escarpment); 2 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 4 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 3500m and the lower depth is 5000m.
73	Bougainville Canyons and Bradley Deep	SLB	Four non-contiguous parts of bioregion within Solomon Islands. Mainly contains canyons and escarpments on slopes. The most eastern part includes mainly plateaus. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is deep, MLD is shallow. Solar irradiance and pH, silicate, phosphate, and nitrate are low. Calcite is moderate. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak) and 2 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); Includes 27 Blind canyon type and 23 Shelf incising canyon type. The upper depth is 0m and the lower depth is 2500m.
74	Moses Reef and Austral Seamounts	COK, PYF	Contains mainly abyssal features (plains, hills and mountains) with seamounts and runs across Cook Islands and French Polynesia. SST low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 6 seamount type 2 (small with deep peak, most common type); 3 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 5000m.
75	Line, Cooks and French Polynesia High Seas	COK, PYF, KIR	Contains basins and abyssal features with very few seamounts. Runs across the Cooks, Line Group - Kiribati and French Polynesia. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. Calcite, solar irradiance, phosphorous, silicate, and nitrate levels are low. Dissolved oxygen, salinity, and pH levels are high. Temperature at 200m is high, while at 1000m it is moderate and variable. Mixed layer is deep; 20 degree isotherm is shallow and variable. Contains 1 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 4 (small with deep peak, most isolated type); 3 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 8 (small and short with very deep peaks, deepest type); The upper depth is 4500m and the lower depth is 5500m.
78	South Fabert and McGee Seamount	COK, PYF, TON	Small bioregions with canyons, ridges, plateau and slope. Non-contiguous and falls within Tonga's, Cooks and French Polynesia EEZ. Sea surface temperature is low and stable; chlorophyll-concentrations, 20°C Isotherm and the deep water temperature are moderate. Salinity and pH levels are high. Nitrate and solar irradiance are moderate to low. Mixed layer depth and calcite are moderate and variable. Dissolved oxygen concentrations are moderate and stable. Strong sea surface currents generally from the North West. Contains 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 4 (small with deep peak, most isolated type); 1 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 2 Blind canyon types. The upper depth is 4500m and the lower depth is 5000m.

Code	Name	Countries	Summary description
79	Northwest Niue and north Arutanga (Cooks)	ASM, COK, PYF, TON, NIU	Non-contiguous bioregion contains plateau, ridges and abyssal mountains. Sea surface temperature is high, chlorophyll-a concentrations, 20°C Isotherm and the deep water temperature are low. Mixed layer depth, salinity and pH levels, nitrate and solar irradiance are moderate. Calcite is low and variable and dissolved oxygen concentrations are low and stable. Strong sea surface currents generally from the Northeast. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 2 (small with deep peak, most common type); 4 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 6 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type. The upper depth is 4500m and the lower depth is 5000m.
80	Capricorn and Eclipse Deep	COK, PYF, TON, NIU	Contains the biggest seamount “the Capricorn Seamount” and Eclipse Seamount with Cook Islands on abyssal hill and trench. Sea surface temperature is high, chlorophyll-a concentrations, 20°C Isotherm and the deep water temperature are low. Salinity is variable. and pH levels, nitrate and solar irradiance are moderate. Mixed layer depth is low. Calcite is low and variable and dissolved oxygen concentrations are low and stable. Moderate sea surface currents generally from the North northeast. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 2 (small with deep peak, most common type); 4 seamount type 3 (intermediate size, large tall and deep); 7 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 6 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 2 Blind canyon type. The upper depth is 4000m and the lower depth is 5500m.
81	Yap Trench and Patches	FSM, PLW	Mostly contains ridges, abyssal mountains and the Yap Trench. Also includes few canyons and seamounts. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m, MLD and 20°C isotherm are shallow, pH and solar irradiance are low. Silicate, phosphate, nitrate and calcite are low. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 7 Blind canyon type. The upper depth is 2000m and the lower depth is 4500m.
82	Ambae Trough and North Fiji Basin	SLB, FJI, VUT	Contains Trough and abyssal features with Basin and plateau in the north of the Fiji main islands. Also includes spreading ridge and ridge with escarpments. Sea surface temperature moderate, mildly variable. Chlorophyll-a concentrations are low, with scattered blooms around Maewo Island. Mid-depth temperatures very high while temperature at 1000m is low. 20 degree isotherm is exceptionally low. Silicate and phosphorous levels are high. PH is high. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 10 (large and tall with shallow peak: shallow); Includes 10 Blind canyon type and 1 Shelf incising canyon type. Contains 3 active, inferred and 1 inactive, hydrothermal vents. The upper depth is 2500m and the lower depth is 3500m.
83	Nukuoro Deep and Dmitri Seamount	FSM	Mostly plateau and abyssal plain features. Includes also the Dmitri Seamount in Micronesia. SST high and stable, Chlorophyll-a concentrations are low. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD, pH and solar irradiance, Silicate, phosphate, and nitrate are low. Calcite is moderate. Intersect 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3000m and the lower depth is 4000m.

Code	Name	Countries	Summary description
84	North Strakhov Seamount	MHL	Contains seamounts on abyssal mountains, hills and plains. Also includes basin and a few ridges. SST moderate and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD, PH, moderate and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are low. Contains 3 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 6 (very large and tall with low escarpment); 1 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth).The upper depth is 5500m and the lower depth is 6000m.
87	South Tonga North New Zealand Patches	TON	Contains ridges, abyssal mountains and plateau. Sea surface temperature is low and stable; chlorophyll-concentrations, 20°C Isotherm and the deep water temperature are moderate. Salinity and pH levels are high. Nitrate and solar irradiance are moderate to low. Mixed layer depth and calcite are low and variable. Dissolved oxygen concentrations are moderate and stable. Moderate sea surface currents generally from the North West. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 9 (Large and tall with shallow peak, larger); Includes 9 Blind canyon type. The upper depth is 2000m and the lower depth is 4000m.
88	West Caroline and Mussau Ridge	FSM, PLW	Five non-contiguous bioregion containing abyssal mountains, hills, plains AND ridges, spreading ridges and trough. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD, pH and solar irradiance are low. Silicate, phosphate, and nitrate are low. Calcite is moderate. Contains 4 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); 5 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 6 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 4000m and the lower depth is 4500m.
91	Palau Trench and Philippines, Indonesia Boarder	FSM, PLW	Contains part of the Philippine trench and ridges in the west and the Yap trench and ridges in the east. Other features include deep abyssal features and seamounts. SST high and stable, Chlorophyll-a concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contains 2 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 3 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 11 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 5000m and the lower depth is 6000m.
93	Dolmah	KIR, UMI	Consist of Ridges that cuts across from the southern to the north eastern side, trough and seamounts mainly in the eastern side including Dolmah seamount. Sea surface temperature is low and variable. Chlorophyll-a concentrations are high. Mixed layer depth and 20 degree isotherm are shallow. Temperatures at 1000m and 200m are moderate. Silicate and phosphorous levels are high. Salinity, calcite, and dissolved oxygen levels are moderate. PH is low. Solar irradiance and nitrate levels are high. Contains 1 seamount type 2 (small with deep peak, most common type); 4 seamount type 3 (intermediate size, large tall and deep); 5 seamount type 7 (small and short with very deep peaks, shortest); 16 seamount type 8 (small and short with very deep peaks, deepest type); The upper depth is 5000m and the lower depth is 5500m.
95	East Emden Deep	PLW	Mostly abyssal plains and hills with western side including tiny part of the Philippine Trench. SST high and stable, Chlorophyll-a concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contains 1 seamount type 2 (small with deep peak, most common type) and 1 seamount type 7 (small and short with very deep peaks, shortest); The upper depth is 5500m and the lower depth is 6000m.

Code	Name	Countries	Summary description
98	Santa Isabel Slope	SLB	Consist of canyons on ridge and slope bottoms. Escarpment is also well featured. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is deep, MLD is shallow. Solar irradiance and pH, silicate, phosphate, and nitrate are low. Calcite is moderate. Intersect 1 seamount type 3 (intermediate size, large tall and deep); Includes 21 Blind canyon type and 10 Shelf incising canyon type. Contains 2 active, inferred hydrothermal vents. The upper depth is 0m and the lower depth is 3000m.
99	West Nauru High Seas	NRU	Mostly abyssal hills including one/two seamounts and plateaus high and stable, Chlorophyll-concentrations are low. Salinity and dissolved oxygen are low and variable. Temperature at 1000m and 20°C isotherm are moderate. Solar irradiance is high and MLD is shallow. PH, Silicate, phosphate, nitrate and Calcite are low. Contains 1 seamount type 4 (small with deep peak, most isolated type); and Intersect1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3000m and the lower depth is 4500m.
100	South Challenger Deep	GUM, FSM, PLW	Narrow and long, no contiguous containing seamounts in the east part north Yap trench in the west and cuts through few ridges and basins. SST high and stable, Chlorophyll-a concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 10 (large and tall with shallow peak: shallow); 8 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type. The upper depth is 4000m and the lower depth is 5500m.
102	Macdonald Seamount	PYF	Contains seamounts, ridges, escarpments, abyssal hills, abyssal plains and abyssal mountains that form the base of the seamounts. SST and Chlorophyll-a concentrations are very low. Salinity is moderate and dissolved oxygen is very high. Temperature at 1000m and MLD are moderate, 20°C isotherm is shallow, and PH, Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains 3 seamount type 1 (small with deep peak, short with moderately deep peak); 4 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 4 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 4 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Contains 1 active, confirmed hydrothermal vent. The upper depth is 3500m and lower depth is 4500m.
104	North French Polynesia	PYF, KIR	Mainly abyssal plains and abyssal hills with few ridges and seamounts. SST moderate and stable, Chlorophyll-a concentrations and Silicate are moderate and variable. DO is low. 20 degree isotherm and mixed layer are deep. Temperature at 1000m is moderate and low at 200m. Solar irradiance is high. Salinity, nitrate, and phosphorous levels are high. PH and calcite levels are low. Contains 1 seamount type 4 (small with deep peak, most isolated type); 1 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 5000m.
106	Torres Rise	SLB, VUT	Contains Plateaus, ridges and canyons and the north New Hebrides Trench. Other feature include: trough, escarpment and basin. Sea surface temperature stable and relatively high for Vanuatu. Chlorophyll-a concentrations are moderate, stable. Salinity and dissolved oxygen are low but higher in east of region. Mid-depth temperatures very high while temperature at 1000m is low. 20 degree isotherm is exceptionally low. Solar irradiance is quite high. Contains NO Seamounts Includes 20 Blind canyon type and 11 Shelf incising canyon type. The upper depth is 500m and the lower depth is 3500m.
107	Mellish Rise	NCL	Mainly plateaus and abyssal hills and mountains with few canyons, a seamount, a ridge and part of a trough. SST moderate and stable, Chlorophyll-a concentrations, DO and Salinity are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD is shallow, and PH is high. Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains 2 seamount type 9 (Large and tall with shallow peak, larger), and one intersected. Includes 6 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 2000m and the lower depth is 3000m.

Code	Name	Countries	Summary description
108	West Guam Basin	GUM, FSM, MNP	Deep feature with large seamounts in the west, large spreading ridges and basin in the central part and non-contiguous parts in the east contain northern Mariana and Guam trough, ridges and seamounts. SST moderate and stable, Chlorophyll-a concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contains 10 seamount type 2 (small with deep peak, most common type); 6 seamount type 3 (intermediate size, large tall and deep); 4 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 2 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 3 seamount type 10 (large and tall with shallow peak: shallow); 6 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 8 Blind canyon type and 1 Shelf incising canyon type. Contains 2 active, confirmed hydrothermal vents. The upper depth is 3500m and the lower depth is 5000m.
109	Northern Tonga Trench	WSM, TON	Forms on the northern part of the Tongan trench. Seamounts formed on ridges sitting on abyssal hills and mountains. Sea surface temperature is high, chlorophyll-a concentrations, 20°C Isotherm and the deep water temperature are low. Mixed layer depth, salinity and pH levels, nitrate and solar irradiance are moderate. Calcite is low and variable and dissolved oxygen concentrations are low and stable. Strong sea surface currents generally from the Northeast. Intersect 1 seamount type 3 (intermediate size, large tall and deep) and 1 seamount type 10 (large and tall with shallow peak: shallow); Contains 1 active, confirmed; 1 active, inferred and 1 inactive, hydrothermal vents. The upper depth is 3500m and the lower depth is 7500m.
111	Marshall Patches	MHL	Four parts and tiny non-contiguous bioregion scattered across the Marshall Islands and high seas. Three bioregion parts contain ridges and one bioregion part contains seamounts. SST moderate and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD, PH, moderate and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are low. Contains 1 seamount type 6 (very large and tall with low escarpment); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); The upper depth is 1500m and the lower depth is 4500m.
112	Ujelang chain	MHL, FSM	Contains seamounts, abyssal mountains, basins and abyssal plains. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are moderate and variable. Temperature at 1000m is moderate. 20°C isotherm is shallow, MLD and solar irradiance are moderate and pH is high. Silicate, phosphate, nitrate and calcite are moderate. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5000m.
113	Jarvis Deep	KIR, UMI	Contains Seamounts with escarpments and deep abyssal mountains, hills and plains. Sea surface temperature is low and variable. Chlorophyll-a concentrations are high and variable. Dissolved oxygen, silicate, and pH levels are low. Salinity, phosphorous, solar irradiance, and nitrate levels are high. Temperature at depth is high but variable. 20 degree isotherm is deep. Mixed layer depth is shallow but variable. Contains 3 seamount type 2 (small with deep peak, most common type); 6 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 3 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth).The upper depth is 4500m and the lower depth is 5500m.

Code	Name	Countries	Summary description
115	Solomon Sea Spread	SLB	Contains the northern tip of the South Solomon Trench, medium size seamounts, Solomon sea spreading ridges and rift valleys, basin canyons and the Rennell and Bellona Plateau, SST moderate and stable, Chlorophyll-a concentrations, DO and Salinity are low. Temperature at 1000m is deep, 20°C isotherm is deep, MLD is shallow, and PH is low. Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains 3 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 10 (large and tall with shallow peak: shallow); 5 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 28 Blind canyon type. Contains 2 active, inferred hydrothermal vents. The upper depth is 2500m and the lower depth is 4000m.
116	Sylvania Tablemount	MHL	Contains mostly large ridges with escarpments and cuts across few seamounts within the Marshall islands. SST high and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD, PH, moderate and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are low. Contains 2 seamount type 2 (small with deep peak, most common type); 5 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 3 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type. The upper depth is 1500m and the lower depth is 4500m.
117	Northern Cooks Plateau	COK	Contains Plateaus in the eastern side with few large seamounts. Trough runs through the center of bioregion and deep abyssal hills and mountains to the west. Bioregion falls within the Cook Islands. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are low. Very deep mixed layer and a more shallow 20 degree isotherm. 1000m temperature is low. Temperature at 200m is high and stable. Silicate, nitrate, dissolved oxygen, calcite, and phosphorous levels are low. Salinity is high. Solar irradiation and pH are high to moderate. Contains 3 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 2500m and the lower depth is 4000m.
119	Satawan Parallel	FSM	Contains Plateaus, ridges, basins and seamounts and Helena Shoal and Lady Elgin Bank with overlying escarpments. SST high and stable, Chlorophyll-a concentrations are low. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD, pH and solar irradiance, Silicate, phosphate, and nitrate are low. Calcite is moderate. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 9 (Large and tall with shallow peak, larger); 5 seamount type 11 (intermediate size, largest basal area and deepest peak depth).The upper depth is 1500m and the lower depth is 3500m.
120	North Solomon High Seas	SLB	Mostly abyssal hills and plains and cuts across two large seamounts formed on abyssal mountains and also a plateau in the east. SST high and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is shallow, 20°C isotherm is deep, MLD is low and pH is high. Solar irradiance is moderate, silicate, phosphate, nitrate and calcite are low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3000m and the lower depth is 4000m.
121	North Mussau Trench, South Palau and Micronesia	FSM, PLW	Non-contiguous region split into 4 parts. Most eastern side contains trough, ridges and few smaller seamounts. The middle is mainly abyssal features whereas the most western region contains seamounts and the southern tip of the Philippines Trench. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD, pH and solar irradiance are low. Silicate, phosphate, nitrate and calcite are low. Contains 8 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 5 Blind canyon type. The upper depth is 4000m and the lower depth is 5500m.

Code	Name	Countries	Summary description
122	Southern French Polynesia	PYF	Mostly abyssal hills and abyssal plain with basins and few seamounts in the western part of region. SST and Chlorophyll-a concentrations are very low. Salinity is moderate and dissolved oxygen is very high. Temperature at 1000m and MLD are moderate, 20°C isotherm is shallow, and PH, Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains 5 seamount type 2 (small with deep peak, most common type); 1 seamount type 4 (small with deep peak, most isolated type); 2 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.
123	South (Banaba) Ocean Island	NRU, KIR	Bioregion contains only abyssal hills and abyssal plains. Sea surface temperature is high and stable. Chlorophyll-a concentrations are moderate. Calcite is low. Dissolved oxygen is moderate and increases towards the NW. Salinity is moderate. Nitrate, phosphorous, and silicate levels are low to moderate. PH levels are high. Solar irradiation is high. Mixed layer depth is variable. Temperatures at 1000m and 200m start high and decrease greatly as one moves north. 20 degree isotherm is deep. Contains NO Seamounts. The upper depth is 3500m and the lower depth is 4500m.
125	Temotu and Lord Howe Cluster	SLB, VUT	Contains the Solomon Plateau and large ridges with escarpments. Canyons and seamounts run through the region with deep water basins on abyssal features. Sea surface temperature very high and stable. Chlorophyll-a concentrations are moderate, with large bloom in southern region. Salinity, dissolved oxygen, silicate and phosphorous levels are low. Solar irradiance is high. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 5 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 22 Blind canyon type and 2 Shelf incising canyon type. Contains 1 active, confirmed; 2 active inferred hydrothermal vents. The upper depth is 1000m and the lower depth is 3500m.
127	South New Caledonia High Seas and Norfolk	NCL, NFK	Two parts bioregion with mostly plateaus and canyons with a ridge in the eastern part. SST very low and stable, Chlorophyll-a concentrations are low. Salinity is high, DO is moderate, Deepwater temperature is shallow, 20 Degree Isotherm is shallow, Solar irradiance is low and MLD is shallow. Silicate, pH, Calcite, Nitrate and phosphorous levels are low. Contains NO Seamounts. Includes 16 Blind canyon type. The upper depth is 1000m and the lower depth is 2000m.
128	Northeast Gilbert	KIR, UMI	Mostly abyssal habitat (hills and plains with deep basin). Cuts across a ridge and few seamounts in the east. SST moderate and stable, Chlorophyll-a concentrations are high, variable. Mixed layer depth is deep. Temperature at 1000m and 200m is moderate. 20 degree isotherm is moderate depth. Solar irradiation is high; pH, nitrate, and silicate levels are moderate. Phosphorous and salinity are high. Dissolved oxygen and calcite levels are low, but calcite is highly concentrated around islands. Contains 3 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5000m and the lower depth is 5500m.
129	Funafuti, Tokelau and Tema Deep (Cooks)	TUV, WLF, ASM, COK, TKL	Contains small to medium size deep seamounts formed on abyssal mountains. Seamounts have steep escarpments. SST high and stable, Chlorophyll-a concentrations are low. Very deep mixed layer and a more shallow 20 degree isotherm. 1000m temperature is low. Temperature at 200m is high and stable. Silicate, nitrate, dissolved oxygen, calcite, and phosphorous levels are low. Salinity is high. Solar irradiation and pH are high to moderate. Contains 15 seamount type 2 (small with deep peak, most common type); 3 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 4 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 2 Blind canyon type and 4 Shelf incising canyon type. The upper depth is 4000m and the lower depth is 5000m.

Code	Name	Countries	Summary description
132	Penrhyn Basin	COK, PYF, KIR	Mostly abyssal hills and plains with basin. Sea surface temperature is high to moderate and stable. Chlorophyll-a concentrations are moderate. Shallow 20 degree isotherm and deep mixed layer. High temperature at 1000m and 200m depths. Salinity, solar irradiance, nitrate, dissolved oxygen, and phosphorous levels are moderate to high. PH, silicate, and calcite levels are low. Contains 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 4 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5000m and the lower depth is 5500m.
134	Negonego to Tureia Atolls Deep	PYF	Contains seamounts formed on plateaus and abyssal mountains, sloping escarpments, few canyons, ridges on top of plateaus and underlying basins. SST low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 5 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 5 Blind canyon type. The upper depth is 3000m and the lower depth is 4500m.
137	Atuona far Eastern Boarder of French Polynesia	PYF	Abyssal features with basin on plains. SST moderate and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Intersect 1 seamount type 8 (small and short with very deep peaks, deepest type); The upper depth is 4000m and the lower depth is 4500m.
138	Phoenix Seamounts	KIR, UMI	Large region cutting through trough, seamounts with steep escarpments, deep basins and abyssal features (mountains, hills and plains). Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are moderate. Temperatures at depth are moderate to high. Depth of mixed layer and 20 degree isotherm are both middling. Phosphorous, dissolved oxygen and salinity are high. Silicate, calcite, and pH levels are low. Nitrate and solar irradiance levels are moderate. Contains 9 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 2 seamount type 7 (small and short with very deep peaks, shortest); 6 seamount type 8 (small and short with very deep peaks, deepest type); 5 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5000m and the lower depth is 6000m.
140	Tonga NZ High Seas	TON	Contains ridges, canyons, basins, troughs, plateaus and abyssal plains, hills and mountains. Sea surface temperature is low and stable; chlorophyll-concentrations, 20°C Isotherm and the deep water temperature are moderate. Salinity and pH levels are high. Nitrate and solar irradiance are moderate to low. Mixed layer depth and calcite are low and variable. Dissolved oxygen concentrations are moderate and stable. Moderate sea surface currents generally from the North West. Contains NO Seamounts. Includes 5 Blind canyon type. Contains 1 active, confirmed; 1 active inferred hydrothermal vents. The upper depth is 1000m and the lower depth is 2500m.
142	US and Line Islands Group High Seas	KIR, UMI	Contains seamounts on abyssal mountains, hills and plains. Sea surface temperature is low and variable. Chlorophyll-a concentrations are moderate. Mixed layer depth and 20 degree isotherm are deep. Temperature at 200m is low, but high at 1000m. Silicate, phosphorous, salinity, and solar irradiance levels are high. Nitrate, pH, dissolved oxygen, and calcite levels are low. Contains 2 seamount type 2 (small with deep peak, most common type); 12 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 3 seamount type 7 (small and short with very deep peaks, shortest); 5 seamount type 8 (small and short with very deep peaks, deepest type); The upper depth is 5000m and the lower depth is 5500m.

Code	Name	Countries	Summary description
143	Tahiti and Society Deep	PYF	Contains chain of large seamounts on southern end of bioregion and few ridges with slope and steep escarpments. SST moderate and stable, Chlorophyll-a concentrations are low. Calcite, solar irradiance, phosphorous, silicate, and nitrate levels are low. Dissolved oxygen, salinity, and pH levels are high. Temperature at 200m is high, while at 1000m it is moderate and variable. Mixed layer is deep; 20 degree isotherm is shallow and variable. Contains 4 seamount type 1 (small with deep peak, short with moderately deep peak); 9 seamount type 2 (small with deep peak, most common type); 5 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 10 seamount type 10 (large and tall with shallow peak: shallow); Includes 10 Blind canyon type and 2 Shelf incising canyon type. Contains 1 active, confirmed; 1 active, inferred and 1 inactive, hydrothermal vent. The upper depth is 2500m and the lower depth is 4500m.
145	Hereheretue and YOTO Seamount	PYF	Contains chain of seamounts on northern end of bioregion and few ridges with slope and steep escarpments. Basin also featured in the east. SST low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 8 seamount type 2 (small with deep peak, most common type); 5 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 5 seamount type 8 (small and short with very deep peaks, deepest type); 6 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 4500m.
146	East West Kingman and Palmyra	KIR, UMI	Two parts bioregion with abyssal features in the west and deep seamounts on abyssal mountains and ridges in the east. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. Deep 20 degree isotherm and shallow mixed layer depth. Temperature is low at depth. Silicate, phosphorous, calcite, nitrate, solar irradiance, and salinity levels are low. PH levels are high. Dissolved oxygen is high to moderate. Contains 3 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 5000m.
148	South Christmas Island	KIR, UMI	Contains mostly seamounts, ridges and abyssal mountains with steep escarpments. Sea surface temperature is low and variable. Chlorophyll-a concentrations are high and variable. Dissolved oxygen, silicate, and pH levels are low. Salinity, phosphorous, solar irradiance, and nitrate levels are high. Temperature at depth is high but variable. 20 degree isotherm is deep. Mixed layer depth is shallow but variable. Contains 3 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); 2 seamount type 10 (large and tall with shallow peak: shallow); 4 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type. The upper depth is 3000m and the lower depth is 5000m.
149	North Napuka Atoll	PYF	Mostly abyssal plains and hills and mountains. SST moderate and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 5000m.

Code	Name	Countries	Summary description
150	Marshall and Gilbert High Seas	KIR	Contains Hadal base and cuts across few seamounts in the west. Mostly abyssal habitat in the east. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are low. Calcite and dissolved oxygen levels are low. PH and salinity levels are moderate. Solar irradiance is low. Mixed layer depth is shallow in the north and deep in the south. Silicate, phosphorous, and nitrate levels are high. Solar irradiance is high in the southern regions but low in the north. Temperatures at 1000m and 200m are moderate. Contains 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5500m and the lower depth is 6000m.
153	Six Ocean Realms	PYF, PCN	Mostly abyssal hills and plains. SST and Chlorophyll-a concentrations are very low. Salinity is moderate and dissolved oxygen is very high. Temperature at 1000m and MLD are moderate, 20°C isotherm is shallow, and PH, Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains NO Seamounts. The upper depth is 3500m and the lower depth is 4000m.
157	Central Micronesia cluster	FSM	Complex features including plateaus, basin, seamounts, and ridges, spreading ridges, slopes and steep escarpments. SST high and stable, CHL is low and variable, Salinity is low, Dissolved Oxygen is low and stable, Deepwater temp is moderate, 20°C isotherm is moderate, mixed layer depth is moderate, Solar irradiance is moderate, pH level is low, silicate level is low, phosphate level is low, nitrate level is moderate, Calcite is low variale.Contains 4 seamount type 1 (small with deep peak, short with moderately deep peak); 5 seamount type 2 (small with deep peak, most common type); 4 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 10 (large and tall with shallow peak: shallow); 8 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 2 Blind canyon type. The upper depth is 3000m and the lower depth is 4500m.
159	North East Christmas Boarder	KIR	Contains abyssal features and a seamount. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are moderate. Mixed layer depth and 20 degree isotherm are deep. Temperature at 200m is low, at 1000m is low as well but with warmer scattered areas. Silicate, dissolved oxygen, phosphorous, salinity, pH, and solar irradiance levels are moderate. Nitrate and calcite levels are low. Contains 2 seamount types 2 (small with deep peak, most common type).The upper depth is 4500m and the lower depth is 5000m.
160	North Enyu and Bikini	MHL	Cuts across a large seamount with steep escarpments and a rise. Abyssal features form the base. SST high and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD, PH, moderate and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 2 seamount type 9 (Large and tall with shallow peak, larger); 3 seamount type 10 (large and tall with shallow peak: shallow); The upper depth is 3500m and the lower depth is 5000m.
162	East Reao Atoll	PYF, PCN	Mostly abyssal hills and cutting across a number of small seamounts and ridges. SST low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 2 seamount types 1 (small with deep peak, short with moderately deep peak); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 11 intermediate size, largest basal area and deepest peak depth). The upper depth is 3000m and the lower depth is 4500m.
164	South Loyalty Basin	NCL, SLB, VUT	Large bioregion containing plateaus in the southern end, one large seamount featured with two morphology types and few smaller seamounts. Few ridges, basin and deep abyssal habitat. Sea surface temperature moderate, variable. Chlorophyll-a concentrations are high to moderate. Deepwater temperature is deep, Solar irradiance and MLD is moderate. Silicate, pH, Calcite and phosphorous levels are low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 2 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 5 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 12 Blind canyon type and 3 Shelf incising canyon type. The upper depth is 3500m and the lower depth is 4500m.

Code	Name	Countries	Summary description
165	East Shefa, Fiji Central and Maui's Stone Place.	FJI, TON, VUT	Contains 1 intermediate and 2 small seamounts formed on spreading ridges and basins. Rift valleys also form the base of the seamounts with plateau also featured. Sea surface temperature moderate, variable. Chlorophyll-a concentrations are high with a large bloom in the west region. MLD quite low in SW part. Silicate, PH, and phosphorous levels are high. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 8 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); Includes 24 Blind canyon type and 9 Shelf incising canyon type. Contains 2 active, confirmed; 5 active, inferred hydrothermal vents. The upper depth is 500m and the lower depth is 3000m.
166	Woleai to Satawal Deep	FSM	Contains mostly ridges and spreading ridges from east to west and rift valleys. Included are a lot of smaller and medium size seamounts with steep escarpments. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m, MLD and 20°C isotherm are shallow, pH and solar irradiance are low. Silicate, phosphate, nitrate and calcite are low. Contains 5 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 6 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); 3 seamount type 10 (large and tall with shallow peak: shallow); 5 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 10 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 1500m and the lower depth is 4000m.
167	Battle of the Coral Sea	SLB,	Mostly abyssal features and a seamount with canyons and bits of plateaus. SST moderate and stable, Chlorophyll-a concentrations, DO and Salinity are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD is shallow, and PH is high. Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains 1 seamount type 4 (small with deep peak, most isolated type). Includes 3 Blind canyon type. The upper depth is 3000m and the lower depth is 4500m.
170	Marosszeky Gap	NCL	Contains three seamounts, four canyons and ridge. Includes slope base with steep escarpments into abyssal habitats. SST low and stable, Chlorophyll-a concentrations are high to moderate. Deepwater temperature is moderate. Solar irradiance and MLD are moderate. Silicate, pH, Calcite and phosphorous levels are low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 9 Blind canyon type. The upper depth is 1500m and the lower depth is 3000m.
175	Tiki Basin	PYF	Bioregion cuts across a long ridge in the north with couple of seamounts in the southern end. Mostly abyssal features with deep basins. SST moderate and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 4 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 3 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); The upper depth is 4000m and the lower depth is 4500m.
176	Raivavae Southwest and Southeast	PYF	Long non-contiguous bioregion with mostly abyssal features and basin in the east. West part contains seamounts and abyssal features. SST very low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 5000m.

Code	Name	Countries	Summary description
177	Rungata, Tamana and Arorae DeeP	TUV, KIR, UMI	Contains medium to large seamounts on abyssal mountains. Large trough included in the south eastern side of bioregion. Other features include basin, escarpments and ridges. Sea surface temperature is high but moderate in the north and stable. Chlorophyll-a concentrations are moderate. 20 degree isotherm and mixed layer are deep. Temperature at 1000m is high but greatly decreases in the north. At 200m, temperature is steadily high. Solar irradiance is high. PH levels are low. Phosphorous, nitrate, silicate, and salinity levels are high. Dissolved oxygen and calcite level are low, but dissolved oxygen increases significantly towards the east. Contains 3 seamount type 2 (small with deep peak, most common type); 1 seamount type 4 (small with deep peak, most isolated type); 3 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 5 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 3 Blind canyon type. The upper depth is 5000m and the lower depth is 6000m.
179	Southern Niue and High Seas	COK, TON, NIU	Mostly dominated by abyssal plains and hills with basin. Other features include escarpment and ridges. Sea surface temperature is low and stable; chlorophyll-concentrations, 20°C Isotherm and the deep water temperature are moderate. Salinity and pH levels are high. Nitrate and solar irradiance are moderate to low. Mixed layer depth and calcite are moderate and variable. Dissolved oxygen concentrations are moderate and stable. Strong sea surface currents generally from the North West. Intersect 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5000m and the lower depth is 6000m.
181	Northeast Tuvalu to Southern Phoenix Boarder	TUV, TKL, KIR	Contains trough in north western end of region, cuts across few chain of seamounts ad a ridge, other feature are abyssal hills. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. Very deep mixed layer and a more shallow 20 degree isotherm. 1000m temperature is low in eastern regions and much higher in the western region. Temperature at 200m is high and stable. Silicate, nitrate, dissolved oxygen, calcite, and phosphorous levels are low. Salinity is high. Solar irradiation and pH are high to moderate. Contains 4 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 8 (small and short with very deep peaks, deepest type); 4 seamount type 10 (large and tall with shallow peak: shallow); 5 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5000m and the lower depth is 6000m.
182	Fabert and McGee Seamount	COK, PYF, TON	Small bioregions with canyons, ridges, plateau and slope. Sea surface temperature is low and stable; chlorophyll-concentrations, 20°C Isotherm and the deep water temperature are moderate. Salinity and pH levels are high. Nitrate and solar irradiance are moderate to low. Mixed layer depth and calcite are moderate and variable. Dissolved oxygen concentrations are moderate and stable. Strong sea surface currents generally from the North West. Contains 2 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 8 (small and short with very deep peaks, deepest type); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 7 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 4500m and the lower depth is 5000m.
183	Boudeuse Ridge	KIR, UMI	Long and narrow bioregion stretched across east to west. Contains few ridges, small seamounts and few small basins. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are moderate. Shallow 20 degree isotherm and deep mixed layer. Moderate 1000m temperature and low 200m temperature. Salinity, solar irradiance, nitrate, dissolved oxygen, and phosphorous levels are high. PH, silicate, and calcite levels are low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 6 (very large and tall with low escarpment); 3 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.

Code	Name	Countries	Summary description
184	East Temotu and Northwest Rotuma Seamounts and the Vityaz trench	SLB, FJI	Mostly abyssal with several seamounts and ridges. Deep abyss mountains form the base of the seamounts. Vityaz Trench bisects the two ridges and connects to the Cape Johnson Trough with steep escarpments. SST moderate and stable, CHL low and variable, Salinity increases eastward and stable, DO low and stable, Deepwater temp is moderate, 20°C isotherm is shallow, mixed layer depth is shallow closer to land, Solar irradiance is moderate, pH level is moderate and variable, silicate level is low, phosphate level is low, nitrate level is low, Calcite is low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 2 (small with deep peak, most common type); 3 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1seamount type 9 (Large and tall with shallow peak, larger); 3 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 3 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 3000m and the lower depth is 4500m.
185	East West Christmas Islands Boarders	KIR, UMI	Contains abyssal features with few seamounts in the western end. Sea surface temperature is high to moderate and variable. Chlorophyll-a concentrations are moderate. Mixed layer depth and 20 degree isotherm are deep. Temperature at 200m is low, but high at 1000m. Silicate, phosphorous, salinity, and solar irradiance levels are high. Nitrate, pH, dissolved oxygen, and calcite levels are low. Contains 1 seamount type 2 (small with deep peak, most common type); 6 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 10 (large and tall with shallow peak: shallow); Includes 2 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 4000m and the lower depth is 5000m.
187	Sibylla and Kamwome	MHL, UMI	Large bioregion with lots of seamounts with sizes ranging from small - medium to large, other feature are mostly abyssal hills, mountains and plains with basins. SST moderate and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD, PH, moderate and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are low. Contains 6 seamount type 2 (small with deep peak, most common type); 8 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 6 (very large and tall with low escarpment); 4 seamount type 7 (small and short with very deep peaks, shortest); 14 seamount type 8 (small and short with very deep peaks, deepest type); 13 seamount type 9 (Large and tall with shallow peak, larger); 6 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.
189	Oeno Island Deep	PYF, PCN	Mostly abyssal plains and hills with few seamounts with steep escarpment in the east. SST very low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 3 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 3 seamount type 7 (small and short with very deep peaks, shortest); The upper depth is 3500m and the lower depth is 4500m.
190	Malaguana-Gadao Rise	GUM, FSM	Bioregion cuts across few large ridges, a trough and a spreading ridge. Canyons are included in the north western side with few large seamounts. Other feature includes steep escarpments and deep basins. SST high and stable, Chlorophyll-a concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 18 Blind canyon type. Contains 4 active, confirmed; 1 active, inferred hydrothermal vents. The upper depth is 2500m and the lower depth is 4000m.

Code	Name	Countries	Summary description
191	Manihi West to Raroia East	PYF	Mostly includes plateaus, ridges and few canyons with steep escarpments. SST moderate and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 3 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 7 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 10 (large and tall with shallow peak: shallow).Includes 11 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 1500m and the lower depth is 3500m.
192	Solomon Boarder and Plateau	NCL, SLB	Contains plateaus, deep ridges, basin and a seamount with steep escarpment. SST moderate and stable, Chlorophyll-a concentrations, DO and Salinity are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD is shallow, and PH is moderate. Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains 1 seamount type 4 (small with deep peak, most isolated type). The upper depth is 2500m and the lower depth is 3500m.
196	Lakina to Northern Tokelau Submerged Seamounts	TUV, TKL, KIR	Contains deep seamounts with steep escarpments on abyssal mountains and hills. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. Dissolved oxygen, silicate, phosphorous, nitrate, solar irradiance, and calcite levels are low. PH and salinity levels are high. Temperature is low at 1000m and high at 200m. Mixed layer is shallow and 20 degree isotherm is very deep. Contains 6 seamount type 2 (small with deep peak, most common type); 6 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 8 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 8 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.
199	Manihiki and Tokelau to South Phoenix	ASM, COK, TKL, KIR	Non-contiguous region with mostly seamounts and plateaus in the east. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. Very deep mixed layer and a more shallow 20 degree isotherm. 1000m temperature is low. Temperature at 200m is high and stable. Silicate, nitrate, dissolved oxygen, calcite, and phosphorous levels are low. Salinity is high. Solar irradiation and pH are high to moderate. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 4 seamount type 2 (small with deep peak, most common type); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 2 seamount type 10 (large and tall with shallow peak: shallow); 5 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3500m and the lower depth is 5000m.
200	South Nukuoro, Mussau Trench and Eauripik Rise	FSM	Mostly plateau in the east, trough in the middle region and abyssal hills and mountains in the west. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD, pH and solar irradiance are low. Silicate, phosphate, and nitrate are low. Calcite is moderate. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 4 (small with deep peak, most isolated type); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest). The upper depth is 2500m and the lower depth is 3500m.
202	East Pohnpei, Kosrae and west Namorik Atoll	MHL, FSM	Mostly basin, abyssal plains and hills with steep escarpments. SST high and stable, CHL is low and variable, Salinity is low, Dissolved Oxygen is low and stable, Deepwater temp is moderate, 20°C isotherm is moderate, mixed layer depth is moderate, Solar irradiance is moderate, pH level is low, silicate level is low, phosphate level is low, nitrate level is moderate, Calcite is low variale.Contains 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 5000m.

Code	Name	Countries	Summary description
204	Northern Hunga and Wallis plateaus and North Viti and Vanua Levu basin	WLF, FJI, TON	Bioregion exists in the two Niua islands, sits on a plateau north of Tonga's EEZ with numerous large and intermediate size seamounts. Non-contiguous bioregion which extends into Fiji's EEZ. SST is moderate and variable, CHL is high closer to land (Viti Levu and Vanua Levu - Fiji) and low towards the east, Salinity is low and variable, Dissolved Oxygen is low and variable, Deepwater temp is deep, 20°C isotherm is deep, mixed layer depth is shallow, Solar irradiance is moderate, pH level is moderate, silicate level is high, phosphate level is moderate, nitrate level is moderate, Calcite is generally low but high close to land (Fiji main islands - Viti Levu and Vanua Levu). Contains 7 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 3 (intermediate size, large tall and deep); 14 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 2 seamount type 10 (large and tall with shallow peak: shallow); Includes 9 Blind canyon type and 11 Shelf incising canyon type. Contains 9 active, confirmed; 17 active, inferred hydrothermal vents. The upper depth is 0m and the lower depth is 2500m.
205	West Melanesian Trench	FSM	Dominated by Trench and Trough with steep escarpments and deep basin. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD, pH and solar irradiance are low. Silicate, phosphate, and nitrate are low. Calcite is moderate. Contains 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 6 (very large and tall with low escarpment); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 16 Blind canyon type. The upper depth is 4000m and the lower depth is 5500m.
206	South Ceva-I-Ra Deep and Southern Cliff from Kalau	FJI, TON, VUT	Small bioregion dominated by abyssal hills and mountains with few seamounts. SST is low and stable, CHL low and stable, Salinity is moderate, Dissolved Oxygen is low and stable, Deepwater temp is moderate, 20°C isotherm is moderate, mixed layer depth is shallow, Solar irradiance is low, pH level is moderate, silicate level is moderate, phosphate level is low, nitrate level is moderate, Calcite is low. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 10 (large and tall with shallow peak: shallow); Includes 2 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 2500m and the lower depth is 4000m.
207	Torres Canyons Deep	SLB, VUT	Region dominated by canyons and deep basin. Other features include a seamount and steep escarpment. Sea surface temperature mildly variable and relatively high for Vanuatu. Chlorophyll-a concentrations are moderate, stable. Salinity and dissolved oxygen are low. Mid-depth temperatures very high while temperature at 1000m is low. MLD is high. Silicate and phosphorous levels are low. PH is very low. Contains 1 seamount type 4 (small with deep peak, most isolated type); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 13 Blind canyon type. The upper depth is 3000m and the lower depth is 4500m.
208	East of Minneapolis Ridge	KIR	Mostly abyssal plain and hills. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. Mixed layer depth and 20 degree isotherm are deep. Temperature at 200m is low, at 1000m is low as well but with warmer scattered areas. Silicate, dissolved oxygen, phosphorous, salinity, pH, and solar irradiance levels are moderate. Nitrate and calcite levels are low. Contains 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 6 (very large and tall with low escarpment); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5000m.
210	West Bouchard Seamount	PYF, TON	Non-contiguous bioregion dominated by abyssal hills and mountains. Other features include seamounts with steep escarpments. Sea surface temperature is low and stable; chlorophyll-concentrations, 20°C Isotherm and the deep water temperature are moderate. Salinity and pH levels are high. Nitrate and solar irradiance are moderate to low. Mixed layer depth and calcite are moderate and variable. Dissolved oxygen concentrations are moderate and stable. Strong sea surface currents generally from the North West. Contains 1 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.

Code	Name	Countries	Summary description
211	South Gilbert Boarder	TUV, KIR	Deep seamounts on abyssal mountains with steep escarpments. Basin on abyssal plains and cuts across few ridges. Sea surface temperature is high and stable. Chlorophyll-a concentrations are moderate. Calcite is low. Dissolved oxygen is moderate. Salinity is high. Nitrate, phosphorous, pH, and silicate levels are high to moderate. PH levels decrease towards the east. Solar irradiation is high. Mixed level and 20 degree isotherm are deep. Temperature at 1000m is high but greatly decreases in the north. At 200m, temperature is steadily high. Contains 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 10 (large and tall with shallow peak: shallow); The upper depth is 4500m and the lower depth is 5000m.
216	Malampa and Loyalty Basin	NCL, SLB, VUT	mostly deep abyssal hills and mountains with overlying basins, and cuts across few seamounts, ridges and trench. Sea surface temperature moderate, variable. Chlorophyll-a concentrations are high to moderate, variable. Salinity and dissolved oxygen are low. Temperature at 200m is low. Solar irradiance is quite high in the north. Contains 1 seamount type 2 (small with deep peak, most common type); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 2 Blind canyon type and 3 Shelf incising canyon type. The upper depth is 3500m and the lower depth is 5000m.
218	Rarotonga and the Byus Seamount	COK, PYF	Long thin with deep seamounts formed on abyssal habitats scattered across the bioregion with steep escarpments. SST low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 2 seamount type 2 (small with deep peak, most common type); 6 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 6 (very large and tall with low escarpment); 4 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 3 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5000m.
220	Nukutipipi Deep	COK, PYF	Mostly abyssal hills and two seamounts. SST low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); The upper depth is 4000m and the lower depth is 4500m.
221	North Ahe and Manihi	PYF, KIR	Deep abyssal mountains and hills with seamounts with steep escarpments. Few canyons and ridges are also featured in the west end. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are low. Calcite, solar irradiance, phosphorous, silicate, and nitrate levels are low. Dissolved oxygen, salinity, and pH levels are high. Temperature at 200m is high, while at 1000m it is moderate and variable. Mixed layer is deep; 20 degree isotherm is shallow and variable. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 5 seamount type 2 (small with deep peak, most common type); 5 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 3 Blind canyon type. The upper depth is 3000m and the lower depth is 4500m.
222	North of Solomon and Cape Johnson Troughs and Duff Islands	SLB	Contains part of a Trench and Trough in the north Solomon, and plateaus and canyons, steep escarpments and abyssal features. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is deep, MLD is shallow. Solar irradiance and pH, silicate, phosphate, and nitrate are low. Calcite is moderate. Contains 3 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 7 (small and short with very deep peaks, shortest); 4seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 19 Blind canyon type and 3 Shelf incising canyon type. The upper depth is 2500m and the lower depth is 4000m.

Code	Name	Countries	Summary description
226	Rennell and Pocklington Troughs	SLB	Two parts region with trough, canyons, plateau, ridges, basin, escarpments, and abyssal mountains. SST moderate and stable, Chlorophyll-a concentrations, DO and Salinity are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD is shallow, and PH is moderate. Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contains Intersect1 seamount type 4 (small with deep peak, most isolated type); Includes 13 Blind canyon types. The upper depth is 2500m and the lower depth is 4000m.
228	Norfolk and High Seas Deep	NCL, NFK, FJI, VUT	Contains trough and basin in the western end and abyssal plains, hills and mountains with few seamounts formed with steep escarpments. SST is low and stable, CHL is low and stable, Salinity is high, Dissolved Oxygen is moderate and variable, Deepwater temp is low, 20°C isotherm is shallow, mixed layer depth is medium, Solar irradiance is low, pH level is low, silicate level is low, phosphate level is low, nitrate level is moderate, Calcite is low. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type. The upper depth is 3500m and the lower depth is 4500m.
229	North Palau and Yap Trenches and Miklukho-Maklaya Seamount	FSM, PLW	Contains mostly the Palau ridge, trench and seamounts formed on abyssal mountains. Steep escarpments and deep basin also featured. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m, MLD and 20°C isotherm are shallow, pH and solar irradiance are low. Silicate, phosphate, nitrate and calcite are low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 5 seamount type 2 (small with deep peak, most common type); 3 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 10 (large and tall with shallow peak: shallow); 5 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 15 Blind canyon type and 3 Shelf incising canyon type. The upper depth is 3500m and the lower depth is 5000m.
231	Marokau to Reao	PYF	Contains seamounts, plateau in the west and cuts across a chain of ridges. Steep escarpments and deep basin, and abyssal features included. SST low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contains 20 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 2 (small with deep peak, most common type); 7 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 2 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 3 Blind canyon type. The upper depth is 2500m and the lower depth is 4000m.
232	Far West Marshall and North East Micronesia	MHL, FSM	Large seamounts in the east and mostly deep abyssal basin in the west. SST high and stable, CHL is low and variable, Salinity is low, Dissolved Oxygen is low and stable, Deepwater temp is moderate, 20°C isotherm is moderate, mixed layer depth is moderate, Solar irradiance is moderate, pH level is low, silicate level is low, phosphate level is low, nitrate level is moderate, Calcite is low variale.Contains 1 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 9 (Large and tall with shallow peak, larger); 5 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5000m and the lower depth is 5500m.
233	Swains Atoll and Nassau Island Deep	WLF, ASM, COK, WSM, TKL	Mostly seamounts, abyssal features (plains, hills and mountains), basin and steep escarpments. SST moderate and stable, CHL low and variable, Salinity is low, Dissolved Oxygen is low and stable, Deepwater temp is deep, 20°C isotherm is deep, mixed layer depth is medium, Solar irradiance is high, pH level is low, silicate level is moderate, phosphate level is moderate, nitrate level is moderate, Calcite is low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 18 seamount type 2 (small with deep peak, most common type); 4 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 13 seamount type 8 (small and short with very deep peaks, deepest type); 6 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 7 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 4500m and the lower depth is 5500m.

Code	Name	Countries	Summary description
234	Wallis, Samoa and American Samoa	WLF, ASM, COK, WSM, TON	Includes medium size seamounts, northern bits of the Tonga trench, ridges that form the base of American Samoa with lots of canyons. Sea surface temperature is high, CHL low and variable, Salinity is low, Dissolved Oxygen is low and stable, Deepwater temp is deep, 20°C isotherm is deep, mixed layer depth is medium, Solar irradiance is high, pH level is low, silicate level is moderate, phosphate level is moderate, nitrate level is moderate, Calcite is low. Contains 1 seamount type 1 (small with deep peak, short with moderately deep peak); 7 seamount type 2 (small with deep peak, most common type); 9 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 9 (Large and tall with shallow peak, larger); 10 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 16 Blind canyon type and 12 Shelf incising canyon type. The upper depth is 2000m and the lower depth is 5000m.
236	Nova Trough and Celestial Seamount	KIR, UMI	Contains few large seamounts in the west end and ridges in the east. Other feature is mostly abyssal. Sea surface temperature is low to moderate and variable. Chlorophyll-a concentrations are moderate. Calcite and pH levels are low. Solar irradiance, nitrate, phosphorous silicate, salinity, and dissolved oxygen levels are high. Temperatures at depth are moderate to low. Mixed layer is quite deep; 20 degree isotherm is on the shallow end. Contains 2 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 9 (Large and tall with shallow peak, larger); 4 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5000m and the lower depth is 5500m.
237	Melanesian Basin High Seas	FSM	Mostly abyssal hills and plains and plateau. SST high and stable, Chlorophyll-a concentrations are low. Salinity and dissolved oxygen are low and variable. Temperature at 1000m and 20°C isotherm are moderate. Solar irradiance is high and MLD is shallow. PH, Silicate, phosphate, nitrate and Calcite are low. Contains 1 seamount type 4 (small with deep peak, most isolated type); The upper depth is 3000m and the lower depth is 4000m.
238	Ile Haute Bagao Deep and New Hebrides Ridge	NCL, VUT	Shallow region on Vanuatu plateau and ridges with canyons featured comprehensively. Also includes a trough in the east and seamounts in the west part. Sea surface temperature reduces significantly moving south, relatively stable. Chlorophyll-a concentrations are high, variable, with very high concentrations around Efate and Epi islands. Calcite concentration is high in this area as well. Salinity and dissolved oxygen are high, lower in the north. Deepwater temperatures are high. MLD is low. Solar irradiance is low, especially around islands. Contains 2 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 31 Blind canyon type and 4 Shelf incising canyon type. Contains 2 active, confirmed; 1 active, inferred hydrothermal vents. The upper depth is 500m and the lower depth is 3000m.
239	South Kosrae Deep	MHL, FSM, NRU	Mostly abyssal plains with basins. SST high and stable, Chlorophyll-a concentrations are low. Salinity and dissolved oxygen are low and variable. Temperature at 1000m and 20°C isotherm are moderate. Solar irradiance is high and MLD is shallow. pH, Silicate, phosphate, nitrate and Calcite are low. Contains NO Seamounts. The upper depth is 4000m and the lower depth is 4500m.
240	Abyssal plain, seamounts and Vityaz trench bordering Fiji (NW), Tuvalu (SW) and Solomon Islands (SE)	SLB, TUV, FJI	Very deep bioregion with abyssal plains, vityaz trench and ridges with few chain of seamounts. SST high and stable, CHL low and variable, Salinity is moderate and stable, DO is low and stable, Deepwater temp is moderate, 20°C isotherm is deep, mixed layer depth is shallow, Solar irradiance is moderate, pH level is variable, silicate level has a left to right gradual increase, phosphate level is low, nitrate level is low, Calcite is low. Contains 4 seamount type 2 (small with deep peak, most common type); 3 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 4 Blind canyon type. The upper depth is 4000m and the lower depth is 5000m.

Code	Name	Countries	Summary description
241	Tuvalu Nui, Boarder and Cooper Seamount	TUV, ASM, TKL, KIR	Deep bioregion with seamounts on abyssal mountains, hills and basin formed on abyssal plain. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. Dissolved oxygen, silicate, phosphorous, nitrate, solar irradiance, and calcite levels are low. PH and salinity levels are high. Temperature is low at 1000m and high at 200m. Mixed layer is shallow and 20 degree isotherm is very deep. Contains 5 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 6 seamount type 7 (small and short with very deep peaks, shortest); 8 seamount type 8 (small and short with very deep peaks, deepest type); Includes 1 Blind canyon type. The upper depth is 5000m and the lower depth is 5500m.
242	Line and North French Polynesia	PYF, KIR	Seamounts formed on abyssal mountains with steep escarpments. Other features include abyssal hills with a few abyssal plain patches, and a ridge in the east. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are low to moderate. Calcite, solar irradiance, phosphorous, silicate, and nitrate levels are low. Dissolved oxygen, salinity, and pH levels are high. Temperature at 200m is high, while at 1000m it is moderate and variable. Mixed layer is deep; 20 degree isotherm is shallow and variable. Contains 2 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 3 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 3 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 5000m.
243	East Temotu,Banks and West of Rotuma Seamounts and the Vityaz trench	SLB, FJI, VUT	Contain large spreading ridge in the western part and a number of seamounts in the north and eastern part of the bioregion. Ridges and steep escarpments are also featured and the south of the Vityaz trench. Sea surface temperature high and stable. Chlorophyll-a concentrations are low, except for high concentration in NW corner. Mid-depth temperatures very high while temperature at 1000m is low. MLD is high. Silicate and phosphorous levels are high. PH is high. Contain 7 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 8 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); 7 seamount type 10 (large and tall with shallow peak: shallow); 6 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 18 Blind canyon type and 1 Shelf incising canyon type. Contain 2 inactive, hydrothermal vents. The upper depth is 2000m and the lower depth is 3500m.
244	Mysteries of Ontong Java	SLB	Mostly plateaus and abyssal hills. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is deep, MLD is shallow. Solar irradiance and pH, silicate, phosphate, and nitrate are low. Calcite is moderate. Contain NO Seamounts. The upper depth is 2000m and the lower depth is 3000m.
247	Flint and Vostok Islands Deep	COK, PYF, KIR	Contain many smaller seamounts formed on abyssal mountains, steep escarpments and underlying basins. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. Calcite, solar irradiance, phosphorous, silicate, and nitrate levels are low. Dissolved oxygen, salinity, and pH levels are high. Temperature at 200m is high, while at 1000m it is moderate and variable. Mixed layer is deep; 20 degree isotherm is shallow and variable. Contain 9 seamount type 2 (small with deep peak, most common type); 5 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 4 (small with deep peak, most isolated type); 1 seamount type 7 (small and short with very deep peaks, shortest); 5 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 9 (Large and tall with shallow peak, larger); 7 seamount type 10 (large and tall with shallow peak: shallow); 4 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.
251	South Pitcairn High Seas	PYF	Contain few seamounts in the west and mostly abyssal plain and hill in the east side. SST and Chlorophyll-a concentrations are very low. Salinity is moderate and dissolved oxygen is very high. Temperature at 1000m and MLD are moderate, 20°C isotherm is shallow, and PH, Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 2 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); The upper depth is 4000m and the lower depth is 4500m.

Code	Name	Countries	Summary description
252	Daisu and West Marshall Cluster	MHL	Mostly seamounts with steep escarpments on abyssal mountains and also ridges. SST high and stable, CHL is low and variable, Salinity is low, Dissolved Oxygen is low and stable, Deepwater temp is moderate, 20°C isotherm is moderate, mixed layer depth is moderate, Solar irradiance is moderate, pH level is low, silicate level is low, phosphate level is low, nitrate level is moderate, Calcite is low variale.Contain 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 9 (Large and tall with shallow peak, larger); 3 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 1500m and the lower depth is 4500m.
254	South President Thiers Bank	PYF	Contain a number of seamounts on the western side with east mostly abyssal habitat. SST very low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contain 2 seamount type 1 (small with deep peak, short with moderately deep peak); 6 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 4500m.
257	North Western and Marshall Boarder and South Thomas Guyots	MHL, UMI	Mostly seamounts with steep escarpments on abyssal mountains and hills. SST moderate and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD, PH, moderate and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are low. Contain 4 seamount type 2 (small with deep peak, most common type); 5 seamount type 3 (intermediate size, large tall and deep); 4 seamount type 7 (small and short with very deep peaks, shortest); 8 seamount type 8 (small and short with very deep peaks, deepest type); 5 seamount type 9 (Large and tall with shallow peak, larger); 5 seamount type 10 (large and tall with shallow peak: shallow); 4 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 5500m.
258	Tepoto, Napuka and Pukapuka Deep	PYF	Small bioregion with five seamounts, escarpments on abyssal mountains and hills. Ridge and Plateau is also part in the south end. SST moderate and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contain 3 seamount types 2 (small with deep peak, most common type); 2 seamount types 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); The upper depth is 3000m and the lower depth is 4000m.
259	Southwest Adamstown	PYF, PCN	Mostly abyssal hills and plains. SST very low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contain 1 seamount type 7 (small and short with very deep peaks, shortest); The upper depth is 3500m and the lower depth is 4000m.
260	Manokwari Abyss	PLW	Contain abyssal mountains and hills, spreading ridges, ridge seamounts, canyons, basin and steep escarpments. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD, pH and solar irradiance are low. Silicate, phosphate, and nitrate are low. Calcite is high. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 6 Blind canyon type. The upper depth is 2500m and the lower depth is 4000m.

Code	Name	Countries	Summary description
261	Victoria Fracture Zone	MHL, KIR	Mostly abyssal habitat that cuts through few seamounts and ridges. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are low, with blooms around islands. 20 degree isotherm is mid-depth. Temperature at 1000m is quite high, while 200m temperature is moderate. Mixed layer depth is average. Solar irradiance is low. PH is low, silicate, phosphorous, nitrate levels are high. Salinity, dissolved oxygen, and calcite levels are low. Contain 1 seamount type 2 (small with deep peak, most common type); 3 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 2 Blind canyon type and 2 Shelf incising canyon type. The upper depth is 4500m and the lower depth is 5000m.
262	North Palau and Mariana Deep	GUM, FSM, PLW	Non-contiguous with east part including the Mariana Trench and west side abyssal hills and patches of Hadal base. SST high and stable, Chlorophyll-a concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contain 3 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Contain 1 inactive, hydrothermal vent. The upper depth is 5500m and the lower depth is 6000m.
263	Avon Islets Group, Fairway Plateau and South Ile Surprise	NCL	Mostly plateaus, ridges and canyons. SST very low and stable, Chlorophyll-a concentrations are high to moderate. Deepwater temperature is moderate. Solar irradiance and MLD are moderate. Silicate, pH, Calcite and phosphorous levels are low. Contain NO Seamounts. Includes 7 Blind canyon type and 4 Shelf incising canyon type. The upper depth is 0m and the lower depth is 2500m.
265	Tonga Ridge, Beveridge Reef Deep and west Cooks	COK, TON, NIU	Deep bioregion with mostly abyssal hills and plains extending towards the Tongan trench and ridges. Sea surface temperature is moderate, chlorophyll-a concentrations, 20°C Isotherm and the deep water temperature are low. Salinity, pH levels, nitrate and solar irradiance are moderate. Mixed layer depth is moderate. Calcite is low and variable and dissolved oxygen concentrations are low and stable. Strong sea surface currents generally from the North. Contain 1 seamount type 2 (small with deep peak, most common type); 4 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 6 (very large and tall with low escarpment); 4 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5000m and the lower depth is 5500m.
266	Gifford Tablemount	NCL	Mostly plateau with few canyons and seamounts. SST very low and stable, Chlorophyll-concentrations are low. Salinity is high, DO is moderate, Deepwater temperature is shallow, 20 Degree Isotherm is shallow, Solar irradiance is low and MLD is shallow. Silicate, pH, Calcite, Nitrate and phosphorous levels are low. Contain 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 5 Blind canyon type. The upper depth is 2500m and the lower depth is 3500m.
267	Durand Reef and South Aneityum Deep	NCL, VUT	Two parts region with plateau, ridges and canyons in the west part and seamounts, ridges and canyons in the east. Sea surface temperature very unstable, low. Chlorophyll-a concentrations are high, stable. Salinity and dissolved oxygen are high. Temperature at 200m is low while Deepwater temperatures are high. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 23 Blind canyon type and 4 Shelf incising canyon type. Contain 1 active, confirmed; 1 active inferred hydrothermal vents. The upper depth is 0m and the lower depth is 2500m.

Code	Name	Countries	Summary description
268	North Eiao and Hatutu Deep	PYF	Mostly abyssal plains. Other features include basin and hills. SST moderate and stable, Chlorophyll-a concentrations and Silicate are moderate and variable. DO is low. 20 degree isotherm and mixed layer are deep. Temperature at 1000m is moderate and low at 200m. Solar irradiance is high. Salinity, nitrate, and phosphorous levels are high. PH and calcite levels are low. Contain 2 seamount type 2 (small with deep peak, most common type); 1 seamount type 10 (large and tall with shallow peak: shallow); The upper depth is 4000m and the lower depth is 4500m.
269	North-East Rotuma, Futuna, Tuvalu abyssal mountains and seamounts	TUV, WLF, FJI	Large bioregion with abyssal hills and mountainous area consisting of ridges and seamounts. Few canyons also featured in the west region. SST moderate and stable, CHL low and variable, Salinity is low, Dissolved Oxygen is low and stable, Deepwater temp is deep, 20°C isotherm is deep, mixed layer depth is medium, Solar irradiance is high, pH level is low, silicate level is moderate, phosphate level is moderate, nitrate level is moderate, Calcite is low. Contain 2 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 2 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 9 (Large and tall with shallow peak, larger); 3 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 20 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 2500m and the lower depth is 4500m.
270	Rotuma-Futuna-Tuvalu-abyssal mountains and seamounts	TUV, WLF, FJI	Large bioregion with abyssal hills and mountainous area consisting of ridges and seamounts. SST is high and stable, CHL is low and variable, Salinity is low, Dissolved Oxygen is low and stable, Deepwater temp is moderate, 20°C isotherm is deep, mixed layer depth is medium, Solar irradiance is moderate, pH level is low, silicate level is moderate, phosphate level is moderate, nitrate level is moderate, Calcite is low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 3 (intermediate size, large tall and deep); 5 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); 5 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 11 Blind canyon type and 3 Shelf incising canyon type. The upper depth is 1000m and the lower depth is 3500m.
271	South Bouchard Seamount	PYF	Mostly abyssal hills and mountains with ridges. Few seamounts are also featured in the east. SST and Chlorophyll-a concentrations are very low. Salinity is moderate and dissolved oxygen is very high. Temperature at 1000m and MLD are moderate, 20°C isotherm is shallow, and PH, Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contain 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 1 seamount type 8 (small and short with very deep peaks, deepest type); The upper depth is 4500m and the lower depth is 5000m.
274	South Nauru and Gilbert Boarder	NRU, KIR,	Mostly abyssal plains and hills with ridges on top of abyssal mountains. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. 20 degree isotherm is quite deep; temperature at 200m is high. At 1000m, temperature is low in the north and high in the south. Solar irradiation is moderate, pH is high. Silicate phosphorous, nitrate, calcite, and salinity are low. Dissolved oxygen is moderate and variable. Contain 1 seamount type 4 (small with deep peak, most isolated type); The upper depth is 3000m and the lower depth is 4000m.
275	Nuku Hiva West and Ua Huka East	PYF	Contains abyssal plains and hills. Bioregion including a number of chains of seamounts with steep escarpments. SST moderate and stable, Chlorophyll-a concentrations and Silicate are moderate and variable. DO is low. 20 degree isotherm and mixed layer are deep. Temperature at 1000m is moderate and low at 200m. Solar irradiance is high. Salinity, nitrate, and phosphorous levels are high. PH and calcite levels are low. Contain 3 seamount type 1 (small with deep peak, short with moderately deep peak); 4 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 5 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 5 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 10 (large and tall with shallow peak: shallow); The upper depth is 4000m and the lower depth is 5000m.

Code	Name	Countries	Summary description
276	Line East West Boarders and High Seas	KIR	Mostly ridges with steep escarpments on abyssal mountainous areas. Two or so seamounts also included. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are moderate. Shallow 20 degree isotherm and deep mixed layer. Moderate 1000m temperature and high 200m temperature. Salinity, solar irradiance, nitrate, dissolved oxygen, and phosphorous levels are high. PH, silicate, and calcite levels are low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 6 (very large and tall with low escarpment); 1 seamount type 8 (small and short with very deep peaks, deepest type).The upper depth is 3000m and the lower depth is 5000m.
277	North New Hebrides Trench and Trough	VUT	Includes the north New Hebrides Trench. Sea surface temperature very high and stable. Chlorophyll-a concentrations are moderate, stable. Salinity and dissolved oxygen are low. Mid-depth temperatures very high while temperature at 1000m is low. MLD is high. Silicate and phosphorous levels are low. Solar irradiance is quite high. PH is relatively low. Contain NO Seamounts. Includes 1 Blind canyon type. The upper depth is 3500m and the lower depth is 6500m.
280	South New Caledonia Boarder	NCL	Contains trough, plateau and deep abyssal hills and plains with canyons featured. SST very low and stable, Chlorophyll-concentrations are low. Salinity is high, DO is moderate, Deepwater temperature is shallow, 20 Degree Isotherm is shallow, Solar irradiance is low and MLD is shallow. Silicate, pH, Calcite, Nitrate and phosphorous levels are low. Contain 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 3 Blind canyon type. The upper depth is 2500m and the lower depth is 3500m.
281	Eiao and Hatutu	PYF	Small bioregion containing seamounts, steep escarpments, ridges on abyssal mountains. SST moderate and stable, Chlorophyll-a concentrations and Silicate are moderate and variable. DO is low. 20 degree isotherm and mixed layer are deep. Temperature at 1000m is moderate and low at 200m. Solar irradiance is high. Salinity, nitrate, and phosphorous levels are high. PH and calcite levels are low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 2 seamount type 10 (large and tall with shallow peak: shallow). Includes 1 blind canyon type. The upper depth is 1000m and the lower depth is 4000m.
284	North Cooks, Line and High Seas	COK, KIR	Contain seamounts, ridges, trough, plateau and abyssal hills and mountains. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are moderate. Shallow 20 degree isotherm and deep mixed layer. High temperature at 1000m and 200m depths. Salinity, solar irradiance, nitrate, dissolved oxygen, and phosphorous levels are moderate to high. PH, silicate, and calcite levels are low. Contain 2 seamount type 1 (small with deep peak, short with moderately deep peak); 3 seamount type 2 (small with deep peak, most common type); 4 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 5 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3000m and the lower depth is 4500m.
287	East Caroline Basin	FSM	Mostly abyssal hills and mountains cutting through spreading ridges and rift valleys. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m, MLD and 20°C isotherm are shallow, pH and solar irradiance are low. Silicate, phosphate, nitrate and calcite are low. Contain 1 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 2 seamount type 7 (small and short with very deep peaks, shortest); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3500m and the lower depth is 4500m.

Code	Name	Countries	Summary description
289	Minto Reef Deep	MHL, FSM	Contain abyssal plains with basin, abyssal hills and mountains with small to medium size seamounts. SST high and stable, CHL is low and variable, Salinity is low, Dissolved Oxygen is low and stable, Deepwater temp is moderate, 20°C isotherm is moderate, mixed layer depth is moderate, Solar irradiance is moderate, pH level is low, silicate level is low, phosphate level is low, nitrate level is moderate, Calcite is low variale.Contain 1 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 3 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 3 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type. The upper depth is 5000m and the lower depth is 5500m.
290	North of Yap Trench and Northwest Micronesia	FSM, PLW	Contain some medium size seamounts in the east with steep escarpments, cuts across ridges and spreading ridges with rift valleys. Deep basin also featured with abyssal mountains. SST high and stable, Chlorophyll-a concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 5 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 2seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3500m and the lower depth is 5500m.
292	Gardner Island and North Cooks Boarder	COK, KIR	Two parts bioregion with troughs, seamounts, ridges, basin and abyssal mountains and hills featured in the right side. The left part mostly includes deep abyssal habitats with seamounts. Sea surface temperature is high and stable. Chlorophyll-a concentrations are moderate. Dissolved oxygen, phosphorous, solar irradiation, pH, nitrate levels are moderate. Salinity levels are high, and silicate and calcite levels are low. Temperatures at depth are quite high. Mixed layer and 20 degree isotherm are deep. Contain 7 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 7 (small and short with very deep peaks, shortest); 7 seamount type 10 (large and tall with shallow peak: shallow); 5 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 5500m.
294	Northeast Phoenix and High Seas	KIR, UMI	Mostly abyssal features (hills and mountains) with seamounts. Basin represented also in the eastern side on abyssal plains. Sea surface temperature is low to moderate and variable. Chlorophyll-a concentrations are moderate with generalized blooms. Calcite and pH levels are low. Solar irradiance, nitrate, phosphorous silicate, salinity, and dissolved oxygen levels are high. Temperatures at depth are moderate to low. Mixed layer is quite deep; 20 degree isotherm is on the shallow end. Contain 5 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 5 seamount type 8 (small and short with very deep peaks, deepest type).The upper depth is 5000m and the lower depth is 5500m.
298	Matthew and Hunter, South Fiji and Telekom Outbound Deep	NCL, FJI, TON, VUT	Contains trough and plateau with rift valleys forming on spreading ridges and basins. Western side of bioregion contain part of the New Hebrides trench and ridges. SST is low and stable, CHL low and stable, Salinity is moderate, Dissolved Oxygen is low and variable, Deepwater temp is moderate, 20°C isotherm is moderate, mixed layer depth is shallow, Solar irradiance is low, pH level is moderate, silicate level is moderate, phosphate level is low, nitrate level is moderate, Calcite is low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 2 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 9 Blind canyon type. Contain 1 active, inferred hydrothermal vent. The upper depth is 2000m and the lower depth is 4000m.
299	Keats Reef Deep	MHL, KIR	Mostly abyssal plains and few big seamounts in both west and eastern sides. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are low. 20 degree isotherm is shallow; temperature at 1000m is high, low at 200m. Solar irradiance is low. PH is moderate, silicate, phosphorous, and nitrate levels are high. Salinity, dissolved oxygen, and calcite levels are low. Contain 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 9 (Large and tall with shallow peak, larger); 11 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type. The upper depth is 4500m and the lower depth is 5500m.

Code	Name	Countries	Summary description
301	South Tonga Eastern Lookout, South Cooks and High Seas	COK, TON	Contains deep Tonga ridge, abyssal hills and seamounts on abyssal mountains. Sea surface temperature is low and stable; chlorophyll-concentrations, 20°C Isotherm and the deep water temperature are moderate. Salinity and pH levels are high. Nitrate and solar irradiance are moderate to low. Mixed layer depth and calcite are moderate and variable. Dissolved oxygen concentrations are moderate and stable. Strong sea surface currents generally from the North West. Contain 2 seamount type 2 (small with deep peak, most common type); 1 seamount type 7 (small and short with very deep peaks, shortest); 3 seamount type 8 (small and short with very deep peaks, deepest type); 11 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5000m and the lower depth is 6000m.
302	Tonga Passage from Trench	TON	Dominated by chain of canyons formed on ridges and plateau. Sea surface temperature is moderate, chlorophyll-a concentrations, 20°C Isotherm and the deep water temperature are deep. Salinity, pH levels, nitrate and solar irradiance are moderate. Mixed layer depth is moderate. Calcite is low and variable and dissolved oxygen concentrations are low and stable. Strong sea surface currents generally from the North. Contain NO Seamounts. Includes 9 Blind canyon type and 5 Shelf incising canyon type. The upper depth is 1500m and the lower depth is 4500m.
303	Southwest Macdonald Seamount	PYF	Contain abyssal hills mostly and few smaller seamounts. SST and Chlorophyll-a concentrations are very low. Salinity is moderate and dissolved oxygen is very high. Temperature at 1000m and MLD are moderate, 20°C isotherm is shallow, and PH, Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contain 3 seamount type 4 (small with deep peak, most isolated type); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type). The upper depth is 4000m and the lower depth is 5000m.
304	Southeast Tagula and Louisiade Plateau	SLB	Mostly canyons on slope with escarpments and canyons on plateaus. SST moderate and stable, Chlorophyll-a concentrations, DO and Salinity are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD is shallow, and PH is high. Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contain NO Seamounts. Includes 14 Blind canyon type. The upper depth is 2000m and the lower depth is 3000m.
306	North Marshalls Guyots Cluster (SIO,Harvey,HIG, Allen)	MHL, UMI	Contain some of the medium and large seamounts and deep ridges formed on abyssal mountains. SST moderate and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD, PH, moderate and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are low. Contain 4 seamount type 1 (small with deep peak, short with moderately deep peak); 5 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 4 seamount type 7 (small and short with very deep peaks, shortest); 5 seamount type 10 (large and tall with shallow peak: shallow); 7 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 2500m and the lower depth is 4500m.
307	North New Caledonia	NCL	Contain canyons on ridges and plateaus with trough in the center of bioregion. SST low and stable, Chlorophyll-a concentrations are high to moderate. Deepwater temperature is moderate. Solar irradiance and MLD are moderate. Silicate, pH, Calcite and phosphorous levels are low. Contain 1 seamount type 9 (Large and tall with shallow peak, larger); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 23 Blind canyon type and 10 Shelf incising canyon type. The upper depth is 0m and the lower depth is 3500m.
311	King Seamount	KIR, UMI	Mostly abyssal hills, plains with basin, and few mountains with seamounts. SST moderate and stable, Chlorophyll-a concentrations are high, variable. Mixed layer depth is deep. Temperature at 1000m and 200m is moderate. 20 degree isotherm is moderate depth. Solar irradiation is high; pH, nitrate, and silicate levels are moderate. Phosphorous and salinity are high. Dissolved oxygen and calcite levels are low, but calcite is highly concentrated around islands. Contain 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 2 seamount type 7 (small and short with very deep peaks, shortest); 4 seamount type 8 (small and short with very deep peaks, deepest type); The upper depth is 5500m and the lower depth is 6000m.

Code	Name	Countries	Summary description
312	Seamounts of Micronesia	MHL, KIR	Mostly abyssal plain with few seamounts, ridges and canyons included in the east. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are low, with blooms around islands. 20 degree isotherm is mid-depth. Temperature at 1000m and hgt2000 are quite high, while 200m temperature is moderate. Mixed layer depth is quite low, as is solar irradiance. PH, phosphorous, nitrate, and silicate levels are moderate, salinity are low. Dissolved oxygen is low to moderate; calcite levels are low except around Makin Island. Contain 1 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); Includes 3 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 4000m and the lower depth is 4500m.
315	South New Caledonia and Norfolk Boarder	NCL, NFK	Three parts bioregion. Most western side includes trough, plateau with deep hills. The Central region is dominated with canyons on Plateau and the far eastern side contains large plateau with deep ridges on abyssal mountains. SST very low and stable, Chlorophyll-a concentrations are low. Salinity is high, DO is moderate, Deepwater temperature is shallow, 20 Degree Isotherm is shallow, Solar irradiance is low and MLD is shallow. Silicate, pH, Calcite, Nitrate and phosphorous levels are low. Contain 1 seamount type 4 (small with deep peak, most isolated type); 3seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 18 Blind canyon type. The upper depth is 2000m and the lower depth is 3000m.
317	Suwarrow Atoll Deep	COK	Mostly plateau with ridge. SST moderate and stable, Chlorophyll-a concentrations are low. Calcite, solar irradiance, phosphorous, silicate, and nitrate levels are low. Dissolved oxygen, salinity, and pH levels are high. Temperature at 200m is high, while at 1000m it is moderate and variable. Mixed layer is deep; 20 degree isotherm is shallow and variable. Contain 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 7 (small and short with very deep peaks, shortest); The upper depth is 2500m and the lower depth is 3500m.
318	Woodlark Basin	SLB,	Slope with steep escarpments containing canyons and ridges, plateau, spreading ridges and rift valleys in deep abyssal hills with basin. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD and solar irradiance are low. PH is moderate. Silicate, phosphate, and nitrate are low. Calcite is high. Contain 3 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); Includes 19 Blind canyon type and 1 Shelf incising canyon type. Contain 1 active, confirmed hydrothermal vent. The upper depth is 0m and the lower depth is 3000m.
320	Ontong Java Rise and Melanesian Basin	FSM,	Mostly plateau. SST high and stable, Chlorophyll-a concentrations are low. Salinity and dissolved oxygen are low and variable. Temperature at 1000m and 20°C isotherm are moderate. Solar irradiance is high and MLD is shallow. PH, Silicate, phosphate, nitrate and Calcite are low. Contain 1 seamount type 6 (very large and tall with low escarpment); Includes 1 Shelf incising canyon type. The upper depth is 2000m and the lower depth is 3000m.
324	Strakhov Seamount	MHL	Deep basin on abyssal plain, three seamounts on abyssal mountains. SST moderate and stable, Chlorophyll-a concentrations are low stable. Salinity and dissolved oxygen are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD, PH, moderate and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are low. Contain 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 5500m and the lower depth is 5500m.

Code	Name	Countries	Summary description
325	South New Hebrides trench and South Eastern Ceva-I-Ra seamounts abyssal hills	NCL, FJI, VUT	Includes part of the New Hebrides Trench, few seamounts, spreading ridges and rift valleys and deep abyssal features. SST is low and stable, CHL low and variable, Salinity is moderate and variable, Dissolved Oxygen is low and variable, Deepwater temp is moderate, 20°C isotherm is moderate, mixed layer depth is medium, Solar irradiance is low, pH level is moderate, silicate level is low, phosphate level is low, nitrate level is low, Calcite is low. Contain 2 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 2 (small with deep peak, most common type); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 10 (large and tall with shallow peak: shallow); 4 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type. The upper depth is 4000m and the lower depth is 4500m.
327	Mejit Island Deep	MHL	Mostly deep abyssal plains with overlying basins, and abyssal hills and mountains with again basin, few seamounts and ridges. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are moderate and variable. Temperature at 1000m is moderate. 20°C isotherm is shallow, MLD and solar irradiance are moderate and pH is high. Silicate, phosphate, nitrate and calcite are moderate. Contain 1 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type. The upper depth is 4500m and the lower depth is 5500m.
328	North Cooks Spot	COK	Mostly abyssal hills. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. Very deep mixed layer and a more shallow 20 degree isotherm. 1000m temperature is low. Temperature at 200m is high and stable. Silicate, nitrate, dissolved oxygen, calcite, and phosphorous levels are low. Salinity is high. Solar irradiation and pH are high to moderate. Contain 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3500m and the lower depth is 4500m.
330	Pocklington Ridge and Louisiade Plateau with Hammondsport Seamount and Rennell Ridge	SLB,	Two parts bioregion. West side contains ridge, seamounts and canyons. East side contains plateau, large ridge and canyons. SST moderate and stable, Chlorophyll-a concentrations, DO and Salinity are low. Temperature at 1000m is deep, 20°C isotherm is deep, MLD is shallow, and PH is low. Solar irradiance, silicate, phosphate, nitrate and calcite are low. Intersect 2 seamount type 10 (large and tall with shallow peak: shallow) Includes 14 Blind canyon type. The upper depth is 1500m and the lower depth is 3000m.
331	Ailuk Atoll Deep	MHL	Contain ridges on slopes with steep escarpments. Canyons run on slopes into deep abyssal habitats, seamounts on mountainous areas and east side includes deep abyssal plain with basin. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are moderate and variable. Temperature at 1000m is moderate. 20°C isotherm is shallow, MLD and solar irradiance are moderate and pH is high. Silicate, phosphate, nitrate and calcite are moderate. Contain 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 4 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 3500m and the lower depth is 5500m.
333	North New Hebrides Trench	SLB, VUT	Includess the north New Hebrides Trench. Sea surface temperature very high and stable. Chlorophyll-a concentrations are moderate, stable. Salinity and dissolved oxygen are low. Mid-depth temperatures very high while temperature at 1000m is low. MLD is high. Silicate and phosphorous levels are low. PH is very low. Contain NO Seamounts. Includes 3 Blind canyon type. The upper depth is 4500m and the lower depth is 8000m.

Code	Name	Countries	Summary description
334	North Kingman Reef	KIR, UMI	This bioregion consists of a lot of large deeper water seamounts formed on top of abyssal mountains and lot of smaller seamounts as well. Other features include abyssal hills, plains, and escarpments. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. Shallow 20 degree isotherm and mixed layer depth. Temperature is high at 1000m and low at 200m. Silicate, phosphorous, calcite, nitrate, solar irradiance, and salinity levels are low. PH levels are high. Dissolved oxygen is high to moderate. Contain 4 seamount type 1 (small with deep peak, short with moderately deep peak); 12 seamount type 2 (small with deep peak, most common type); 8 seamount type 3 (intermediate size, large tall and deep); 8 seamount type 7 (small and short with very deep peaks, shortest); 6 seamount type 8 (small and short with very deep peaks, deepest type); 7 seamount type 9 (Large and tall with shallow peak, larger); 5 seamount type 10 (large and tall with shallow peak: shallow); 7 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3500m and the lower depth is 5000m.
335	Ono-i-Lau, South Lau Ridge and Halved Ridge	FJI, TON	Non-contiguous bioregion dominated by ridges forming the base of a chain of canyons along the Tonga ridge. Also contain terraces and plateau. SST moderate and stable, CHL low generally but high close to land (Tongatapu - Tonga and Southern Lau - Fiji), Salinity is moderate and stable, Dissolved Oxygen is moderate and stable, Deepwater temp is moderate, 20°C isotherm is medium, mixed layer depth is medium, Solar irradiance is generally low, pH level is moderate, silicate level is moderate, phosphate level is low, nitrate level is moderate, Calcite is low generally but high close to land (Tongatapu - Tonga and Southern Lau - Fiji). Contain 4 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); Includes 10 Blind canyon type and 2 Shelf incising canyon type. Contain 1 active, confirmed; 2 active inferred hydrothermal vents. The upper depth is 500m and the lower depth is 2000m.
337	North New Ireland and Ontong Java Atoll	SLB	Two parts bioregion, east side contain plateau and the west part contain ridges, slope with canyon on escarpments and abyssal mountains. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD and solar irradiance are low. PH is moderate. Silicate, phosphate, and nitrate are low. Calcite is high. Contain NO Seamounts. Includes 14 Blind canyon type and 5 Shelf incising canyon type. Contain 1 active, confirmed; 2 active, inferred and 1 inactive, hydrothermal vent. The upper depth is 500m and the lower depth is 2000m.
342	West Shefa	NCL, VUT	Mostly includes the New Hebrides Trench. Sea surface temperature moderate, variable. Chlorophyll-concentrations are moderate to high, stable. Contain 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 6000m.
344	Kena Guyot	PYF	Contains seamounts on slopes with steep escarpments. Ridges on slopes are also featured. SST moderate and stable, Chlorophyll-a concentrations and Silicate are moderate and variable. DO is low. 20 degree isotherm and mixed layer are deep. Temperature at 1000m is moderate and low at 200m. Solar irradiance is high. Salinity, nitrate, and phosphorous levels are high. PH and calcite levels are low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 2 (small with deep peak, most common type); 5 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 1000m and the lower depth is 3500m.
346	Maloelap and Aur East	MHL	contain deep ridges and seamounts with steep escarpments on abyssal mountains and hills. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are moderate and variable. Temperature at 1000m is moderate. 20°C isotherm is shallow, MLD and solar irradiance are moderate and pH is high. Silicate, phosphate, nitrate and calcite are moderate. Contain 1 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 8 (small and short with very deep peaks, deepest type); 1 seamount type 9 (Large and tall with shallow peak, larger); 2 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 3 Blind canyon type. The upper depth is 4500m and the lower depth is 5500m.

Code	Name	Countries	Summary description
349	Bellona Plateau and Minerva Shoal	NCL,	Contain ridges and canyons on plateaus. SST very low and stable, Chlorophyll-concentrations are high to moderate. Deepwater temperature is moderate. Solar irradiance and MLD are moderate. Silicate, pH, Calcite and phosphorous levels are low. Contain 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group) Includes 11 Blind canyon type and 2 Shelf incising canyon type. The upper depth is 500m and the lower depth is 2500m.
350	Northern Micronesia Patches	FSM, PLW	Mostly deep abyssal plains with basins and few seamounts on mountains. SST high and stable, Chlorophyll-a concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contain 2 seamount type 2 (small with deep peak, most common type); 2 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 1seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4500m and the lower depth is 6000m.
354	Kiritimati Deep	KIR	Mostly ridges and canyons with steep escarpments on plateau. Sea surface temperature is moderate and variable. Chlorophyll-a concentrations are moderate with high concentrations around the island. Mixed layer depth is shallow but varied, and 20 degree isotherm is deep. Temperature at 200m is low, but high at 1000m. Silicate, phosphorous, salinity, and solar irradiance levels are high. Nitrate, pH, and dissolved oxygen levels are low. Calcite is low except for high levels around Kiritimati. Intersect 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 3 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 2000m and the lower depth is 4000m.
357	Northwest New Caledonia	NCL,	Ridges on plateau and abyssal habitats SST low and stable, Chlorophyll-concentrations DO and Salinity is low. Temperature at 1000m is high, 20°C isotherm is deep, MLD is shallow, and PH is high. Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contain NO Seamounts. Includes 3 Blind canyon type. The upper depth is 3000m and the lower depth is 4000m.
358	Tematagi Group of Atolls	PYF	Deep abyssal hills, ridges and seamounts on abyssal mountains. SST very low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 4 (small with deep peak, most isolated type); 1 seamount type 8 (small and short with very deep peaks, deepest type); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 4000m and the lower depth is 4500m.
359	Guam's Challenger Deep	GUM, FSM	Contain the Mariana Trench. SST moderate and stable, Chlorophyll-concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contain NO Seamounts. The upper depth is 6000m and the lower depth is 10000m.
360	Loyalty Ridge and Chamois Bank	NCL	Contain canyons and ridges on plateau and deep abyssal hills and mountains. SST very low and stable, Chlorophyll-a concentrations are high to moderate. Deepwater temperature is moderate. Solar irradiance and MLD are moderate. Silicate, pH, Calcite and phosphorous levels are low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); Includes 8 Blind canyon type and 2 Shelf incising canyon type. The upper depth is 1000m and the lower depth is 4500m.
364	Pikelot Banks Cluster	FSM	Large ridges with escarpments and few canyons on abyssal hills and mountains. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m, MLD and 20°C isotherm are shallow, pH and solar irradiance are low. Silicate, phosphate, nitrate and calcite are low. Contain NO Seamounts. Includes 3 Blind canyon type. The upper depth is 0m and the lower depth is 2500m.
365	Maturei Vavao to Tenararo split	PYF	Contain seamounts and canyons on plateau. Also ridges and canyons on abyssal mountains. SST very low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Intersect 2 seamount type 10 (large and tall with shallow peak: shallow) Includes 3 Blind canyon type. The upper depth is 500m and the lower depth is 3500m.

Code	Name	Countries	Summary description
368	Washington Island and Christmas Ridge	KIR, UMI	Contain seamounts and ridges o plateaus. Deeper seamounts on abyssal mountains. Other features include abyssal hills and plains. Sea surface temperature is high and stable. Chlorophyll-a concentrations are moderate. Mixed layer depth and 20 degree isotherm are deep. Temperature at 200m is low, at 1000m is low as well but with warmer scattered areas. Silicate, dissolved oxygen, phosphorous, salinity, pH, and solar irradiance levels are moderate. Nitrate and calcite levels are low. Contain 2seamount type 2 (small with deep peak, most common type); 4 seamount type 3 (intermediate size, large tall and deep); 3 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 3 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 8 (small and short with very deep peaks, deepest type); 4 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 3500m and the lower depth is 5000m.
369	Far North-eastern Boarder of French Polynesia	PYF	Contain ridge and abyssal hills and plains. SST moderate and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); The upper depth is 3500m and the lower depth is 4500m.
370	Marshall eastern boarder to high seas	MHL	Mostly abyssal plain basins and hills. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are moderate and variable. Temperature at 1000m is moderate. 20°C isotherm is shallow, MLD and solar irradiance are moderate and pH is high. Silicate, phosphate, nitrate and calcite are moderate. Contain NO Seamounts. The upper depth is 5000m and the lower depth is 5500m.
373	West Palau to South Philippine Trench	PLW	Contain the Philippine trench, ridges and seamounts in the east. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD, pH and solar irradiance are low. Silicate, phosphate, nitrate are low. Calcite is moderate. Contain 4 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 10 (large and tall with shallow peak: shallow) Includes 3 Blind canyon type. The upper depth is 4500m and the lower depth is 6000m.
377	Yap Island non contiguous	FSM, PLW	Seven parts bioregion containing deep ridges and seamounts on abyssal mountain areas. SST high and stable, Chlorophyll-a concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 2 (small with deep peak, most common type); 3 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 3 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 4 Blind canyon type. The upper depth is 2500m and the lower depth is 4500m.
378	Minerva to South Ata plateaus	FJI, TON	Contains 2 seamounts. Contains trough and plateau with rift valleys forming on spreading ridges and basins. Towards the east is a chain of ridges which forms the Tonga ridge with canyons in between the ridges. SST is low and stable, CHL is low and variable, Salinity is high, Dissolved Oxygen is moderate and stable, Deepwater temp is moderate, 20°C isotherm is moderate, mixed layer depth is shallow, Solar irradiance is low, pH level is moderate, silicate level is moderate, phosphate level is low, nitrate level is moderate, Calcite is low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group) Includes 5 Blind canyon type. Contain 2 active, confirmed; 3 active, inferred hydrothermal vents. The upper depth is 500m and the lower depth is 2500m.
382	Southern Lau and the Ha'apai Tofua Ridge and Trough	FJI, TON	3 non-contiguous bioregion splits between Fiji and Tonga. Boundary within Tonga is dominated by plateau with ridges and canyons around the Ha'apai region. The west region contains plateau and ridges on slopes. SST moderate and variable, CHL is generally moderate but high close to land (Southern Lau group - Fiji and Ha'apai Group - Tonga), Salinity is moderate, Dissolved Oxygen is moderate and variable, Deepwater temp is medium, 20°C isotherm is medium, mixed layer depth is medium, Solar irradiance is moderate, pH level is moderate, silicate level is moderate, phosphate level is low, nitrate level is moderate, Calcite is generally low but high closer to land (Southern Lau group - Fiji and Ha'apai Group - Tonga). Contain 3 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group) Includes 3 Blind canyon type and 7 Shelf incising canyon type. Contain 2 active, inferred hydrothermal vents. The upper depth is 500m and the lower depth is 2000m.

Code	Name	Countries	Summary description
387	Marutea Atoll and Northwest Pitcairn	PYF, PCN	Mostly abyssal hills and plains with ridges and steep escarpment in the west. SST very low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 1 Blind canyon type. The upper depth is 3500m and the lower depth is 4000m.
392	Nova and Argo Banks	NCL	Contain mostly plateau with few seamounts on the center of bioregion and ridges and canyons in the west. SST very low and stable, Chlorophyll-a concentrations are low. Salinity is high, DO is moderate, Deepwater temperature is shallow, 20 Degree Isotherm is shallow, Solar irradiance is low and MLD is shallow. Silicate, pH, Calcite, Nitrate and phosphorous levels are low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 9 (Large and tall with shallow peak, larger); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 17 Blind canyon type. The upper depth is 1500m and the lower depth is 2500m.
393	Challenger Deep	GUM, FSM	Mostly contain the Marianas Trench (Challenger Deep) SST high and stable, Chlorophyll-a concentrations, salinity and dissolved oxygen are low and variable. Temperature at 1000m, 20°C isotherm, MLD and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are all low. Contain NO Seamounts. Includes 2 Blind canyon type. The upper depth is 5000m and the lower depth is 8000m.
395	Gilbert, Tuvalu High Seas	TUV, KIR	Mostly abyssal hills and plains. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. 20 degree isotherm is quite deep, temperature at depth is high. Mixed layer depth is shallow. Solar irradiation is moderate, pH is high. Silicate, phosphorous, salinity, dissolved oxygen, and nitrate levels are moderate. Calcite levels are low. Contain NO Seamounts. The upper depth is 4000m and the lower depth is 4500m.
396	Sonsorol and East Kayangel	FSM, PLW	Shallow non-contiguous bioregion consisting of ridges, spreading ridges with rift valleys and a couple of seamounts with steep escarpments. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD, pH and solar irradiance are low. Silicate, phosphate, nitrate and calcite are low. Contain 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 2 Blind canyon type. The upper depth is 3000m and the lower depth is 4500m.
397	Ahurei Deep	PYF	Two parts bioregion with west part containing ridges on plateau and seamounts. The east part contains mostly ridges and seamounts on abyssal mountains with escarpments. SST very low and stable, Chlorophyll-a concentrations are very low. Salinity is moderate and dissolved oxygen is high. Temperature at 1000m and MLD are moderate, 20°C isotherm is shallow, and PH, Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 3 (intermediate size, large tall and deep); 7 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 10 (large and tall with shallow peak: shallow); 7 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 1500m and the lower depth is 3500m.
398	Tuamotu Atolls Deep	PYF	Mostly ridges and canyons with steep escarpments on plateau. SST moderate and stable, Chlorophyll-concentrations are low. Calcite, solar irradiance, phosphorous, silicate, and nitrate levels are low. Dissolved oxygen, salinity, and pH levels are high. Temperature at 200m is high, while at 1000m it is moderate and variable. Mixed layer is deep; 20 degree isotherm is shallow and variable. Contain 1 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 10 (large and tall with shallow peak: shallow) Includes 7 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 0m and the lower depth is 2500m.
400	Rongelap Atoll Deep	MHL	Contain ridges on slopes with steep escarpments. Also contain a seamount in the east. SST high and stable, Chlorophyll-a concentrations are low and high around the islands. Salinity and dissolved oxygen are low. Temperature at 1000m is high, 20°C isotherm is deep, MLD, PH, moderate and Solar irradiance are moderate. Silicate, phosphate, nitrate and calcite are low. Contain 1 seamount type 6 (very large and tall with low escarpment); Includes 1 Blind canyon type. The upper depth is 0m and the lower depth is 4000m.

Code	Name	Countries	Summary description
407	West Aneityum and New Hebrides Trench	NCL, VUT	Contain mostly the south of the New Hebrides Trench. Sea surface temperature very unstable, low. Chlorophyll-a concentrations are high, scattered. Salinity and dissolved oxygen are high. Deepwater temperatures are high. Contain NO Seamounts. Includes 5 Blind canyon type. The upper depth is 4000m and the lower depth is 6000m.
410	Majuro, Arno and Mili Atolls	MHL, KIR	Contain ridges on slopes with escarpments and canyons on seamounts with escarpment. Sea surface temperature is moderate and stable. Chlorophyll-a concentrations are low. High temperatures at 1000m, moderate at 200m. Mixed layer depth and solar irradiance are low. PH, silicate, phosphorous, and nitrate levels are moderate. Salinity is low. Dissolved oxygen and calcite levels are low. Contain 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth).Includes 11 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 0m and the lower depth is 4500m.
412	North Fiji and Tuvalu ridge chain	TUV, WLF, FJI	Non-contiguous region featuring mostly ridges with few canyons and seamounts on slopes and escarpments. SST is high and stable, CHL is generally low but high toward west, Salinity is low and variable, Dissolved Oxygen is low and stable, Deepwater temp is medium, 20°C isotherm is deep, mixed layer depth is medium, Solar irradiance is moderate, pH level is moderate, silicate level is moderate, phosphate level is moderate, nitrate level is moderate, Calcite is low. Contain 1 seamount type 1 (small with deep peak, short with moderately deep peak); 2 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 9 (Large and tall with shallow peak, larger); Includes 5 Blind canyon type and 4 Shelf incising canyon type. The upper depth is 500m and the lower depth is 2500m.
413	Gambier Islands Deep	PYF, PCN	Contain seamounts on abyssal mountains in the east and southern side with escarpments and deep ridges on abyssal mountainous areas in the north-western side. Other features include canyons. SST very low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contain 6 seamount type 1 (small with deep peak, short with moderately deep peak); 4 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 2 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); Includes 2 Blind canyon type. The upper depth is 2500m and the lower depth is 4000m.
415	South New Hebrides and Tu'a Tele'a	TON, VUT	Contains deep trench, ridge, abyssal hills and abyssal mountains. Sea surface temperature is low and stable; chlorophyll-concentrations, 20°C Isotherm and the deep water temperature are moderate. Salinity and pH levels are high. Nitrate and solar irradiance are moderate to low. Mixed layer depth and calcite are moderate and variable. Dissolved oxygen concentrations are moderate and stable. Strong sea surface currents generally from the North West. Contain NO Seamounts. The upper depth is 5500m and the lower depth is 6500m.
416	Kingman, Palmyra and North Line Group	KIR, UMI	Contain ridges and seamounts on plateau with few deep ridges and seamounts on abyssal mountains. Sea surface temperature is high and stable. Chlorophyll-a concentrations are low. Shallow 20 degree isotherm and mixed layer depth. Temperature is high at 1000m and low at 200m. Silicate, phosphorous, calcite, nitrate, solar irradiance, and salinity levels are low. PH levels are high. Dissolved oxygen is high to moderate. Contain 3 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 7 (small and short with very deep peaks, shortest); 1 seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 1500m and the lower depth is 4000m.
417	Tabuaeran/ Fanning Deep	KIR, UMI	Mostly ridges and intermediate seamounts on plateau and abyssal mountains. Sea surface temperature is high and stable. Chlorophyll-a concentrations are moderate. Mixed layer depth and 20 degree isotherm are deep. Temperature at 200m is low; at 1000m it is high. Silicate, dissolved oxygen, phosphorous, salinity, pH, and solar irradiance levels are moderate. Nitrate and calcite levels are low. Contain 4 seamount type 3 (intermediate size, large tall and deep); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 1500m and the lower depth is 4000m.

Code	Name	Countries	Summary description
420	Lala ‘i Moana	TON	Slope into Tonga trench with extending canyon features. Sea surface temperature is moderate, chlorophyll-a concentrations, 20°C Isotherm and the deep water temperature are moderate. Salinity, pH levels, nitrate and solar irradiance are moderate. Mixed layer depth is moderate. Calcite is also moderate and variable and dissolved oxygen concentrations are low and stable. Strong sea surface currents generally from the North Northeast. Contain NO Seamounts. Includes 3 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 4500m and the lower depth is 9000m.
424	South Raivavae and President Thiers Bank	PYF	Small bioregion with large and intermediate size seamounts, ridges and escarpments on slopes and abyssal features. SST very low and stable, Chlorophyll-a, DO, concentrations are generally low. Salinity is high and dissolved oxygen is low and variable. Temperature at 1000m and 20°C isotherm are deep, MLD is moderate. pH is low. Silicate, phosphate, nitrate and calcite are moderate. Contain 1seamount type 9 (Large and tall with shallow peak, larger); 1 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). The upper depth is 2000m and the lower depth is 4000m.
425	Winslow Reef Deep	KIR, UMI	Mostly seamounts with escarpments. Sea surface temperature is low to moderate and variable. Chlorophyll-a concentrations are moderate. Calcite and pH levels are low. Solar irradiance, nitrate, phosphorous silicate, salinity, and dissolved oxygen levels are high. Temperatures at depth are moderate to low. Mixed layer is quite deep; 20 degree isotherm is on the shallow end. Contain 1 seamount type 3 (intermediate size, large tall and deep); 1 seamount type 9 (Large and tall with shallow peak, larger); 2 seamount type 10 (large and tall with shallow peak: shallow); The upper depth is 1000m and the lower depth is 4500m.
426	Tele’a Moana	TON	Deep bioregion with mostly trench. Sea surface temperature is moderate, chlorophyll-a concentrations, 20°C Isotherm and the deep water temperature are moderate. Salinity, pH levels, nitrate and solar irradiance are moderate. Mixed layer depth is moderate. Calcite is also moderate and variable and dissolved oxygen concentrations are low and stable. Strong sea surface currents generally from the North Northeast. Contain NO Seamounts. Includes 1 Blind canyon type. The upper depth is 6000m and the lower depth is 9000m.
429	Falakoni	TON	Deep bioregion on trench and abyssal hills and mountains. Also includes 2 canyons and a small ridge on basin. Sea surface temperature is high, chlorophyll-a concentrations, 20°C Isotherm and the deep water temperature are low. Salinity is variable. and pH levels, nitrate and solar irradiance are moderate. Mixed layer depth is low. Calcite is low and variable and dissolved oxygen concentrations are low and stable. Moderate sea surface currents generally from the North northeast. Contain NO Seamounts. Includes 2 Blind canyon type. The upper depth is 4000m and the lower depth is 8500m.
430	Likukoloa and High Seas	TON	Contains mostly sloppy basins and deep trench. Non-contiguous region. Sea surface temperature is low and stable; chlorophyll-concentrations, 20°C Isotherm and the deep water temperature are moderate. Salinity and pH levels are high. Nitrate and solar irradiance are moderate to low. Mixed layer depth and calcite are moderate and variable. Dissolved oxygen concentrations are moderate and stable. Strong sea surface currents generally from the North West. Contain NO Seamounts. Shelf incising canyon type. The upper depth is 4500m and the lower depth is 8000m.
431	Southwest Espiritu Santo Deep	NCL, VUT	Contain ridges, seamounts and canyons on plateau and abyssal features with escarpments. Sea surface temperature moderate, mildly variable. Chlorophyll-a concentrations are moderate, stable. Silicate and phosphorous levels are low. Solar irradiance is quite high. Contain 1 seamount type 2 (small with deep peak, most common type); 1 seamount type 10 (large and tall with shallow peak: shallow); 2 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 7 Blind canyon type and 4 Shelf incising canyon type. The upper depth is 1000m and the lower depth is 4000m.
434	Makira/Ulawa Deep	SLB	Contain canyons on slopes and escarpments with a ridges included. SST moderate and stable, Chlorophyll-a concentrations, DO and Salinity are low. Temperature at 1000m is deep, 20°C isotherm is deep, MLD is shallow, and PH is low. Solar irradiance, silicate, phosphate, nitrate and calcite are low. Intersect 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth). Includes 7 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 0m and the lower depth is 3000m.

Code	Name	Countries	Summary description
439	Solomon PNG Boarder	SLB	Contain the New Britain Trench. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD and solar irradiance are low. PH is moderate. Silicate, phosphate, and nitrate are low. Calcite is high. Contain NO Seamounts. Includes 3 Blind canyon type. The upper depth is 4000m and the lower depth is 7500m.
440	San Cristobal Trench	SLB	Contain the San Cristobal Trench with few canyon features. SST moderate and stable, Chlorophyll-a concentrations, DO and Salinity are low. Temperature at 1000m is deep, 20°C isotherm is deep, MLD is shallow, and PH is low. Solar irradiance, silicate, phosphate, nitrate and calcite are low. Contain NO Seamounts. Includes 2 Blind canyon type. The upper depth is 4000m and the lower depth is 7000m.
446	Tele'a 'Ata	TON	Deep bioregion which contains ridges, basins that slopes into the Tongan trench. Sea surface temperature is low and stable; chlorophyll-concentrations, 20°C Isotherm and the deep water temperature are moderate. Salinity and pH levels are high. Nitrate and solar irradiance are moderate to low. Mixed layer depth and calcite are moderate and variable. Dissolved oxygen concentrations are moderate and stable. Strong sea surface currents generally from the North West. Contain NO Seamounts. The upper depth is 5000m and the lower depth is 9500m.
449	Vava'u Archipelago	TON	Contain ridges and canyons on plateaus with steep escarpments. SST low and stable, chlorophyll-a concentrations, 20°C Isotherm and the deep water temperature are deep. Salinity, pH levels, nitrate and solar irradiance are moderate. Mixed layer depth is moderate. Calcite is low and variable and dissolved oxygen concentrations are low and stable. Strong sea surface currents generally from the North. Contain NO Seamounts. Includes 5 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 500m and the lower depth is 3000m.
450	Southeast Malaita and Maramasike	SLB	Contain slopes, basin and escarpment on deep abyssal mountain area and part of ridge. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is deep, MLD is shallow. Solar irradiance and pH, silicate, phosphate, and nitrate are low. Calcite is moderate. Contain NO Seamounts. The upper depth is 0m and the lower depth is 3000m.
451	Ulava Deep	SLB	Contain canyons, ridges and deep Cape Johnson Trough and trench. SST moderate and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is deep, MLD is shallow. Solar irradiance and pH, silicate, phosphate, and nitrate are low. Calcite is moderate. Contain NO Seamounts. Includes 3 Blind canyon type and 2 Shelf incising canyon type. The upper depth is 1500m and the lower depth is 6000m.
452	Eua East	TON	Mostly ridge and canyon on Plateau. SST low and stable, chlorophyll-concentrations, 20°C Isotherm and the deep water temperature are deep. Salinity, pH levels, nitrate and solar irradiance are moderate. Mixed layer depth is moderate. Calcite is low and variable and dissolved oxygen concentrations are low and stable. Strong sea surface currents generally from the North. Contain NO Seamounts. Includes 2 Blind canyon type and 1 Shelf incising canyon type. The upper depth is 2000m and the lower depth is 3500m.
454	Southeast Rotuma, Isle De Horne, Futuna,Samoa and Niuas plateau	TUV, WLF, FJI, WSM, TON	Bioregion north of the Niua Islands and includes two seamounts forming on ridges and escarpments. Other dominant features includes plateau and spreading ridges. SST is high and stable, CHL low and stable, Salinity is low and variable, Dissolved Oxygen is low and stable, Deepwater temp is deep, 20°C isotherm is deep, mixed layer depth is medium, Solar irradiance is moderate, pH level is moderate, silicate level is moderate, phosphate level is moderate, nitrate level is moderate, Calcite is low. Contain 2 seamount type 3 (intermediate size, large tall and deep); 4 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 7 seamount type 10 (large and tall with shallow peak: shallow); Contain 1 active, confirmed; 2 active, inferred hydrothermal vents. The upper depth is 2000m and the lower depth is 5500m.

Code	Name	Countries	Summary description
455	East Temotu and North Fiji Ridge	SLB, FJI	Deep bioregion containing large seamounts, ridges and canyons and part of the Vityaz trench. SST is high and stable, CHL low and stable, Salinity is moderate, Dissolved Oxygen is low and stable, Deepwater temp is medium, 20°C isotherm is deep, mixed layer depth is medium, Solar irradiance is moderate, pH level is moderate, silicate level is moderate, phosphate level is moderate, nitrate level is low, Calcite is low. Contain 3 seamount type 3 (intermediate size, large tall and deep); 6 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); 1 seamount type 9 (Large and tall with shallow peak, larger); 3 seamount type 10 (large and tall with shallow peak: shallow); 1 seamount type 11 (intermediate size, largest basal area and deepest peak depth).Includes 7 Blind canyon type and 2 Shelf incising canyon type. The upper depth is 1500m and the lower depth is 3000m.
458	North Eauripik Rise	FSM	Mostly abyssal hills and a patch of abyssal mountain area. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m, MLD and 20°C isotherm are shallow, pH and solar irradiance are low. Silicate, phosphate, nitrate and calcite are low. Contain NO Seamounts. The upper depth is 2500m and the lower depth is 3500m.
459	Sonsorol and Tobi Ridge	PLW	Contain deep ridges and an intermediate seamount with steep escarpments and spreading ridges and rift valleys on abyssal mountains. SST high and stable, Chlorophyll-a concentrations are low but high around the islands. Salinity and dissolved oxygen are low and variable. Temperature at 1000m is moderate. 20°C isotherm is moderate; MLD, pH and solar irradiance are low. Silicate, phosphate, nitrate and calcite are low. Contain 1 seamount type 3 (intermediate size, large tall and deep); The upper depth is 2000m and the lower depth is 4000m.
460	Vanuatu and Fiji Plateau High Seas	FJI, VUT	Deep abyssal hills, spreading ridges, rift valleys and a seamount all with escarpment features. SST moderate and variable, CHL is low and stable, Salinity is moderate, Dissolved Oxygen is moderate and stable, Deepwater temp is deep, 20°C isotherm is deep, mixed layer depth is shallow, Solar irradiance is low, pH level is low, silicate level is low, phosphate level is moderate, nitrate level is low, Calcite is low. Contain 1 seamount type 4 (small with deep peak, most isolated type); Contain 2 active, confirmed; 1 inactive, hydrothermal vents. The upper depth is 2500m and the lower depth is 3000m.
461	Central Lau to Northwest Vava'u plateau and hydrothermal vents	FJI, TON	Non-contiguous bioregion. Western part of bioregion is big and dominated by spreading ridges formed on plateaus. Also includes rift valleys formed on basins. The eastern bioregion is mainly dominated by plateau. SST moderate and stable, CHL is low and stable, Salinity is low and variable, Dissolved Oxygen is low and stable, Deepwater temp is deep, 20°C isotherm is deep, mixed layer depth is medium, Solar irradiance is medium, pH level is low, silicate level is moderate, phosphate level is low, nitrate level is moderate, Calcite is low but high closer to land (Lau Islands Group- Fiji).Contain 4 seamount type 1 (small with deep peak, short with moderately deep peak); 1 seamount type 5 (intermediate size, small, moderately tall and shallowest peak depths of this group); Includes 3 Blind canyon type and 4 Shelf incising canyon type. Contain 2 active, inferred hydrothermal vents. The upper depth is 1000m and the lower depth is 2500m.
462	North New Hebrides Ridge	VUT	Bioregion contains canyons and trough with escarpments on plateau and including deep abyssal hills and mountainous features on the eastern side. Sea surface temperature moderate, variable. Chlorophyll-a concentrations are high, with scattered blooms throughout. Mid-depth temperatures very high while temperature at 1000m is low. 20 degree isotherm is exceptionally low. Solar irradiance is quite varied, low around Ambrym and high towards Espiritu Santo. PH is high. Contain NO Seamounts. Includes 2 Blind canyon type and 2 Shelf incising canyon type. Contain 1 active, confirmed; 1 active inferred hydrothermal vents. The upper depth is 0m and the lower depth is 3000m.

8.5 NAMES OF REEF-ASSOCIATED BIOREGIONS ACROSS THE SOUTHWESTERN PACIFIC REGION

Code	Name	Countries
1	Vila and Tafea Fringe	Vanuatu
2	Ata Reefs and Associated	Tonga
3	Tuvalu and Wallis Chain	Tuvalu; Wallis and Futuna
4	Polynesian associated reefs	Tuvalu; Wallis and Futuna; Samoa; American Samoa; Niue; French Polynesia
5	Niue and Niuas Reefs	Niue; Tonga
6	Tongatapu, Ha'apai and Butaritari associated reefs	Tonga; Kiribati
8	Manihiki and Rakahanga	Cook Islands
9	Daisu and Nauru	Marshall Islands; Nauru
10	Oroluk	Micronesia
11	Ailuk to North Kamwome	Marshall Islands
12	Bikini to Kwajalein Atolls	Marshall Islands
13	Enewetak Atoll	Marshall Islands
15	Northwest Fiji Continental Shelf and West Marshall	Fiji; Marshall Islands
16	Majuro to west Likiep Atolls Chain	Marshall Islands
17	Aur to Likiep Atolls	Marshall Islands
18	Falalop and Fais Islands	Micronesia
19	Central Palau reefs	Palau
20	Yap Island and Outer reef	Micronesia
21	Ailinglaplap, Lae and Ujae Atolls	Marshall Islands
22	Orairuguron Islands	Micronesia
23	Moen cluster and Satawal isolated islands	Micronesia
24	Numurus and Igup and micronesia Banks	Micronesia
25	Fayu and Magererik chain of islands	Micronesia
26	Micronesia west and Minto reef	Micronesia
27	North and South Palau	Palau
28	Western Munda and Atonn island	Micronesia; Solomon Islands
29	Etal, Lukunor and Satawan Group	Micronesia
30	Rennell Bellona and Isabel Oceanic influenced	Solomon Islands
31	Small Islands Influenced	Fiji
32	Pohnpei to Kosrae Reefs	Micronesia
33	West Pohnpei and East Sepik outer islands	Micronesia
35	Washington Island	Kiribati
36	Sapwuahfik Atoll and West Manus outer islands	Micronesia
37	Jaluit, Namorik and Ebon	Marshall Islands

Code	Name	Countries
38	Iles de Horne to South Tuvalu Banks	Tuvalu; Wallis and Futuna
39	Sonsorol, Pulo Anna, Dongosaro and Fana Islands	Palau
41	Tobi and Helen Reef	Palau
43	East Nukuoro Atoll	Micronesia
44	Fanning and Tautua Islands	Cook Islands; Kiribati
45	Nukuoro Atoll and Solomon Land Influenced	Micronesia; Solomon Islands
46	North Gibert Atolls	Kiribati
51	Christmas Islands and nearby Atolls	USA Minor Outlying Islands; Kiribati
53	Northern islands of French Polynesia	French Polynesia
59	West Kapingamarangi Atoll	Micronesia
60	East Kapingamarangi Atoll and Indispensable and Shortland reefs	Micronesia; Solomon Islands
63	Nonouti and South Gilbert Atolls	Kiribati
64	Winslow Reef	USA Minor Outlying Islands; Kiribati
65	Kapingamarangi, South Bougainville and North Choiseul Reefs	Micronesia; Solomon Islands
68	Ocean Island	Kiribati
74	Canton to Phoenix Islands Chain	Kiribati
75	Bougainville and Lord Howe Islands Cluster	Solomon Islands
76	Lyra Reef and Lord Howe Islands Cluster	Solomon Islands
78	New Hanover, West Bougainville and South Tafea Island	Solomon Islands
81	Mapua and Treasures Islands Cluster	Solomon Islands
83	Malabou peninsula	New Caledonia
84	Central New Caledonia	New Caledonia
88	Rewa River Mouth	Fiji
89	Vanuatu Big1	Vanuatu
90	Vanuatu Big2	Vanuatu
92	Vanuatu Big3	Vanuatu
93	Mckean to Manra cluster	Kiribati
94	Efate to Epi cluster	Vanuatu
97	Vanuatu Ocean Influenced	Vanuatu
100	Ndeni and Tinakula Islands	Solomon Islands
101	Sikaiana	Solomon Islands
102	Ontong Java and Eastern Solomon	Solomon Islands
105	Tikopia, Anuta and Fatutaka Reefs	Solomon Islands
106	Nanumanga and Nanumea Moriapepe	Tuvalu
107	Malaita and Makira cluster	Solomon Islands
109	Vuna Peninsula, Taveuni	Fiji
110	Solomon Big1	Solomon Islands
111	Solomon Big2	Solomon Islands

Code	Name	Countries
117	Solomon Big3	Solomon Islands
119	South New Caledonia and Aneityum	New Caledonia; Vanuatu
120	Boigu Saibai and Fiji Land influenced	Fiji
125	North Cooks and East Tahiti Chain of Atolls	French Polynesia; Cook Islands
129	Fakaofo and Tahiti Northeastern Atolls	French Polynesia; Tokelau
130	Ahe Atolls Cluster	French Polynesia
131	Flint and South Islands	Kiribati
132	Mitiaro to Anaa	French Polynesia; Cook Islands
133	Rotuma and Outer Banks	Fiji
134	Northwest Tahiti	French Polynesia, Cook Islands
135	Mataiva Lagoon and Atoll	French Polynesia
136	Tepoto, Napuka and Pukapuka	French Polynesia
137	Northern Lau Islands	Fiji
138	Far Eastern Atolls Chain	French Polynesia
139	Fiji Reef Influenced	Fiji
140	Hao Amanu Cluster	French Polynesia
141	Rarotonga and South Cooks	Cook Islands
142	Central Lau	Fiji
143	South Eastern Atolls Cluster	French Polynesia
144	Nawi and Kioa Peninsula	Fiji
145	Negonego Cluster	French Polynesia
146	Bellona Reefs and Islets	New Caledonia
147	Hakau Nimenima	Tonga
148	Ile Pott and Atoll de Huon cluster	New Caledonia
149	Ile Art and Atoll de la Surprise	New Caledonia
150	Iles Maria to Raivavae and Hereheretue cluster	French Polynesia
151	Rikitea and Southeast Atolls Cluster	French Polynesia
152	Astrolabe Reefs	New Caledonia
154	Ouvea and Lifou	New Caledonia
157	Far South and Ahurei Atolls cluster	French Polynesia

MACBIO

Marine and Coastal Biodiversity Management
in Pacific Island Countries

www.macbio-pacific.info