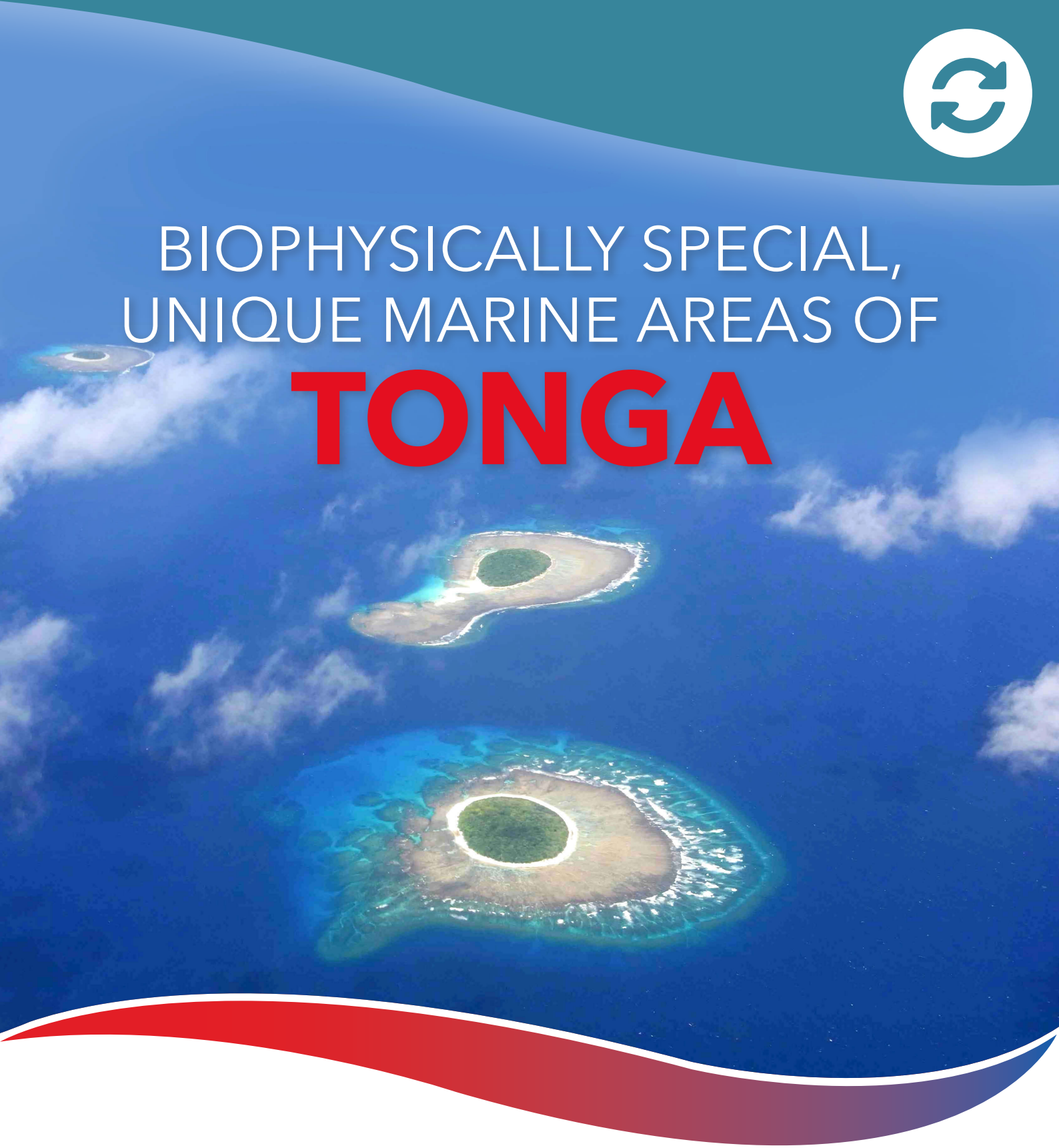
BIOPHYSICALLY SPECIAL, UNIQUE MARINE AREAS OF

TONGA



KO E ʻOTUA MO TONGA KO HOKU TOFIʻA

MACBIO

Marine and Coastal Biodiversity Management in Pacific Island Countries

EFFECTIVE MANAGEMENT

Marine and coastal ecosystems of the Pacific Ocean provide benefits for all people in and beyond the region. To better understand and improve the effective management of these values on the ground, Pacific Island Countries are increasingly building institutional and personal capacities for Blue Planning.

But there is no need to reinvent the wheel, when learning from experiences of centuries of traditional management in Pacific Island Countries. Coupled with scientific approaches these experiences can strengthen effective management of the region's rich natural capital, if lessons learnt are shared.

The MACBIO project collaborates with national and regional stakeholders towards documenting effective approaches to sustainable marine resource management and conservation. The project encourages and supports stakeholders to share tried and tested concepts and instruments more widely throughout partner countries and the Oceania region.

This report outlines the process undertaken to define and describe the special, unique marine areas of Tonga. These special, unique marine areas provide an important input to decisions about, for example, permits, licences, EIAs and where to place different types of marine protected areas, locally managed marine areas and Community Conservation Areas in Tonga.

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BIOPHYSICALLY SPECIAL, UNIQUE MARINE AREAS OF TONGA

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SUGGESTED CITATION:
Ceccarelli DM, Wendt H, Matoto AL, Fonua E and Fernandes L (2017)
Biophysically special, unique marine areas of Tonga.
MACBIO (GIZ, IUCN, SPREP), Suva.

2017

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

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ACKNOWLEDGEMENTS

This work was made possible through the work of the Ocean 7, and all workshop participants : Tukua Tonga, Maka Matekitonga, Peti Veikoso, Tevita L. Fotu, Teisa Fifita, Simata-e-la'ā V. Palu, 'Atunaisa Fetokai, Rosamond Bing, Taaniela Kula, Lopeti Tufui, Cadinia Funganitao, 'Aispeli Palaki, Samuela Tatafu, Teisa Fifita, Teisina Fuko, Dr. Vailala Matoto, Dr. Tu'ikolongahau Halafihi, Sosefina Vili, Mafile'o Masi, Kosilio Faka'osi, Dorothy Foliaki, Karen Stone, Hakaumotu Fakapelea and Jonah Sullivan. We acknowledge following sources of data: Birdlife International, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Convention on Biological Diversity (CBD), Flanders Marine Institute (VLIZ), General Bathymetric Chart of the Oceans (GEBCO), Government of the Kingdom of Tonga, GRID-Arendal, Institute for Marine Remote Sensing-University of South Florida (IMaRS-USF), InterRidge Vents Database, The Khaled Bin Sultan Living Ocean Foundation, National Oceanic and Atmospheric Administration (NOAA), Oregon State University, Pacific Community (SPC), the National Aeronautics and Space Administration (NASA), United Nations Environment World Conservation Monitoring Centre (UNEP-WCMC) and the United States Geological Survey (USGS). The MACBIO project is funded by the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). It is being implemented by the German Agency for International Cooperation (GIZ) and the Government of Tonga in close collaboration with the Secretariat of the Pacific Regional Environment Programme (SPREP) and with technical support from the International Union for Conservation of Nature (IUCN).

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CONTENTS

ACRONYNMS

CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species
CMS	Convention on Migratory Species
EBSA	Ecologically or Biologically Significant Marine Areas
EPS	Endangered and Protected Species
FFA	Fisheries Forum Agency
FIME	Fiji Islands Marine Ecoregion
IBA	Important Bird Areas
ICM	Integrated Coastal Zone Management
IUCN	International Union for the Conservation of Nature
KBA	Key Biodiversity Area
MACBIO	Marine and Coastal Biodiversity Management in Pacific Island countries project
OFD	Offshore Fisheries Management Decree
SMA	Special Management Area
WCPFC	Western and Central Pacific Fisheries Commission

EXECUTIVE SUMMARY

In 2015, the Tongan Cabinet embarked upon a National Marine Spatial Planning process, establishing a marine spatial planning technical working group comprising seven Ministries (the “Ocean 7”). One of their tasks was to identify Tonga’s special, unique marine areas. This report brings together data, literature and the outputs of a special workshop synthesising information about the areas identified. Data collected informed a scoring system by which the areas could be rated. The areas were described, justified and scored according to four criteria: geographic explicitness, justification, information sources and legal obligations associated with each site. Each site was described in as much detail as the available information sources allowed, and given a score out of 12. Sites were divided into large-scale sites and finer-scale sites, and the latter were divided into island groups.

None of the large-scale sites was given the maximum score of 12. Because of their large-scale and often offshore nature, the geographic boundaries of these sites were not exactly defined. A clear site boundary is important for spatial planning, especially in the case of marine areas where the features to be protected are usually under the surface or determined by the movements of animals, and therefore not readily visible. However, also because of their broad-scale nature, many of the large-scale sites received high scores, because their geographic span guarantees the inclusion of some important attributes, and had some directly relevant sources.

Among the finer-scale sites, the two highest-scoring sites (12) were Fonualei and Toku Islands and Tongatapu coral reefs. Many of the sites were given a special, unique status because their remoteness had left their ecosystems relatively intact. For instance, it is the coral reefs further offshore that are considered more special and unique because the lack of exploitation and pollution makes them more diverse and resilient, with more abundant flora and fauna and intact food webs. Spatial planning can also take this into account in the context of connectivity, where intact coral reefs could act as sources of larvae to replenish degraded reefs. Geographic isolation also often leads to unique assemblages, genetic distinctness and the presence of endemics. Similarly, when a site was considered special and unique because of the presence or high density of a certain species (e.g. octopus), it was usually due to the disappearance of this species in many other areas throughout Tonga.

Both high and low scores are useful for management; high-scoring sites can be prioritised with confidence, while lower-scoring sites can be highlighted for needing more research or requiring protection for the purposes of ecosystem recovery, or even restoration efforts. Future scoring systems may take into account levels of human use or impact, as this affects the intrinsic ecological value of a habitat, assemblage, population or ecosystem. The identification and scoring of special, unique marine areas can guide the next steps in marine spatial planning, but also inform other management measures (e.g. permit or licencing decisions) or environmental impact assessments (EIAs) that may be relevant to these locations.

1. INTRODUCTION

On 22 July 2015, the Tongan Cabinet decided to embark upon a National Marine Spatial Planning process (Cabinet Decision 716). They consequently established a marine spatial planning technical working group (the "Ocean 7"), comprised of the seven key Ministries with responsibilities regarding use, development and management of Tonga's ocean. The Ocean 7 is a working group of the National Environmental Coordinating Committee – a national committee comprised of CEOs from Ministries with responsibilities for, or interests in, Tonga's environment.

The Ocean 7 recommended the following marine spatial planning process for Tonga. The outcomes of the *italicised* part of task No. 5 (below) are described in this report.

1. Define ocean planning objectives/goals
2. Determine consultation process
3. Finalise Management Area typology including objectives and activity matrix
4. Legal Review completed
5. *Definition of biophysically special, unique marine places* and use mapping *workshop*
6. Bioregionalisation workshop
7. Draft biophysical and socio-economic, cultural and management feasibility principles to guide Management Area placement
8. Preparation for first national consultations and awareness materials
9. Consultations on bioregion/principles and get input on what kind of management communities want
10. Revisions of bioregion/principles/priority areas based upon consultations
11. Government agreement bioregions/principles/priorities
12. Prepare draft map of candidate Management Areas & prepare for consultations on same
13. Consultations on draft map
14. Analysis of input from consultations is used to revise draft map
15. Final (mini) round consultations on "final" map of systems of Management Areas
16. Final adjustments map
17. Final system Management Areas agreed (informally) by government
18. Internal Government approval processes
19. Gazettal of spatial Ocean Plan = system of marine Management Areas across Tonga
20. Final consultations on final Ocean Plan once implemented

The Cabinet paper endorsed this process and the support of the Marine and Coastal Biodiversity Management in Pacific Island Countries (MACBIO) project. The MACBIO project aims to strengthen marine and coastal biodiversity management in Pacific Island countries such as Tonga. In particular, it can support ocean-wide marine spatial planning. MACBIO is funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). It is being implemented by the German Agency for International Development (GIZ) with the countries of Fiji, Kiribati, Solomon Islands, Tonga and Vanuatu. It has technical support from the Oceania Office of the International Union for the Conservation of Nature (IUCN) and is working in close collaboration with the Pacific Regional Environment Program (SPREP).

On 18 May 2016, the Ocean 7, supported by MACBIO, co-hosted a technical workshop to define Biophysically Special, Unique Marine Areas (SUMA) of Tonga. This report describes the preparations that preceded the workshop, the outcomes of that workshop, and follow-up research recommended during the workshop and by the Ocean 7.

The report also outlines the methods used to identify and describe the sites and the resulting list of biophysically special, unique marine areas of Tonga. The sites are categorized as either being "large scale" or associated with an island group ("fine scale").

2. METHODS

The technical workshop aimed to identify special and/or unique marine areas (SUMAs) in Tonga. Therefore it explicitly focused only upon the marine environment. Tonga has many very important and special terrestrial sites, (e.g. Niuafu'ou and the forested areas of Niuatoputapu) however these were not the purpose of this workshop and the data and expertise required to identify special, unique terrestrial areas were not available in this marine workshop.

2.1 DATA GATHERING

The Government of Tonga, together with the MACBIO project team, had spent two years collating, assessing, preparing and mapping open source and freely available data on, amongst other things, the special and/or unique marine features of Tonga. The data available for use at the workshop, both in electronic and hardcopy format, are listed in Appendix 1. In total, there were 28 datasets available for use in the workshop, of which 17 were related to biodiversity and 11 were related to human use of marine areas. All were available electronically and as hardcopy maps. All the data have been stored with associated metadata using the ANZMEt Lite (www.anzlic.gov.au/resources/metadata) standard and have been delivered to all interested parties, including Government Departments, in Tonga. These data and maps can also be accessed via the MACBIO website (http://macbio-pacific.info/).

2.2 WORKSHOP AND ADDITIONAL CONSULTATIONS

Workshop participants were chosen based upon their expertise and are listed in Appendix 2. These participants (and other contributors) have marine expertise to do with one or more of the following: inshore and offshore fish and other species, marine habitats and environments, high biodiversity areas, whale areas, hydrology, findings from deep sea mineral explorations, oceanography, ports, fisheries, marine research, and social issues.

The workshop agenda is presented in Appendix 3. Participants were told to define marine areas for Tonga that were biologically and/or physically special or unique. In addition to the data described above, participants were provided with worksheets to complete for each site identified (Appendix 4) as well as maps of Tonga at roughly three scales: ocean-wide (1: 3.1 million scale), Tonga divided into five "strips" from top to bottom with one island group per strip but including adjacent waters out to the provisional Exclusive Economic Zone (EEZ) boundary (scales from 1: 2 million to 1: 1 million), plus other hardcopy maps which "zoomed in" on each island group (roughly at scales from 1: 300 000 to 1: 11 000 scale) (for full list of response maps see Appendix 4). These were for participants to mark the geographic boundaries of the sites they had identified.

The workshop required participants to provide, per site they identified:

- A site name;
- A geographic description of the site's location and boundaries;
- A justification. This may include information as to whether areas support, or are likely to support, rare, vulnerable or unusual habitats or species, threatened species, important life stages of key species, endemic species, physically or biologically outstanding attributes (e.g. unique geomorphology, high species diversity or high productivity);
- Sources. These could be peer reviewed scientific papers, peer reviewed reports, other reports, data or personal communications from participants or other expert sources;
- Legal or other obligations to protect the site or species within the site;
- Follow-up tasks required to finalise description of the site.

The participants were divided into three groups to make decisions about what they considered biophysically special and/or unique sites for Tonga. Each group had available: the electronic data on a GIS with a screen and GIS technician to access and map any data they wished to view, a facilitator, hard copy maps, worksheets and response maps upon which to draw their chosen sites. Each group also nominated a rapporteur. At the end of the workshop, each group presented their findings to a plenary session.

Preliminary workshop findings were also presented to the Ocean 7. They requested that the final report access any additional research, data and information to both inform the descriptions of the sites identified in the workshop, and to consider any additional sites that the workshop had not identified. This involved following up on potential sources of information, including experts who were not able to attend the workshop. Information was collected through online libraries that linked to peer-reviewed journals and other online "grey" (or unpublished) literature. Species-specific obligations were supplemented by compiling a list of species occurring in Tongan waters that are listed in national and international conservation legislation (Appendix 5).

All spatial data and information collected during the workshop were digitized and a map of each identified site was created. A geographic boundary for each site was created in GIS from the minimum bounding geometry enclosing each site. The diagonal coordinates (latitudes/longitudes) generated from this process were used to identify the geographic boundaries for the special and unique marine areas of Tonga.

2.3 RATING OF TONGA'S SPECIAL, UNIQUE MARINE SITES

Tonga has a vast range of marine biophysical features, some which are well known and understood, some which are special, some of which are unique and some of which may require special consideration when planning forward for the optimal use and management of Tonga's ocean. There is not equal justification for, or information about, the special, unique sites identified during the workshop and in this report. Data from the workshop and other sources were used to systematically assess each site against the following criteria:

a. Geographic explicitness – how well-defined and well-justified the boundaries of the site are. All sites identified exclude land above the high water mark. For example, if a site demarcates a ring around a fringing reef of an island (e.g. Site T 10 Ata' Island), then the marine special, unique site indicated includes the entire marine environment within that ring up to high water mark but does not include the island itself.

b. Amount, detail and nature of justification (including whether there is clear, abundant and convincing information to indicate whether the area is likely to support rare, vulnerable or unusual habitats or species, threatened species, endemic species, important life stages of key species, or physically or biologically outstanding attributes e.g. unique geomorphology, high species diversity or high productivity). If the information provided is only generic to the type of site being described, and not specific to the site/s located in Tonga, then the score under the criterion "Justification" will be diminished by ½ to a whole of a point. A ½ point will be subtracted from the score it might otherwise have received if the site is one where, globally, there's not much information (e.g. many offshore, deeper water sites). A full point will also be subtracted if, globally, there is a wealth of information and so the chances of having site-specific information is greater (e.g. coral reefs).

c. Information source(s) – how reliable and verifiable the information source(s) are, and how many of them are available. Information is more likely to be correct and can be cross-referenced and triangulated if multiple information sources are used. All the sites will have at least one, locally specific, expert source, namely, one of the workshop participants; some have more expert sources. Aside from this, for the offshore, deeper water sites it is well understood that data, globally, are sparse and thus, for these sites, generic sources may be considered to count as sources in this criterion. For globally well studied habitats, such as coral reefs or mangroves, for which there are literally thousands of global "sources", only locally specific sources contribute to this criterion.

d. National or international obligations – are the areas associated with species or habitats for which the country has international obligations (e.g. under Conventions) or national obligations (e.g. under law).

Experts then rated proposed special, unique sites as scoring relatively low (1), medium (2) or high (3) against each of the four criteria. Special and/or unique areas scoring highly against all criteria ranked more highly overall. This meant that these sites had better and more reliable descriptions and were also likely to be relevant to the country's existing environmental

protection obligations. If scoring highly against just some of the criteria, they were nominated as medium-level special or unique areas. If scoring poorly against all criteria, areas were not identified as special or unique for planning purposes.

The scoring system used is described in the table below. Three points are allocated as the top "score" for each of the four criteria (justification, geographic explicitness, source – including both type and number of sources – and national and international obligations that pertain to the site). The highest score possible is 12; the lowest is four.

Geographic Explicitness	
1	Boundaries are quite loosely defined
2	Boundaries broadly match the features
3	Boundaries exactly match the biophysical features identified as important
Justification	
1	One or two reasons (e.g. presence of organisms) justifying the site, with generic information sources
1 ½	One or two reasons (e.g. presence of organisms) justifying the site, with site-specific information sources
2	Three or four reasons justifying the site, with generic information sources
2 ½	Three or four reasons justifying the site, with site-specific information sources / five or more reasons justifying the site, with generic information sources
3	Five or more reasons justifying the site, with site-specific information sources
SOURCE	
Source Type	
½	Only expert advice from workshop participants
1	No peer reviewed papers are available but there are good reports available
1 ½	At least one peer reviewed scientific paper or report discusses this site (for inshore sites) – or, for offshore sites, good generic sources describing the main feature(s) of the site
Source Number	
½	One source
1	Two to three sources
1 ½	Four or more sources
International/ National Obligations	
1	One species / habitat with obligations
2	Two or three species/habitats
3	More than three species/habitat with obligations

2.4 OVERALL PRIORITISATION

The rating of the criteria were added up to give an overall score out of 12. A higher score means a site has a higher rating.

2.5 LAYOUT OF SITE INFORMATION IN REPORT

For each site identified in the workshop, we provide, in this report, the following information: a site name, and if it is a lesser known type of habitat we provide a broad definition of the habitat; a map, a summary table with the name and score of the site, the diagonal coordinates (latitudes/longitudes) – see Section 5.2 for details – a geographic description, a descriptive justification for the inclusion of the site, with relevant references, the number and type of sources used and the international and national obligations pertaining to the site and its key attributes.

3. RESULTS

3.1 LARGE-SCALE BIOPHYSICALLY SPECIAL, UNIQUE MARINE SITES

These are sites that extend throughout large parts of the coastal and ocean environment of Tonga. This section describes all the deeper-water and the larger-scale nearshore special, unique marine sites.

3.1.1 **SITE L 1**: Seamounts and ridges around ‘Ata Island

Seamounts are “a discrete (or group of) large isolated elevation(s), greater than 1,000m in relief above the sea floor, characteristically of conical form. Ridges are defined as “an isolated (or group of) elongated narrow elevation(s) of varying complexity having steep sides, often separating basin features”(IHO, 2008a). Abyssal hills are defined by the IHO (2008a) as “An isolated (or tract of) small elevation(s) on the deep seafloor”. They occur on abyssal seafloors (i.e. at 3,000–6,500m depth). Hills on the seabed at abyssal depths having peaks that rise >300 to <1,000 m above the seafloor were mapped as abyssal hills (Harris et al., 2014); they are abundant between the mid-ocean ridges and the comparatively flat abyssal plains.

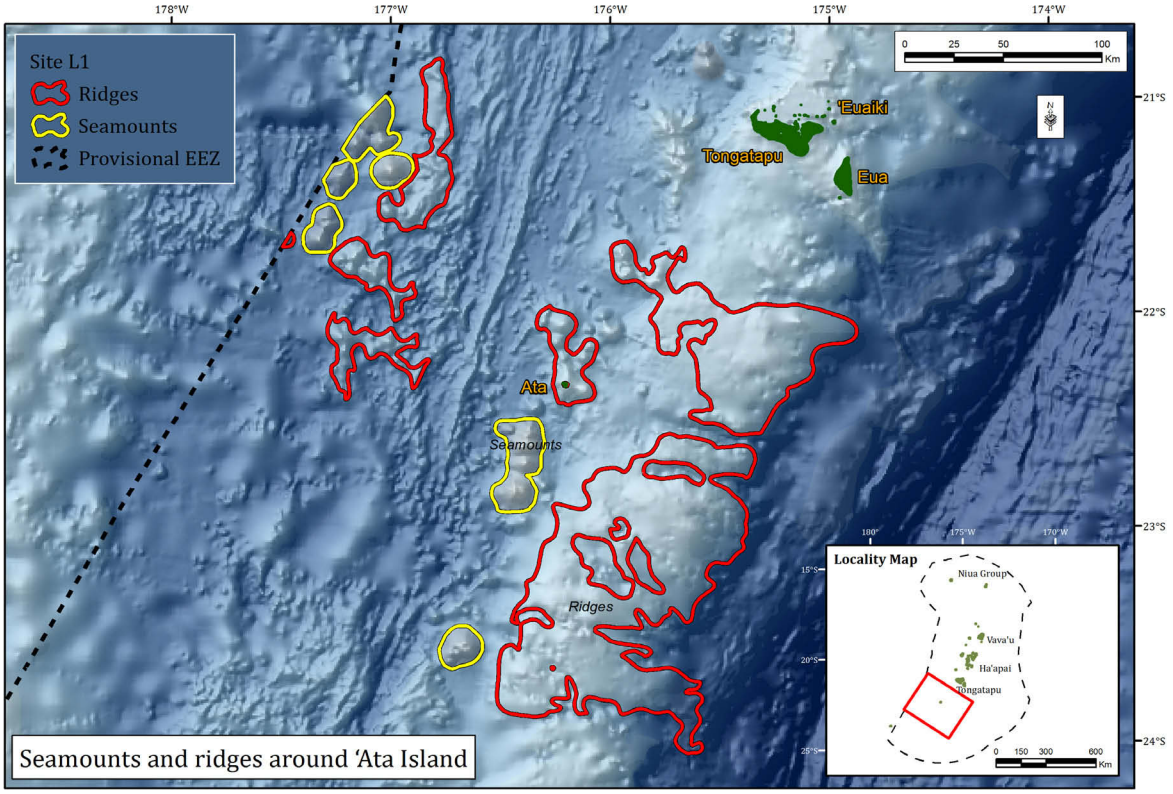

FIGURE 1. SITE L 1: Seamounts and ridges around ‘Ata Island

TABLE 1. SITE L 1: Seamounts and ridges around ‘Ata Island. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Score
Large-scale special, unique site	Seamounts and ridges around ‘Ata Island	L1	9.5

Geographic boundaries

(-20.7534, -176.882) and (-24.3272, -175.769)

Geographic description (score = 2)

Tonga has 43 seamounts, approximately seven ridge systems (although more ridges are present that are not in systems) and some deep underwater hills running from the northeast to south south-west, as described by Harris et al. (2014) (Figure 1). Technically, seamounts and ridges are subsets of abyssal mountains (Harris et al., 2014). The seamounts in Tonga have been classified: there are 26 seamounts described as intermediate, small, moderately tall and shallowest; 10 seamounts are short with moderately deep peaks; two intermediate, large tall and deep peaks; two are large and tall with shallow peaks; one small and short with very deep peaks, deepest type; one small and short with very deep peaks, shortest; and one large with tall with shallow peak but larger seamount.

Justification (score = 2.5)

Seamounts and ridges in this region have been identified as being relatively nutrient rich compared to surrounding waters (pers. comm. A. Palaki). Many seamounts exhibit a positive biological cascade effect with elevated levels of primary productivity, leading to higher concentrations of zooplankton, which supports high abundance of benthic fauna and consequently large populations at higher trophic levels (Stone et al., 2004). Other taxa living on seamounts can include biogenic habitat-forming corals and sponges, anemones, crabs, sea stars, sea urchins, brittle stars, sea cucumbers and feather stars (Baker and Beaudoin, 2013; Clark et al., 2011; CSIRO, 2008).

Seamounts and ridges have steep slopes which can cause the upward movement of nutrients from the deep ocean (upwellings) and create “hotspots” of biodiversity and productivity. In some instances, they host deepwater coral communities and attract deepwater and pelagic species such as tuna, deep-water snapper, sharks, whales and dolphins (Baker and Beaudoin, 2013; Morato and Clark, 2007; Stone et al., 2004). Longline fishing vessels often target seamounts specifically, due to their high productivity attracting aggregations of tuna (Passfield and Gilman, 2010). This higher productivity makes them important for deepwater bottom fish including snapper and the bluenose warehou (*Hyperoglyphe antarctica*) – although the latter is known only south of ‘Ata (pers. comm. T. Halafihi, A. Palaki; Clark, 2013).

Many seamounts in Tonga (Baker and Beaudoin (2013) referred to many seamounts in the Pacific Island Countires) extend to within 800 to 1,000m of the surface (Figure 1), which is within the depth range of the deep scattering layer (DSL). This is a mix of zooplankton (such as shrimps, euphausiids, and copepods), mesopelagic fish (such as lanternfish) and small squid that migrate vertically upwards at night and down during the day. Where the DSL makes contact with the seamount summit and upper flanks, there is a zone of interaction between pelagic and benthic ecosystems. Other seamounts extend into the photic zone, where light penetration allows growth or aggregation of light-dependent organisms (Baker and Beaudoin, 2013).

The seamounts, ridges and the seascapes between them, including more inshore areas, have an important role for humpback whales during migration (pers. comm. T. Halafihi; Garrigue et al., 2015). The seamounts and ridges also are, probably, breeding locations, resting areas, navigational landmarks or even supplemental feeding grounds for whales (pers. comm. T. Halafihi; Garrigue et al., 2015). Seamounts are also thought to be important aggregation areas for other highly migratory species such as tuna, billfish and oceanic sharks (Morato and Clark, 2007). Telemetry studies have shown a high levels of individual fidelity to specific sites, such as seamounts, by highly migratory marine species, and basin-wide movements can be directed towards these locations (Luschi, 2013).

The deepwater seamount communities often have a high level of endemism, and are likely to have different fauna on the leeward and windward sides (Marchese, 2014; Stone et al., 2004). Species may be restricted to a chain of seamounts, to a few adjacent seamounts or even to a single seamount (Stone et al., 2004). Rates of endemism vary, from a low of 5–9% up to 52% (Stone et al., 2004). Richer de Forges et al. (2000) found that adjacent seamounts in New Caledonia shared only 21% of species; and seamounts approximately 1,000km apart shared only 4% of species. However,

seamounts and seamount-like features (e.g. ridges) don't have to be isolated or large to support high levels of endemism. Work by Koslow et al. (2001) and Rowden et al. (2002) (both in Stone et al. (2004)) showed that even relatively small underwater hills (100 to 400m above the seafloor) had rates of endemism of 15 to 35%. Work in Tonga by Halafihi (2015) using chemical analysis of otoliths supports the premise of relative isolation of populations on seamounts, finding independent populations of the flame snapper (*Etelis coruscans*) and crimson jobfish (*Pristipomoides filamentosus*) on seamounts in the north and south of Tonga.

How biodiversity, including endemism, varies on seamounts, ridges and hills with parameters such as depth, surface productivity, temperature, substrate composition, organic flux to the seafloor, currents, oxygen level, latitude and other factors is unknown and unpredictable (Baker and Beaudoin, 2013; Stone et al., 2004). In Tonga, Halafihi (2015) found different chemical signatures in otoliths of juveniles and adults of the flame snapper and crimson jobfish, indicating that these deepwater fishes use different parts of a seamount at different life-stages. Species new to science continue to be discovered each time seamounts are sampled and, due to the longevity of many of those species, they may provide valuable information regarding the workings of the ocean and the source of some parts of life on Earth (CSIRO, 2008; Stone et al., 2004). Harris et al. (2014) has classified the seamounts of the world based upon at least some of the physical parameters likely to determine the nature and diversity of species inhabiting them (e.g. depth of seamount base and summit, slope, size, height above seabed, shape of summit, etc). Globally, 11 types of seamounts occur; Tonga has three types of seamounts (Figure 1) (Harris et al., 2014)192 separate polygons in 29 geomorphic feature categories, used here to assess differences between passive and active continental margins as well as between 8 major ocean regions (the Arctic, Indian, North Atlantic, North Pacific, South Atlantic, South Pacific and the Southern Oceans and the Mediterranean and Black Seas.

Of the species on seamounts that are not endemic to that seamount, research has shown genetic connectivity in animals (e.g. tuna and other fish) between seamounts, and between seamounts and nearby non-seamount areas (Stone et al., 2004). This indicates that some populations of animals found on seamounts are unlikely to be self-sustaining.

The area around the centre of seamounts identified as important is generally circular, with a diameter of some 25–35km. The Capricorn Guyot is an exception, with a 55km diameter of important biodiversity area (see below – Site V 7: Capricorn seamount – for specific site information) (Baker and Beaudoin, 2013). This diameter is biologically important due to the connectivity discussed above and the variation, with depth and related parameters, of the biodiversity living on the flanks of seamounts and the surrounding area (Baker and Beaudoin, 2013).

Seamounts often host uncommon forms of marine life which, like many deepwater species, are very slow-growing and long-lived (Stone et al., 2004). Combined with highly variable recruitment due to isolation and intermittent dispersal from other seamounts (if the species are not endemic to that seamount), this results in very delicate habitats vulnerable to over-exploitation and with poor recovery potential (Baker and Beaudoin, 2013; Stone et al., 2004). The seamounts in Tonga have been noted to include endangered species such as Mohuafi (the convict grouper, *Epinephelus octofsciatus*) and *Palumalau* (the ruby snapper, *Etelis carbunculus)* (pers. comm. *T. Halafihi*).

See a video on seamounts here: https://www.youtube.com/watch?v=0NUaxdxt2sE

See pictures from seamounts here: http://ngm.nationalgeographic.com/2012/09/seamounts/interactive-gallery

Type and number of sources (score = 2)

No documented references were found for any of the individual seamounts, ridges or hills in Tonga, however, this report draws upon six relevant peer reviewed papers and four reports whose findings apply to all seamounts, including those in Tonga. There was also information from three Tongan experts specific to Tonga's seamounts.

Obligations (score = 3)

There are obligations to protect and sustainably manage many fish species, including some associated with seamounts, within the Fisheries Management Act 2002 and subordinate regulations, including terms and conditions associated with licenses. The Environment Management Act 2010 also describes obligations to protect some of the features associated with seamounts. Humpback whales and some sharks found around seamounts are on the IUCN Red List (IUCN, 2016) and listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). There are also obligations for the protection of sharks under Tonga's National Plan of Action for Sharks 2014–2016, including sharks typically known to aggregate around seamounts (e.g. scalloped hammerhead shark (Kimley Pers. Comm. See http://voices.nationalgeographic.com/2016/01/12/sharks-use-seamounts-as-compass-to-navigate-undersea/) (Tonga Fisheries Division & Pacific Islands Forum Fisheries Agency, 2013).

3.1.2 SITE L 2: Tonga Trench and Tonga Ridge

A trench is “a long, narrow, characteristically very deep and asymmetrical depression of the sea floor, with relatively steep sides” (IHO, 2008a). Trenches are generally distinguished from flat-bottomed troughs by their “V” shape in cross section (IHO, 2008a). Ocean trenches are the deepest parts of the ocean, commonly 6 to 10 km in depth (IHO, 2008a). For a definition of ridges see Site L 1: Seamounts and ridges around ‘Ata Island.

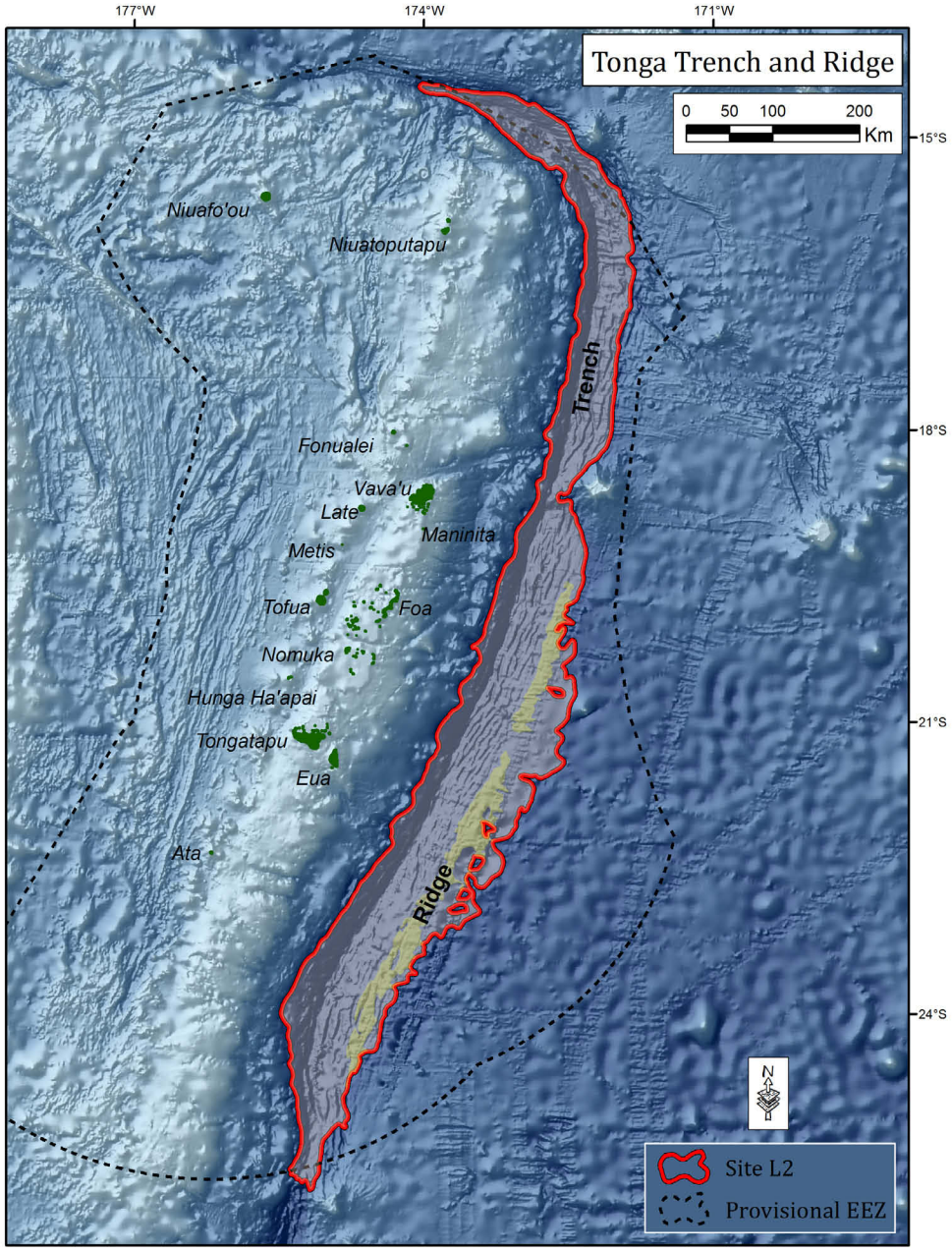

FIGURE 2. SITE L 2: Tonga Trench and Tonga Ridge

TABLE 2. SITE L 2: Tonga Trench and Tonga Ridge. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Score
Large-scale special, unique site	Tonga Trench and Tonga Ridge	L2	10

Geographic boundaries

(-25.7201, -175.745) and (-14.7971, -171.5396)

Geographic description (score = 2)

The Tonga Trench is a submarine trench in Tonga of about 1,375 km in length, forming the eastern boundary of the Tonga Ridge. Their boundary is defined by Harris et al. (2014) and Figure 2.

Justification (score = 2)

The deepest biozone in the oceans is the hadal zone (6,500–11,000m deep) of which the Tonga Trench is a part (Jamieson, 2011). The Tonga Trench and Tonga Ridge, together, constitute the northern half of the Tonga-Kermadec Arc, a structural feature of the Pacific seafloor completed to the south by the Kermadec Ridge and Trench. This latter feature has been the focus of some study (e.g. Jamieson, 2011; Lacey et al., 2016). The Tonga Trench has an average depth of 6,000 m and a width of about 80 km; it reaches a maximum depth, at Horizon Deep, of 10,882 m (only 180m less than the deepest part of earth, the Mariana Trench)(Jamieson, 2011; Raitt et al., 1955). This deepwater habitat contains unique communities with high levels of species endemism due to their geographic isolation (IHO, 2008b; Jamieson, 2011 K. Stone, pers. comm.). These species are adapted to conditions of extreme hydrostatic pressure, low temperature, an absence of light and limited food supply. However, these communities can be quite diverse, and even at depths >8,000m can include holothurians, amphipods, isopods, gastropods and polychaetes; most animal taxa are represented in the Tonga Trench (Jamieson, 2011).

Globally, in the hadal zone (i.e. deeper than 6,500m) over 1,000 species have been recorded, including fish (and excluding bacteria); some of these have been recorded from the Tonga Trench (Jamieson, 2015). Because trench-associated animals are unable to pass through the adjacent relatively shallow ocean with vastly different conditions, trenches are biologically isolated from each other (IHO, 2008b; Lacey et al., 2016). Lacey et al (2016) found faunal assemblages in the Kermadec Trench which were distinct from the surrounding abyssal and bathyal depths and were correlated to hydrostatic pressure and particulate organic carbon flux.

In the Tonga Trench, hydrostatic pressure and temperature are the strongest drivers of intra-trench assemblage composition, with a unimodal pattern of species diversity, peaking between 4,000 and 5,000m (Lacey et al., 2016). Different species assemblages occupy different depths along the slope of the Tonga Trench, and this pattern is most likely carried through to the associated ridge system (Jamieson, 2015). Trench topography provides a unique setting with regards to food supply, because organic matter (food) is accumulated at the deepest trench axis (Jamieson, 2011).

The waters above the Trench and associated ridge system support migrating sperm whales (pers. comm. T. Halafihi, CBD, 2011). Sperm whales are the largest of the toothed whales, and the waters over submarine canyons are their preferred habitat, as they undertake deep dives to hunt for food, spending only around 13% of their time on the surface (Whitehad, 2002). Their association with upwellings and geomorphic features such as steep seamounts and canyons makes them useful indicators of hotspots of biodiversity and productivity (Mannocci et al., 2015). The Tonga Trench is specifically named as one of the features in the Ecologically and Biologically Significant Area (EBSA) 26 – Tongan Archipelago – for its extreme depth and unique fauna (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 3)

The Tonga Trench and Ridge have been studied from a geological perspective since the 1950s (Crawford et al., 2003; Foley and Long, 2011; Raitt et al., 1955), because of the feasibility of such research and resource-driven interests. Much less work has focused upon the biology of the Tonga Trench and Ridge as distinct from oceanic trenches and ridges in general. However, this report draws upon six relevant peer reviewed papers (two of which concern sperm whales), three reports (including the EBSA report) and the information from one Tongan expert attending the workshop.

Obligations (score = 3)

The Fisheries Management Act 2002 and Environment Management Act 2010 have relevant legislation that pertains to the protection of this habitat and/or the species it supports. Whales, which may be using the trench or associated ridge system during migration, are on the IUCN Red List and CITES listed.

3.1.3 SITE L 3: Inshore marine areas

Inshore marine areas are those immediately seaward of the coast. Inshore marine areas can encompass a variety of habitats, including rocky substrata, sand or other soft sediment, mangroves, seagrass beds or coral reefs. In Tonga this inshore area is often understood to extend to the outer edge of the fringing reefs around islands.

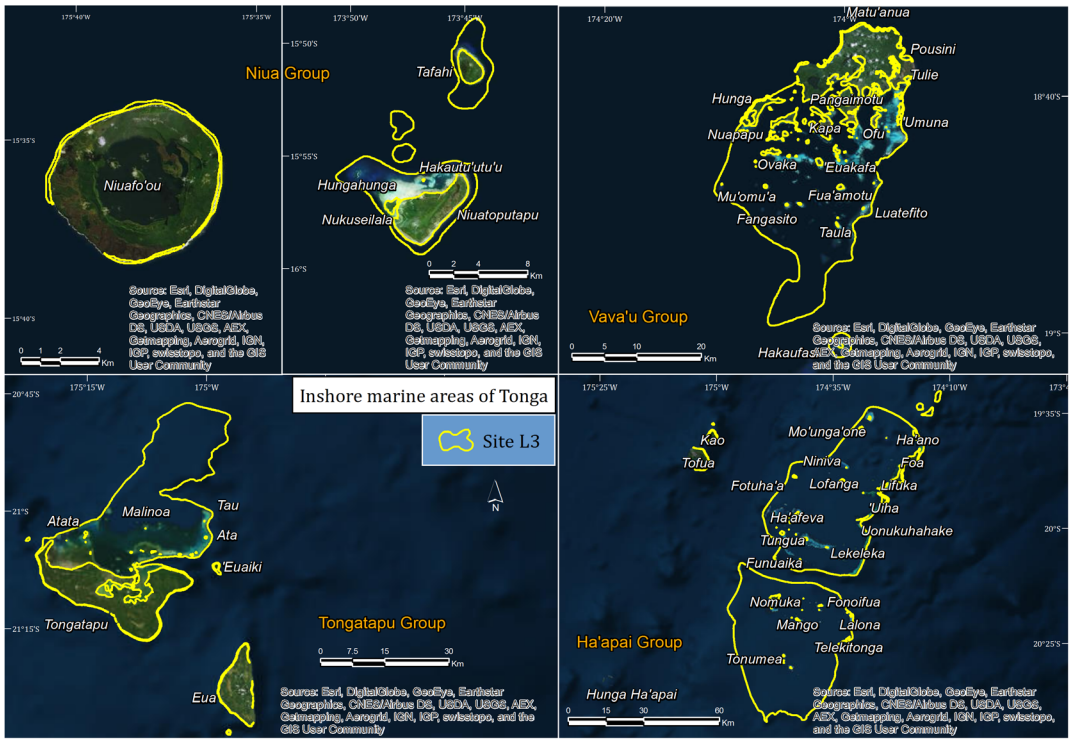

FIGURE 3. SITE L 3: Inshore marine areas

TABLE 3. SITE L 3: Inshore marine areas. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Score
Large-scale special, unique site	Inshore marine areas	L3	10

Geographic boundaries

Tongatapu (-20.7626, -174.9531) and (-21.5082, -175.3428);
Ha'apai (-19.5018, -174.1994) and (-20.7345, -174.9672);
Vava'u (-18.9770, -174.2289) and (-18.5855, -173.8759);
Niuas (-15.5583, -175.6751) and (-15.9941, -173.7478)

Geographic description (score = 1)

This site encompasses all coral reef, seagrass and mangrove areas surrounding Tonga's islands and island groups. For the purposes of this assessment, the site will include these three habitats to the outer edge of the reef. However, there are not complete data on the location of all seagrasses and mangroves in Tonga and this site's geographic boundaries are very broad-based.

Justification (score = 3)

Coral Reefs: Coral reefs are perhaps the best studied of Tonga's inshore marine habitats, because of their high biodiversity, conservation and economic value. Tonga's National Biodiversity and Action Plan (NBSAP) and subsequent reviews list coral reefs as priority habitats (Department of Environment, 2006; Geocare & Petroleum Consult Ltd, 2010; Ministry of Lands, Environment, Climate Change and Natural Resources, 2014). Coral reef biodiversity Tonga lies on a gradient between the richest reefs in the Coral Triangle, and more depauperate towards the eastern Pacific (Atherton et al., 2015; Randall et al., 2003); however, greater survey efforts may reveal higher species richness than expected, given the large variety of available habitats.

There is a general consensus that, despite being the best studied of Tonga's marine habitats, coral reefs in Tonga have been poorly studied compared to many other coral reefs. Past surveys of coral reefs in Tonga have focused upon coral (Adjeroud et al., 2013; Holthus, 1996; Lovell and McLardy, 2008; Lovell and Palaki, 2000), commercially exploited invertebrates by Chesher (1993), Okamoto (1984) and Pakoa et al. (2013) and reef fishes by Randall et al. (2003). The first comprehensive underwater survey focusing on fish communities was conducted by the Secretariat of the Pacific Community (SPC) in Vava'u in 2004 (Kulbicki, 2004), under the DemEcoFish project. Most recently, the Living Oceans Foundation surveyed coral reefs of Niuatoputapu, Ha'apai and Vava'u (Bruckner, 2014), a Rapid Biodiversity Assessment (BIORAP) survey included a snapshot of coral reef organisms of Vava'u (Atherton et al., 2015) and a baseline survey for Special Management Areas also surveyed coral reefs in Vava'u (Ceccarelli, 2016).

The BIORAP in Va'vau recorded 206 species of hard corals in 55 genera (Fenner, 2015), and it is expected that Tongan coral reefs overall support approximately 300 species of hard corals (Geocare & Petroleum Consult Ltd, 2010). The most abundant coral genera were *Acropora, Montipora, Porites, Pavona* and *Fungia.* Adjeroud et al. (2013) recorded 37 hard coral genera around Tongatapu, dominated by *Montipora, Acropora* and *Porites.* These coral genera are especially important for creating complex, 3-dimensional habitat for invertebrates and fishes (Chabanet et al., 1997). Spatial patterns in the coral assemblages in Tongatapu suggested a strong reliance of local (within-island) recruitment sources (Adjeroud et al., 2013) from brooding coral species (Magalon et al., 2005). High numbers of recruits suggested a good potential for local reef recovery in the short-term, if stressors that inhibit the survival of juvenile corals are absent or removed (Adjeroud et al. 2013).

Coral reef macroinvertebrates are an important fishery resource in Tonga, with some species becoming severely depleted over the last few decades. The recent BIORAP survey of Vava'u recorded 249 species from 101 families and 146 genera, dominated by molluscs (Bauman, 2015). Estimates of abundance for taxa like sea cucumbers can be misleading, because despite high abundances, the proportion of commercially valuable species is very low (17%) (Bauman, 2015).

Randall et al. (2003) recorded 1,162 shore and reef fish species in their survey of Tonga; this is considered a highly diverse fish community, and further surveys are likely to add species to the list. The most recent fish surveys reported 406 species from the reefs of Vava'u (Stone, 2015). Reef fish fauna was dominated by species from relatively low trophic groups, with high abundances of damselfishes (Pomacentridae) and wrasses (Labridae), and low numbers of piscivores and carnivores, including sharks (Stone, 2015). Generally, the fish community shows strong signs of overfishing, both in terms of trophic structure and size; only small size classes are represented in most surveys (Imirizaldu, 2015).

Reef structure is highly influential in determining the diversity, density and condition of coral reef organisms. The recent Vava'u BIORAP found that moderately exposed reefs had the highest number of coral species, followed in descending order by exposed reefs, sheltered reefs, limestone drop-offs and volcanic reefs (Fenner, 2015). The lowest cover of coral in the Vava'u group of islands (1.9%) was recorded on northern volcanic reefs at Fonualei Island, and the highest on moderately exposed reefs in the southern part of the Vava'u island group (70.6%)(Webster, 2015).

As human activities degrade coral reefs worldwide, reefs in good condition become more valuable. Reefs close to the larger islands and inhabited coastlines are more heavily influenced by terrestrial activities (Bruckner, 2014), whilst isolated reefs tend to be more pristine and species-rich (Kulbicki and Bozec, 2005). However, some ambient levels of terrestrial sediment input are natural, and it is only close to human population centres that land-based run-off and associated nutrient enrichment and pollution become problematic (Atherton et al., 2015).

Coral reefs and other inshore habitats in Tonga are subject to numerous stressors, including severe climatic disturbances such as cyclones and temperature-induced bleaching, crown-of-thorns seastar (COTS) outbreaks, overharvesting, coastal pollution and sedimentation (Adjeroud et al., 2013; Chin et al., 2011; Lovell and Palaki, 2000; Pagad, 2013; Webster, 2013). Major cyclones are reported to have affected Tonga in 1982, 1995, 1997, 1999, 2000 and 2014, and Tongan reefs suffered a major bleaching event in 2000 (UNEP-WCMC, 2015). Outer islands and island groups such as Vava'u are considered to be under less pressure than the main island of Tongatapu (Adjeroud et al., 2013).

These more isolated, unimpacted coral reefs may be more resilient (able to return to their previous state after suffering damage) than those already under various degrees of human pressure (McLean et al., 2016). Resilient coral reefs are becoming more important and valuable, as their ability to recover from natural and climate change induced disturbance events confers to them a role of refuges and sources of larvae that assist the recovery of more damaged reefs (Holbrook et al., 2016). Typically, coral reef resilience is expected to be higher on reefs further from human activities (McLean et al., 2016), with intact trophic structure, especially populations of predators and herbivores (Holbrook et al., 2016; McLean et al., 2016) higher diversity (Ferrigno et al., 2016), greater structural complexity, deeper habitats acting as refuges, higher densities of juvenile corals and low nutrient loads (Graham et al., 2015). Remote and isolated coral reefs also have a

greater likelihood of hosting unique assemblages, genetically distinct populations, or even endemic species (Hobbs et al., 2013; Hughes et al., 2002).

Seagrasses and mangroves: Seagrass beds and mangrove forests are also key features of Tonga's inshore marine habitats. Seagrass beds in Tonga are well-developed in nearshore areas, usually on sandy substrata between patches of coral reefs. Tonga has four known species of seagrass: *Halophila ovalis, H. ovalis ssp. bullosa* (endemic to Tonga, Fiji and Samoa), *Halodule uninervis* and *Syringodium isoetifolium* (Ellison, 2009). Seagrass beds are food sources and key habitats for numerous marine species, including protected species (e.g. green turtles) and species of commercial or subsistence value (e.g. emperors). Many species that are ecologically and commercially important, especially invertebrates, use seagrass beds as nurseries (McDevitt-Irwin et al., 2016). Seagrasses contribute to the primary production of shallow marine habitats, serve as nursery habitats for fish and invertebrate species that may complete their life cycle elsewhere, and they also stabilize sediments, hence contributing to coastal protection (Norlund et al., 2016). They are vulnerable to poor water quality, excess sedimentation and destructive fishing (Ellison, 2009).

Mangrove forests are highly specialized and adapted to coastal and intertidal environments. They provide nursery grounds for fish and crustaceans, feeding and breeding grounds for birds, shoreline protection, sediment and nutrient trapping of runoff and habitat for a diverse assemblage of mangrove specialist species. They are a key component in the maintenance of water quality for nearshore marine environments, and are ecologically linked to seagrass beds and coral reefs. Tonga had an area of 1,000 ha of mangroves in the 1980s, but coastal reclamation, particularly on shores adjacent to Nuku'alofa in Tongatapu, have dramatically reduced mangrove cover since then. The World Atlas of Mangroves (2010) gave an estimate of mangrove areas of 336 ha for Tonga. An earlier estimate stated the total area of mangroves at 10 km^2, representing 1.33 % of Tonga's total land area of 750 km^2 (MESCAL, 2013). Eight species of mangroves are found in Tonga, with a dominance of *Rhizophora mangle, Rhizophora stylosa (Tongolei/Tongo), Bruguiera gymnorrhiza (Tongo ta'ane), Excoecaria agallocha (Feta'anu)* and *Lumnitzera littorea (Hangale)* (Ellison, 2009; MESCAL, 2013).

Inshore marine areas gain the best biodiversity and productivity value when all three ecosystems (coral reefs, seagrass beds and mangroves) are present in close proximity (Guannei et al., 2016); this is the case in many areas of Tonga (Figure 3). When connectivity between these habitats is high, it also increases their productivity and diversity, and therefore their conservation value, as a number of species use two or three habitats at different times during their life cycle (Olds et al., 2016). This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 3)

Sources included four peer-reviewed papers and 14 reports specific to Tonga, three datasets specific to Tongan reefs, and five peer-reviewed papers relevant to the site, but not specific to Tonga. The sources are much better defined for coral reefs than for the other inshore habitats. There are many gaps in the geographic coverage of references for the inshore marine areas of Tonga, but it is possible to extrapolate from research conducted in Tongan waters, and from general knowledge gathered elsewhere.

Obligations (score = 3)

A review of Tonga's NBSAP estimated that 40% of Tongan reefs are currently threatened, and outlined findings of decreased coral cover, reef fish abundance and size between 2006 and 2009 (Department of Environment, 2006); threats included overfishing, destructive fishing methods, poor land management, pollution and global climate change (Geocare & Petroleum Consult Ltd, 2010). The NBSAP discussed a variety of species of concern, due to rarity, suspected endemism, or overharvesting. For instance, the most recent coral biodiversity survey found 33 species with an elevated risk of global extinction, 17 species which have been proposed for listing under the US Endangered Species Act (ESA), and five species which are already listed under the ESA (Fenner, 2015). These listings, whilst for occurrances of the species in US waters, provides some indication of their status more broadly, including in Tonga. Some of Tonga's species have been assessed against the IUCN Red List criteria. They include both terrestrial and marine organisms: 315 species of bony fishes, 9 cartilaginous fishes, 228 stony corals, 4 hydrozoans, 49 birds, 21 mammals, 13 reptiles, 8 crustaceans, 15 molluscs, 13 flowering plants, 8 monocots, 2 mangrove species, and one conifer, cycad and fern (Pagad, 2013). Ten percent (68 species) of these species were classified as 'threatened' – that is either 'Critically Endangered (CR)' (5), 'Endangered (EN)' (6) or 'Vulnerable (VU)' (56); another 75 species were classified as 'Near Threatened (NT)'. Of the 'threatened species' 45 are stony corals, five seabirds, four molluscs, three cartilaginous fish, five reptiles, two mammals, two flowering plants and one conifer and cycad (Pagad, 2013).

Coral reefs, mangroves and seagrass beds are protected by national and international legislation, including the Convention on Biological Diversity. Many species that use these habitats are harvested and are therefore covered in the Fisheries Management Act 2002 and Environment Management Act 2010. There are obligations for the protection of sharks under Tonga's National Plan of Action for Sharks 2014–2016. The habitats themselves are protected through the National Spatial and Management Act 2012 (mangroves) and the Environment Impact Assessment Act 2003 (all habitats). The National Forest Policy (2008) has provision for the protection of mangroves and other wetland ecosystems. Corals, some mobile invertebrates (e.g. sea cucumbers), some fishes (e.g. groupers, sharks) and turtles are on the IUCN Red List and protected under CITES (see above).

3.1.4 **SITE L 4**: Hydrothermal vents

Hydrothermal vents are the result of seawater percolating down through fissures in the ocean crust in the vicinity of spreading centers or subduction zones (places on Earth where two tectonic plates move away or towards one another) (NOAA, 2016). The cold seawater is heated by hot magma and re-emerges to form the vents (NOAA, 2016).

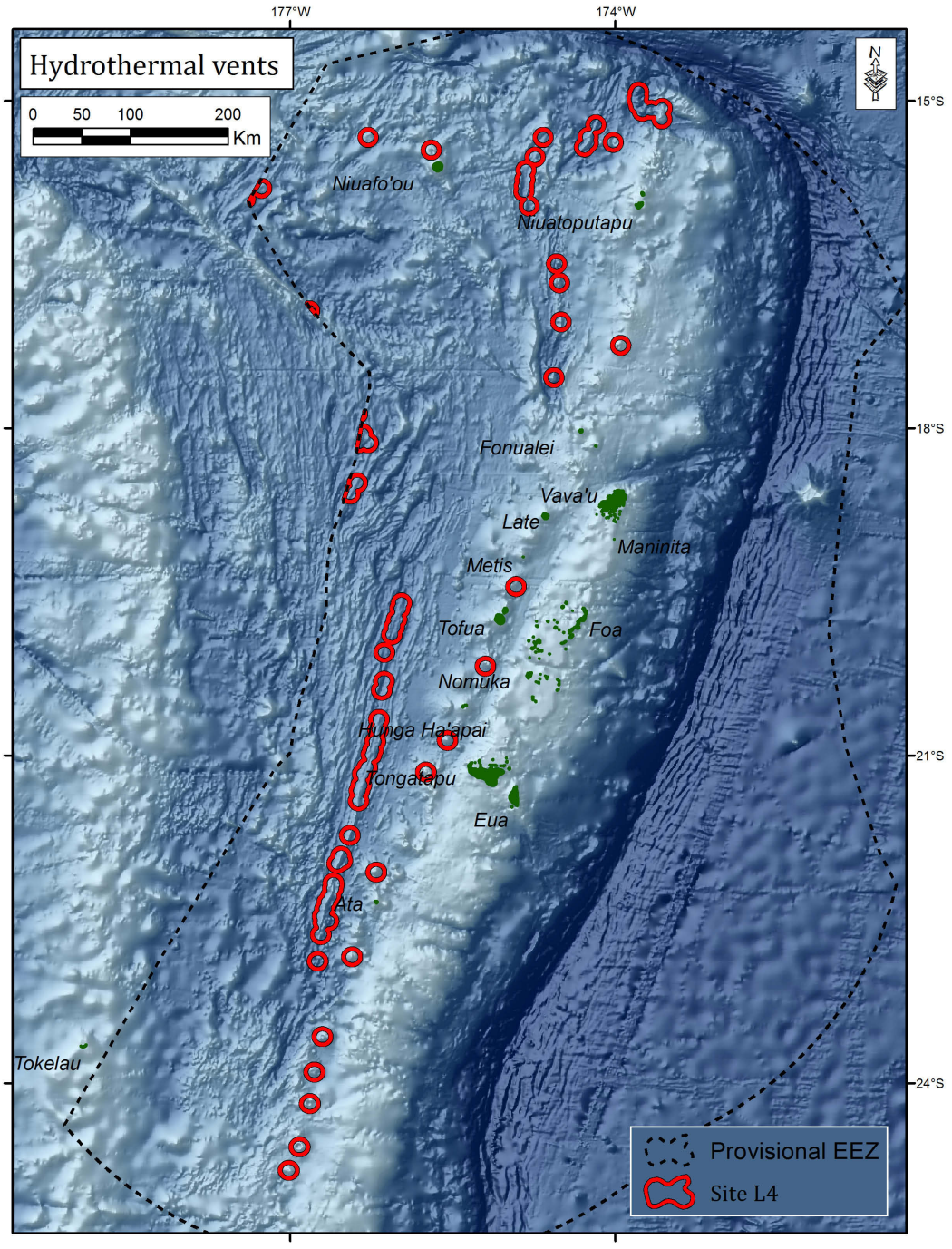

FIGURE 4. SITE L 4: Hydrothermal vents

TABLE 4. SITE L 4: Hydrothermal vents. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Score
Large-scale special, unique site	Hydrothermal vents	L4	9.5

Geographic boundaries

(-24.5194, -178.9551) and (-14.9045, -173.4468)

Geographic description (score = 3)

There are at least 27 confirmed active hydrothermal vents in Tonga (Beaulieu et al., 2013), almost all located in the submerged hills to the west, south and north of the island chain.

Justification (score = 2.5)

Seawater in hydrothermal vents may reach temperatures of over 370° C (NOAA, 2016). Hydrothermal vents have unique ecosystems which derive energy from volcanic gases rather than sunlight (https://www.cbd.int/doc/meetings/mar/ebsaws-2014-01/other/ebsaws-2014-01-azores-brochure-en.pdf Accessed 3 May 2016). These areas are very productive although small in spatial extent and relatively ephemeral – perhaps lasting some decades (Vrijenhoek, 1997). The size of the vent communities is small due to reliance upon the reach of the energy release from the volcanic activity (Vrijenhoek, 1997). Their ephemeral nature is inherent due to the reliance upon that volcanic activity, which moves as the tectonic plates of the earth move (Vrijenhoek, 1997). Whilst exact locations of extant hydrothermal vents may move, they will always be located at spreading centres or subduction zones – where magma meets the sea. Biomass is high, but as most of the animals are unique to the vent environments, and endemic to the specific area, they are confined to small areas around the vents (Little and Vrijenhoek, 2003; Vrijenhoek, 1997). Different hydrothermal vents have also been shown to host different meio- and macrofaunal communities depending upon the specific environmental parameters (e.g. temperature, metal concentrations, concentrations of reduced chemicals, oxygen concentration, as well as level of variation in all of these parameters space and time) (Gollner et al., 2015). Also, whilst macrofaunal species occur primarily at vents and are generally restricted to this habitat, meiofaunal species are distributed more widely and evenly across proximate and distant basalt habitats and are less restricted only to extent vent habitats (Gollner et al., 2015).

New work shows the ecological linkage between dead hydrothermal vents and the adjacent environment – indicating potentially essential connectivity between these and other deepsea habitats (Klose et al., 2015). Hydrothermal vents have recently also been found to act as a recycling and decomposition systems for dissolved organic carbon (DOC), an important constituent of the global carbon pool (Hawkes et al., 2015). If the vents are disturbed, entire ecosystems can be destroyed very quickly. Experiments carried out in both the Peru basin and the Clarion Clipperton Zone show that even though mobile species may return after disturbance, sessile species do not recover (Bluhm, 2001; ISA, 1999; Kaneko et al., 1997; Thiel et al., 2001). Hydrothermal vents are specifically listed under EBSA 26 – Tongan Archipelago – with reference to their unique fauna and the presence of “living fossils” (Secretariat of the Convention on Biological Diversity, 2014).

A video from a Pacific hydrothermal vent (albeit the eastern Pacific) is available here:
https://ocean.si.edu/ocean-videos/hydrothermal-vent-creatures

Photos of hydrothermal vent animals are available here:
http://deepseaphotography.com/downloads/category/hydrothermal_vent_animals

Type and number of sources (score = 2)

The sources for hydrothermal vents found and used here includes one that is specific to Tonga (the relevant section of the EBSA report). The other source information is not specific to Tonga, but applies to all hydrothermal vents and includes four peer reviewed papers, a NOAA website and one of the experts from the workshop (A. Palaki pers. comm.).

Obligations (score = 2)

There is no specific legal framework to protect hydrothermal vents, but Tonga is a signatory to the United Nations Convention on the Law of the Sea (UNCLOS), which has regulatory frameworks relating to deep sea resource exploitation. http://eu-midas.net/sites/default/files/downloads/Briefs/MIDAS_brief_legal.pdf

3.1.5 **SITE L 5**: Offshore west of Tongan islands

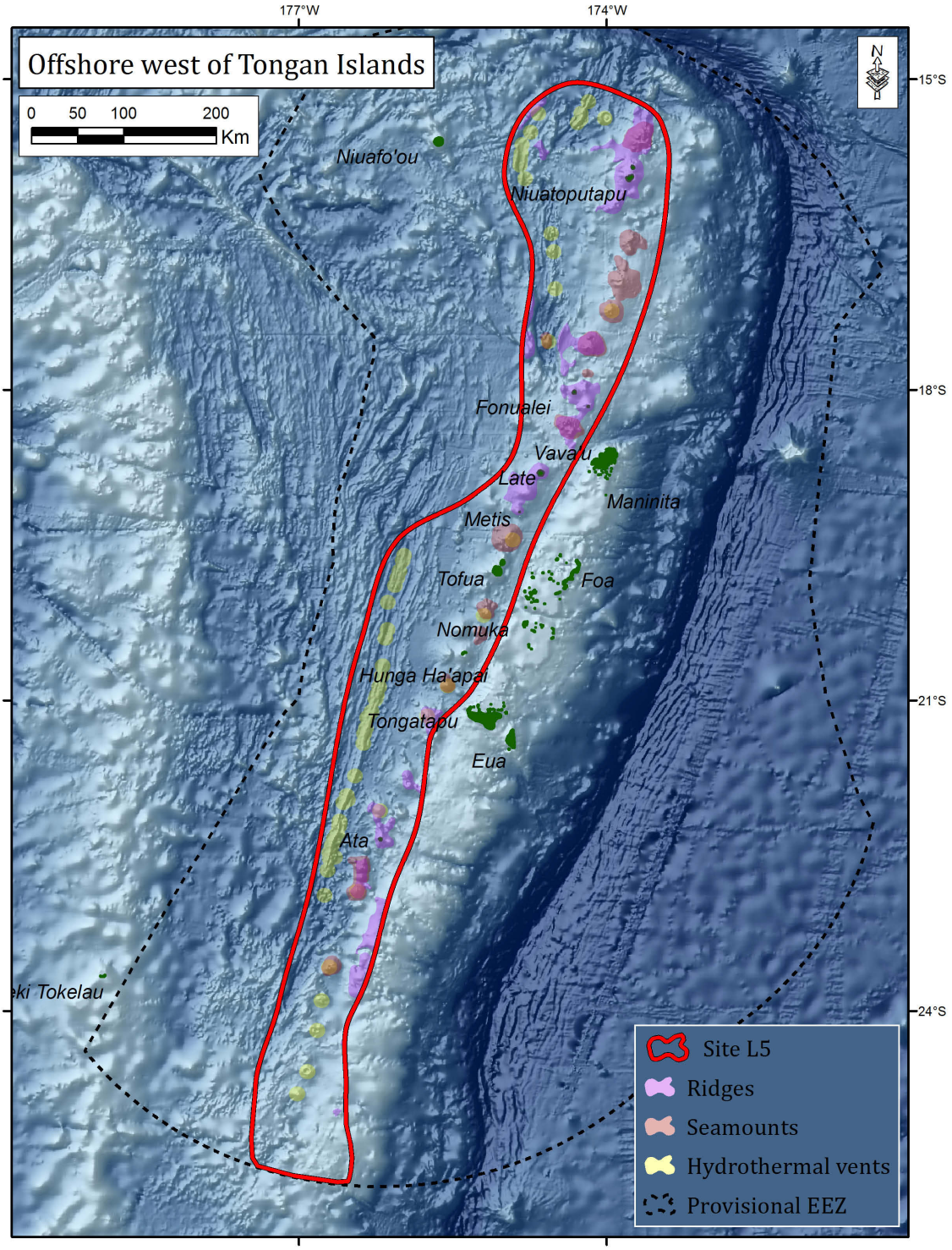

FIGURE 5. SITE L 5: Offshore west of Tongan islands

TABLE 5. SITE L 5: Offshore west of Tongan islands. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Score
Large-scale special, unique site	Offshore West of Tongan islands	L5	7

Geographic boundaries

(-25.3387, -177.9137) and (-15.3726, -173.0659)

Geographic description (score = 1)

To the west of the Tongan island groups lies a stretch of deep water including seamounts west of the main Tongan Ridge, hydrothermal vents, volcanic islands and deep pelagic habitats (see individual definitions above). This is a large, elongated, oval-like area extending approximately 1,150 km from north to south and 185 km from west to east. It begins at around 15 0S at its northern-most point and extends south, south-west to 250S. Its western-most reach is at 1770 W, and its eastern-most extent at 1730W (Figure 4). It has an area of 120,728km^2, however, if removing features already identified in Sites L1 and L3, the remaining area is 105962km^2.

Justification (score = 1.5)

The offshore areas and seamounts west of the Tongan Ridge, including all of the hydrothermal vent areas (Beaulieu et al., 2013) and volcanic islands[1], are important as a corridor for migratory species such as marine mammals, pelagic fishes, oceanic sharks, and turtles (pers. comm. K. Stone, Garrigue et al., 2015). Because the seamounts, ridges, hills and hydrothermal vents form their own special, unique marine sites (Site L 1: Seamounts and ridges around 'Ata Island, and Site L 4: Hydrothermal vents) this site refers then to the remaining features within the offshore areas west of Tonga's island groups. This area includes the surrounding pelagic habitats and surrounding geomorphic features. The latter includes a plateau, basin, spreading ridge and rift valleys (Harris et al., 2014).

All migratory species that might use the seamounts or ridges in their traverse of the area (as per Site L 1: Seamounts and ridges around 'Ata Island) would also make use of the seas between those features to move from one seamount or ridge to the next. Telemetry studies are suggesting that oceanic migrants most likely rely on biological compasses and other simpler navigational tools to maintain a direction in the open sea between undersea landmarks, such as this offshore area (Luschi, 2013). Displacement experiments have provided evidence for the ability of seabirds and turtles to rely on position-fixing mechanisms, possibly involving magnetic and/or olfactory cues, not just physical cues (Luschi, 2013). This site overlaps with two EBSAs: 26 (Tongan Archipelago) and 07 (Monowai Seamount), notably for the presence of hydrothermal vents (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score =1.5)

Very little is known about this offshore site. The EBSA report refers to the presence of hydrothermal vents in this area. Two peer reviewed papers from work on long-distance migratory species suggest the importance of oceanic "highways", and there is local Tongan expertise that supports the importance of this area.

Obligations (score = 3)

Some shark species, including oceanic species found in Tonga, turtles and whales are CITES listed and/or on IUCN's Red List of threatened species.

1 Hydrothermal vents and seamounts, however, form their own Sites (see Sites 1 and 3).

3.1.6 SITE L 6: Ha'apai High Productivity Zone

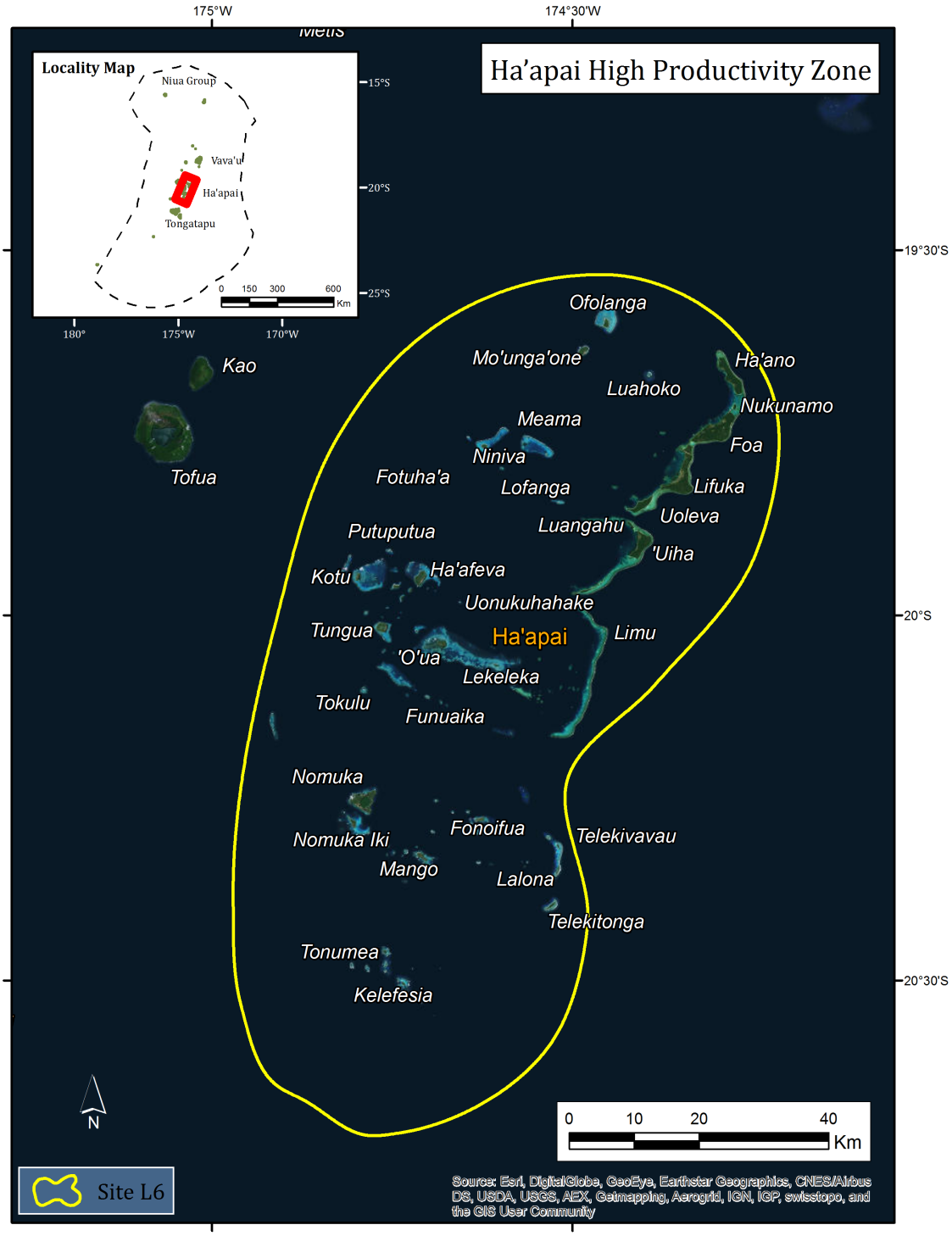

FIGURE 6. SITE L 6: Ha'apai High Productivity Zone

TABLE 6. SITE L 6: Ha'apai High Productivity Zone. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Score
Large-scale special, unique site	Ha'apai High Productivity Zone	L6	10

Geographic boundaries

(-20.5568777, -175.1635791) and (-19.64868026, -174.1348559)

Geographic description (score = 1)

This site encompasses the marine habitats surrounding the Ha'apai Island Group (see Geographic description below), from shallow corals reefs to deep areas of upwelling, which are recognised as being highly productive. The Ha'apai Group lies in the centre of the Kingdom of Tonga between (19o35'S to 20o30'S, 174o15'W to 175o6'W), extending 150 km from Hunga Ha'apai and Hunga Tonga in the southwest to Ofolanga and Ha'ano in the north and northeast, and covering an ocean area of approximately 10,000 km^2 (Thaman et al 1997). It consists of 64 islands, plus numerous rocks, sandbars, and reefs, and the now-submerged active volcanic island of Fonua Fo'ou (Falcon Island) which has appeared and disappeared numerous times over the past two centuries (Thaman et al 1997). The Ha'apai Group is assumed to extend to the territorial seas, that is, to 12nm from shore (Figure 6). The boundary of this site is only very coarsely defined.

Justification (score = 3)

From the 1986 census, Ha'apai had a population of 8,919 in 1,616 households, and there were 30 villages on the 17 inhabited islands (Thaman et al., 1997). The 64 islands of Ha'apai range in size from less than 1 ha (0.01km^2) to 46.6 km^2 in the case of Foa Island. Most of the islands are quite small, with only four islands spanning areas over 10 km^2 (Thaman et al., 1997).

A broad description of the inshore marine areas of Tonga is given at Site L 3: Inshore marine areas, and much of this is relevant, although not specific, to Ha'apai. The entire Ha'apai Archipelago has disproportionately high productivity due to localised upwellings from the Tonga Trench and nutrient runoff from land (organic material). This promotes high concentrations of chlorophyll and high productivity within the Ha'apai Island Group. Recognising the value of this productivity, the Ha'apai Conservation Area extends from high water mark out to 12nm and was declared by Cabinet (pers. comm. A. Palaki).

Ha'apai itself hosts a variety of coral reef types in its relatively oligotrophic, and extensive, shallower waters, including a 130km barrier reef along the eastern edge of the group with uplifted and submerged sections, numerous fringing reefs, isolated patch reefs and newly established coral colonies on recently formed islands. The barrier reef has numerous passages through which fast-wing tidal waters allow for exchange and movement of, among other things, planktonic eggs or larvae during spawning times (Thaman et al., 1997).

Thaman et al. conducted extensive community surveys in Ha'apai in 1997, resulting in a description of the marine environment and biodiversity of the island group (Thaman et al., 1997). They estimated that there were about 23 seabirds or migratory bird species in Ha'apai. Of these, 11 are probably resident, 4 are migratory, 7 are seen only occasionally, and one is a migratory breeder. The sea birds nest primarily on Ha'apai's uninhabited islands (Thaman et al., 1997).

Thaman et al. (1997) highlighted the following as being of cultural importance to the people of Ha'apai: marine flora, comprising over 20 species of seagrasses and seaweeds as well as mangroves; over 750 finfish species, including deepwater pelagic and demersal species (e.g. tunas, flyingfish, marlins and other billfish and deepwater snapper); and many reef, lagoon or inshore species as well as sharks, rays and eels. It was acknowledged that a range of small or cryptic species, many of which probably have no Tongan names, also inhabit the marine environment of Ha'apai. Other marine animals identified by the people of Ha'apai include four whale species (including sperm and humpback whales), five dolphin species, four turtle species, two sea snakes, over 110 species of shellfish, over 40 echinoderms (including sea urchins and sea cucumbers), more than 35 crustaceans (e.g. lobsters, prawns and crabs), mollusks (octopus, squid, sea slugs, sea hares), chitons, sea worms, seven types of anemone, over sixty culturally important hard and soft corals, as well as foraminifera, protozoa and zooplankton. These data, being a description of culturally important marine flora and fauna, are likely an underestimate of the biodiversity of Ha'apai. Lovell and Palaki (2000), for instance, reported 192 hard coral species from surveys conducted on just 11 reefs in the Tongatapu Island Group. A more recent survey that included Ha'apai coral reefs recorded 42 genera of hard corals (Bruckner, 2014).

Thaman et al.'s (1997) survey results indicate that a range of seaweeds, over 300 finfish species, over 40 shellfish, about 20 crab species, and a number of other marine invertebrates are important for food. Many of these plants and animals are also main sources of cash income to villages, with many marine products being sold locally, shipped for sale in Tongatapu, or exported overseas for commercial gain. Furthermore, a survey of Nomuka Island's coral reef in the context of establishing a Special Management Area reported a high density of herbivorous reef fishes (Malimali et al., 2010), an

important indicator of coral reef health (Mumby et al., 2006). A survey of Lifuka Island noted a healthy density of giant clams, including the rare and restricted *Tridacna tevoroa* (Friedman et al., 2009). Giant clams are ecologically, culturally and commercially important species in Tonga, and healthy populations are rare (Friedman et al., 2009). On Lofanga, the same team found the Tongan endemic *Siganus niger* (Friedman et al., 2009).

Several species of marine organisms have been introduced into Ha'apai. In 1982, the seaweed *Eucheuma sp.* was brought to Vava'u from Fiji and was later cultured on a trial basis in Ha'apai. In 1995, 587 commercial trochus shells were transplanted from Fiji to the 'Auhangamea Passage between Uoleva and 'Uiha. These, and other unintended introductions, may have displaced native species in the marine environment (Thaman et al., 1997).

Surveys of communities have assessed numerous taxa of marine plants and animals to be rare or threatened including some species of: mangroves, seabirds, seagrasses and seaweeds, sharks, rays, eels, reef and deepwater finfish, shellfish, crabs, lobsters, sea cucumber, corals, sea urchins and sea hares (Thaman et al., 1997).

Pelagic waters around Ha'apai are also considered highly productive, especially on the eastern side of the islands close to the Tonga Trench. The Trench itself has been described above at Site L 2: Tonga Trench and Tonga Ridge. Waters in that area, especially around seamounts, are targeted by longliners due to their known productivity attracting high densities of tunas (Passfield and Gilman, 2010). These waters overlap with EBSA 26 – Tongan Archipelago – which is noted, among other things, for its areas of high productivity (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 3)

This site includes both inshore (primarily coral reefs) and offshore marine habitats. Considering the information also provided at site L3, above, which is not specific to Ha'apai supporting documentation for this site includes five peer-reviewed papers and 17 reports, and two datasets, with three of the reports, one dataset and one expert comment containing information specific to the Ha'apai island group.

Obligations (score = 3)

Species in the area which are covered by the IUCN Red List of Threatened Animals, the U.S. Endangered Species Act, and the Convention on International Trade in Endangered Species (CITES) include: humpback whale (*Megaptera novaeangliae*), green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), all stony coral species (*Order Scleractinia*), southern giant clam (*Tridacna derasa*), elongate giant clam (*Tridacna maxima*), the fluted giant clam (*Tridacna squamosa*) and the Tevoro clam (*Tridacna tevoroa*) (Friedman et al., 2009; Thaman et al., 1997).

Fisheries Management Act 2002 and Environment Management Act 2010 pertain to protection of habitat and/or species in Ha'apai as elsewhere. The Convention on Biological Diversity lists obligations to protect fisheries resources, threatened species and habitats such as coral reefs. The National Forest Policy (2008) has provision for the protection of mangroves and other wetland ecosystems.

In 1997, the Government of the Kingdom of Tonga designated the entire Ha'apai Group, the 64 central islands of Tonga, as a Conservation Area (CA) indicating a commitment to a higher level of conservation in Ha'apai than might be expected elsewhere. A management plan for this conservation area was prepared (Thaman et al., 1997) but information available to date does not indicate its status.

3.1.7 SITE L 7: Vava'u waters

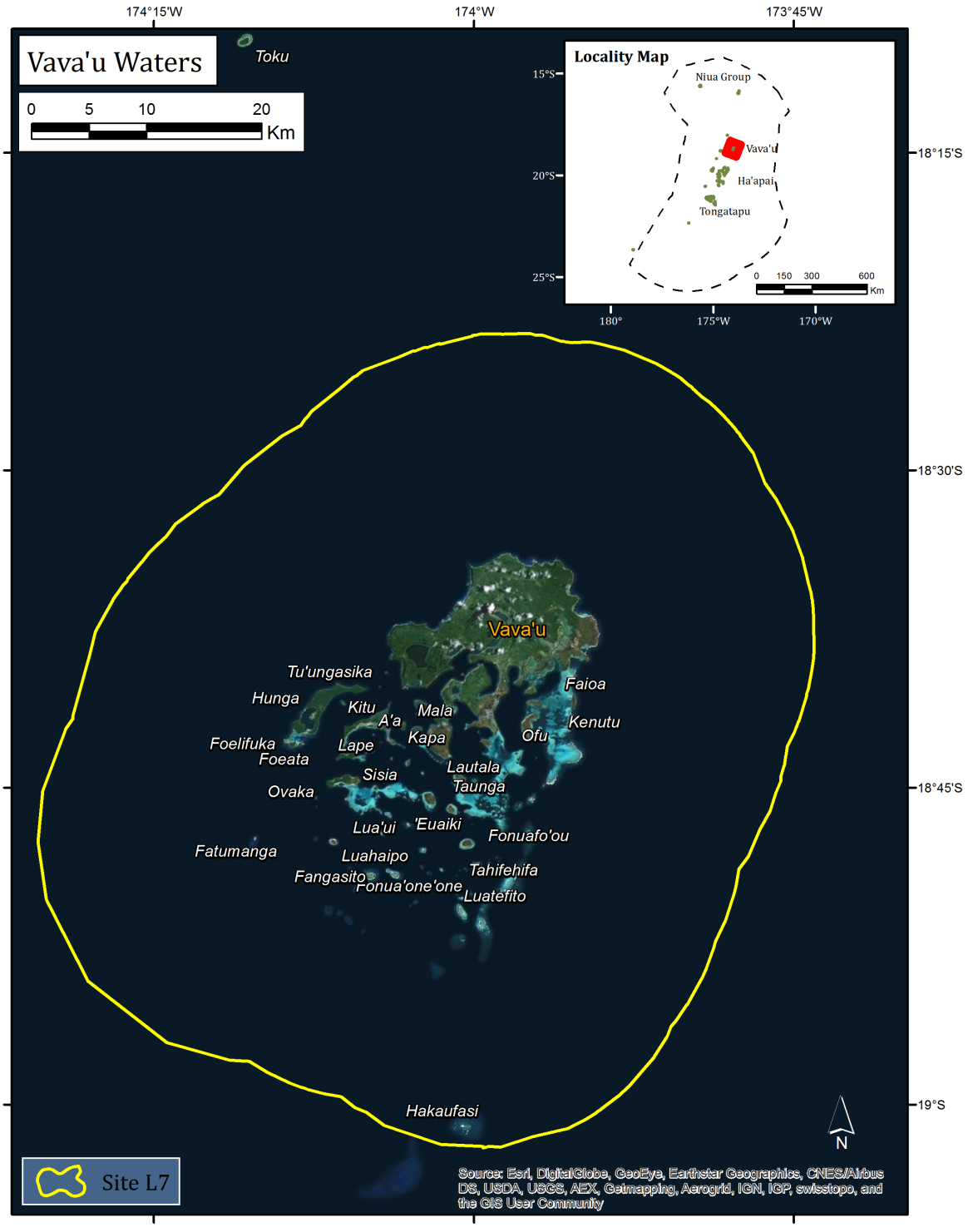

FIGURE 7. SITE L 7: Vava'u waters

TABLE 7. SITE L 7: Vava'u waters. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Large-scale special, unique site	Vava'u waters	L7	10

Geographic boundaries

(-18.8909, -174.3968) and (-18.4901, -173.66178)

Geographic description (score = 1)

The Vava'u Group lies in the northern waters of the Kingdom of Tonga, at 18.6228° S, 173.9903° W. It consists of a main island and 40 smaller islands, as well as numerous rocky islets, sandbars, and reefs. The Vava'u waters as described in the expert workshop is assumed to extend to approximately 12nm from shore, and to include all waters shallower than 200m.

Justification (score = 3)

The Vava'u Island group is surrounded by diverse marine habitats, including inshore coral reefs, seagrass beds, mangroves, shallow soft-bottom communities, deep channels, oceanic waters and deep seafloor topography (including features covered in L1 and L4). The coral reefs of Vava'u have been surveyed by BIORAP and Living Oceans Foundation, and more recently the Climate Resilience Sector Project's (CRSP) Special Management Area (SMA) project (Atherton et al., 2015; Bruckner, 2014; Ceccarelli, 2016).

The Vava'u Island group is the one of the northernmost island groups in Tonga. The main island has long, narrow indentations and embayments along its southern coast, which give way to an extensive reef and island complex to the south (Holthus, 1996). This unique geomorphology gives rise to a high diversity of habitats (Webster, 2015). Reefs in the northern part of Vava'u, with its coves and bays, are more heavily influenced by terrestrial activities (Bruckner, 2014), whilst the barrier reefs of the south tend to be more species-rich (Kulbicki and Bozec, 2005). Reef structure is highly influential in determining the diversity, density and condition of coral reef organisms in Vava'u. The recent BIORAP found that moderately exposed reefs had the highest number of coral species, followed in descending order by exposed reefs, sheltered reefs, limestone drop-offs and volcanic reefs (Fenner, 2015). The lowest cover (1.9%) was recorded on northern volcanic reefs at Fonualei Island, and the highest on moderately exposed reefs in the southern part of the Vava'u island group (70.6%) (Webster, 2015).

The BIORAP recorded 206 species of hard corals (Fenner, 2015), and 249 species of macroinvertebrates from 101 families and 146 genera, dominated by molluscs (Bauman, 2015). The fish surveys reported 406 species from the reefs of Vava'u (Stone, 2015). Reef fish fauna was dominated by species from relatively low trophic groups, with high abundances of damselfishes (Pomacentridae) and wrasses (Labridae), and low numbers of piscivores and carnivores, including sharks (Bruckner, 2014; Stone, 2015). A focused survey on species targeted by fisheries found a dominance of surgeonfishes (Acanthuridae) and parrotfishes (Scaridae), with a lower representation of species from higher trophic levels (Imirizaldu, 2015).

There are now 14 marine mammal species officially confirmed as occurring in Tonga, including two baleen whales, nine dolphins and one sperm whale – many of these occur in Vava'u. As for most archipelagos of Oceania, the spinner dolphin appears to be the most common species in the coastal waters of Vava'u. As a coastal species, they deserve particular attention, since their coastal habitat is likely to be impacted by anthropogenic pressures. Opportunistic sightings along the coast of Fonualei suggest that the common bottlenose dolphin is a regular user of coastal and inner waters. All other small cetacean species probably tend to frequent offshore waters (Atherton et al., 2015).

Tongan waters are home to one of Oceania's distinctive breeding populations of humpback whales (Garland et al., 2015); Vava'u is well-known as an important area for calving, and survey data exist for a number of years (Lindsay et al., 2016). Vava'u's entire marine environment, especially shallow water close to reefs, but beyond the reef edge, is important for calving humpback whales (Lindsay et al., 2016) and should be protected in this regard. Interestingly, in Vava'u there is a positive association between coral reefs and mother-calf pairs of humpback whales, probably for purposes of protection (Lindsay et al., 2016).

Mother–calf pairs seem to be most common in the shallow nearshore waters surrounding the islands of Luaui, Fangasito, Fonua'one'one, Lape, Mala and Ofu. The Lalolomei Bank south of Vava'u has been predicted as highly suitable habitat for adult humpback groups. For other groups of humpback whales, important areas include up to approximately 3km off the western and northern coasts of Hunga Island, up to 3km south of Foelifuka and Foeata islands, and the triangular region between the islands of Fonuafo'ou, Luatafito and Tahifehifa. However, considering that humpback whales are observed in most shallow waters of the Vava'u islands group, it is recommended that all waters less than 200m deep and north of the Lalolomei Bank be considered important for humpback whales. (Atherton et al., 2015)

The Oceania population of humpback whale is listed as an Endangered species under the IUCN Red List and their slow recovery in Tonga appears to be related to the fact that there is limited interchange between the population that frequents Tonga, French Polynesia and New Caledonia and other humpback populations in the South Pacific (Garrigue et al., 2015); there may even be limited exchange between groups within this central south Pacific population, making the Tongan humpback population unique (Garland et al., 2015).

Coral reefs in Vava'u are subject to numerous stressors, all of which are covered in Site L 3: Inshore marine areas. The reefs of Vava'u have had recent outbreaks of coral predators, including COTS, *Culcita and Drupella* (Bruckner, 2014). A recent assessment of coral communities in various Pacific Island countries found that Neiafu Harbour in Vava'u was one of Tonga's most disturbed areas (Chesher, 1995; UNEP-WCMC, 2015). Within the Vava'u group itself, the outer islands subject to oceanic influences are in better condition than those around the main island and even better than those close to inhabited areas, making these reefs more valuable (Imirizaldu, 2015). Land clearing and the construction of roads and causeways, such as on 'Uta Vava'u, has caused sedimentation and disrupted the natural water flows, resulting in reef and mangrove mortality (UNEP-WCMC, 2015). This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score =3)

There are at least three raw datasets for coral reefs, one for humpback whales, one for nesting turtles, six peer-reviewed papers and five reports available for marine habitats of Vava'u, especially the coral reefs and marine mammals. These is also ample (at least six sources) anecdotal evidence from residents and scientists who have conducted research in these areas. There is less material available for offshore waters, but some of this can be inferred from information about similar environments (see L1, 3 and 4).

Obligations (score = 3)

There are obligations to protect and sustainably manage fish and invertebrate species associated with coral reefs, seagrass beds, mangroves, pelagic ecosystems and seamounts within the Fisheries Management Act 2002 and subordinate regulations, including terms and conditions associated with licenses. There are obligations also for the protection of sharks under Tonga's National Plan of Action for Sharks 2014–2016 (Kimley pers. comm., see http://voices.nationalgeographic.com/2016/01/12/sharks-use-seamounts-as-compass-to-navigate-undersea/) (Tonga Fisheries Division & Pacific Islands Forum Fisheries Agency, 2013). The Whale Watching and Swimming Act 2009, Whale Watching Regulation 2013 pertains to the protection of humpback whales and other marine mammals targeted by the tourism industry. The Whale Watching Act offers a level of control over whale watching tourism, which could potentially pose a threat to mother and calf pairs (Kessler et al., 2013), and all of Tongan waters has been considered for a whale sanctuary although no final decision has been made. Corals, some clams, sea cucumbers, groupers, sharks, pelagic fishes, dolphins and whales are listed under the IUCN Red List and CITES. The Convention on Biological Diversity lists obligations to protect fisheries resources, threatened species and habitats such as coral reefs. The National Forest Policy (2008) has provision for the protection of mangroves and other wetland ecosystems.

Sites identified by the BIORAP were Fonua one one, Vaka Eitu, Eueiki, Fangasito Islands, and across the channel from Lotuma island for corals (Fenner, 2015), Maninita, Taula, 'Euakafa Island and 'Euaiki Islands for fish diversity (Stone, 2015); Toku, Fangasito, Maninita and 'Euakafa Islands for the restoration of target fish populations (Imirizaldu, 2015); whilst the central and southern islands were most speciose in terms of macroinvertebrates (Bauman, 2015) and Fonualei and Toku Islands were identified as potential spawning grounds (Stone, 2015). In terms of overall reef condition, Taula Island and surrounding reefs, Fangasito, Euakafa and Eueiki Islands were considered in best condition (Webster, 2015). Fangasito, Maninita and Taula are also part of the southern Vava'u islands identified as a special, unique site for turtle nesting, sharks and coral reefs in good condition (see Site V 1: Southern Vava'u islands and turtle nesting sites and Site V 4: Vava'u Southern Bank). Fonualei and Toku islands were suggested as a further site for their high densities of higher trophic level fish (see Site V 2: Fonualei and Toku Islands).

3.1.8 SITE L 8: Tongatapu and ‘Eua whale areas

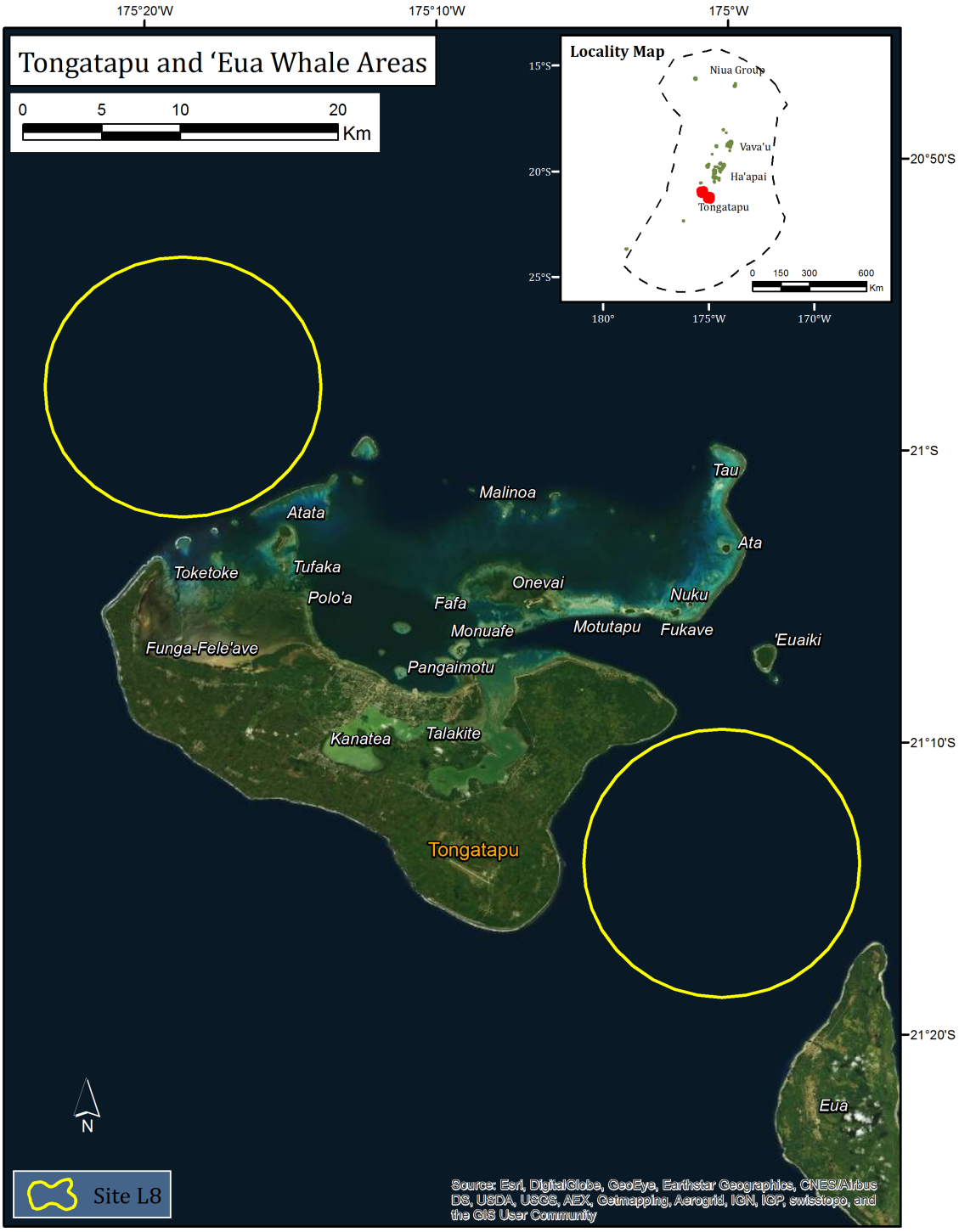

FIGURE 8. SITE L 8: Tongatapu and ‘Eua whale areas

TABLE 8. SITE L 8: Tongatapu and ‘Eua whale areas. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Large-scale special, unique site	Tongatapu and ‘Eua whale areas	L8	6

Geographic boundaries

Tongatapu (-20.8967, -175.3957) and (-21.0311, -175.2270);
Eua (-21.1530, -175.07560) and (-21.3182, -174.9319)

Geographic description (score = 1)

The general marine area around the two most southern islands of Tonga, ‘Eua and Tongatapu, host the initial annual arrival of the humpback whales into Tongan waters. The geographic area seems loosely defined and includes a rectangular swathe of ocean around the islands.

Justification (score = 1)

A description of the humpback whale population in Tonga is given in Site L 4: Vava’u Waters. Humpback whales travel from Antarctica to Tonga every year between May and November (http://www.deepbluediving.to/ Accessed 26/05/16). They come to mate, give birth and socialize; female humpback whales arrive heavily pregnant. After a month or two of their arrival, they give birth to a calf that they then nurse to build up their blubber to survive the journey back to Antarctica in November. Humpback whales arrive at the two most southern islands of ‘Eua and Tongatapu before any other islands in Tonga. Many whales stay in these two southern islands while others travel further north (http://www.deepbluediving.to/ Accessed 26/05/16). These whales support whale watching tourism in the area (pers. comm. R. Bing, L. Matoto). Whale habitat is specifically listed as a feature of EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 2)

Peer-reviewed information and data on humpback whale populations in Tonga was only available for Vava’u. The main source of information about humpback whales in waters around Tongatapu and ‘Eua in particular was a website advertising whale watching, and expert advice from workshop participants.

Obligations (score = 2)

Tourism activities associated with whales are controlled by the Whale Watching and Swimming Regulations, 2013 (pers. comm. R. Bing, L. Matoto). There are further obligations for protecting whales under the Fisheries Management Act 2002, Environment Management Act, and Whale Watching and Swimming Act 2009. Humpback whales are on the IUCN Red List and protected under CITES.

3.1.9 SITE L 9: Canyons

Submarine canyons are defined as “steep-walled, sinuous valleys with V-shaped cross sections, axes sloping outward as continuously as river-cut land canyons and relief comparable to even the largest of land canyons” (Shephard, 1964). “Large” canyons were mapped in Tonga and are defined as extending over a depth range of at least 1,000 m and as being incised at least 100 m into the slope at some point along their thalweg (lowest part of the valley)(Harris & Whiteway, 2011). The aim of this study is to assess the global occurrence of large submarine canyons to provide context and guidance for discussions regarding canyon occurrence, distribution, geological and oceanographic significance and conservation. Based on an analysis of the ETOPO1 data set, this study has compiled the first inventory of 5849 separate large submarine canyons in the world ocean. Active continental margins contain 15% more canyons (2586, equal to 44.2% of all canyons.

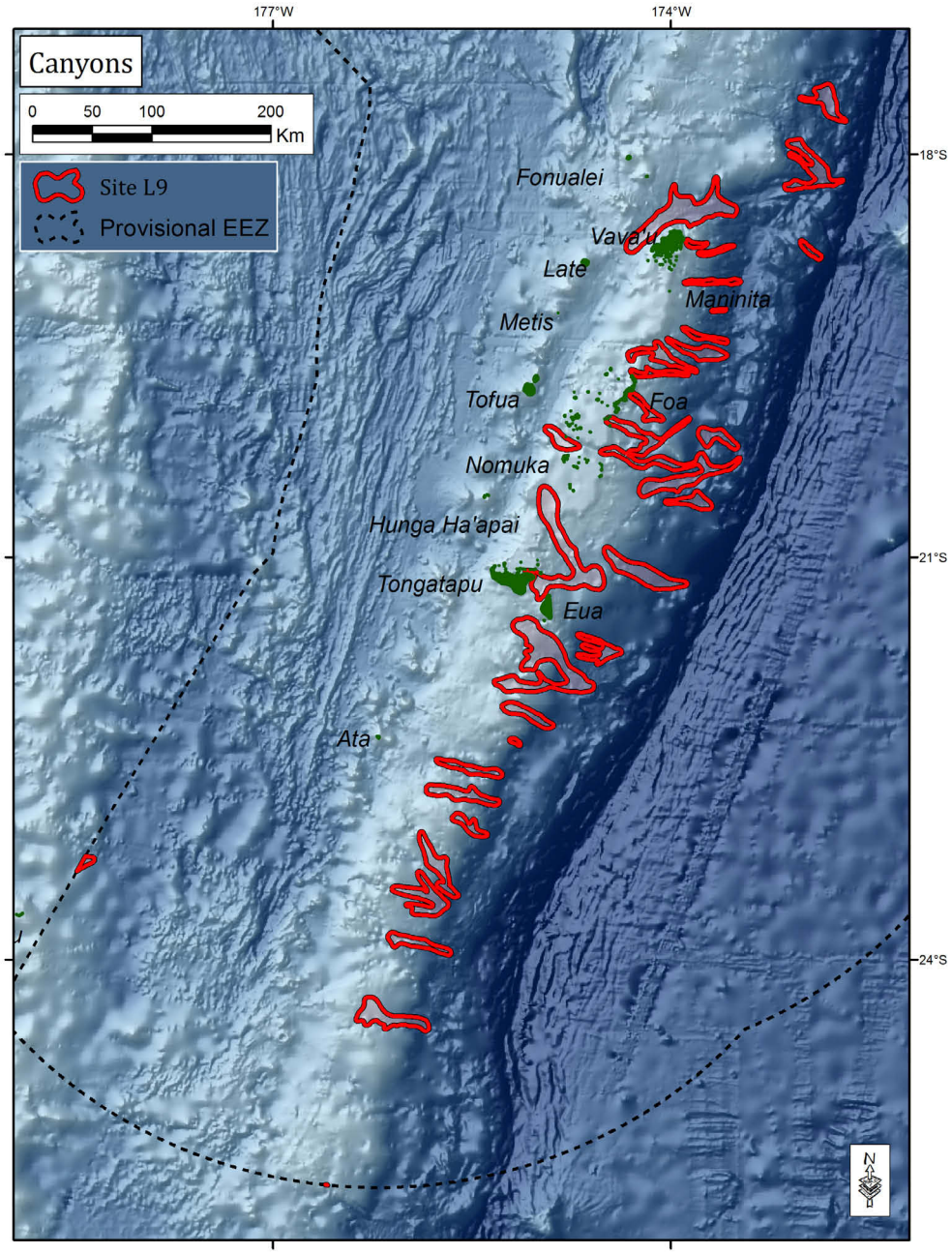

FIGURE 9. SITE L 9: Canyons

TABLE 9. SITE L 9: Canyons (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Large-scale special, unique site	Canyons	L8	8.5

Geographic boundaries

(-24.1052, -178.9924) and (-18.2143, -171.6797)

Geographic description (score = 2)

Geographic location: Tonga has 37 deepwater canyons, some of which are interlinked. They run east of the island chain or interspersed it in a south, south-westerly direction from 17.5°S, 172.8°W to 24.5°S and 176°W. Their geographic boundaries are defined as per Harris et al. (2014). See also Figure 9.

Justification (score = 2.5)

Submarine canyons are features along continental and oceanic island margins that connect continental shelves to deep ocean basins (De Leo et al., 2010). Submarine canyons are diverse and complex in terms of their origins, hydrography, geologic settings, sediment transport and accumulation and biodiversity (Harris et al 2014). Unusual physical oceanographic conditions inside canyons, such as accelerated currents and dense-water cascades, can be caused by topographic and climate forcing, increasing suspended particulate matter concentrations and transport of organic matter from coastal zones to the deep ocean. These phenomena can be responsible for enhancing both pelagic and benthic productivity inside canyon habitats as well as biodiversity of many benthic faunal groups (De Leo et al., 2010). The combination of steep rocky slopes, strong currents and enhanced access to food makes submarine canyons places of special ecological significance (Harris et al., 2014).

Canyons often have strong currents and a lot of water movement up and down the depth range, moving sediments, nutrients and small organisms. This creates ideal conditions for feeding and spawning, so canyons have high biomass and biodiversity (De Leo et al., 2010). For example, the La Jolla Canyon off southern California has been shown to have as much as 50 times the biomass than surrounding areas of shelf and slope (Vetter and Dayton, 1998). Megafaunal species richness and diversity generally also tend to be higher within canyons, especially for the highly mobile taxa (Vetter et al., 2010). These include whales, dolphins, seabirds and top-level marine predators such as sharks and tuna. They are also corridors of connectivity between deep and shallow habitats – so entire canyons and their adjacent shallow waters are interconnected (Environment Australia 2003).

Incising the continental shelf, they are typically characterized by high spatial heterogeneity and complex hydrographic patterns, and can act as conduits for larvae and organic matter from the shelf to the deep sea (Tyler et al., 2009; Vetter and Dayton, 1998). Thirty-six submersible dives delivered video and photographic evidence of higher abundances of highly mobile fishes and invertebrates compared with nearby slopes at the same depth, supporting the concept that canyons may be important sources of larvae for surrounding habitats (Vetter et al., 2010).

Typical canyon-related processes, including locally enhanced internal tides and focussed downslope organic carbon transport, provide favourable environmental conditions (current regime, food input) to sustain deepwater azooxanthellate coral communities (Huvenne et al., 2011). In this way, deep-sea canyons can form natural refuges for faunal communities sensitive to anthropogenic disturbance, and have the potential to fulfil the crucial role of larval sources for the recolonisation of damaged sites elsewhere (Huvenne et al., 2011). This site coincides with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 2)

No studies specific to Tonga's canyons were found, but the generic results of research into deepwater canyons certainly apply to Tonga's canyons and are used here: eight peer-reviewed papers provided the source of this information.

Obligations (score = 2)

Some of the animals generally found associate with canyons e.g. whales, sharks, seabirds will likely include species that are IUCN Red Listed or CITES listed.

3.2 FINER SCALE BIOPHYSICALLY SPECIAL, UNIQUE MARINE SITES

3.2.1 Niuatoputapu Island Group

3.2.1.1 SITE N 1: SOUTHEAST NIUATOPUTAPU

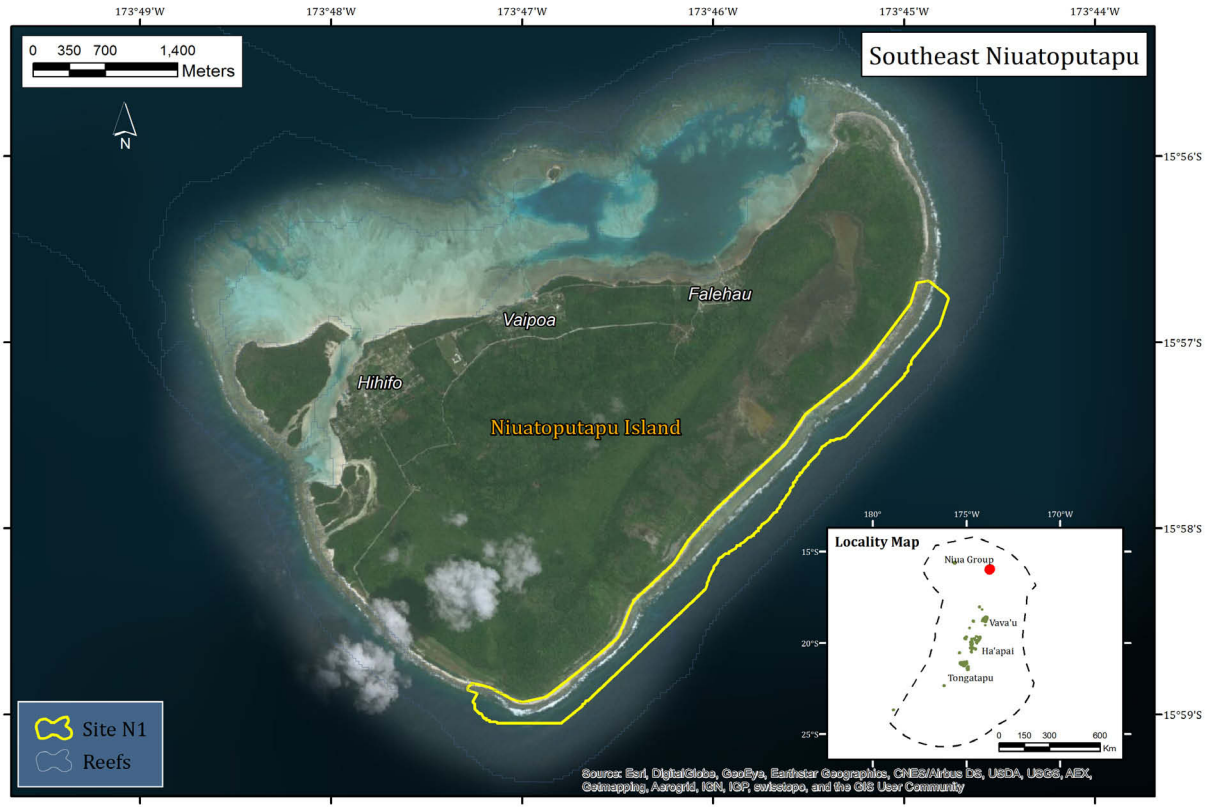

FIGURE 10. SITE N 1: Southeast Niuatoputapu

TABLE 10. SITE N 1: Southeast Niuatoputapu. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Niuatoputapu Island Group	Southeast Niuatoputapu	N1	8

Geographic boundaries

(-15.9815, -173.7887) and (-15.9498, -173.7426)

Geographic description (score =3)

Niuatoputapu is a high island in the far north of the country (15.9567°S, 173.7783°W), almost entirely surrounded by fringing coral reef. The southeastern side appears to be more exposed to the prevailing swell than the northern side, and has a narrow reef flat, reef crest and slope. The defined area incorporates the shallow reef flat and intertidal area around Niuatoputapu, from approximately the Mata'aho Airport at the southern end to the northeastern curve of the island.

Justification (score =2)

On the southeastern side of Niuatoputapu, near the airport, at Tahililku, there are high abundances of marine gastropods (for example, sea snails – 'Elili', family Turbinidae) and coastal coconut crabs ('u'u')), which are biologically significant (Ministry of Lands, Environment, Climate Change and Natural Resources, 2014).

Turban snails (Elili) are commonly harvested gastropods vulnerable to overexploitation. They tend to be herbivorous grazers, and therefore assist in keeping algal biomass low, which favours coral recruitment and therefore healthy coral communities (Cooling and Smith, 2015). Areas where they are still found in high densities can indicate that the reef is generally not overexploited, and can serve as sources of larvae for other, more depleted reef areas.

Coconut crabs are highly prized throughout the Pacific, including Tonga. They are the largest terrestrial arthropod in the world and can weigh up to 4kg, with a marine larval phase, acting as scavengers on beaches and intertidal areas (Drew et al., 2010). Pacific and Indian Ocean populations are genetically distinct (Lavery et al., 1996). Recruitment is likely to be limited, making relatively intact populations difficult to find (Drew et al., 2010). The coconut crab's well-developed lungs and independence from the marine environment as an adult make it unique among crustaceans. They are vulnerable to overexploitation, and because of their popularity as a food source, they have disappeared almost entirely from some areas (Lavery et al., 1996). Sites with high aboundances of coconut crabs therefore indicate a relatively intact environment.

Type and number of sources (score =1)

Sources include three peer-reviewed papers about turban snails and coconut crabs, the key features of this site; none of these were specific to Tonga. Expert advice from the workshop confirmed the presence of these species at the site.

Obligations (score = 2)

The Fisheries Management Act 2002 and Environment Management Act both state obligations for harvesting or protecting coconut crabs and other shallow water organisms. The Convention on Biological Diversity lists obligations to protect fisheries resources. Coconut crabs are listed as 'Data Deficient' on the IUCN Red List.

3.2.1.2 SITE N 2: TAFAHI ISLAND NESTING SITE

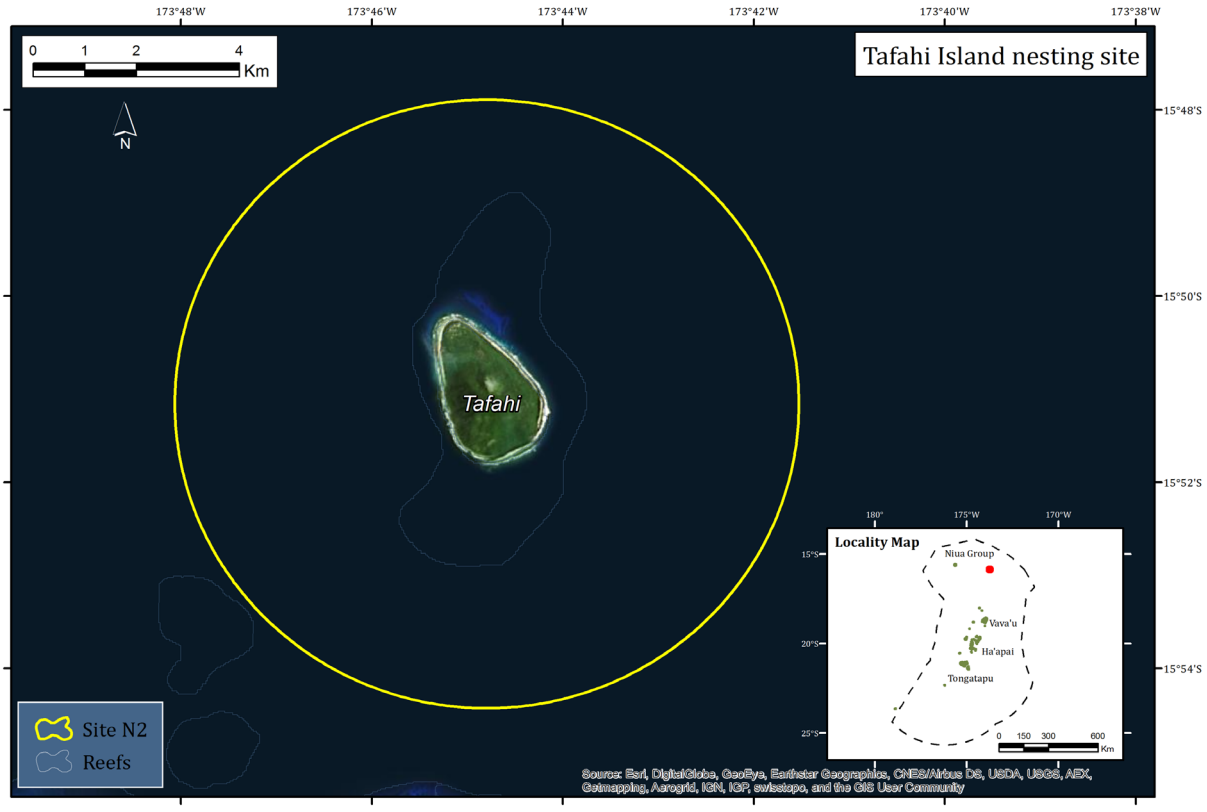

FIGURE 11. SITE N 2: Tafahi Island nesting site

TABLE 11. SITE N 2: Tafahi Island nesting site. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Niuatoputapu Island Group	Tafahi Island nesting site	N2	8.5

Geographic boundaries

(-15.7971), -173.79998) and (-15.9082, -173.6933)

Geographic description (score =2)

Tafahi Island (15.85º S, 173.71º W) lies north of the Vava'u Island group, covers 3.4 km^2 and its peak reaches an altitude of 506m (http://islands.unep.ch/IKY.htm). The site includes seabird and turtle nesting areas, which are concentrated along the shoreline and the band of vegetation directly landward of the beach, as well as surrounding seabird and turtle foraging areas out to at least 5km from the coast (Dobbs et al., 2007). Seabird foraging ranges can vary from 10s to 100s of kilometers.

Justification (score = 2.5)

North of Niuatoputapu Island, Tafahi Island is a nesting site for both turtles and seabirds (pers. comm. K Fakaosi).

The main species of sea turtle nesting on Tongan beaches are the green turtle and the hawksbill turtle (https://www.livingoceansfoundation.org/sea-turtles-of-tongs/). Effective conservation of sea turtles includes identifying and protecting their nesting beaches, such as the beaches of Tafahi Island, and the surrounding foraging area. All turtle species are in need of conservation efforts, making all intact nesting and feeding habitats highly valuable. Their diets include seaweed and seagrasses (green turtle) and invertebrates (hawksbill). Their foraging enhances the productivity and health of seagrass beds, aids nutrient cycling, and regulates sponge densities on coral reefs (Wilson et al., 2006). The nesting activities of both turtles and seabirds introduce nutrients into otherwise nutrient-poor and oligotrophic systems, and are an integral component of dune ecosystems (Wilson et al., 2006). Seabirds are top predators in parts of the ocean where they forage, and their feeding and breeding activities create a unique connectivity between terrestrial and marine habitats (Birdlife International, 2009).

Human impacts affect sea turtle populations at each stage of their life cycle, from the destruction and invasion of their nesting beaches, to the introduction of plastic debris into the ocean, which can be ingested, to the killing of sea turtles with fishing gear and boat strikes. All seven species of sea turtles around the world are threatened by human activities (see obligations section below).

Most seabirds are adapted for extensive migrations, feeding on or just below the ocean's surface, and nesting in colonies on beaches and in other coastal habitats. Seabirds that nest on Pacific Islands often lay their eggs in rudimentary nests on shrub-like vegetation, in crevices or holes dug in the sand, or directly on the ground. Seabird counts in Vava'u have recorded 21 species of seabird (http://vepanews.blogspot.com.au/2013/01/nesting-colonies-of-vavaus-outer-islands.html), and Birdlife International lists 22 seabird species for the country (http://datazone.birdlife.org/country/tonga), but a detailed search suggests there are 43 species whose range extends into Tongan waters. Recently, a survey of Maninita Island stressed the importance of undeveloped islands for the protection of breeding seabird populations, stating that Tonga has lost 78% of its landbird species; only 13 species of seabirds still maintain viable breeding colonies on Tongan Islands (Bull et al., 2002). The black and brown noddies, brown booby and black-naped tern are the most commonly recorded species (Steadman and Freifeld, 1999).

TABLE 12. SEABIRD SPECIES RECORDED IN TONGA

Common name	Species	Occurrence in Tonga / IUCN Red List Status (IUCN, 2016)	Notes
Light-mantled albatross	*Phoebetria palpebrata*	Rare, Accidental/ Near-threatened	Found in Tafahi
Wandering albatross	*Diomedea exulans*	Extant / Vulnerable	Found in Tafahi
Southern giant-petrel	*Macronectes giganteus*	Rare, Accidental / Least Concern	
Cape petrel	*Daption capense*	Extant / Least Concern	
Gray-faced petrel	*Pterodroma gouldi*	Rare, Accidental / Least Concern	
Kermadec petrel	*Pterodroma neglecta*	Extant / Least Concern	
Herald petrel	*Pterodroma heraldica*	Extant / Least Concern	Breeding population in Tonga, including Tafahi
Mottled petrel	*Pterodroma inexpectata*	Extant / Near Threatened	
White-necked petrel	*Pterodroma cervicalis*	Extant / Vulnerable	Found in Tafahi
Black-winged petrel	*Pterodroma nigripennis*	Extant / Least Concern	
Gould's petrel	*Pterodroma leucoptera*	Rare, Accidental / Vulnerable	
Collared petrel	*Pterodroma brevipes*	Rare, Accidental / Vulnerable	
Phoenix petrel	*Pterodroma alba*	Rare, Accidental / Endangered	Listed as previously resident, but now extinct, in Tonga
Tahiti petrel	*Pseudobulweria rostrata*	Extant / Near Threatened	Found in Tafahi
Black petrel	*Procellaria parkinsoni*	Rare, Accidental / Vulnerable	Found in Tafahi
Wedge-tailed shearwater	*Ardenna pacifica*	Extant / Least Concern	Occurs in the 'Ata Island Important Bird Area
Buller's shearwater	*Ardenna bulleri*	Rare, Accidental / Vulnerable	
Flesh-footed shearwater	*Ardenna carneipes*	Extant / Near Threatened	Migrates through Tonga
Sooty shearwater	*Ardenna grisea*	Extant / Near Threatened	
Short-tailed shearwater	*Ardenna tenuirostris*	Extant / Least Concern	
Tropical shearwater	*Puffinus bailloni*	Extant / Least Concern	Resident in Tonga
Black-bellied storm-petrel	*Fregetta tropica*	Rare, Accidental / Least Concern	
Polynesian storm-petrel	*Nesofregetta fuliginosa*	Extant / Endangered	
White-tailed tropicbird*	*Phaethon lepturus*	Extant / Least Concern	Found in Tafahi
Red-tailed tropicbird*	*Phaethon rubricauda*	Extant / Least Concern	
Lesser frigatebird*	*Fregata ariel*	Extant / Least Concern	Resident in Tonga, including Tafahi
Great frigatebird*	*Fregata minor*	Extant / Least Concern	Found in Tafahi
Masked booby*	*Sula dactylatra*	Extant / Least Concern	Resident in Tonga, including Tafahi
Brown booby*	*Sula leucogaster*	Extant / Least Concern	Breeding population in Tonga, occurs in Tafahi and the 'Ata Island Important Bird Area
Red-footed booby*	*Sula sula*	Extant / Least Concern	Occurs in the 'Ata Island Important Bird Area and in Tafahi
Pacific reef-heron	*Egretta sacra*	Extant / Least Concern	
Brown skua	*Catharacta antarctica*	Rare, Accidental / Least Concern	
Parasitic jaeger	*Stercorarius parasiticus*	Rare, Accidental / Least Concern	Found in Tafahi
Brown noddy*	*Anous stolidus*	Extant / Least Concern	Breeding population in Tonga, including Tafahi
Black noddy*	*Anous minutus*	Extant / Least Concern	Resident in Tonga, occurs in the Maninita, Taula, Lualoli and Vava'u Marine IBAs, and Tafahi
Lesser noddy	*Anous tenuirostris*	Extant / Least Concern	Breeding population in Tonga, including Tafahi
Gray noddy*	*Procelsterna albivitta*	Extant / Least Concern	Resident in Tonga
Blue-gray noddy*	*Procelsterna cerulea*	Presence Uncertain / Least Concern	
White tern*	*Gygis alba*	Extant / Least Concern	Resident in Tonga, including Tafahi
Sooty tern	*Onychoprion fuscatus*	Extant / Least Concern	Breeding population in Tonga, occurs in the Fonualei IBA and on Tafahi
Gray-backed tern	*Onychoprion lunatus*	Extant / Least Concern	
Black-naped tern	*Sterna sumatrana*	Extant / Least Concern	Resident in Tonga
Great crested tern	*Thalasseus bergii*	Extant / Least Concern	Breeding population in Tonga

The exact list of species that nest on Tafahi Island is unknown. Gibbons (2015) observed “boobies, tropicbirds, frigatebirds, white terns, and noddies” nesting on Tafahi Island, but did not list the exact species. They are likely to include a subset of the species identified with an “*” in the table above.

Type and number of sources (score =2)

Sources include two peer-reviewed papers on turtle and seabird foraging ranges, one report on the role and vulnerability of turtles; and two peer-reviewed papers and three websites relating specifically to Tonga. Information about the site itself was provided by expert advice during the workshop.

Obligations (score = 3)

The Fisheries Management Act 2002 contains regulations about the harvest of turtle and seabird eggs. Turtles and seabirds are further protected under the Environment Management Act and the Bird & Preservation Act Cap 125. Tonga is a signatory of the Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia. Species occurring in Tongan waters include the green (*Chelonia mydas)* – Endangered, loggerhead *(Caretta caretta)* – Vulnerable, hawksbill, *(Eretmochelys imbricata)* – Critically Endangered and leatherback *(Dermochelys coriacea)* – Vulnerable. Turtles are also protected under CITES. Seabirds are also covered by IUCN and CITES (see table 12 above). The Convention on Biological Diversity lists obligations to protect threatened species and their habitats.

3.2.1.3 SITE N 3: NORTHERN NIUATOPUTAPU KALOAMA

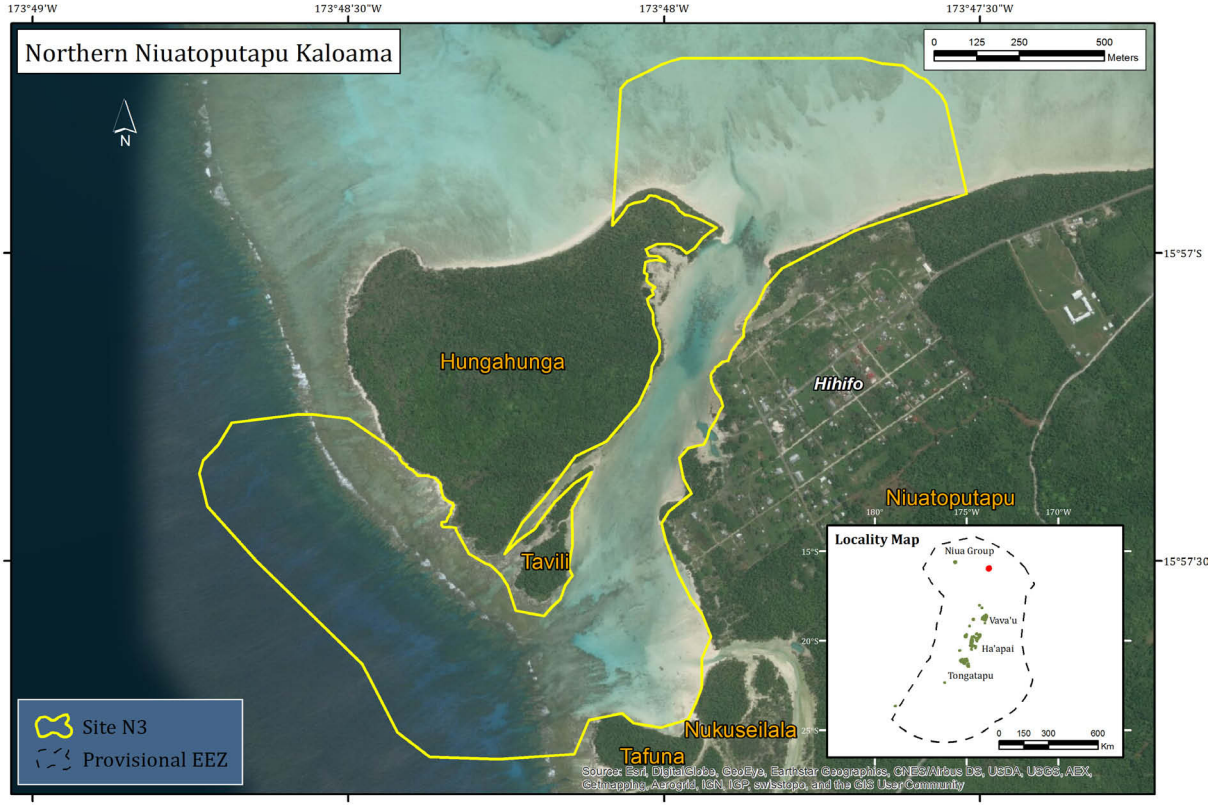

FIGURE 12. SITE N 3: Northern Niuatoputapu Kaloama

TABLE 13. SITE N 3: Northern Niuatoputapu Kaloama. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Niuatoputapu Island Group	Northern Niuatoputapu Kaloama	N3	6

Geographic boundaries

(-15.9561, -173.8131) and (-15.9519, -173.7872)

Geographic description (score =3)

The site is the shallow reef on the northern side of Niuatoputapu Island, following the reef edge contour.

Justification (score = 1)

Kaloama (goatfish) are a commercially valuable and ecologically important family of coral reef fishes, usually found around areas of soft sediment between reef patches. Aggregation sites for feeding and spawning are recognised as being important for conservation, as protecting breeding grounds can ensure the persistence of the population.

The North side of Niuatoputapu is well knows as a Kaloama (goatfish) breeding ground (Ministry of Lands, Environment, Climate Change and Natural Resources, 2014). Goatfish are important for artisanal fisheries in many countries (Kolasinski et al., 2009; Uiblein, 2007). They are usually benthic carnivores, with barbels that are both sensory and muscular to seek and extract invertebrates from soft substrata; they are likely to influence the distribution and abundance of soft-sediment invertebrate assemblages (Kolasinski et al., 2009). Their highly active foraging behaviour stirs up sediment and promotes sediment resuspension, as well as the formation of mixed- species foraging associations; these traits may contribute significantly to food webs in sand-associated coastal ecosystems (Uiblein, 2007). Additionally, goatfish numbers respond rapidly to coral loss, potentially providing a warning sign of reef degradation (Russ et al., 2015).

Goatfish also feature as prey items of species of conservation significance; goatfish (larvae and small individuals) feature prominently in the diets of a number of foraging seabirds, for example (Monticelli et al., 2008; Surman and Wooller, 2003). The abundance of goatfish responds readily to exploitation and protection, suggesting that they may serve as useful indicators for ecosystem condition (Uiblein, 2007).

Reef fish breed by spawning, or releasing gametes into the water for external fertilization; most species form aggregations to maximize the likelihood of success. Spawning aggregations of reef fishes occur periodically, with individuals often travelling long distances to a particular site to spawn in high densities. This critical event occurs in conjunction with certain phases of the moon or tidal cycles, to further maximize the likelihood of fertilization (Domeier and Colin, 1997). Spawning aggregations are especially vulnerable to fishing, as the high density is an artificial and temporary phenomenon that aggregates individuals from a wide area, and targeting them rapidly depletes fish populations from a broad catchment (Abesamis et al., 2014). Thus, the known breeding grounds such as the northern Niuatoputapu area are of special importance.

Type and number of sources (score =1)

Sources include seven peer-reviewed papers on goatfish in general and spawning aggregations in general. There is mention of the site in one technical report, and expert advice from the workshop.

Obligations (score = 1)

The catch of coral reef fishes is regulated through the Fisheries Management Act 2002, and to some degree through the Environment Management Act. The Convention on Biological Diversity lists obligations to protect fisheries resources.

3.2.1.4 **SITE N 4**: TAFAHI ISLAND COCONUT CRAB

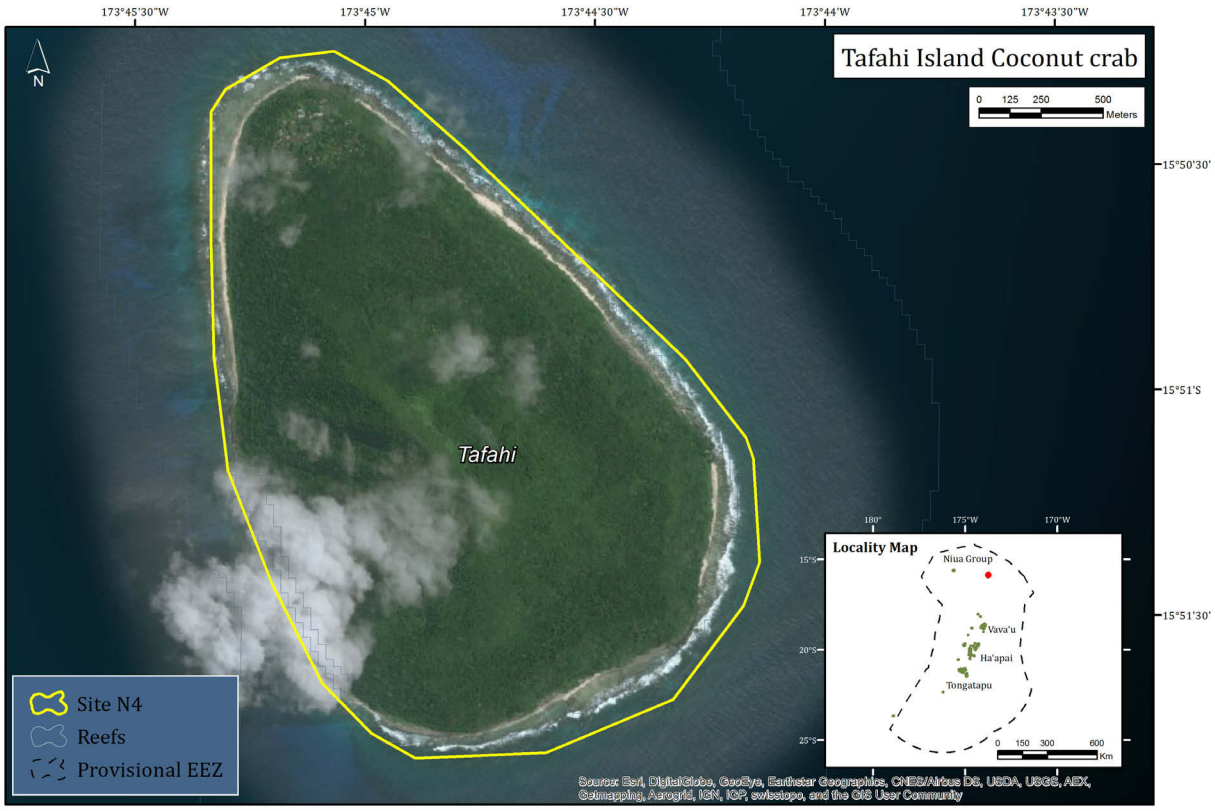

FIGURE 13. SITE N 4: Tafahi Island coconut crab

TABLE 14. SITE N 4: Tafahi Island coconut crab. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Niuatoputapu Island Group	Tafahi Island coconut crab	N4	6

Geographic boundaries

(-15.8357, -173.7519) and (-15.8676, -173.7448)

Geographic description (score =2)

This site covers the coconut crab habitat on Tafahi Island, which includes terrestrial habitats and the adjacent nearshore marine environment that supports the pelagic larval stage of the species.

Justification (score = 1)

Tafahi Island is north of Niauatoputapu and is home to a significant population of coconut crabs (‘u’u’) (Ministry of Lands, Environment, Climate Change and Natural Resources, 2014). Coconut crabs are a prized food source and are vulnerable to overexploitation, with few intact populations remaining. Their special and unique features are reviewed at Site N 1: Southeast Niuatoputapu. Identifying and protecting significant populations can provide an opportunity to establish baseline densities and set benchmarks for protection and management.

Type and number of sources (score = 2)

Sources include two peer-reviewed papers about coconut crabs; these were not specific to Tonga. One report highlighted the importance of coconut crabs to Tongan artisanal fisheries. Expert advice from the workshop confirmed the presence of these species at the site.

Obligations (score = 1)

The harvest of coconut crabs is regulated by the Fisheries Management Act 2002. The crabs are also protected under the Environment Management Act. Coconut crabs are listed as Data Deficient on the IUCN Red List. The Convention on Biological Diversity lists obligations to protect fisheries resources.

3.2.2 Vava'u Island Group

3.2.2.1 SITE V 1: SOUTHERN VAVA'U ISLANDS AND TURTLE NESTING SITES

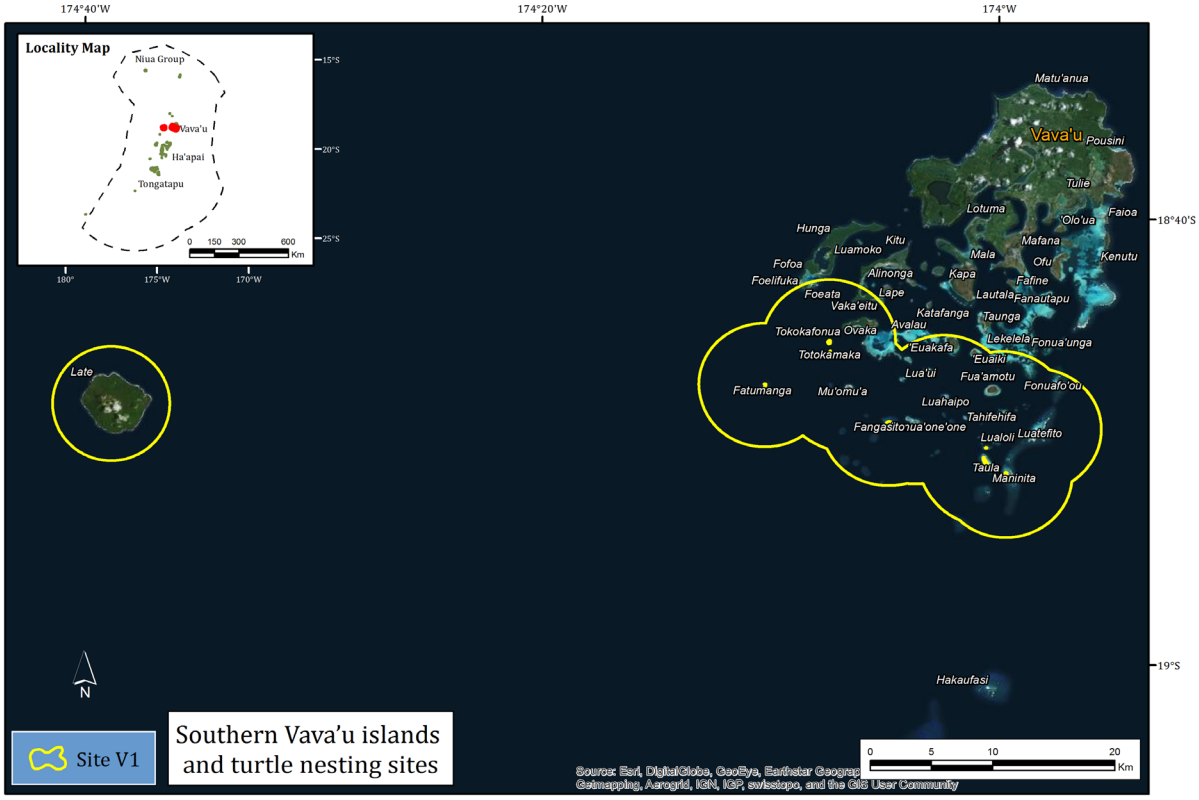

FIGURE 14. SITE V 1: Southern Vava'u islands and turtle nesting sites

TABLE 15. SITE V 1: Southern Vava'u islands and turtle nesting sites. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Vava'u Island Group	Va'vau turtle nesting sites	V1	11

Geographic boundaries

Vava'u uninhabited islands (-18.6857, -174.1822) and (-18.9219, -173.9606);
Late (-18.7642, -174.6931) and (-18.8446, -174.6028)

Geographic description (score = 2)

This site includes the group of uninhabitated islands and surrounding waters in the southern half of the Vava'u Island group, south of a line running between Foelifuka and Fonuafo'ou. The site covers, for example, Fatumanga, Tokokafonua, Totokamaka, Fangasito, Luahipo, Tahifehifa, Luatefito, Lualoli, Taula, Fonua'one'one and Maninita Islands and surrounding waters of each island out to 5km offshore (Dobbs et al., 2007). Also part of this site is the Blue Lagoon of Foeata Island.

Justification (score = 3)

These southernmost islands of the Vava'u archipelago have relatively high diversity of corals, reef fishes and sharks; they also contain turtle nesting sites, high marine mammal populations (seasonally), seabird nesting and potential fish spawning grounds (pers. comm. K. Stone, Atherton et al., 2015; Vava'u Turtle Monitoring Program, 2013).

Coral reef communities in Vava'u have been discussed for Site L 3: Inshore marine areas and Site L 4: Vava'u Waters; including the special value of these reefs further away from human influence.

High densities of sharks are considered a sign of a healthy marine ecosystem. Top predators are typically the first to disappear from marine ecosystems under any degree of fishing pressure, as they are preferentially targeted by most fisheries and/or killed by fishermen when caught as by-catch (Friedlander and DeMartini, 2002; Graham et al., 2010; Hisano et al., 2011; Sandin et al., 2008). Their high commercial value combined with their K-selected life-history (slow growth, late maturity, low fecundity) reduces productivity of apex predators and inhibits recovery of exploited populations under continued fishing pressure (Collette et al., 2011; Pauly et al., 1998; Stevens et al., 2000). In some habitats, anthropogenic impacts have reduced the abundance of apex predators by 90 % or more (Myers and Worm, 2003). The removal of apex predators may result in trophic cascades, with changes occurring throughout the food web, sometimes down to primary producers (Estes et al., 2011). Recent surveys of Vava'u's reefs reported low densities of sharks; only the relatively remote islands, including this site (e.g. Maninita), supported sharks (Bruckner, 2014; Ceccarelli, 2016; Stone, 2015).

Whales and seabirds have been discussed for Site L 4: Vava'u Waters and for Site N 2: Tafahi Island nesting site; the premise that undeveloped islands are especially valuable for nesting seabirds was also referenced (Steadman and Freifeld, 1999).

The archipelago of the Kingdom of Tonga is home to the endangered green sea turtles, *Chelonia mydas* and critically endangered hawksbill sea turtles, *Eretmochelys imbricata.* Populations of both species reside here throughout the year, and migrate from other Pacific Islands to nest on these beaches (Havea and MacKay, 2009). The importance of these turtle species is discussed above for Site N 2: Tafahi Island nesting site and also applies to this site.

Turtle nesting has historically occurred on many islands throughout the Vava'u island group (Atherton et al., 2015). However, due to human impacts, there is now only limited turtle nesting in Vava'u and the nests that do occur are subject to poaching. Beaches on the more remote islands of Vava'u that serve as nesting grounds for green and hawksbill turtles are becoming more important as beaches closer to population centres pose greater risks such as egg harvesting, habitat loss and pests (Atherton et al., 2015).

All the uninhabited islands of Vava'u remain important turtle nesting sites, and the marine areas 5km around those islands are important aggregation and foraging areas during nesting season, which is from October to February, with peak nesting occurring in December. Additional important turtle foraging grounds include Blue Lagoon of Foeata Island, Hunga Lagoon of Hunga Island and the waters surrounding Mala Island (http://www.seaturtle.org/mtn/archives/mtn123/mtn123p15.shtml, accessed 26/5/16; pers. comm. T. Halafihi, K. Stone; Dobbs et al 2007, Atherton et al 2015, Vava'u Turtle Monitoring Program 2013). This site coincides with EBSA 26 – Tongan Archipelago, which specifically refers to the presence of green turtles (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 3)

Sources include one peer-reviewed paper, five reports (see also sources for Site N 2: Tafahi Island nesting site) and expert advice based on direct experience of the sites. Information on sharks was supplemented with eight general peer-reviewed papers, and the EBSA report refers to turtles in Tonga. Some of the information is based directly on a turtle monitoring programme taking place in Vava'u *(*http://tongaturtles.weebly.com/index.html *accessed 23.02.2017).*

Obligations (score = 3)

Both the Fisheries and Environment Management Acts refer to obligations to protect marine turtles and their nesting and foraging habitats. Both turtle species, a number of coral and reef fish species and reef sharks are listed on the IUCN Red List and are protected under CITES. There are obligations for the protection of sharks under Tonga's National Plan of Action for Sharks 2014–2016. The Convention on Biological Diversity lists obligations to protect threatened species and their habitats.

3.2.2.2 SITE V 2: FONUALEI AND TOKU ISLANDS

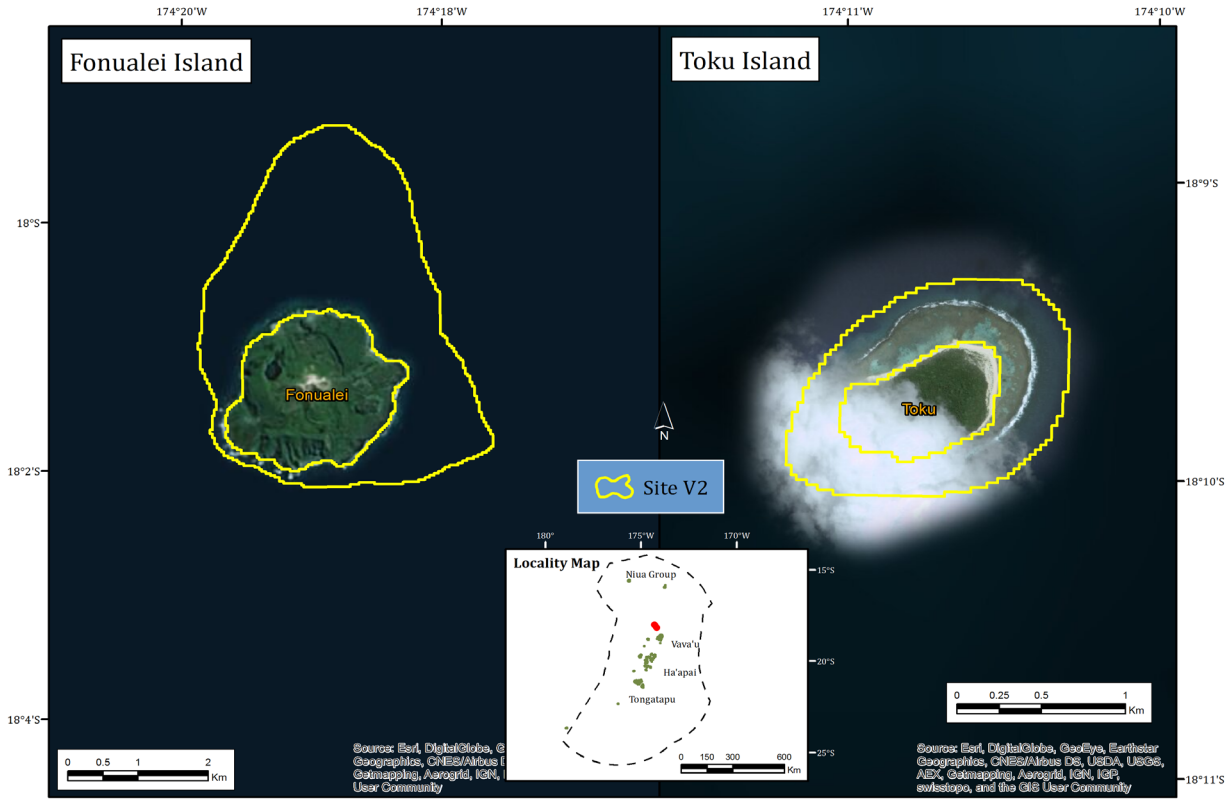

FIGURE 15. SITE V 2: Fonualei and Toku Islands

TABLE 16. SITE V 2: Fonualei and Toku Islands. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Vava'u Island Group	Fonualei and Toku Islands	V2	12

Geographic boundaries

(-17.9835, -174.3126) and (-18.1879, -174.2011)

Geographic description (score =3)

This site encompasses the land and shallow reef areas around Fonualei and Toku Islands.

Justification (score = 3)

Northwest of the main islands in the Vava'u Archipelago are Fonualei and Toku Islands (37 and 27 nautical miles distant, respectively) noted for their relatively intact populations of large, higher trophic level reef fishes. The reefs of these two islands are unusual; Fonualei's reef has developed on volcanic rock, and Toku has oceanic pinnacle characteristics (BioRAP). Fonualei Island is important for snapper and sharks, the relocated Tongan megapode (*Megapodius pritchardii, a bird endemic to Tonga), seabird nesting and, probably, a grouper spawning ground* (Birdlife International, 2004; Imirizaldu, 2015). Toku Island has, relative to other places in Vava'u, a higher diversity of fish species, especially commercially targeted species (Stone, 2015). Green and hawksbill turtles and bottlenose dolphins have been observed in the waters around the two islands (Atherton et al., 2015).

The importance of breeding and spawning grounds for reef fishes is explained above for Site N 3: Northern Niuatoputapu Kaloama, as is their vulnerability to fishing pressure. Thus, the relatively intact spawning aggregations on the reefs around Fonualei and Toku Islands are of special importance.

Marine surveys of Toku and Fonualei are rare, due to their isolation and high degree of exposure. The recent BIORAP

identified Fonualei as having low marine macroinvertebrate species richness, but Toku had very high species richness, most probably due to the nature of the surveyed habitats (Bauman, 2015). Both reefs had high abundances of sea cucumbers, probably due to their distance from the larger population centres. The distance from the main island was also thought to be the main driver of the high density of snappers (Lutjanidae) and groupers (Serranidae) (Imirizaldu, 2015). Sites relatively unimpacted by fisheries efforts, such as the marine environment around Fonualei and Toku Islands, are special, including in Tonga.

Megapodes were successfully introduced to Fonualei in the 1990s, and surveys in 2003 showed a doubling of the population (Birdlife International, 2004; Geocare & Petroleum Consult Ltd, 2010). A number of nesting seabird species were recorded in 2013, including the brown booby, red-footed booby, great and lesser frigatebirds, sooty terns, white terns, red-tailed tropicbirds, brown and black noddies, golden plovers and some land-based birds (Geocare & Petroleum Consult Ltd, 2010). More than 100 000 sooty terns (*Sterna fuscata) are estimated to breed in the volcanic crater on Fonualei* (Pagad, 2013). The survey also noted a lack of invasive rats. Such large numbers of seabirds would use the surrounding marine environment for foraging. This site coincides with EBSA 26 – Tongan Archipelago, which specifically refers to the importance of seabird nesting habitats (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 3)

This site was subject to direct surveys by the SPREP BIORAP team, resulting in a peer-reviewed report, and at least three online and unpublished sources exist for the megapode. Peer-reviewed information on the importance of some of the species present at the site, coming from studies in other areas, is also available (see relevant sections above). The EBSA report provides a further Tonga-wide reference for the importance of these islands to nesting seabirds.

Obligations (score = 3)

Both the Fisheries and Environment Management Acts refer to obligations to protect these natural attributes, especially pertaining to the catch of snappers and groupers, and the protection of spawning aggregations. Sharks are protected under the Shark Protection Act, and the Tongan Bird and Preservation Act, Cap 125, protects the megapode from overexploitation. Many species present at this site are listed on the IUCN Red List and protected under CITES. Fonualei Island is proposed by MEIDECC as a conservation area.

3.2.2.3 SITE V 3: ‘UTA VAVA’U SPAWNING GROUNDS

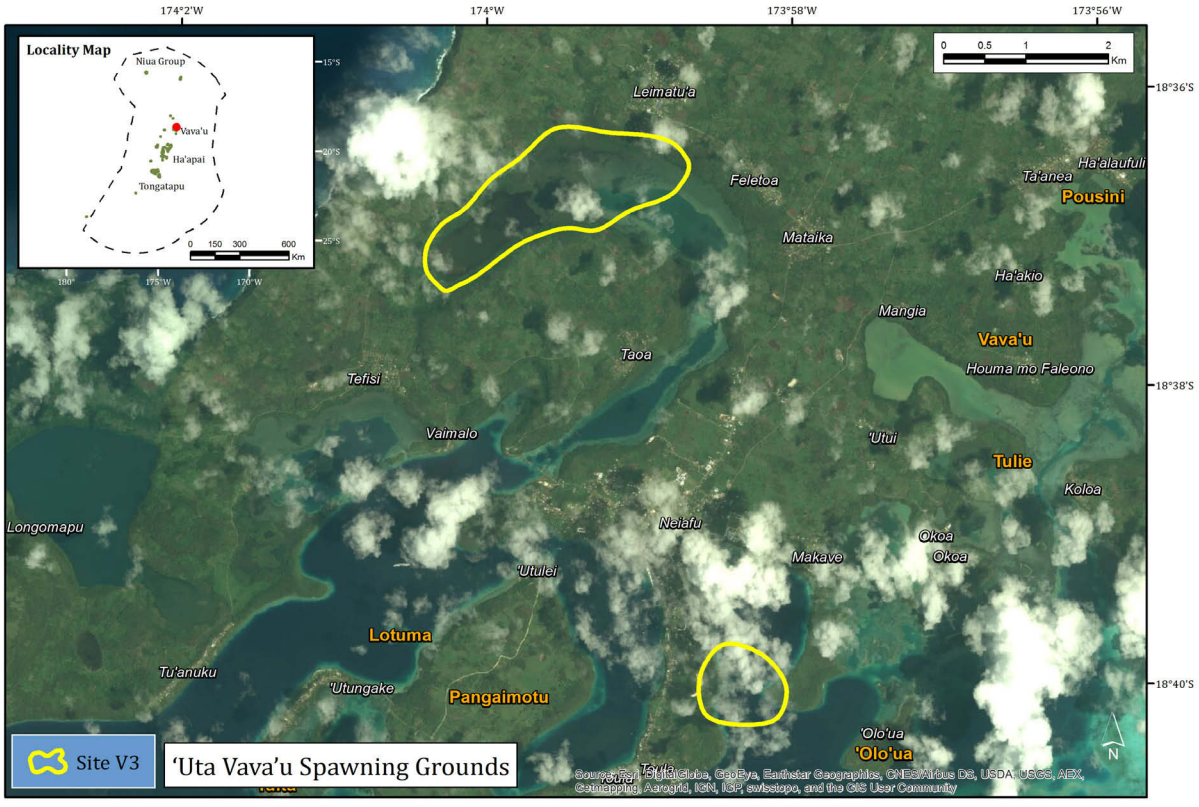

FIGURE 16. SITE V 3: ‘Uta Vava’u spawning grounds

TABLE 17. SITE V 3: 'Uta Vava'u spawning grounds. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Vava'u Island Group	'Uta Vava'u spawning grounds	V3	8.5

Geographic boundaries

Site 1: near Leimatua village: (-18.6120, -174.0102) and (-18.6114, -173.9768);
Site 2 – near Makave village (-18.6618, -173.9762) and (-18.6720, -173.9679)

Geographic description (score = 2)

This site encompasses two areas within the waters adjacent to the main island of Vava'u ('Uta Vava'u): the mangrove forest within the large lagoon near Laimatua Village, and the channel entrance to the old Vava'u Harbour.

Justification (score = 2)

Spawning and nursery areas for species of conservation significance (e.g. groupers) are often shallow inshore habitats at risk from habitat destruction and pollution. They include mangroves, seagrass beds and topographically and hydrodynamically complex areas such as channel entrances (Abesamis et al., 2014). 'Uta Vava'u, the largest island in the Vava'u Island group, is known to have at least two such areas.

There is an important mangrove nursery area within the large lagoon on Vava'u Island, near Laimatua Village. Mangroves are nursery grounds for a large number of crustacean and fish species that spend other parts of their life cycle elsewhere, such as coral reefs (Sheaves et al., 2016). A large number of species that spend their juvenile stages in mangrove areas are of conservation or commercial significance, and provide a crucial trophic link between terrestrial and marine habitats (Guannei et al., 2016). Depending on the composition, extent and health of a particular mangrove forest, they can be of variable quality as nursery habitats (Sheaves et al., 2016). The mangrove area near Laimatua Village has been recognized by the local community as a nursery area worth preserving (per. Comm. K. Stone).

The channel entrance to the old Vava'u Harbour, which lies at the opposite end of harbour from Makave Village, is a grouper spawning habitat. Many species of coral reef fishes form aggregations to spawn, to maximize the chances of fertilization (Domeier and Colin, 1997). This makes them vulnerable to overexploitation, because spawning aggregations guarantee high and easy catch rates (see also Site N 3: Northern Niuatoputapu Kaloama). Groupers are especially sensitive to overexploitation at spawning grounds (Abesamis et al., 2014). This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 1.5)

This information comes from communities and expert advice (pers. comm. K. Stone). General information about nursery habitats and spawning aggregations was found in four peer-reviewed papers.

Obligations (score = 3)

The protection of mangrove nursery habitats, fish species of commercial and conservation value, and fish spawning aggregation sites is prescribed under the Environment Management Act 2002 and Fisheries Management Act, 2002. Some grouper species are also listed on the IUCN Red List as Near Threatened, Threatened or Vulnerable. The National Forest Policy (2008) has provision for the protection of mangroves and other wetland ecosystems.

3.2.2.4 SITE V 4: VAVA'U SOUTHERN BANK

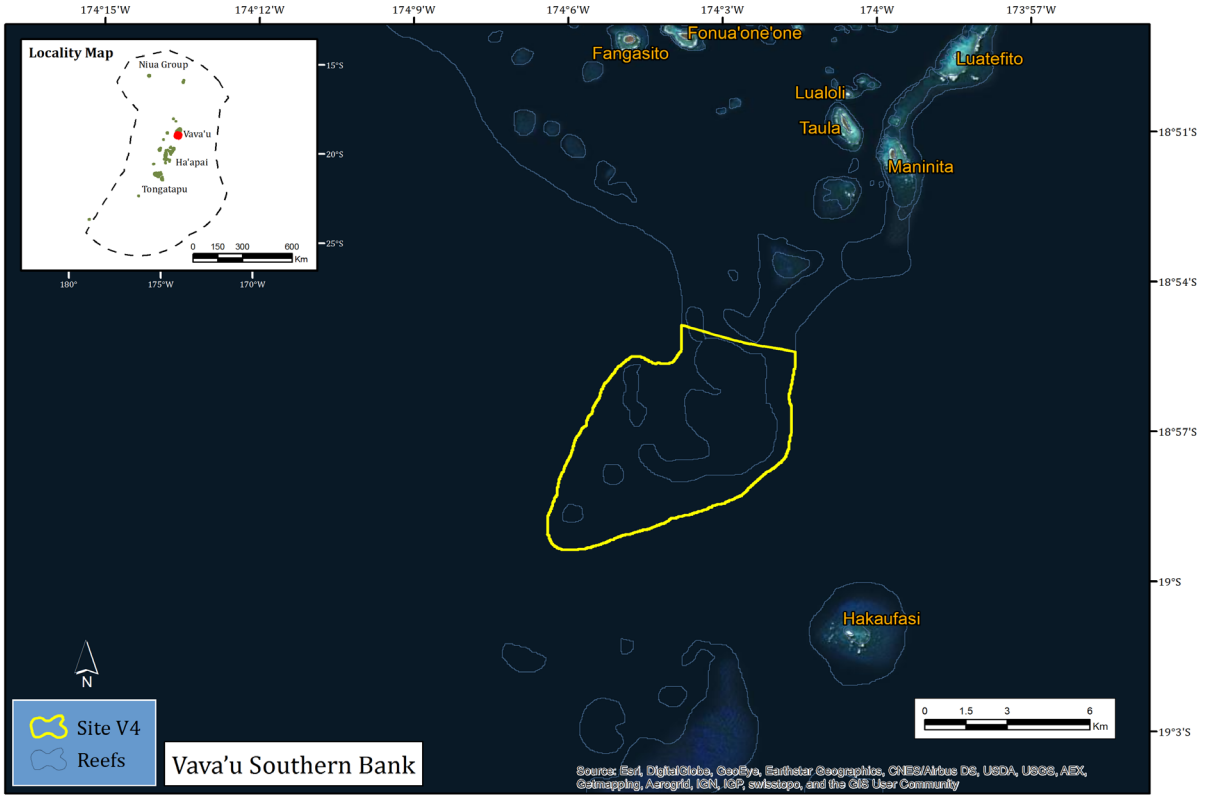

FIGURE 17. SITE V 4: Vava'u southern bank

TABLE 18. SITE V 4: Vava'u southern bank. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Vava'u Island Group	Vava'u southern bank	V4	10.5

Geographic boundaries

(-18.9877, -174.1091) and (-18.9249, -174.0210)

Geographic description (score = 3)

The site comprises of the lobe of shallow reef at the southern tip of the Vava'u Archipelago, between Mananita and Hakaufasi Islands.

Justification (score = 2.5))

The shallow lobe of reef at the Southern tip of the Vava'u Archipelago, by virtue of its position adjacent to open ocean pelagic habitats, is important for billfish and humpback whales (Pers. Comm. K. Stone, Atherton et al 2015). Vava'u is an especially important area for calving humpback whales (see Site L 4: Vava'u Waters). Banks and shallow areas south of Vava'u have been predicted as highly suitable habitat for adult humpback groups, which is consistent with results from satellite tagged humpback whales of New Caledonia which showed that whales move between New Caledonia and Tonga, and spend time around seamounts and shallow banks (Garrigue et al., 2010). Banks, shoals and reefs independent of islands can host the most pristine coral reef ecosystems.

Coral reefs around Maninita Island were surveyed by the BIORAP; these are the closest reefs to the site. It is assumed that there will be great similarity to the southern bank reefs and the reefs off Maninita Island. The latter displayed high diversity and abundance of coral and fish communities and was also reported to be in good condition (Atherton et al. 2015). See inshore areas (Site L 3: Inshore marine areas) and Vava'u marine areas (Site L 4: Vava'u Waters) for more detail about the coral reefs of Tonga.

Billfish are wide-ranging pelagic predators that aggregate around significant geomorphic features and exposed coral reefs, for feeding and spawning purposes (Morato et al., 2010). FishBase (Froese and Pauly, 2016) lists five species of billfish for Tonga: black marlin, striped marlin, Indo-Pacific blue marlin, short-billed spearfish and Indo-Pacific sailfish. Most data come from fisheries stock assessments; swordfish and striped marlin populations that frequent Tongan waters are assessed as part of the South-West Pacific Management Stock (Punt et al., 2015). Catch rates in Tongan waters have generally been higher for blue and black marlin, and lower for striped marlin (Williams and Bigelow, 1998).

Currently, little is known about significant areas for these pelagic species, but fisheries data show that they do aggregate, although their aggregation sites in Tonga are unknown. The identification of confirmed aggregation sites, or sites that are regularly visited, is important to guide future conservation efforts. Fishing charter websites (e.g. http://www.gamefishtonga.com/, http://www.bluemarlinmagic.fishing/location/, Accessed 17.02.2017) guarantee the presence of billfish in Vava'u, especially during the Austral summer, but do not give exact locations. This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 2)

Information for this site comes from personal communication and a peer-reviewed report. General knowledge about the species and habitats is readily available through peer-reviewed papers. Additional to the sources already listed for the sites above, there were two peer-reviewed papers on billfish in general, one report on billfish catch rates that included Tongan waters, and two websites specific to billfish in Vava'u.

Obligations (score = 3)

The Environment Management Act 2002, Fisheries Management Act 2002, Whale Watching Act 2003 and Whale Watching Regulation 2013 all set out obligations for the protection of coral reef habitats, billfish and whales. Humpback whales, corals and some billfish are listed on the IUCN Red List, and most are also protected under CITES. The Convention on Biological Diversity lists obligations to protect habitats such as coral reefs.

3.2.2.5 SITE V 5: LATE ISLAND AND HOME REEF

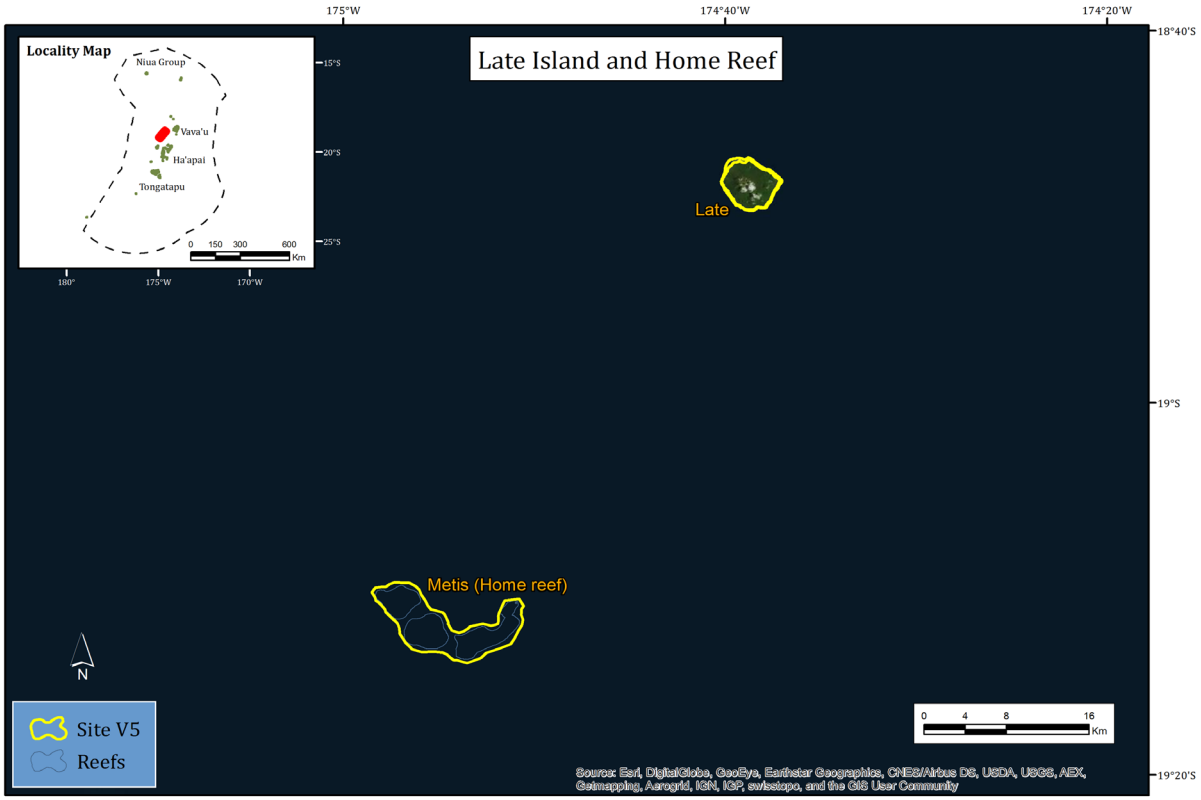

FIGURE 18. SITE V 5: Late Island and Home Reef

TABLE 19. SITE V 5: Late Island and Home Reef. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Vava'u Island Group	Late Island and Home Reef	V5	9.5

Geographic boundaries

Late: (-19.1568, -174.9731) and (-19.2391, -174.8500);
Home Reef: (-18.7732, -174.6587) and (-18.8352, -174.635744

Geographic description (score = 3)

Late Island and Home Reef, including nearshore coastal and shallow coral reef habitats and 5km around it which serves as foraging and resting areas for nesting turtles.

Justification (score = 2)

Late Island's reef and Home Reef are very important areas for corals and other reef and nearshore species, due to the lack of land-based pollution and low human impacts. Their remoteness lends the coral reef communities a degree of protection (through isolation). The relatively healthy and less exploited status of these habitats gives them a degree of resilience, and geographic isolation often leads to unique assemblages, genetic distinctness and the presence of endemics (see Site L 3: Inshore marine areas).

Late is also important as a turtle and seabird nesting island, also with reduced human disturbance due to its isolated location. (Pers. Comm. K. Stone, Atherton et al. 2015). See Site N 2: Tafahi Island nesting site above for more information on turtle and seabird nesting habitats. This site overlaps with EBSA 26 – Tongan Archipelago – which specifically notes the importance of the area for seabirds and turtles (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 1.5)

No peer-reviewed papers or reports, other than those providing general information identified previously, were available for this site. The importance of the site was confirmed through expert input and one technical report, and through inference from the distance of these reefs from human activities.

Obligations (score = 3)

There are legal obligations to protect turtle and bird nesting sites under the Parks and Reserve Act and the Fisheries Conservation (Management) Regulations 2010. Corals, turtles and seabirds are further afforded various levels of protection and management under the Environment Management Act 2002, Fisheries Management Act 2002 and Bird & Preservation Act, CAP 125. Corals and numerous coral reef species, as well as turtles and seabirds, are listed on the IUCN Red List and under CITES. The Convention on Biological Diversity lists obligations to protect coral reefs.

3.2.2.6 SITE V 6: WEST VAVA'U WETLANDS

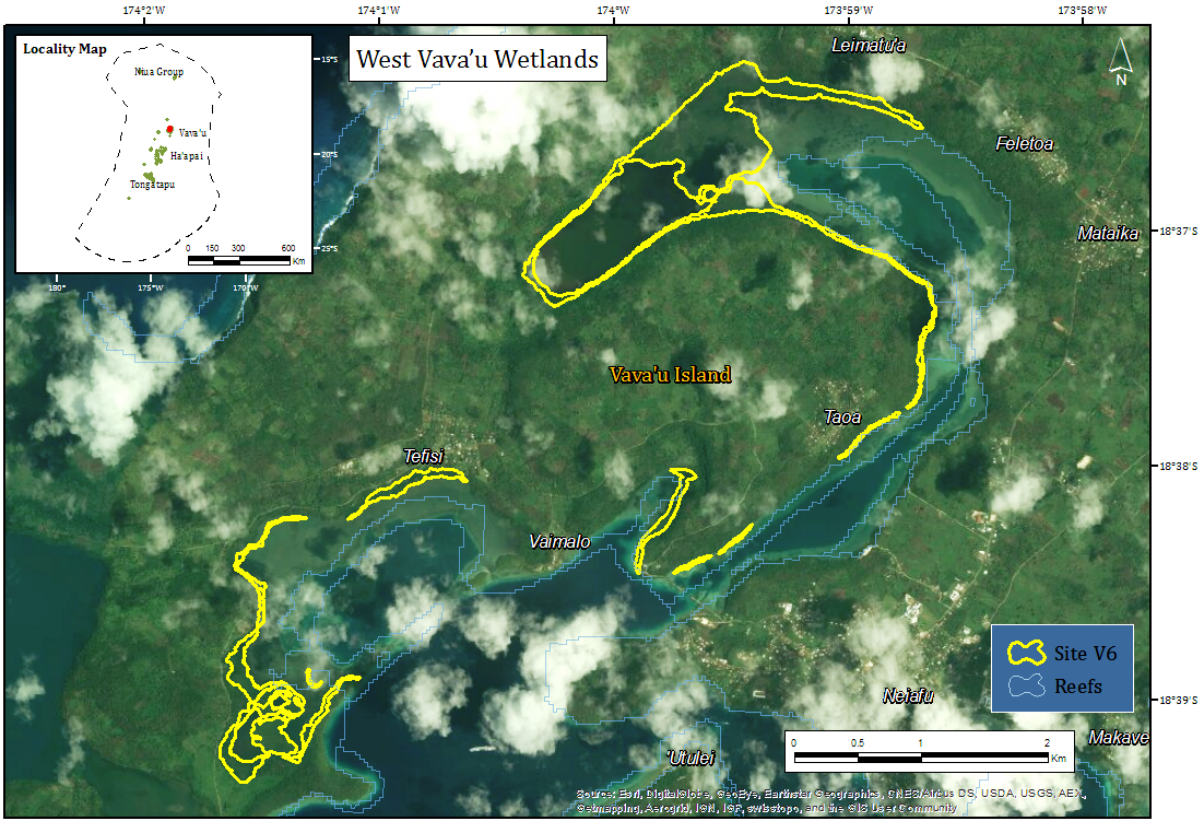

FIGURE 19. SITE V 6: West Vava'u wetlands

TABLE 20. SITE V 6: West Vava'u wetlands. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Vava'u Island Group	West Vava'u wetlands	V6	9.5

Geographic boundaries

(-18.6201, -173.9686) and -18.6441, -174.0368)

Geographic description (score = 2.5)

This site includes an area to the north of Tu'anuku, around Tefisi, known for the presence of seahorses. It also encompasses a shallow enclosed area or wetlands further north. They are known as Lake Ano and Ngofe Marsh, near Tu'anuku village at the west end of 'Uta Vava'u Island.

Justification (score = 2)

The shallow and enclosed habitats north of Tu'anuku include a freshwater marsh and an enclosed brackish lagoon, seahorse habitat and spawning grounds for milkfish (Chanos chanos), (K. Stone, pers. comm, and www.iwmi.org). Lake Ano (Lake Ono) is a large enclosed brackish lake near the west end of Vava'u. Ngofe Marsh is a small freshwater swamp in a depression to the south the lake. The swamp covers about 25 ha, and is completely overgrown with reeds, presumably Cyperus sp. No other similar habitats are known in Tonga.

Many seahorse and related species are threatened, to the point that the IUCN has a Seahorse, Pipefish and Stickleback Specialist Group (https://iucn-seahorse.org/). They are prized by the aquarium trade, and due to their cryptic nature they are extremely difficult to census or survey. The species present in Tonga include the seahorses Hippocampus histrix and H. kuda and the pipefishes Choeroichthys cinctus, Cosmocampus maxweberi, Solenostomus paradoxus and Syngnathoides biaculeatus. Which of these species are present at the site is unknown, but the identification of a known area for these cryptic species is uncommon.

The milkfish is one of the most important species in Tongan aquaculture (Izumi and Basco, 2014), and its ecology is one of continuous migration (Bagarinao, 1994), which indicates an important role in linking the food webs of inshore and offshore marine habitats. Milkfish are also wild-caught by local fishers. The importance of spawning aggregations, especially for commercially important species, is highlighted in Site N 3: Northern Niuatoputapu Kaloama.

Type and number of sources (score = 2)

There is one online source specifically describing the site, and there were three sources (two of them peer-reviewed) describing attributes of the site identified by the community, but not specifically about the site.

Obligations (score = 3)

There are no pieces of legislation specifically relating to wetlands in Tonga, and RAMSAR does not specifically mention Tongan wetlands. However, the Birds and Fish Preservation Act (1915, amended in 1974), the Forest Act (1961), the Parks and Reserves Act (1976) and the Public Health Act all have a bearing on the conservation of wetlands. Milkfish are provided for under the Fisheries Management Act 2002. The seahorses known to occur in Tonga (if not necessarily at the site) are listed as Vulnerable on the IUCN Red List, and are under Appendix II of CITES; the pipefishes are also listed on the IUCN Red List.

3.2.2.7 SITE V 7: CAPRICORN SEAMOUNT

A definition of seamounts is provided for Site L1 above. The Capricorn Seamount is technically a guyot, or a flattened seamount, which began as an emergent seamount and was then eroded and submerged (Harris et al., 2014). With a basal diameter of over 100 km, it is the largest seamount in Tonga.

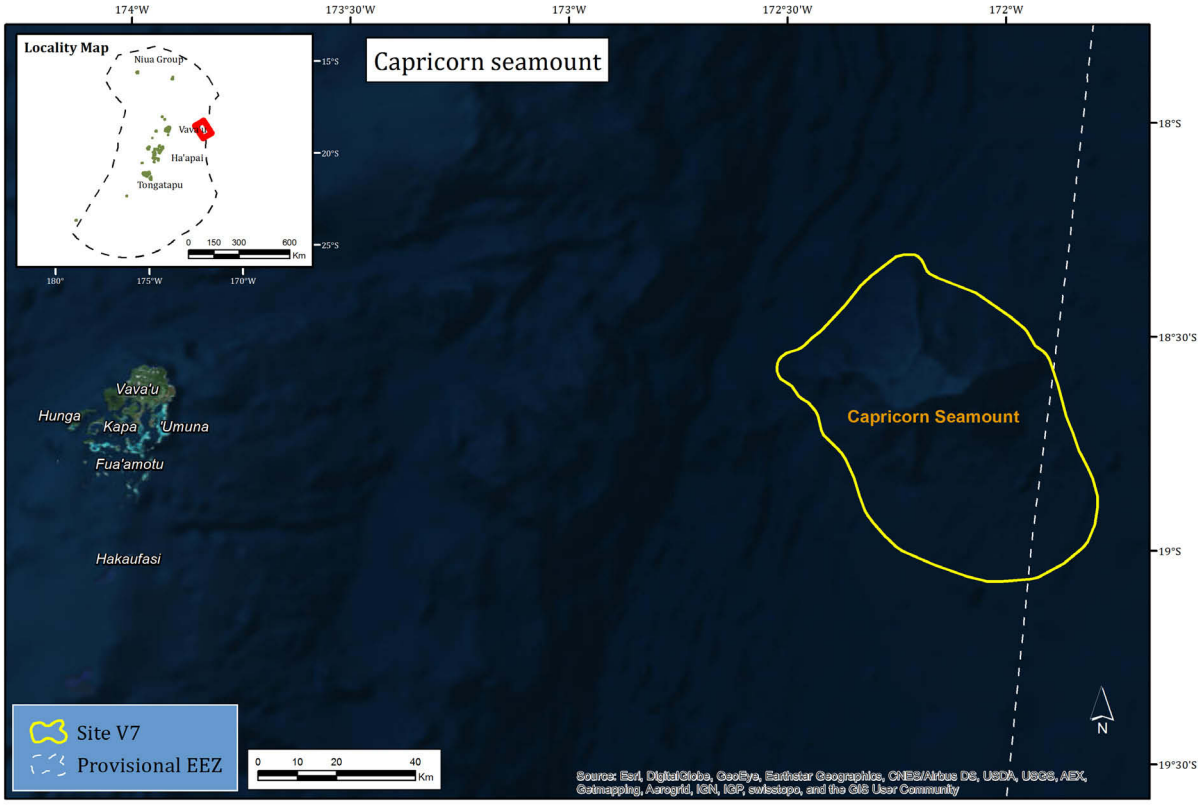

FIGURE 20. SITE V 7: Capricorn Seamount

TABLE 21. SITE V 7: Capricorn Seamount. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Vava'u Island Group	Capricorn Seamount	V7	10.5

Geographic boundaries

(-18.2224, -172.1069) and (-19.2001, -172.1414)

Geographic description (score = 3)

The Capricorn seamount (18°35'S, 172°12'W) is located almost 200 km east of the Vava'u island group.

Justification (score = 2.5)

The Capricorn guyot is the largest seamount in Tonga. Due to the movement of the ocean floor away from oceanic ridges, the sea floor in this region has been sinking gradually, and the flattened guyot was submerged to become an undersea flat-topped peak (www.utdallas.edu/~pujana/oceans/guyot.html, accessed 25/5/16). Data from seismic profiling and dredged samples suggest that it was once a volcanic island (https://books.google.ae/books?id=E8DEhXra8CAC&pg=PA37&lpg=PA37&dq=Capricorn+seamount&source=bl&ots=sCNHFVA5RZ&sig=pKk9ijUKcbOGfART9kyxhQVkE6E&hl=en&sa=X&ved=0ahUKEwihk4qt9fDRAhWL1RQKHetJCj0Q6AEIIjAC#v=onepage&q=Capricorn%20seamount&f=false , Accessed 15.02.2017).

Seamounts, guyots and similar undersea features provide habitat structure for benthic communities and aggregate pelagic species in an otherwise relatively featureless expanse of deep ocean (see Site L 1: Seamounts and ridges around 'Ata Island and Site L 5: Offshore west of Tongan Islands). This guyot contains a large number of species. For example, Kustanowicha (1962) found 87 species of Foraminifera alone. Many species are probably endemic to seamounts, and to guyots, in this part of the Pacific. It is the only guyot in Tonga (pers. comm. L. Matoto, Harris et al., 2014). The area of influence that the Capricornia Guyot extends to adjacent waters, due to its influence on seawater movements and consequent impact on marine life, to approximately 55m from its centre (Baker and Beaudoin, 2013). One of the features specified in EBSA 26 – Tongan Archipelago – is the Carpicorn Seamount, noted for the high productivity of the waters above it and the likelihood of finding cold-water stony corals on its slopes (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 2)

Only one peer-reviewed reference was found for the Capricorn Seamount, but a previous section (Site L 1: Seamounts and ridges around 'Ata Island) draws upon six relevant peer reviewed papers and three reports whose findings apply to all seamounts, and much of this information probably applies to this site. There was also information from three Tongan experts specific to Tonga's seamounts, and some information about the Capricorn Seamount in the EBSA report.

Obligations (score = 3)

There are obligations to protect and sustainably manage many fish species, including some associated with seamounts, within the Fisheries Management Act 2002 and subordinate regulations, including terms and conditions associated with licenses. The Environment Management Act 2010 also describes obligations to protect some of the features associated with seamounts. Humpback whales and some sharks found around seamounts are on the IUCN Red List and listed under CITES. There are obligations also for the protection of sharks under Tonga's National Plan of Action for Sharks 2014–2016, including sharks typically known to aggregate around seamounts (e.g. scalloped hammerhead shark (Kimley pers. comm. See http://voices.nationalgeographic.com/2016/01/12/sharks-use-seamounts-as-compass-to-navigate-undersea/))(Tonga Fisheries Division & Pacific Islands Forum Fisheries Agency, 2013).

3.2.3 Ha’apai Island Group

3.2.3.1 SITE H 1: HA’APAI TURTLE NESTING SITES

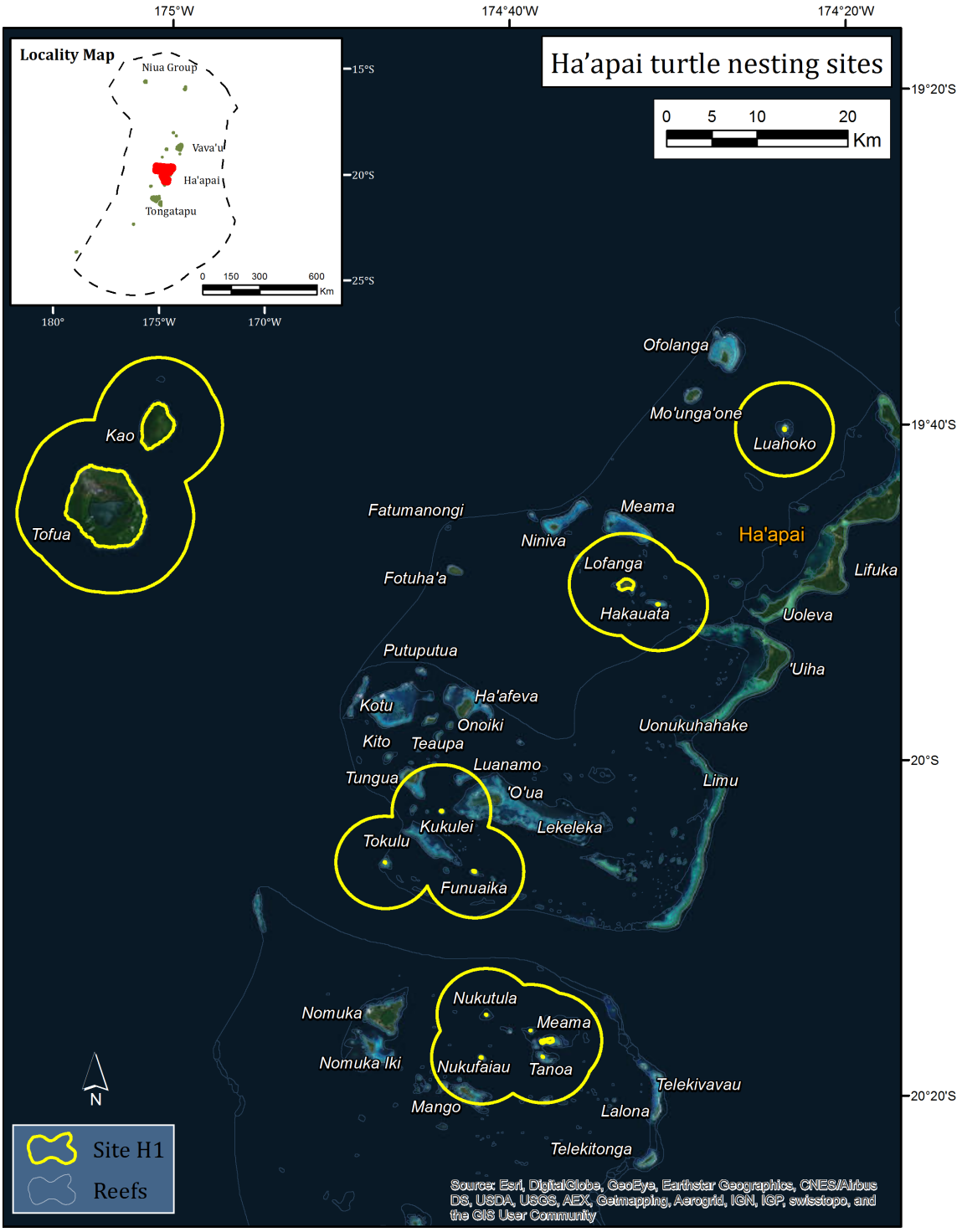

FIGURE 21. SITE H 1: Ha’apai turtle nesting sites

TABLE 22. SITE H 1: Ha’apai turtle nesting sites. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Ha’apai Island Group	Ha’apai turtle nesting sites	H1	8

Geographic boundaries

Tofua cluster: (-19.8039, -175.1743) and (-19.6226, -174.9349);
Lofanga cluster: (-19.7570, -174.5826) and (-19.90669, -174.4923);
Luahoko: (-19.6237, -174.4412) and -19.7193, -174.3470);
Tokulu cluster: (-20.0676, -174.8634) and (-20.1288, -174.6369);
Nukutula cluster: (-20.2012, -174.7324) and (-20.3559, -174.5848)

Geographic description (score = 2)

The key turtle nesting sites in Ha'apai are the uninhabited islands: Tofua, Luahoko, Hakau'ata and Lofaga Nukutula, Meama, Nuku'faiau, Tanoa, Kukulei, Tokulu, Funuaika and Luahoko. The site includes the sandy beach areas and surrounding waters of these islands, to at least 5km (Dobbs et al., 2007).

Justification (score = 1)

All the uninhabited islands of Ha'apai, such as Tofua, Luahoko, Hakau'ata and Lofaga Nukutula, Meama, Nuku'faiau, Tanoa, Kukulei, Tokulu, Funuaika and Luahoko, are important turtle nesting sites. The marine areas to at least 5km around those islands are therefore likely to be important aggregation areas during nesting season, from November to February (pers. comm. T. Halafihi, S. Vili, L. Matoto, V. Matoto, Dobbs et al., 2007). General information for nesting turtles is given for Site N 2: Tafahi Island nesting site. Specific information for Ha'apai was summarized by Havea and MacKay (2009) (http://www.seaturtle.org/mtn/archives/mtn123/mtn123p15.shtml). The nesting turtles include green and hawksbill turtles, with hawksbills predominating. At the time of their report, turtle hunting was still occurring in the Ha'apai islands, but perhaps not at the uninhabited islands listed above. This site overlaps with EBSA 26 – Tongan Archipelago – which specifically notes the importance of the area for turtles (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 2)

Additional to the peer-reviewed papers and reports giving general information on the importance of marine turtles and their nesting sites cited above, there was expert input on the importance of these islands in particular, and a web-based newsletter including data from social surveys.

Obligations (score = 3)

Both the Fisheries and Environment Management Acts refer to obligations to protect marine turtles and their nesting and foraging habitats. Both turtle species are listed on the IUCN Red List and are protected under CITES. The Convention on Biological Diversity lists obligations to protect threatened species and their habitats.

3.2.3.2 SITE H 2: OCTOPUS ("OCTAPUSY")

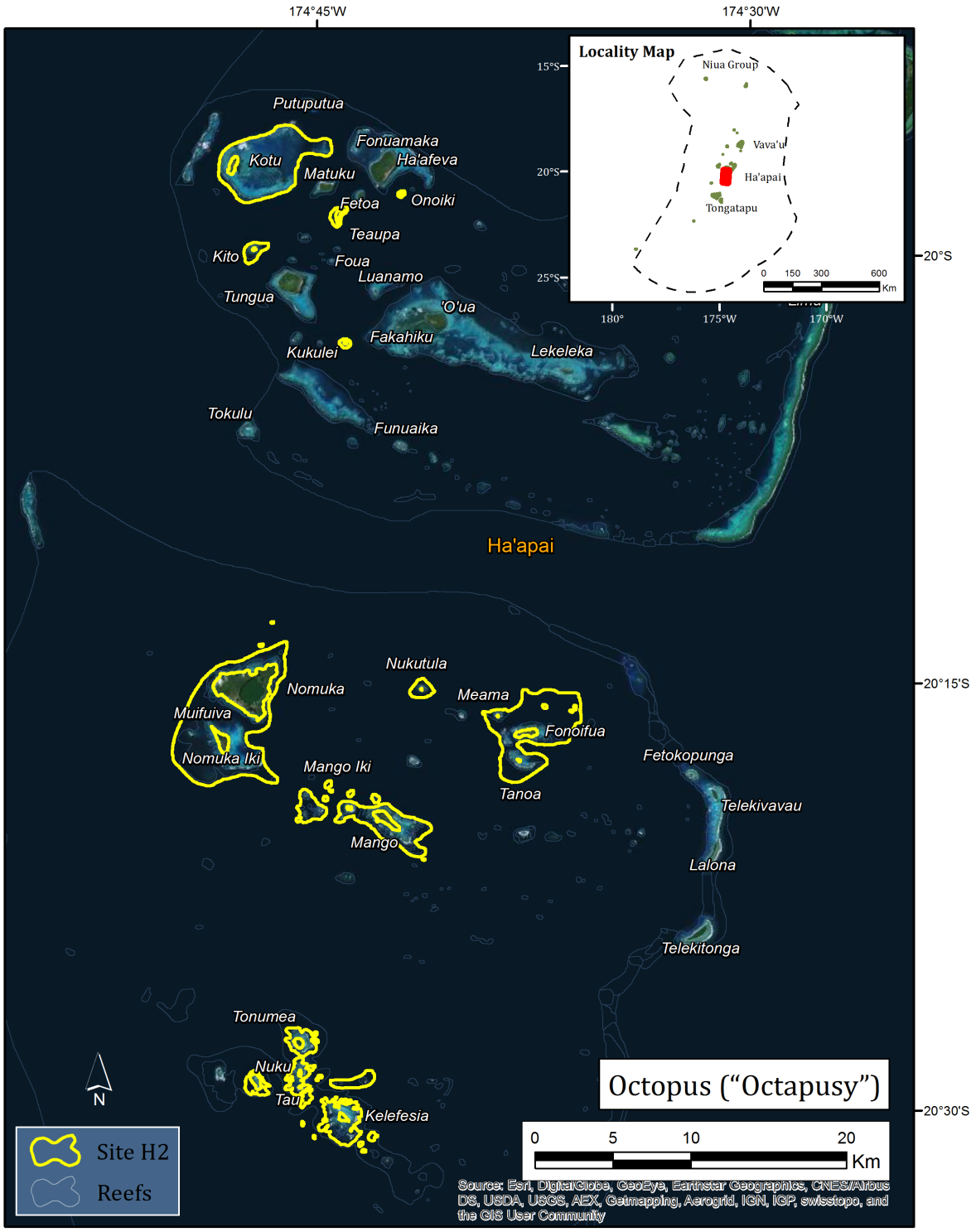

FIGURE 22. SITE H 2: Octopus ("Octapusy")

TABLE 23. SITE H 2: Octopus ("Octapusy"). Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale biophysically special, unique marine sites – Ha'apai Island Group	Octopus ("Octapusy")	H2	6.5

Geographic boundaries

(-20.5144, -174.8513) and (-19.9390, -174.5716)

Geographic description (score = 2)

Octopus are abundant in the shallow reef habitats around some islands in the “Lulunga” and “Nuòmu’a” part of Southern Ha’apai: Fonifua, Kotu, Kito, Onoiki, Teaupa and Kukulei.

Justification (score = 1)

A number of island in the Ha’apai group (in the “Lulunga” and “Nuòmu’a” areas) support high densities of octopus and other prized marine invertebrates, such as sea cucumbers. An unusually high density of octopus is found within the coastal areas of some islands in the “Lulunga” and “Nuòmu’a” part of Southern Ha’apai: Fonifua, Kotu, Kito, Onoiki, Teaupa, Kukulei. This is likely indicative of a relatively unique habitat and ecosystem (pers. comm. T. Halafihi, S. Vili). Coupled with the fact that these areas also tend to be rich in sea cucumbers, the high densities of octopus suggest that this could be a relatively intact environment, or that is has high resilience to artisanal fishing.

Octopus populations are a difficult resource to manage due to their short life span, rapid growth, high natural mortality, sensitivity to environmental conditions and difficulty in conducting surveys for stock assessments (Emery et al., 2016). Their overall sensitivity results in rapid declines when environmental pressure arises, but also rapid recovery during stable times or once pressures cease (Pierce et al., 2008). This makes them good indicators of overall environmental condition (Quetglas et al., 2016). Communities in Tonga, including in Ha’apai, often raise the declining number and size of octopus in their catch as one of their concerns (MAFFF, 2011). This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 1.5)

Three peer-reviewed references on the general importance of octopus, their life-history and value to fisheries, and their high sensitivity to environmental conditions were available from other marine regions. The importance of the listed islands to maintaining high octopus densities comes from expert advice, and the concern over declining octopus, specific to Ha’apai, was sourced from a Fisheries report.

Obligations (score = 2)

Both the Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect octopus populations. The Convention on Biological Diversity lists obligations to protect fisheries resources.

3.2.3.3 SITE H 3: NGĀ'ITŌ

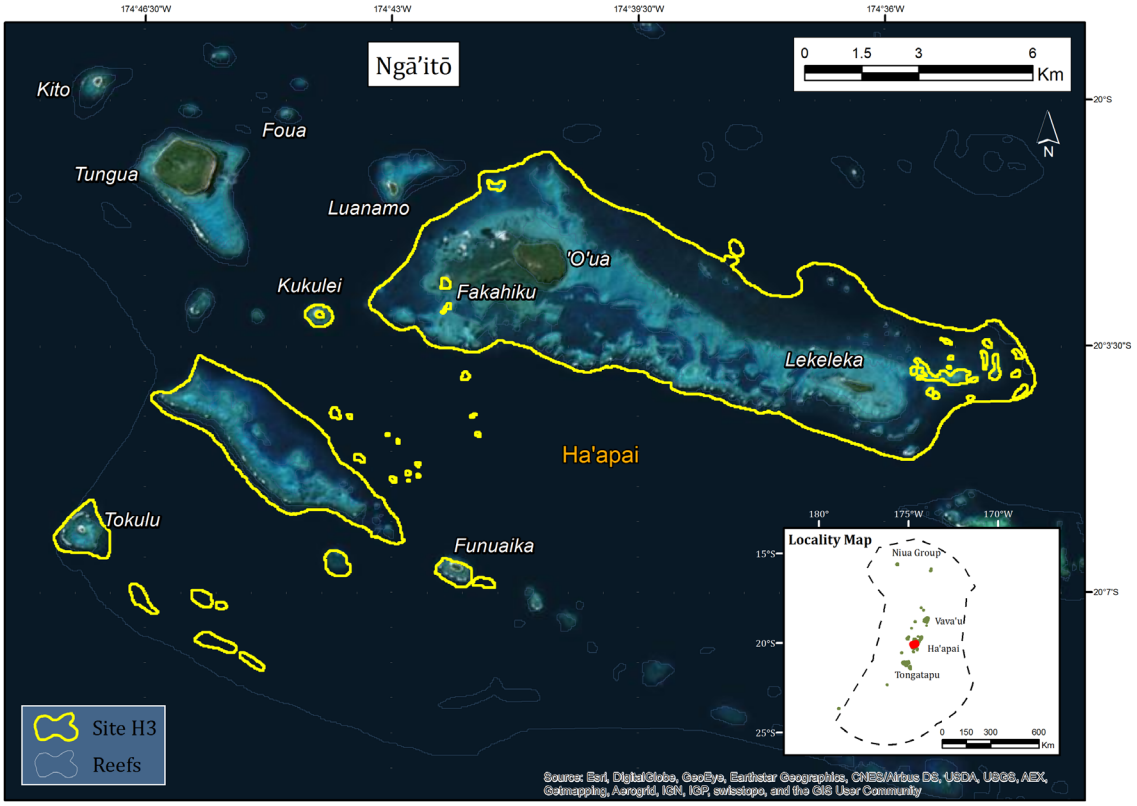

FIGURE 23. SITE H 3: Ngā'itō

TABLE 24. SITE H 3: Ngā'itō. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Ha'apai Island Group	Ngā'itō	H3	6

Geographic boundaries

(-20.0552, -174.8127) and (-20.0749, -174.5614)

Geographic description (score = 2)

Ngā'itō encompasses shallow reef habitat for the curryfish Stichopus hermannii, so this site includes coral reef areas fringing the island of 'O'ua, and a large detached reef to the south of the island.

Justification (score = 1)

The reefs surrounding 'O'ua Island, and reefs directly to the south in the Ha'apai group support high densities of the sea cucumber species "Lomu", also known as the curryfish or *Stichopus hermannii*. Populations of this species are declining elsewhere from overfishing.

The density of the sea cucumber species "Lomu" (curryfish or *Stichopus hermannii*) is uniquely high around the northern Ha'apai island of 'O'ua. The ability for this species to maintain high densities in the case of low or absent exploitation probably stems from the fact that it reproduces asexually (Ngaluafe, 2007). This further enhances the value of the site, as it could provide a larval source to replenish populations on more exploited reefs. The high density of this otherwise exploited species suggests that these reefs may offer something unique in their environment that may also impact positively on biodiversity in general (pers. comm. T. Halafihi, S. Vili). This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 1)

The only sources available for this site are the expert advice of workshop attendees, and a thesis relating to sea cucumbers in Tonga.

Obligations (score = 2)

Both the Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect sea cucumbers and their habitat. The Convention on Biological Diversity lists obligations to protect fisheries resources.

3.2.3.4 SITE H 4: ‘UIHA ISLAND

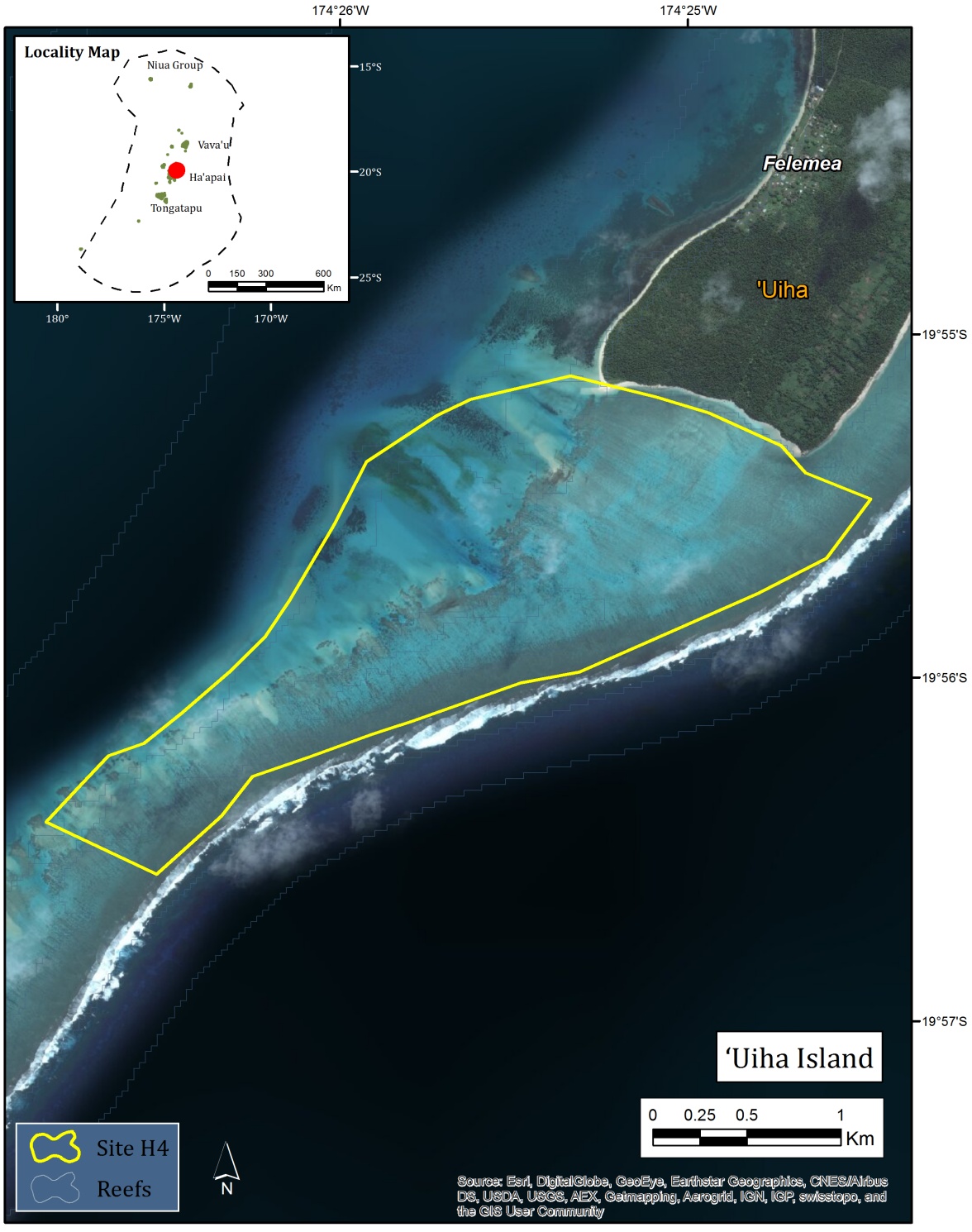

FIGURE 24. SITE H 4: ‘Uiha Island

TABLE 25. SITE H 4: ‘Uiha Island. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Ha’apai Island Group	‘Uiha Island	H4	7.5

Geographic boundaries

(-19.9314, -174.4516) and (-19.9263, -174.4071)

Geographic description (score =3)

This site is the reef extending from the southern part of ‘Uiha Island.

Justification (score = 1)

The southern part of ‘Uiha island, where Felemea Special Management Area (SMA) is located, is the only known home of the Kaloa’a (the antique ark shell, *Andara antiquata*). This area is probably a special habitat that is also important for other shallow reef species (pers. comm. T. Halafihi, S. Vili). The Kaloa’a is disappearing from many parts of the Pacific, and the Felemea SMA, which protects the reef extending from the southern part of ‘Uiha Island, supports a significant population of A. antiquata. The Felemea SMA was subject to a fisheries survey after its implementation, but data were too sparse to draw conclusions about the reef community (Webster, 2013). However, the Coastal Community Management Plan (CCMP) for Felemea SMA noted the Kaloa’a as one of the key factors driving the need for management, as they had been overfished and were found only in deeper waters; it sets out a plan for their protection (MAFFF, 2008a). It is likely that the regulations imposed within the SMA are successful in protecting the Kaloa’a population, and possibly also other species. This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 1.5)

Expert advice and two technical reports were available to suggest that the positive effects of the SMA were a key driver of the high density of Kaloa’a, and potentially other positive ecosystem effects.

Obligations (score = 2)

Both the Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect invertebrate stocks. The Convention on Biological Diversity lists obligations to protect fisheries resources. Felemea was also declared a Multiple Use Conservation Area in the 1970s (Palaki et al., 2007).

3.2.3.5 SITE H 5: NORTHEASTERN HA'APAI

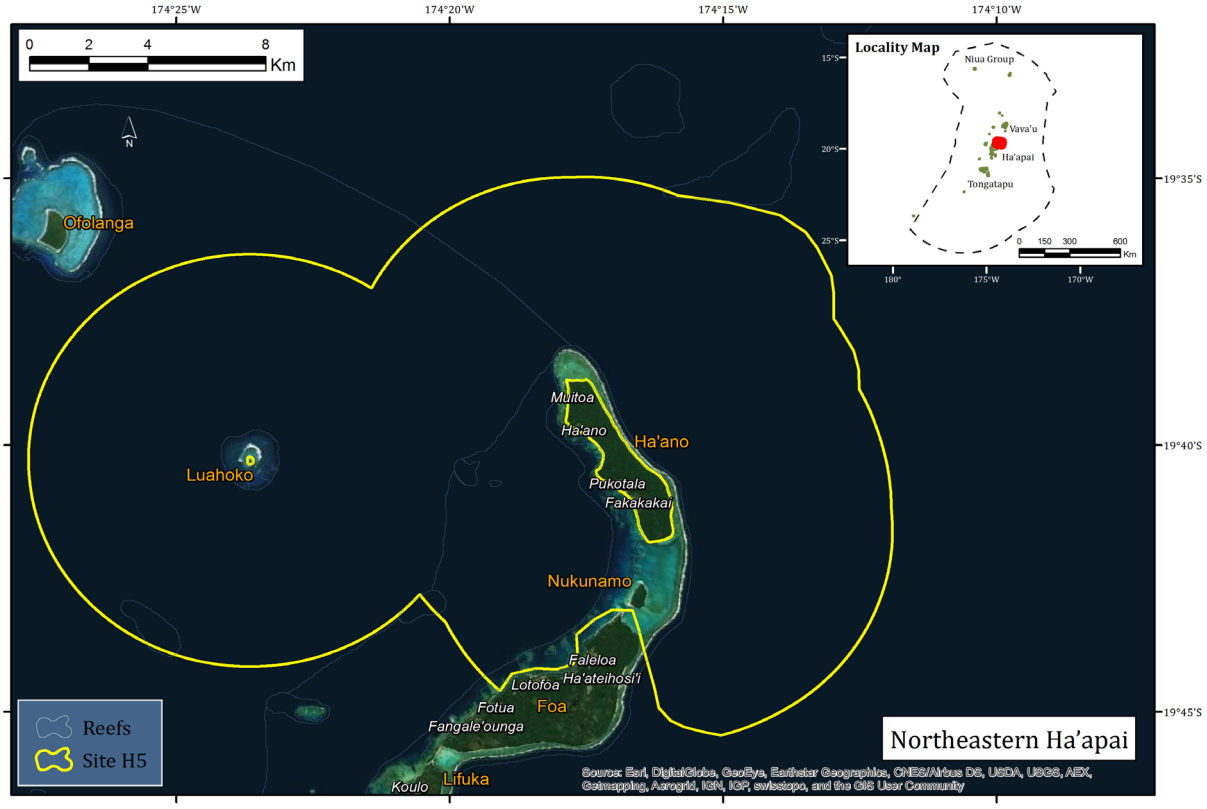

FIGURE 25. SITE H 5: Northeastern Ha'apai

TABLE 26. SITE H 5: Northeastern Ha'apai. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Ha'apai Island Group	Northeastern Ha'apai	H5	6.5

Geographic boundaries

-(19.5599, -174.4463) and (-19.7635, -174.2079)

Geographic description (score = 2)

This site encompasses the waters around Luahoko and Ha'ano Islands and east of those islands.

Justification (score = 1)

Skipjack tuna (*Katsuwonus pelamis,* or 'Atu) are relatively small, short-lived and fast growing, and despite their high value to fisheries, their populations are relatively resilient (Romanov and Chassot, 2017). The waters around two of the islands in northeastern Ha'apai are particularly renowned for their skipjack tuna aggregations.

Skipjack tuna aggregations are found throughout Tongan waters, but the waters around Luahoko and Ha'ano Islands and east of those islands is particularly valued for the regularity and consistency of these aggregations (pers. comm. T. Halafihi, S. Vili). Skipjack tuna school in surface waters with birds, drifting objects, sharks, and whales, and feed on fish, crustaceans, cephalopods, and molluscs; it is an important prey item for larger pelagic fishes (Froese and Pauly, 2016). Aggregations are usually ephemeral and unpredictable; consistent aggregation sites may point to particularly productive areas (Yen and Lu, 2016). Skipjack tuna are not commercially exploited by the Tongan longline fleet (MAFFF, 2015), but they are perhaps the most important tuna species for artisanal fishers. Therefore, any knowledge of predictable aggregation areas is likely to come from anecdotal sources during village consultations. This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

This aggregation of tuna also had cultural significance being tied to a Tongan legend (https://www.livingoceansfoundation.org/a-gift-of-atu/, accessed 8/2/17)

Type and number of sources (score = 1.5)

There are no peer-reviewed publications or technical reports relating directly to this site; the low commercial value of skipjack tuna excludes them from most fisheries reports. There were two relevant peer-reviewed publications. The importance of the site was indicated through expert advice at the workshop.

Obligations (score = 2)

Both the Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect skipjack tuna populations. The Convention on Biological Diversity lists obligations to protect fisheries resources.

3.2.3.6 SITE H 6: HA'APAI SEAGRASS BEDS

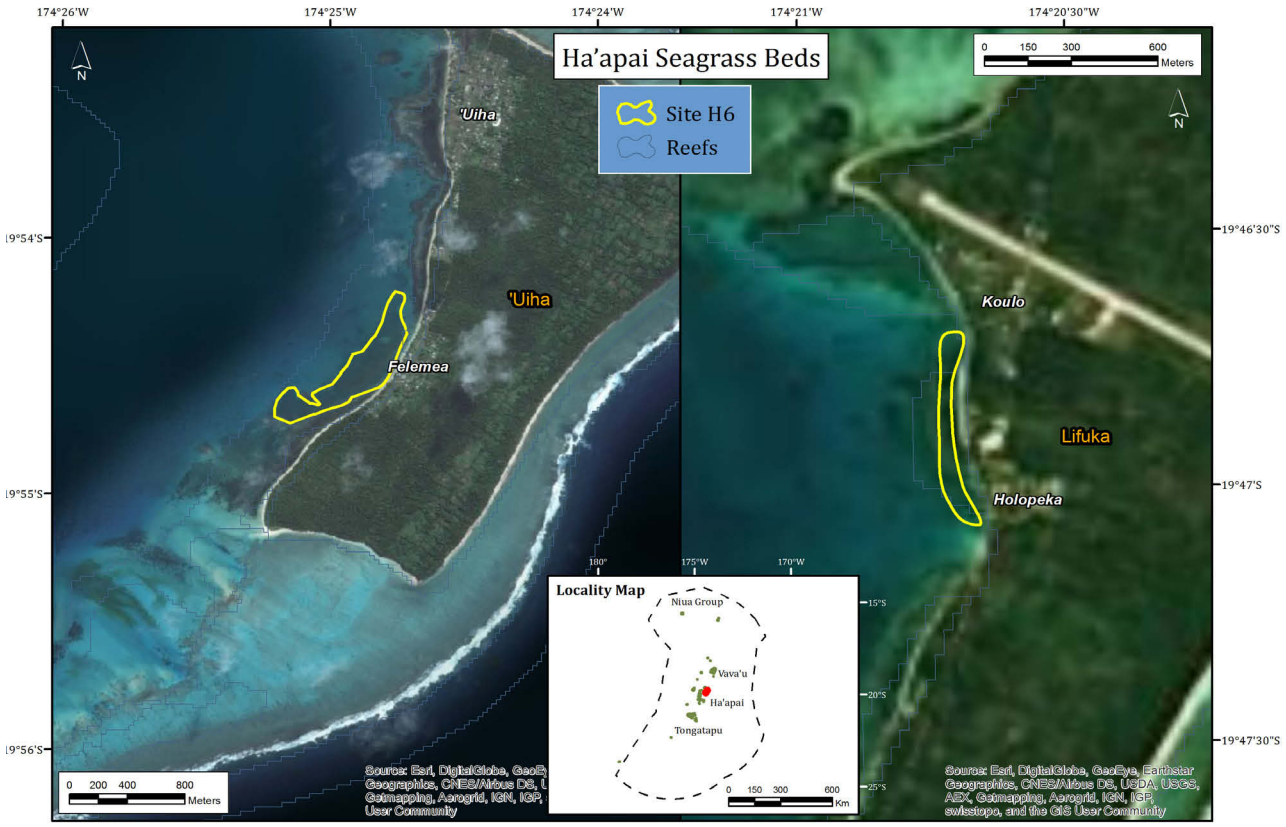

FIGURE 26. SITE H 6: Ha'apai seagrass beds

TABLE 27. SITE H 6: Ha'apai seagrass beds. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Ha'apai Island Group	Ha'apai seagrass beds	H6	9.5

Geographic boundaries

Felemea: (-19.9111, -174.4207) and (-19.9061, -174.4098); Koulo: (-19.7783, -174.3448) and (-19.7848, -174.3454)

Geographic description (score = 3)

The seagrass beds for this site are located on the western sides of Lifuka and 'Uiha Islands, just offshore from Felemea and Koulo villages.

Justification (score = 2.5)

Seagrass beds are important habitats, feeding areas and nursery grounds for many species, including a number of species of commercial and conservation significance; they are threatened by poor water quality and coastal development (for more information about seagrass beds see Site L 3: Inshore marine areas). Significant seagrass beds exist off Felemea and also off Koulo village (pers. comm. S. Vili). Large patches of seagrass (especially Syringodium spp.) are mentioned in the results of a FAO survey, but only for ʻUiha Island (http://www.fao.org/docrep/005/AC894E/AC894E04.htm).

There are seagrass beds throughout Tonga, but there have been no comprehensive country-wide surveys to identify their exact locations. This expert input provides certainty of the location of these seagrass beds. This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 2)

Some direct information is available for the site itself, from a FAO report and expert input from local sources. Peer-reviewed papers are listed for Site L 3: Inshore marine areas.

Obligations (score = 2)

The Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect seagrass beds.

3.2.3.7 SITE H 7: HA'APAI WHALE AREAS

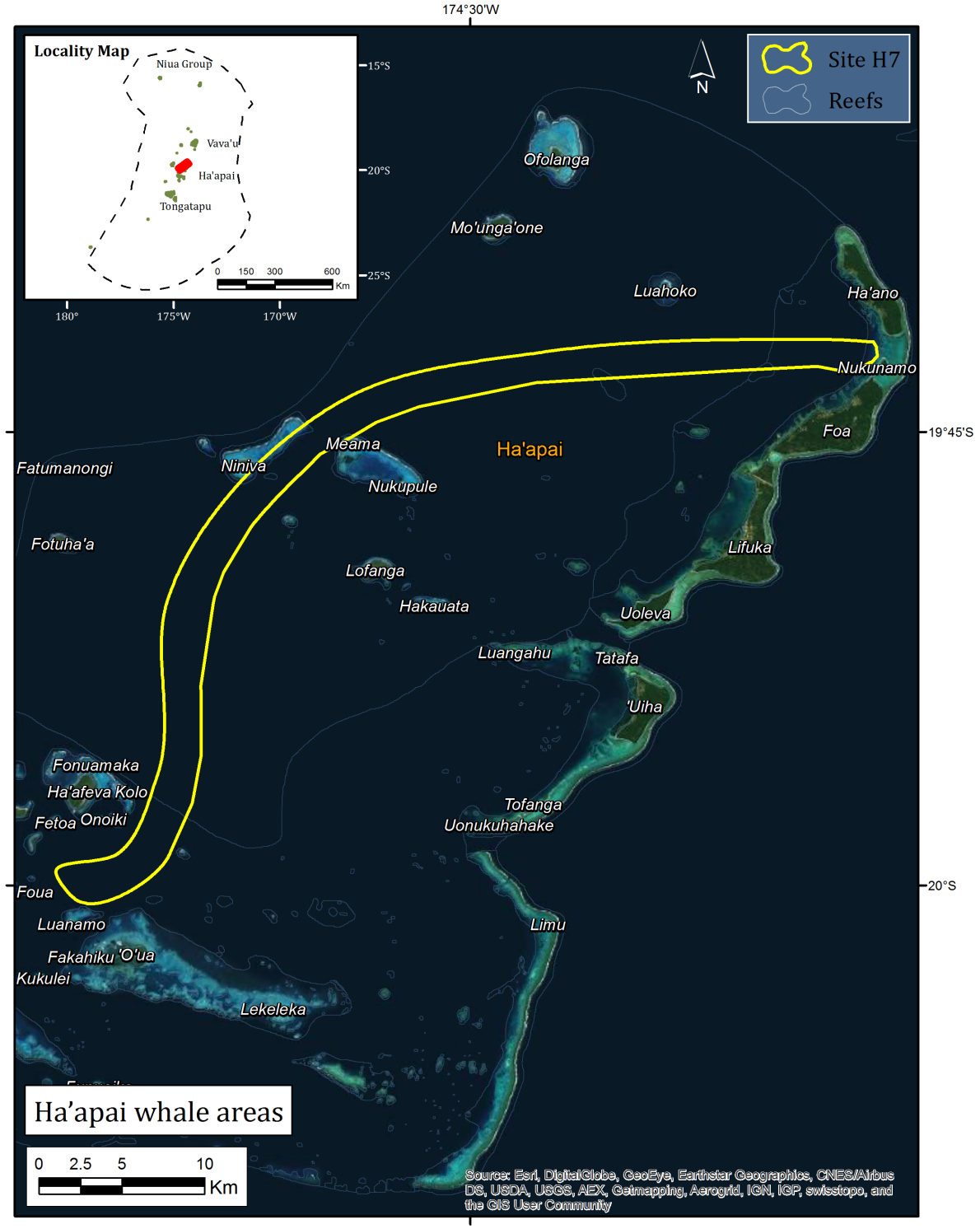

FIGURE 27. SITE H 7: Ha'apai whale areas

TABLE 28. SITE H 7: Ha'apai whale areas. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Ha'apai Island Group	Ha'apai whale areas	H7	9

Geographic boundaries

(-19.8958, -174.7971) and (-19.7073, -174.2758)

Geographic description (score = 3)

The pathway for humpback whales through the Ha'apai islands is from the northeast (the gap between Ha'ano and Foa Island), moving west and then south through the northern island group of Lulunga and then south to the Mu'omu'a island group.

Justification (score = 1)

Whales come into Ha'apai from the northeast, especially the gap between Ha'ano and Foa Island, move west and then south through the northern island group of Lulunga and then further south to the Mu'omu'a island group (pers. comm. T. Halafihi). They are sometimes also seen to the west of Ha'apai towards the Tonga Trench, and to the east around the seamounts (Dept of Fisheries). Whale watching research has recorded the greatest number of sightings to the west of Ha'ano and Foa Islands (Kessler and Harcourt, 2012). General information about humpback whales in Tonga is summarized above for Site L 4: Vava'u Waters. Some specific information is available on the abundant tourism websites (e.g. http://matafonua.com/whales/) that take advantage of the predictable return of the whales each year to give birth.

The Ha'apai island group has only recently been recognized as a significant area for whales, although historically it was here that mythological stories gave whales particular importance (Kessler and Harcourt, 2012). However, whale watching research suggests that humpback whales have low site fidelity in Ha'apai, indicating that they may move through the area rather than staying there (Kessler and Harcourt, 2012). This site overlaps with EBSA 26 – Tongan Archipelago – whereby the importance of this site to humpback whales is one of the key features of its EBSA status (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score =2)

The main sources of information about humpback whales in waters around Ha'apai in particular was a website advertising whale watching, a peer-reviewed paper on whale watching research, and expert advice from workshop participants.

Obligations (score = 3)

Tourism activities associated with whales are controlled by the Whale Watching and Swimming Regulations, 2013. There are further obligations for protecting whales under the Fisheries Management Act 2002, Environment Management Act, Whale Watching and Swimming Act 2009. Humpback whales are on the IUCN Red List and protected under CITES. The Convention on Biological Diversity lists obligations to protect threatened species and their habitats.

3.2.4 Tongatapu Island Group

3.2.4.1 SITE T 1: PASSAGE BETWEEN TONGATAPU AND EUA

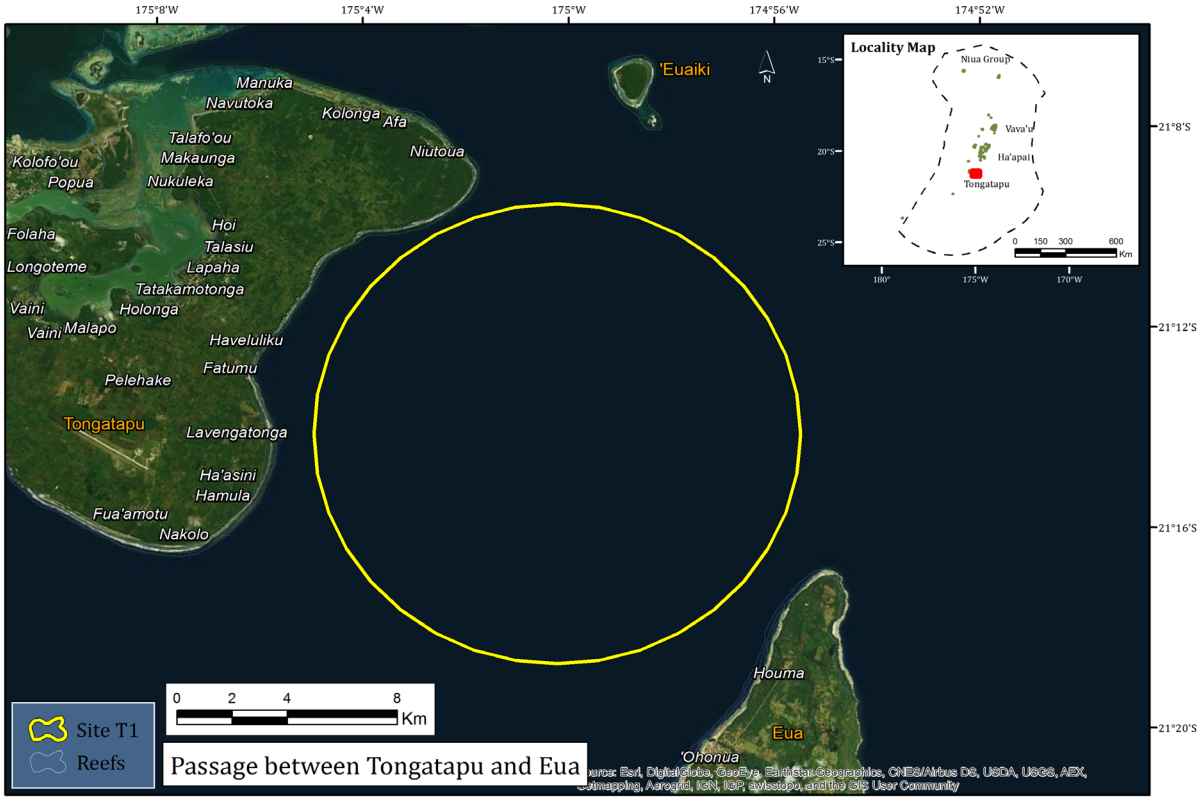

FIGURE 28. SITE T 1: Passage between Tongatapu and Eua

TABLE 29. SITE T 1: Passage between Tongatapu and Eua (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Tongatapu Island Group	Passage between Tongatapu and Eua	T1	8.5

Geographic boundaries

(-21.1530, -175.0756) and (-21.3182, -174.9319)

Geographic description (score = 2)

This site includes the channel between the islands of Tongatapu and Eua, noted for a high abundance of mullet. Mullet are a family of fishes (Mugilidae) that are highly prized, and therefore heavily targeted, in Tongan fisheries.

Justification (score = 2)

Mullet are a family of fishes (Mugilidae) that are highly prized as food, and therefore heavily targeted, in Tonga's fisheries. Areas known to host mullet in high abundance were, in the past, targeted with fences (Fa'anunu and Kimura, 1995). The decline in mullet populations is especially pronounced near human population centres (http://www.fao.org/fi/oldsite/FCP/en/TON/profile.htm). Mullet provide an ecologically important link in the energy flow within estuarine and marine communities, removing detritus and microalgae from the top layer of sediments. Mullet also graze on epiphytes and epifauna from seagrasses as well as surface scum containing microalgae at the air-water interface (Carpentier et al., 2014).

The sea between Tongatapu and Eua is an important passageway for mullet, which move through the area from the east-southeast to the west-northwest. The passage may also be of significance for movement of other pelagic species (pers.

comm. T. Halafihi). Tourism sites list humpback whales and dolphins among the common sightings when travelling by boat between these two islands, but it is unclear whether they refer to the same area (https://greenglobaltravel.com/top-5-ecotourism-activities-on-eua-island-tonga/). This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 1.5)

Sources are limited to expert advice and two websites, a report about the importance of mullet to Tongan fisheries and a peer-reviewed paper about the importance of mullet in trophic dynamics.

Obligations (score = 2)

Both the Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect mullet. The Convention on Biological Diversity lists obligations to protect fisheries resources.

3.2.4.2 SITE T 2: SEISIA / NUKUNUKUMOTU ISLAND MANGROVES

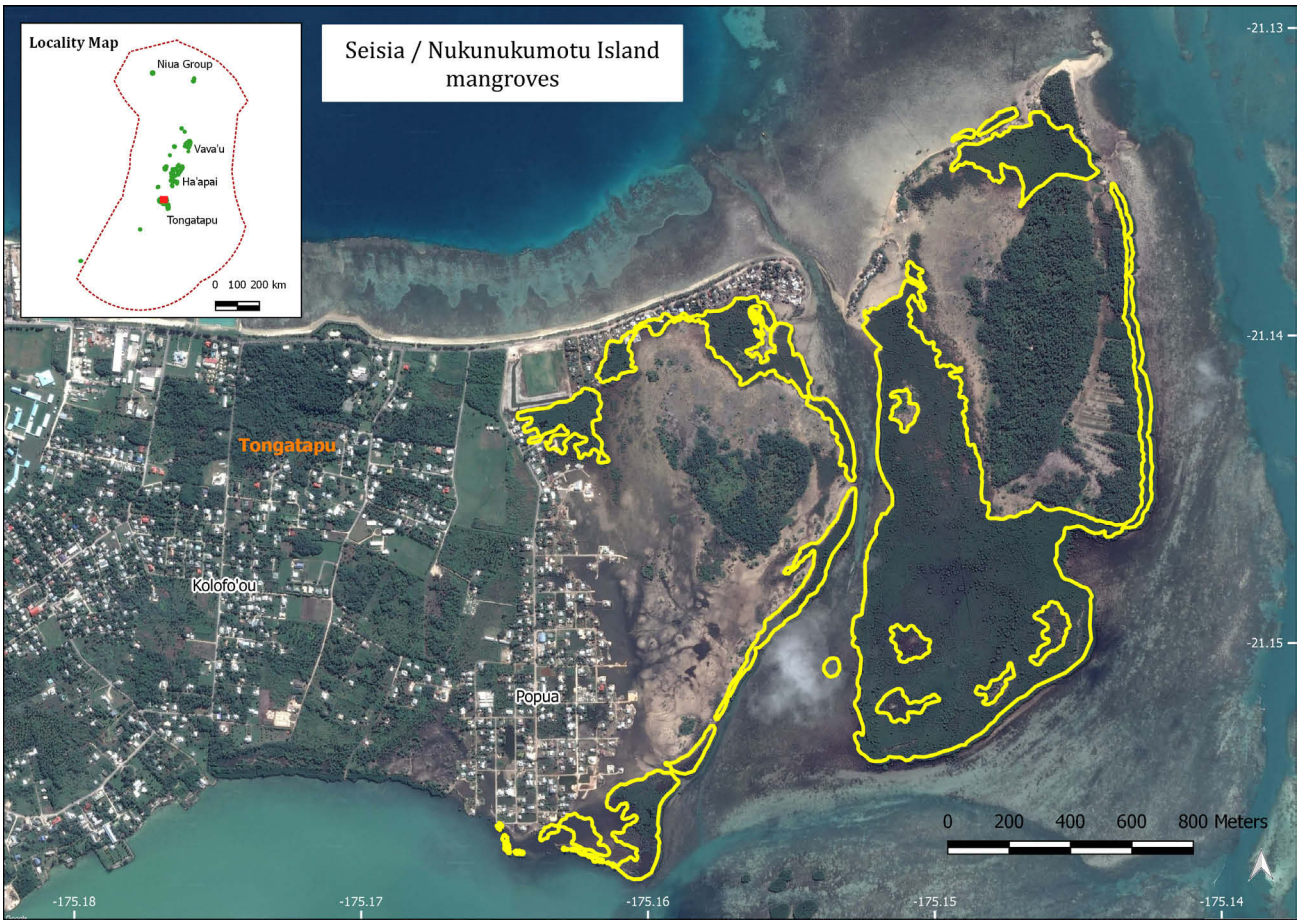

FIGURE 29. SITE T 2: Seisia / Nukunukumotu Island mangroves

TABLE 30. SITE T 2: Seisia / Nukunukumotu Island mangroves (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Tongatapu Island Group	Seisia / Nukunukumotu Island mangroves	T2	10

Geographic boundaries

(-21.1461, -175.1680) and (-21.1471, -175.1375)

Geographic description (score = 3)

This site includes the coastal areas of islands at the western entrance to the Fanga'uta Lagoon on Tongatapu, which is rich in mangroves and other marine resources. Mangroves on Tongatapu Island have been subject to destruction and pollution, making existing stands more important for protection.

Justification (score = 2)

This site is at the western entrance to the Fanga'uta Lagoon on Tongatapu Island. It is rich in mangroves and other marine resources important to the people in Patangata and other areas (Pers. Comm. K. Faka'osi and D. Foliaki, MEIDECC). The importance of mangrove ecosystems has been described above for Site L 3: Inshore marine areas.

An environmental management plan for Fanga'uta lagoon identified this site as sustaining the most important patches of mangroves remaining in the lagoon, near Nukuhetulu and at Nukunukumotu Island (Prescott et al., 2012). The plan proposes to set aside areas of mangrove forest to function fully as fish habitats and part of the lagoon's cleaning system. Water movement is strongest through the entrance of the lagoon, with tidal circulation creating a current of up to 1.1 m/s (Damlamian, 2008), promoting exchange of biological material between the enclosed lagoon and the open sea. The management plan identifies mangrove destruction as a significant problem causing erosion and affecting people's land, making existing healthy stands of mangrove forest especially valuable. Activities that could damage the habitats in this region of the lagoon, such as dredging, reclamations and reef or seagrass damage, have already been prohibited to help protect spawning and nursery grounds, and migration pathways of commercially important fish species, such as mullet (Prescott et al., 2012). This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 2)

Sources for the importance of mangroves in general, and for Tonga, are given for Site L 3: Inshore marine areas. Sources for this particular site include expert advice and two technical reports.

Obligations (score = 3)

An environmental management plan exists for Fanga'uta lagoon, which includes the site and its values (Prescott et al., 2012). It identifies mangrove destruction as a significant problem causing erosion and affecting people's land. Mangroves are protected by national and international legislation. Many species that use mangroves are harvested and are therefore covered in the Fisheries Management Act 2002 and Environment Management Act 2010. The habitat itself are protected through the National Spatial and Management Act 2012 and the Environment Impact Assessment Act 2003, and the National Forest Policy (2008) has provisions for the protection of mangroves and other wetland ecosystems.

3.2.4.3 SITE T 3: FANGA'UTA LAGOON

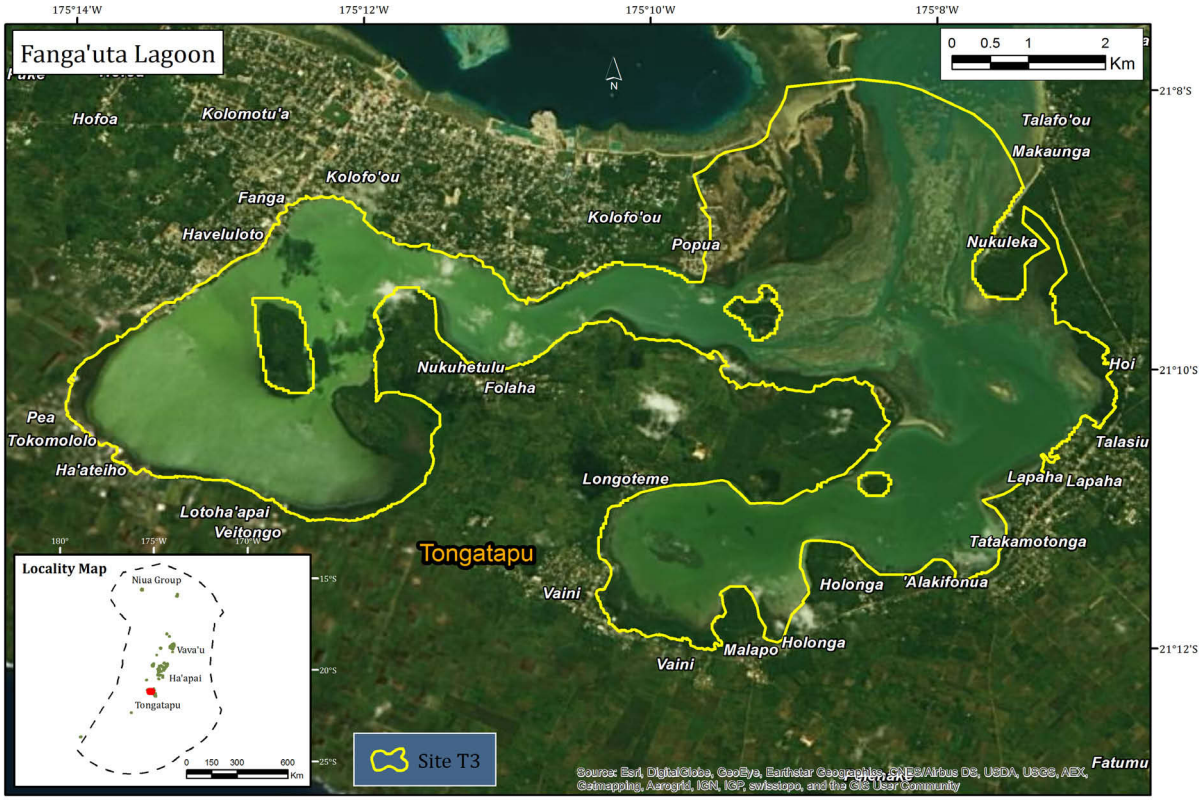

FIGURE 30. SITE T 3: Fanga'uta Lagoon

TABLE 31. SITE T 3: Fanga'uta Lagoon. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Tongatapu Island Group	Fanga'uta Lagoon	T3	10

Geographic boundaries

(-21.1534, -175.2389) and (-21.1890, -175.1077)

Geographic description (score = 3)

The Fanga'uta Lagoon is the enclosed lagoon of Tongatapu. Fangakakau is a further embayment within the Fanga'uta Lagoon, serving as a second lagoon system. The Fanga'uta Lagoon encompasses an area of 36.6 km^2 with a mean depth of ~1.4 m and a maximum of 6 m, excluding the entrance channel (Damlamian, 2008).

Justification (score = 1)

The Fanga'uta and Fangakakau Lagoons (referred to, collectively, as "the Fanga'uta Lagoon") support several types of very diverse and productive ecosystems, including mangroves, mudflats, seagrass beds, and coral patch reefs (UNDP and Government of Tonga, 2014). In particular, the shallow, almost completely closed Fanga'uta Lagoon is an important breeding ground for birds and fishes. Generally, sheltered environments offer good connectivity between complementary habitats (e.g. seagrass beds, mangroves, reefs) and confer greater resilience and biodiversity value to the entire lagoonal ecosystem (Brown et al., 2016).

Tonga had an area of 1,000 ha of mangroves in the 1980s, but coastal reclamation, particularly on shores adjacent to Nuku'alofa in Tongatapu, have dramatically reduced mangrove cover since then. The World Atlas of Mangroves (2010) gave an estimate of mangrove areas of 336 ha for Tonga. An earlier estimate stated the total area of mangroves at 10 km^2, representing 1.33 % of Tonga's total land area of 750 km^2 (MESCAL, 2013). Tonga has eight mangrove species;

two of the most common are *Rhizophora samoensis* and *Rhizophora stylosa* (Ellison, 2009). The greatest extent of mangrove forest in Tonga remains around the Fanga'uta Lagoon (Ministry of Lands, Environment, Climate Change and Natural Resources, 2014). The fauna and flora of the Fanga'uta Lagoon system was relatively diverse when last documented in 1984 and 2001: 96 species of fishes; 9 species of large algae (macroalgae); 2 species of seagrasses; 16 species of nearshore plants; 1 species of jellyfish; 1 species of sea anemone; 30 species of hard and soft corals; 40 species of mollusks (including octopus, clams and other shellfish); over 13 species of crustaceans; and over 11 species of echinoderms (starfish, cucumbers and urchins)(UNDP and Government of Tonga, 2014). The country-wide values for these species are listed at Site L 3: Inshore marine areas.

The Western part of Fanga'uta Lagoon is Fangakakau Lagoon, which is a feeding ground for mullet, has seagrasses, algae and mangroves which are, amongst other things, habitat for seashells (kaloa'a, or antique ark). The government is investing in multiple rehabilitation projects in this area (e.g. R2R/MESCAL) (pers. comm. K. Faka'osi and D. Foliaki, MEIDECC, UNDP and Government of Tonga, 2014).

There are rich mangrove areas are located along the coast north and west of Nukuhetulu Village, including around to the west side of the peninsula north of the village. This site has some of the oldest mangroves in Tonga, and Nukuhetulu Village heavily depends on this resource for crabs and tapa making (pers. comm. K. Faka'osi and D. Foliaki, MEIDECC; MESCAL). This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Unfortunately, recent information about the Fanga'uta Lagoon has focused on its poor environmental state and the need to rehabilitate parts of it, set out in detail in a Ridge to Reef Project report (UNDP and Government of Tonga, 2014). Stakeholders have identified the loss of species and habitats, the reduction of mangrove areas, declining size and abundance of food fishes, and the heavy impacts of pollution and litter (Prescott et al., 2012). Despite the production of a management plan, development and land reclamation around the lagoon continue to contribute to deforestation and sedimentation (Ministry of Lands, Environment, Climate Change and Natural Resources, 2014; UNDP and Government of Tonga, 2014). The poor water quality in the more enclosed parts of the lagoon compared with the lagoon entrance and waters outside the lagoon was also noted (Ministry of Lands, Environment, Climate Change and Natural Resources, 2014). Despite the existing values of the remaining ecosystems around the lagoon supported by sources that are specifically about this site, most sources discuss the degraded state of the lagoon, leading to a reduced score.

Type and number of sources (score = 3)

Five technical reports cover the special attributes and vulnerability of the Fanga'uta Lagoon, with additional peer-reviewed papers and reports covering the general attributes of the habitats and species making up the lagoon ecosystem (see also Site L 3: Inshore marine areas).

Obligations (score = 3)

Both the Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect Fanga'uta Lagoon and all the species it contains that are of commercial or conservation significance. The lagoons were declared a Marine Reserve in 1974 by the government (UNDP and Government of Tonga, 2014). Additionally, a number of species (e.g. corals and giant clams) are listed on the IUCN Red List and protected under CITES. The National Forest Policy (2008) has provisions for the protection of mangroves and other wetland ecosystems.

3.2.4.4 SITE T 4: FUNGAFELE'AVE MANGROVES

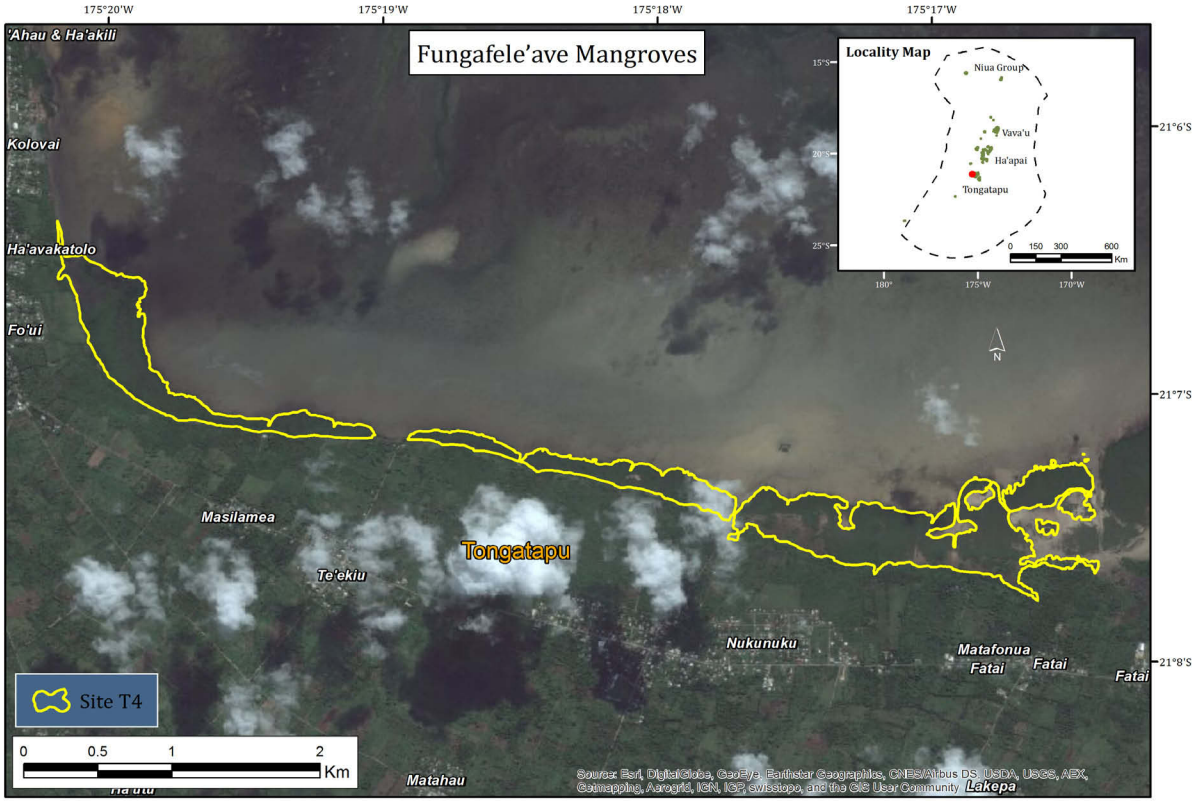

FIGURE 31. SITE T 4: Fungafele'ave mangroves

TABLE 32. SITE T 4: Fungafele'ave mangroves (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Tongatapu Island Group	Fungafele'ave mangroves	T4	7

Geographic boundaries

(-21.1059, -175.3365) and (-21.1311, -175.2741)

Geographic description (score = 3)

This site includes the mangrove forests along the northwest coast of Tongatapu Island, near Nukunuku and Teekiu Villages.

Justification (score = 1)

Stands of mangrove forest growing along the northwest coast of Tongatapu Island, in the low-lying areas of coastline oriented east-west, near Nukunuku and Teekiu Villages, are suffering from erosion and sea level rise. These mangroves are especially important for protecting the coastlines of adjacent villages (pers. comm. L Tifui, MEIDECC). The importance of mangrove ecosystems is outlined above for Site L 3: Inshore marine areas. In areas more exposed to the open ocean, such as this site, mangroves play an even more important role in protecting coastlines and villages (Guannei et al., 2016). They stabilize sediments, filter land-based run-off and break the intensity of oncoming waves. However, they are vulnerable to rising sea levels and storm surges associated with cyclones, which are predicted to increase in intensity as the global climate changes (Ellison, 2009). This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 1)

Sources for the importance and vulnerability of mangroves in general are listed for Site L 3: Inshore marine areas, but there is no written material directly relevant to the site itself. The value of the site was conveyed through expert knowledge.

Obligations (score = 2)

Both the Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect mangrove ecosystems in Tonga. The National Forest Policy (2008) has provisions for the protection of mangroves and other wetland ecosystems.

3.2.4.5 SITE T 5: TONGATAPU CORAL REEFS

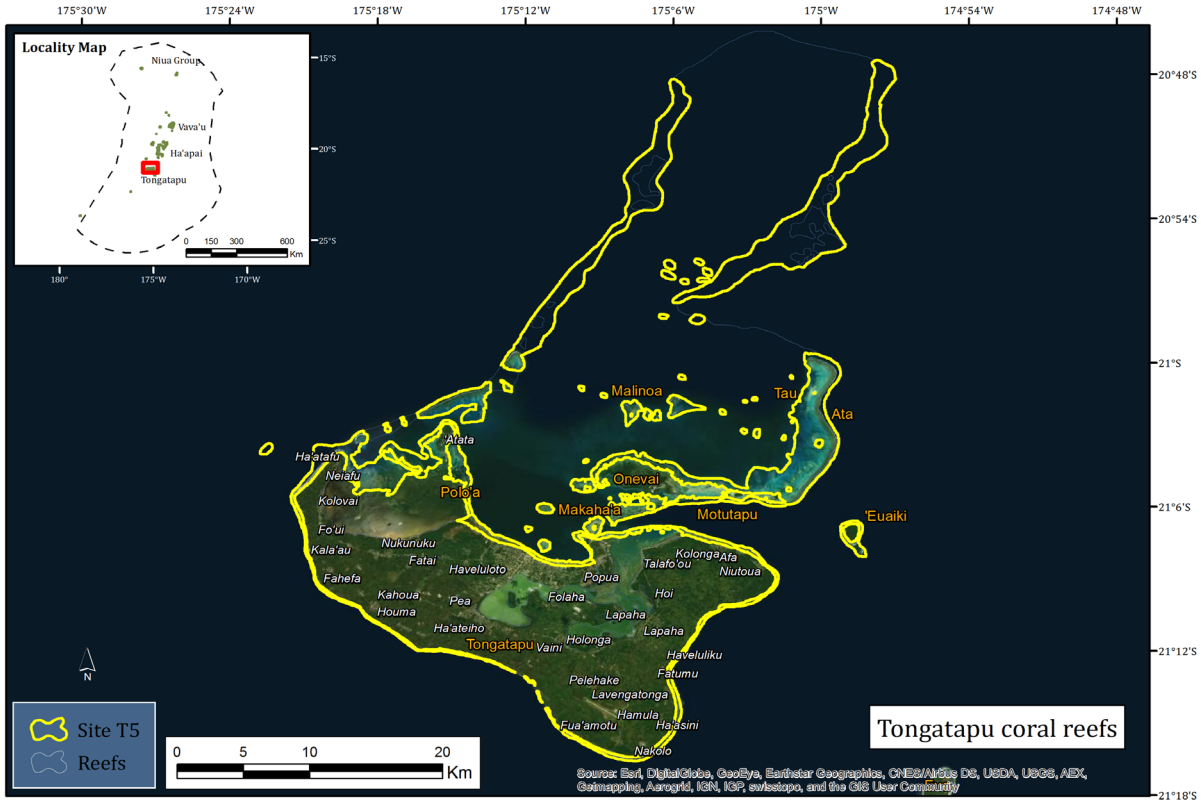

FIGURE 32. SITE T 5: Tongatapu coral reefs

TABLE 33. SITE T 5: Tongatapu coral reefs. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Tongatapu Island Group	Tongatapu coral reefs	T5	12

Geographic boundaries

(-21.0846, -175.4061) and (-20.9724, -174.7885)

Geographic description (score = 3)

Coral reefs around Tongatapu include a narrow band of fringing reef along the south coast, and extensive reef formation to the north, extending approximately 50km from the main Island. These reef formations to the north include fringing reefs around the smaller islands, and barrier and submerged reefs. Some reefs are associated with islands, others are not.

Justification (score = 3)

Coral reefs are highly diverse and productive ecosystems, host to the largest portion of shallow marine biodiversity and provide critical habitat for many species of conservation and commercial importance. In Tonga, coral reefs range from fringing reefs to barrier and platform reefs, and atolls (see Site L 3: Inshore marine areas). On Tongatapu, the greatest portion of reef formation is north of the main island. Some 192 species of scleractinian corals have been recorded at 11 reefs around Tongatapu, as well as 229 reef fish from 39 families, 55 bivalves, 83 gastropods and 13 holothurians (http://www.reefbase.org/global_database/dbr5,24,TON,89.aspx)

General information about the value and vulnerability of coral reefs in Tonga is given above for Site L3. Tongatapu has a unique coralline algal reef formation fringing the southern coastline, which is exposed to prevailing southeasterly swells (Lovell and Palaki, 2000). Adjeroud et al. (2013) recorded 37 hard coral genera around Tongatapu; the country-wide estimate is 40 genera (Ellison, 2009), indicating that these reefs host an almost complete complement of Tonga's coral diversity. The Tongatapu coral assemblage was dominated by *Montipora, Acropora* and *Porites.* Spatial patterns in the coral assemblages suggested a strong reliance of local recruitment sources from brooding coral species (Magalon et al., 2005). High numbers of recruits suggested a good potential for reef recovery in the short-term, if stressors that inhibit the survival of juvenile corals are removed (Adjeroud et al., 2013). At a time of multiple stresses on coral reefs worldwide, coral reefs with a good recovery potential are of special value (see Site L 3: Inshore marine areas).

The coral reefs around Tongatapu were described as important for many people for a variety of uses including artisanal fishing, snorkelling, kayaking and canoeing and other types of recreation. (pers. comm. L. Matoto, M. Matekitonga and F. Hakaumotu). Coral reefs around Tongatapu are considered to be under greater pressure when compared to reefs further away from population centres (Adjeroud et al., 2013). This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 3)

Coral reefs are subject to countless peer-reviewed publications each year; there is a wealth of general information. Some Tongan coral reefs have also been subject to a number of surveys in recent years, resulting in high-quality peer-reviewed studies. Information about the reefs of Tongatapu is more difficult to find, with three peer-reviewed papers and expert advice to use as sources.

Obligations (score = 3)

Coral reefs in Tonga are subject to a number of national and international obligations, protecting them as an ecosystem, but also protecting individual species. Both the Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect coral reefs. Corals and some coral reef fishes are listed on the IUCN Red List, and protected under CITES. The Convention on Biological Diversity lists obligations to protect coral reefs.

3.2.4.6 SITE T 6: WATERS AROUND ‘EUA AND HAKAUMAMA’O REEF

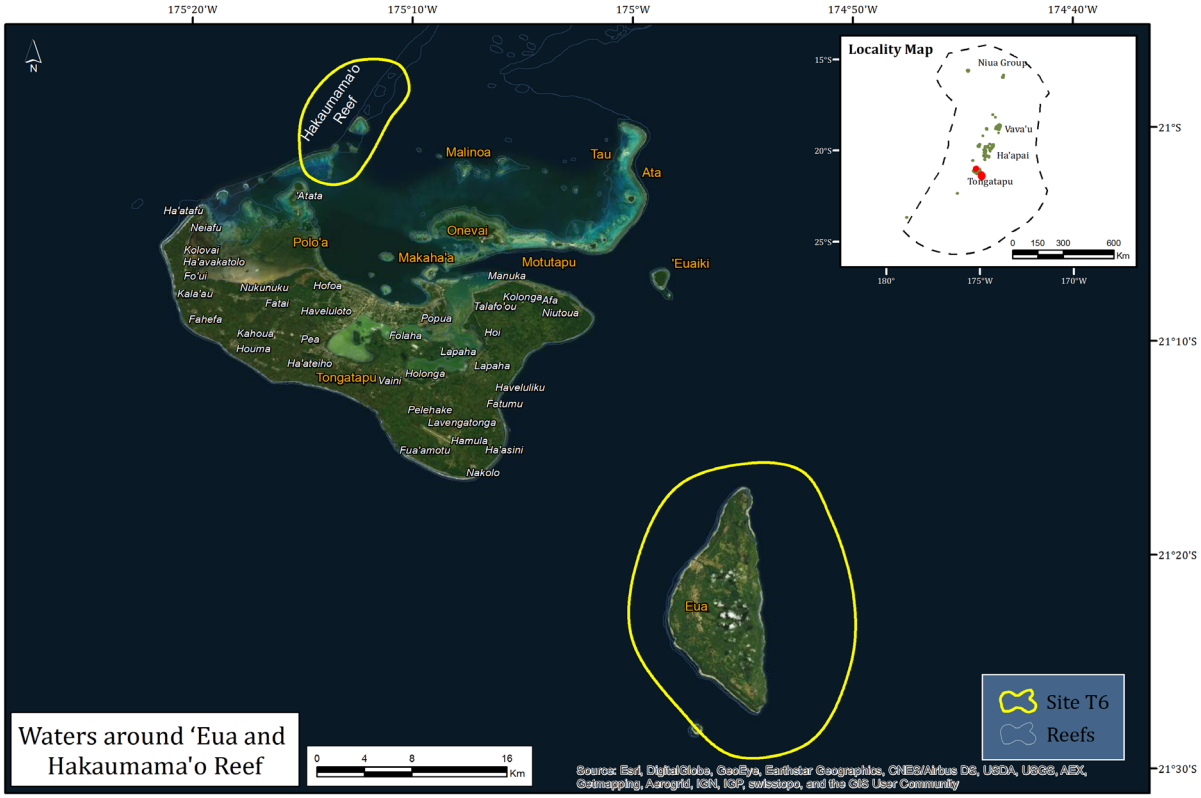

FIGURE 33. SITE T 6: Waters around ‘Eua and Hakaumama’o Reef

TABLE 34. SITE T 6: Waters around ‘Eua and Hakaumama’o Reef. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Tongatapu Island Group	Waters around ‘Eua and Hakaumama’o Reef	T6	7

Geographic boundaries

(-21.2043, -175.2322) and (-21.2751, -175.0878)

Geographic description (score = 2)

This site includes waters around ‘Eua Island and Hakaumama’o Reef, located to the north of Tongatapu Island, containing habitats suitable to both coral reefs and pelagic sharks.

Justification (score = 1)

These waters support notable populations of sharks (pers. comm. S. Tatafu). General knowledge about the vulnerability and importance of top predators such as sharks is presented above for Site V 1: Southern Vava’u islands and turtle nesting sites. Top predators such as sharks are the first to disappear under high fishing pressure. The removal of top predators can have top-down effects throughout the food web, even changing the composition of benthic communities. Areas with high shark densities are indicators of healthy ecosystems. There is no specific information for this site, except for a report on clam surveys in the 1980s which showed a high density and diversity of giant clams on these reefs (McKoy, 1980). This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 1)

Sources about sharks in Tonga were listed for Site V 4: Vava'u Southern Bank. Only one paper and expert advice were available for the site.

Obligations (score = 3)

Some sharks are on the IUCN Red List and listed under CITES. There are obligations also for the protection of sharks under Tonga's National Plan of Action for Sharks 2014–2016. There are also provisions for their protection under both the Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect these natural attributes. Hakaumama'o Reef is a protected area under the IUCN (Paine, 1991; Palaki et al., 2007). The Convention on Biological Diversity lists obligations to protect coral reefs.

3.2.4.7 SITE T 7: COASTAL HAVELULIKU AND FUA'AMOTU VILLAGE

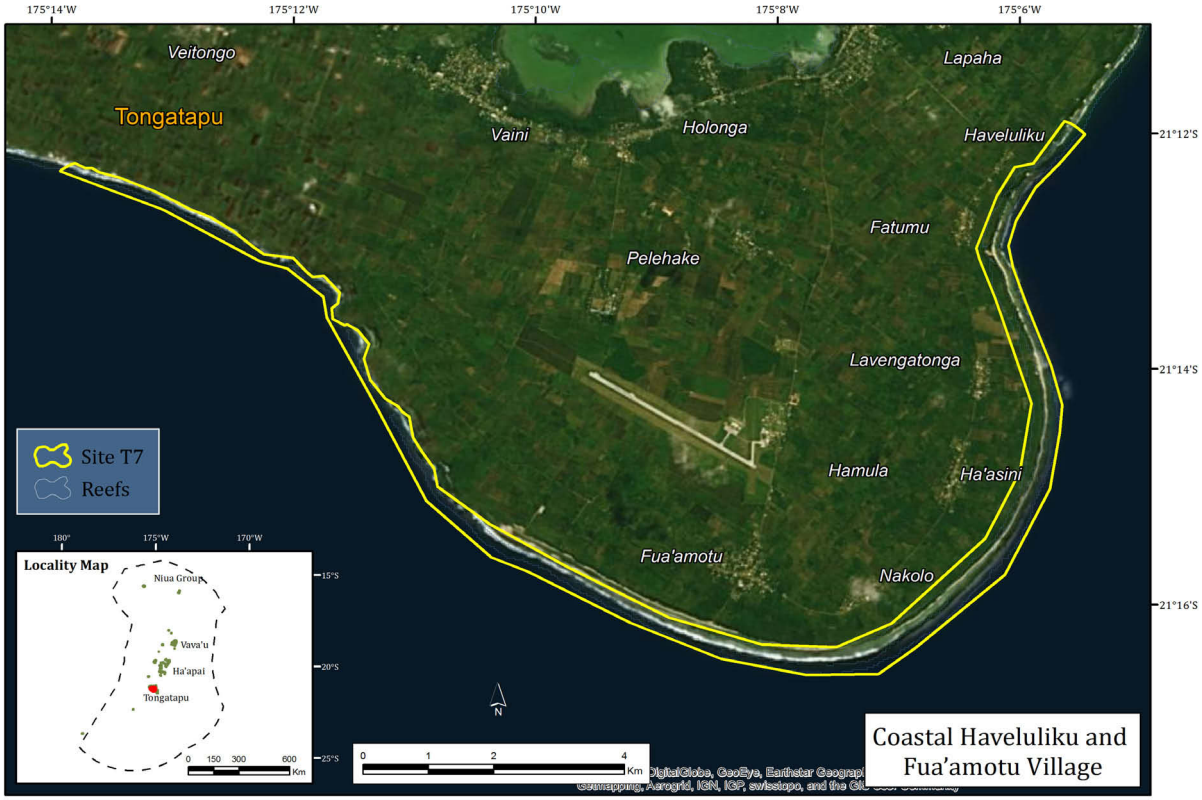

FIGURE 34. SITE T 7: Coastal Haveluliku and Fua'amotu Village

TABLE 35. SITE T 7: Coastal Haveluliku and Fua'amotu Village. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Tongatapu Island Group	Coastal Haveluliku and Fua'amotu Village	T7	6

Geographic boundaries

(-20.7534, -176.882) and (-24.3272, -175.769)

Geographic description (score = 2)

The rocky shores along the southern coastline of Tongatapu provide ideal habitat for mussels.

Justification (score = 1)

This part of Tongatapu is known for Kuku (mussels) (pers. comm. E. Fonua). Mussels are an important component of the Tongan diet, and are plentiful in certain areas. They are generally found in rocky intertidal habitats, where they gather in clumps and filter feed. Where they occur in high densities, mussels can act as important ecosystem engineers, filtering the surrounding water, stabilising sediments, enhancing habitat complexity and providing settlement habitat for other organisms (Buschbaum et al., 2009). In Tongatapu, declining mussel harvest has been listed as one of the concerning trends (UNDP and Government of Tonga, 2014), making areas rich in mussels more valuable. This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 1)

Expert advice and unpublished reports were available for mussels in Tonga, and only expert comments related directly to the site. One peer-reviewed paper was used to highlight the importance of mussels in general.

Obligations (score = 2)

Both the Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect mussels. The Convention on Biological Diversity lists obligations to protect fisheries resources.

3.2.4.8 SITE T 8: SOPU AND HOFOA WETLANDS

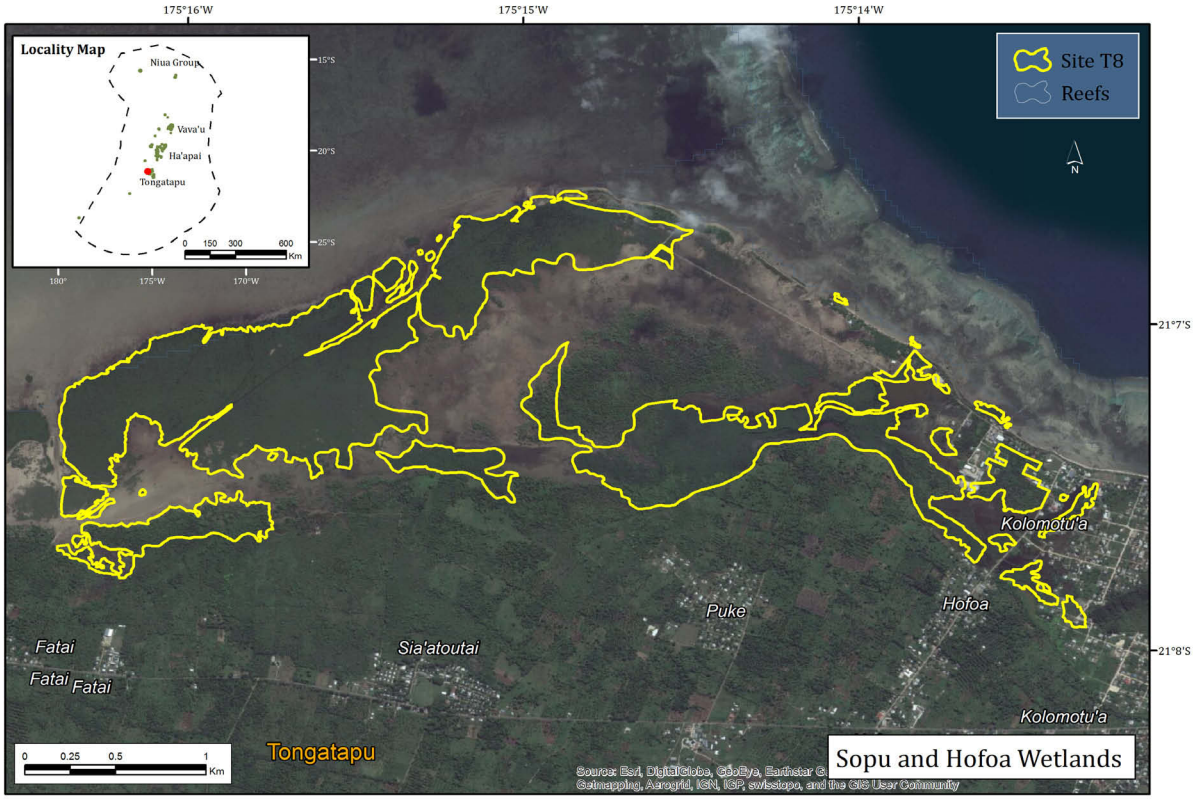

FIGURE 35. SITE T 8: Sopu and Hofoa wetlands

TABLE 36. SITE T 8: Sopu and Hofoa wetlands (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Tongatapu Island Group	Sopu and Hofoa wetlands	T8	8.5

Geographic boundaries

-(21.1086, -175.2724) and (-21.1322, -175.2219)

Geographic description (score = 3)

This site includes the wetland system that exists along the stretch in front of the western end of Vuna Road in Nuku'alofa (in 2017 this is outside the Fisheries office in Tongatapu), from Sopu to Hofoa.

Justification (score = 2)

The wetlands located on this part of Tongatapu are important for their seagrass, mangroves, mud crabs and as fish breeding grounds (pers. comm. L. Matoto, M. Matekitonga, V. Matoto). This part of Tongatapu is known for Kuku (mussels; pers. comm. E. Fonua). There is general information about these systems for Site L 3: Inshore marine areas and Site N 3: Northern Niuatoputapu Kaloama. No specific information was available for the site itself. This site overlaps with EBSA 26 – Tongan Archipelago (Secretariat of the Convention on Biological Diversity, 2014).

Type and number of sources (score = 1.5)

General information about attributes of the site is available for two of the other sites above; there were no sources specific to the site.

Obligations (score = 2)

Both the Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect the wetlands between Sopu and Hofoa. The National Forest Policy (2008) has provisions for the protection of mangroves and other wetland ecosystems.

3.2.4.9 SITE T 9: 'EUEIKI ISLAND

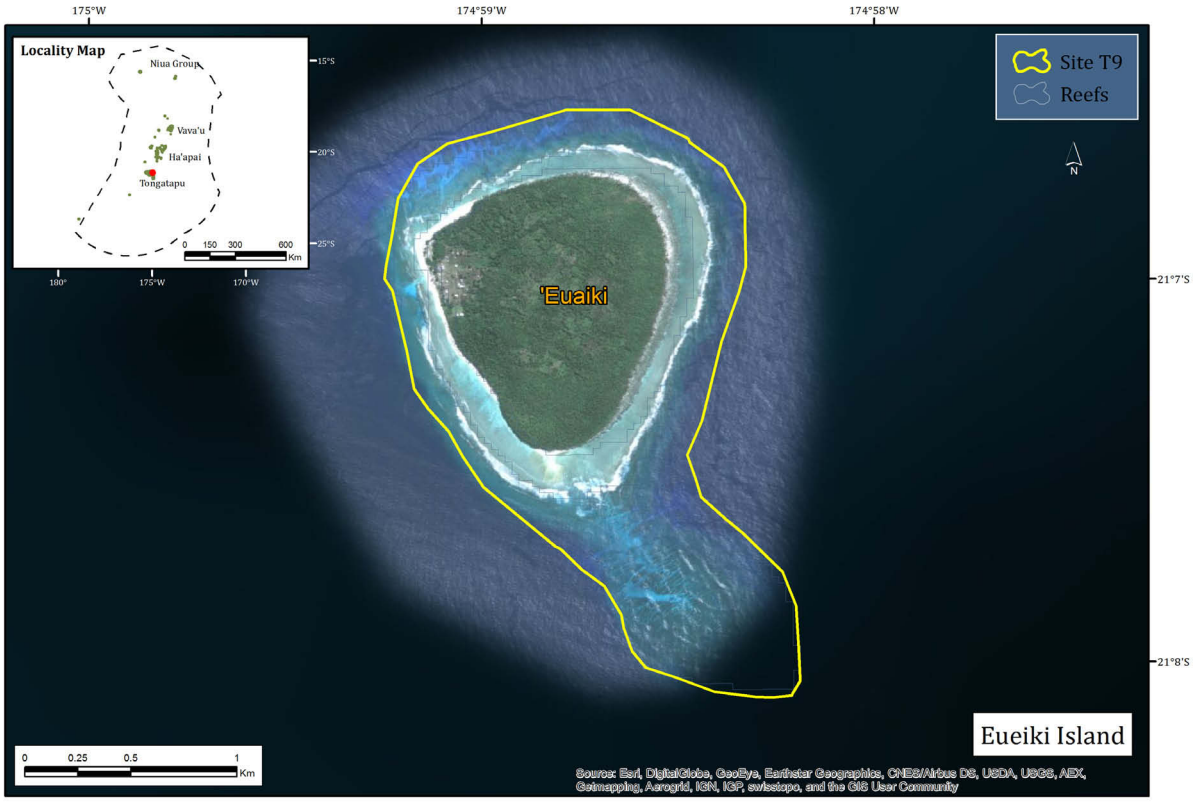

FIGURE 36. SITE T 9: 'Eueiki Island

TABLE 37. SITE T 9: 'Eueiki Island. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale sites – Tongatapu Island Group	'Eueiki Island	T9	8

Geographic boundaries

(-21.1085, -174.9728) and (-21.1367, -174.9850)

Geographic description (score = 3)

Turban shells are found in sandy areas of coral reefs and nearshore areas; this site includes all the shallow marine habitat surrounding ‘Eueiki Island, which is located off Tongatapu Island.

Justification (score = 1)

‘Eueiki Island is located off Tongatapu and ‘Eua Islands and is well known for the marine gastropod ‘Elili’ (pers. comm. L. Matoto and V. Matoto). The marine gastropod ‘Elili (Turban shells or *Turbo* spp.) are highly prized in Tongan artisanal fisheries and are therefore in decline; areas where turban shells are still abundant are rare. Tonga’s most popular species of turban shells, now also used in aquaculture, are *Turbo marmoratus* (green snail), *T. setosus* and *T. argyrostrum* (http://www.tongafish.gov.to/images/documents/Publications/Brochures/Aquaculture%20in%20Tonga%20brochure.pdf, Accessed 16.02.2017). Green snails were considered critically endangered in Tonga by 2010 (Geocare & Petroleum Consult Ltd, 2010); restocking programs have been combined with education to prevent the harvest of new populations introduced into the shallow reef areas of Tongatapu (http://www.tongafish.gov.to/images/documents/Publications/Brochures/Greensnails%20brochure.pdf, Accessed 15.02.2017). In Vava’u, the BIORAP recorded some *Turbo* spp., but no green snails (Atherton et al., 2015), and only a few individuals were found during the Vava’u CRSP SMA surveys (Ceccarelli, 2016). ‘Eueki Island was one of the islands with historically high densities of green snails, and where additional farmed individuals were introduced. However, the Coastal Community Management Plan (CCMP) for ‘Eueiki raised concerns about recent illegal harvesting of green snails (MAFFF, 2008b). The originally high density of green snails, coupled with the perceived need for protection by the community, makes this population important as spawning stock, to potentially provide larvae to adjacent islands.

Type and number of sources (score = 2)

Survey data that include marine gastropods such as turban shells exist for Vava’u and are summarized in two reports. Information about turban shells in Tongatapu was sourced from two websites linked to the Ministry of Fisheries, and expert advice. Information about green snails at the site itself was available in a CCMP.

Obligations (score = 2)

Both the Fisheries and Environment Management Acts (2002, 2010 respectively) refer to obligations to protect Turban shells. The Convention on Biological Diversity lists obligations to protect fisheries resources. ‘Eueiki Island has been declared a Multiple Use Conservation Area (Palaki et al., 2007).

3.2.4.10 SITE T 10: ‘ATA ISLAND

‘Ata Island, an uninhabited island far to the south of Tongatapu, has significant nesting seabird populations and humpback whales migrate close to its coast.

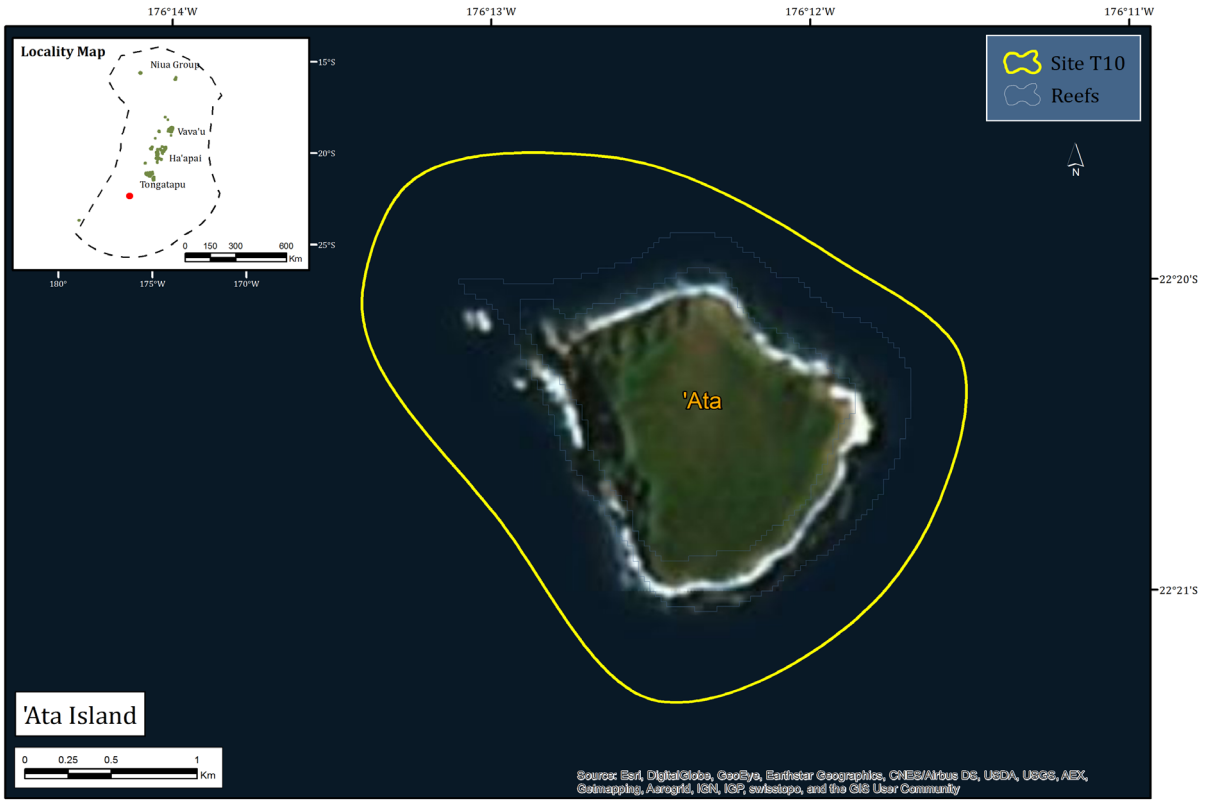

FIGURE 37. SITE T 10: ‘Ata Island

TABLE 38. SITE T 10: ‘Ata Island. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale biophysically special, unique marine sites – Tongatapu Island Group	‘Ata Island	T10	9

Geographic boundaries

(-22.3176, -176.2066) and (-22.3589, -176.2075)

Geographic description (score = 2)

This site encompasses land areas of ‘Ata Island (22°20′30″S 176°12′30″W) where seabirds nest, coastal waters important for foraging, and pathways for migrating humpback whales. ‘Ata Island is one of the most isolated islands south of Tongatapu.

Justification (score = 3)

The area around ‘Ata Island and beyond is important for seabirds and migrating humpback whales (Pers. Comm. L. Matoto, S. Tatafu). Tongan seabirds are described above for Site N 2: Tafahi Island nesting site. Humpback whales in Tongan waters are described above for Site L 4: Vava’u Waters.

‘Ata Island is an Important Bird Area. The island has some of the largest seabird colonies in Tonga, especially wedge-tailed shearwaters, masked, red-footed and brown boobies, and black and brown noddies. Together, these species are believed to include over 50,000 birds (BirdLife International, 2017).

Type and number of sources (score = 1)

There is peer-reviewed literature available for the attributes identified as important for the site (seabirds and humpback whales), but only a website and expert advice are available for the site itself.

Obligations (score = 3)

There are obligations to protect the habitat of seabirds and whales under the Fisheries Management Act 2002, the Environment Management Act 2010 and the Birds and Preservation Act, Cap 125. Humpback whales and some seabirds are further protected through their inclusion on the IUCN Red List and CITES. ‘Ata Island is an International Bird Area. The Convention on Biological Diversity lists obligations to protect threatened species and habitats.

3.2.4.11 SITE T 11: TELEKI TONGA AND TELEKI TOKELAU REEFS

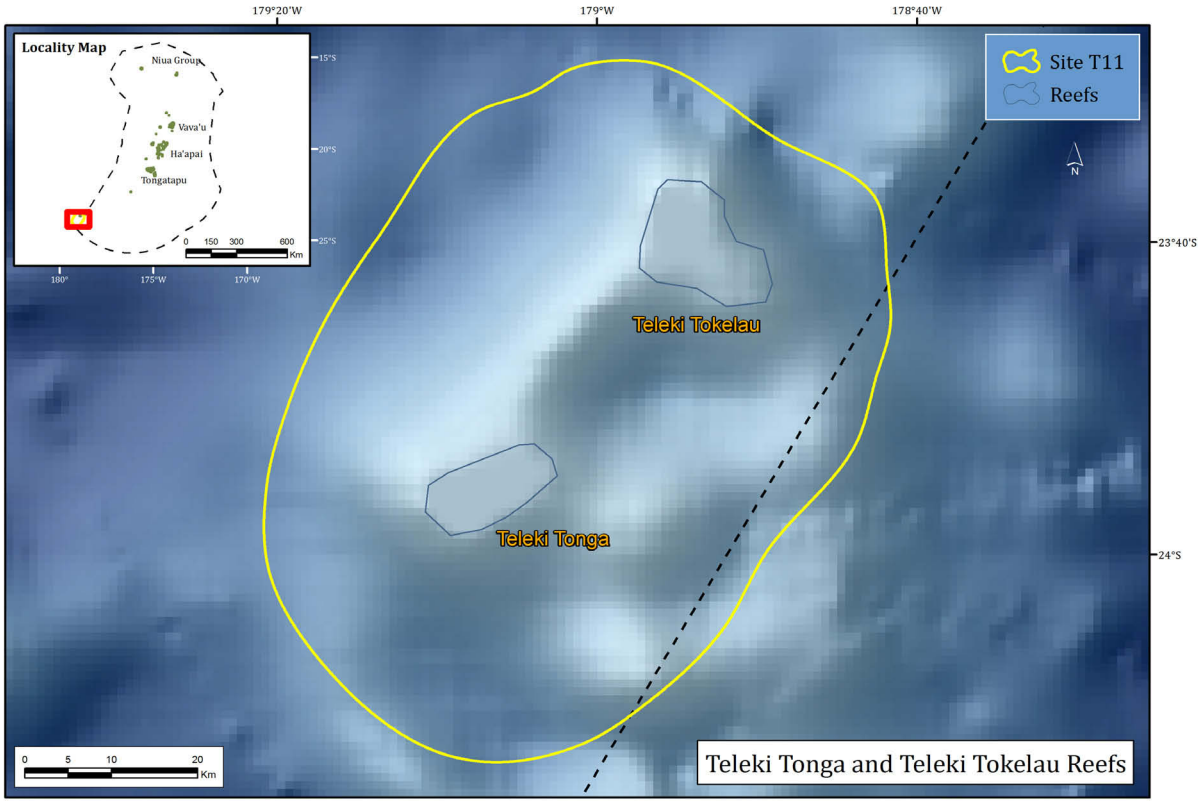

FIGURE 38. SITE T 11: Teleki Tonga and Teleki Tokelau Reefs

TABLE 39. Site T 11: Teleki Tonga and Teleki Tokelau Reefs. Overall score (based upon information below)

Geographic Cluster	Site Name	Site Code	Overall Rating
Finer scale biophysically special, unique marine sites – Tongatapu Island Group	Teleki Tonga and Teleki Tokelau Reefs	T11	10

Geographic boundaries

(-24.0266, -179.4625) and (-23.6808, -178.6015)

Geographic description (score = 3)

The site includes Teleki Tonga and Teleki Tokelau Reefs, and 12 nautical miles of surrounding ocean. They lie 435 km to the southwest of the Tongatapu group. Teleki Tonga has a diameter of ~5.6 km, and Teleki Tokelau has a diameter of ~4.8 km

Justification (score = 3)

Teleki Tonga and Teleki Tokelau are two volcanic atolls that lie outside Tonga's provisional EEZ, but have been declared Special Management Areas by Tonga (reserved for local fishing vessels only) due to their pristine coral reefs, high shark densities and healthy stocks of giant clams. Also known as the Minerva Reefs, they were proclaimed as part of Tonga in 1972 (http://extwprlegs1.fao.org/docs/pdf/ton5226.pdf).

These reefs lie just southwest of Tonga's provisional EEZ boundary and support significant shark and clam populations and relatively isolated but diverse coral reefs. The site offers a safe anchorage to passing yachts, and is also an aid to navigation (pers. comm. L. Matoto, S Tatafu, V. Matoto, F. Hakaumotu, H. Fakapelea).

Giant clams in Tonga have traditionally been harvested by the subsistence fisheries, raising concenrs about overexploitation. Areas that are still rich in giant clams, such as Teleki Tonga and Teleki Tokelau, are therefore important. Four species of giant clam (*Tridacna maxima, T. squamosa, T. derasa* and *T. crocea*) are commonly found in Tonga, and it is typical to find the highest densities of giant clams on reefs more distant from population centres (Atherton et al., 2015).

The tendency for oceanic reefs to be in better condition than those closer to populations centres in Tonga is described above for Site L 3: Inshore marine areas. General information about the vulnerability and importance of top predators such as sharks is presented above for Site V 1: Southern Vava'u islands and turtle nesting sites. There was no ecological information specific to these reefs.

Type and number of sources (score = 1)

The information sources range from general peer-reviewed papers and technical reports for information about the valuable assets of the site (see above), but not for the site in particular. Only expert advice is available for the site itself.

Obligations (score = 3)

The islands have been declared as Special Management Areas by Tonga (Pers. Comm. L. Matoto, S Tatafu, V. Matoto, F. Hakaumotu, H. Fakapelea). The Special Management Area was proclaimed for 12nm from the islands (http://extwprlegs1.fao.org/docs/pdf/ton80085.pdf). Corals and multiple species supported by coral reefs (clams, sharks) are protected under the Fisheries Management Act 2002 and Environment Management Act 2010. Sharks are afforded additional protection under the National Plan of Action for Sharks 2014–2016. Corals, sharks, giant clams and some sea cucumbers are also listed on the IUCN Red List and protected under CITES. The Convention on Biological Diversity lists obligations to protect coral reefs.

4. DISCUSSION

Sites identified by the expert workshop as special, unique marine areas were given scores between 6 and 12 (Table 40). This scoring system is mainly subjective, albeit systematic, and is designed to use as a guide for planning purposes. The final score for each site reflects the amount and type of knowledge available for that site, as well as the attributes of the site; lower-scoring sites may benefit from ground-truthing before definitive decisions are made about their protection or management. Because the highest scoring sites have a more solid information base, prioritisation of these areas during conservation or management planning across all sectors can be viewed with greater confidence. However, the scoring system is based upon information available at the time of writing and, as more information is gathered or as time goes on, the "real" score of any site may be found to be different than as reported here.

None of the large-scale sites was given the maximum score of 12 (see list of scores in Table 40). Because of their large-scale and often offshore nature, the geographic boundaries of these sites were not exactly defined. A clear site boundary is important spatial planning, especially in the case of marine areas where the features to be protected are usually under the surface or determined by the movements or animals, and therefore not readily visible. However, also because of their broad-scale nature, many of the large-scale sites received high scores; their geographic span guarantees the inclusion of many smaller special, unique and important attributes and critical (spawning, breeding, aggregation or feeding) habitats of threatened species such as marine mammals, and increases the likelihood of there being reliable sources directly relevant to the site.

Among the finer-scale sites, the two highest-scoring sites (12) were Fonualei and Toku Islands and Tongatapu coral reefs (see list of scores in Table 40). This was the result of a combination of factors: they were geographically clearly defined, there was high-quality information directly relevant to the site, and the attributes of the sites were clearly special. These high-scoring sites included a combination of remote (Fonualei and Toku) and heavily populated (some of Tongatapu's coral reefs) sites. Low-scoring sites, such as Ngā'itō and Coastal Haveluliku and Fua'amotu village, were those that had been selected for a single specific organism or attribute, or those for which very little information was available. This indicates that both high and low scores are useful for management; while high-scoring sites can be prioritised with confidence, lower-scoring sites can be highlighted for needing more research or requiring protection for the purposes of ecosystem recovery, or even restoration efforts.

Because of the inherently different nature of offshore versus more nearshore sites, the significant differences in data availability and also because of the divergent management issues and management tools that would be applied inshore and offshore, these two sets of sites were not ranked against each other in Table 40. Inshore and offshore areas were not considered comparable in scoring the sites.

Many of the sites were given a special, unique status because of their remoteness. This was partly because geographic isolation often leads to unique assemblages, genetic distinctness and the presence of endemics, and/or because the remoteness itself has left their ecosystems relatively intact. For instance, Tonga has abundant coral reefs, some are heavily exploited, polluted and degraded, and others are practically pristine because of their distance from human settlements. It is the reefs further offshore that are considered more special and unique because the lack of exploitation and pollution makes them more diverse and resilient, with more abundant flora and fauna and intact food webs. Spatial planning can take this into account directly, but also in the context of connectivity, where intact coral reefs could act as sources of larvae to replenish degraded reefs; hydrodynamic modelling could help establish such linkages to further guide planning and management. Given the status of coral reefs worldwide, coral reefs identified in this report may well be special and/or unique at a global level. Similarly, when a site was considered special and unique because of the presence or high density of a certain species (e.g. octopus), it was usually due to the disappearance of this species in many other areas throughout Tonga. The presence or high density of a single or multiple species was therefore an indicator of an area or ecosystem that could be considered to be relatively undisturbed or unexploited, and therefore likely to have other positive attributes. Unfortunately, many of these finer scale sites had very little site-specific information available, and therefore received lower scores.

Future scoring systems could, more explicitly, take into account levels of human use or impact, as this affects the intrinsic ecological value of a habitat, assemblage, population or ecosystem. This intrinsic ecological value is embedded within the ability of the system to function in a balanced and sustainable manner. This includes elements of assemblage structure and diversity, nutrient cycling, trophic linkages and the abundance of keystone species. Sometimes a single

species can indicate that these processes are likely to be intact. However, in the absence of existing information, only ground-truthing can confirm the special, unique nature of a site.

The identification and scoring of special, unique marine areas can guide the next steps in marine spatial planning, but also provide a baseline of information for other management measures or EIA that may be necessary in the future at these locations. The identified sites all scored at least 6 points or above, which is not surprising, given that they all contain features that somehow distinguish them as unique or special, and all are sites / features subject to obligations at national or international level. Sites with higher scores can be seen as priority sites at a national level, while those scoring lower should be flagged for further research.

TABLE 40. Summary of special, unique marine sites, in order of decreasing score. Large-scale and finer scale sites are rated separately.

Geographic Cluster	Site Name	Site Code	Total score
Large-scale special, unique sites	Tonga Trench and Tonga Ridge	L2	10
	Inshore marine areas	L3	10
	Ha'apai High Productivity Zone	L6	10
	Vava'u waters	L7	10
	Seamounts and ridges around 'Ata Island	L1	9.5
	Hydrothermal vents	L4	9.5
	Canyons	L9	8.5
	Offshore west of Tongan islands	L5	7
	Tongatapu and 'Eua whale areas	L8	6
Finer scale special, unique sites	Fonualei and Toku Islands	V2	12
	Tongatapu coral reefs	T5	12
	Southern Vava'u islands and turtle nesting sites	V1	11
	Vava'u southern bank	V4	10.5
	Capricorn Seamount	V7	10.5
	Seisia / Nukunukumotu Island mangroves	T2	10
	Teleki Tonga and Teleki Tokelau Reefs	T11	10
	Fanga'uta Lagoon	T3	10
	Late Island and Home Reef	V5	9.5
	West Vava'u wetlands	V6	9.5
	Ha'apai seagrass beds	H6	9.5
	Ha'apai whale areas	H7	9
	'Ata Island	T10	9
	Sopu and Hofoa wetlands	T8	8.5
	'Uta Vava'u spawning grounds	V3	8.5
	Tafahi Island nesting site	N2	8.5
	Passage between Tongatapu and Eua	T1	8.5
	Southeast Niuatoputapu	N1	8
	Ha'apai turtle nesting sites	H1	8
	'Eueiki Island	T9	8
	'Uiha Island	H4	7.5
	Fungafele'ave mangroves	T4	7
	Waters around 'Eua and Hakaumama'o Reef	T6	7
	Northeastern Ha'apai	H5	6.5
	Octopus ("Octapusy")	H2	6.5
	Northern Niuatoputapu Kaloama	N3	6
	Tafahi Island coconut crab	N4	6
	Ngā'itō	H3	6
	Coastal Haveluliku and Fua'amotu Village	T7	6

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6. APPENDICES

APPENDIX 1
BIOPHYSICAL DATA AVAILABLE DURING THE WORKSHOP

LIST OF BIODIVERSITY MAPS AVAILABLE IN HARDCOPY

- Tonga BaseMap EEZ (including Coastlines and Bathymetry)
- Tonga Mangroves, Reefs, Seagrass
- Tonga Geomorphology EEZ
- Tonga Hydrothermal Vents EEZ
- Tonga Seamount Classification EEZ
- Tonga Seamounts Productivity EEZ
- Tonga Managed Areas ZOOM
- Tonga Ecologically and Biologically Significant Areas and Important Biodiversity Areas EEZ
- Tonga Aquamaps All EEZ (Kaschner et al., 2016)
- Tonga Aquamaps Benthic EEZ (Kaschner et al., 2016)
- Tonga Aquamaps Pelagic EEZ (Kaschner et al., 2016)
- Tonga ColdWater Coral EEZ
- Tonga Number Coral Species EEZ
- Tonga Vertically Generalised Production Model EEZ
- Tonga Chlorophyll A EEZ
- Tonga SST EEZ
- Tonga Currents EEZ

LIST OF BIODIVERSITY AND OTHER DATA AVAILABLE IN GIS

- All of the above
- Tonga Underwater Feature Names
- Tonga Depth of 20 Degree Isotherm EEZ
- Tonga Mixed Layer Depth EEZ
- Tonga Salinity EEZ
- Tonga pH EEZ
- Tonga Photosynthetically Available Radiation EEZ
- Tonga Nitrate EEZ
- Tonga Calcite EEZ
- Tonga Silicate EEZ
- Tonga Phosphate EEZ
- Tonga Particulate Organic Carbon Flux EEZ
- Tonga Reefs at Risk EEZ
- Tonga Historic Tsunami Location EEZ
- Tonga Upwelling EEZ
- Tonga Ocean Productivity EEZ
- Tonga Cyclone Tracks EEZ

The data sources are listed and thanked in the Acknowledgements of this report.

APPENDIX 2

LIST OF WORKSHOP PARTICIPANTS AND SOURCES OF ADDITIONAL DATA FROM NON-PARTICIPANTS

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APPENDIX 3
AGENDA FOR WORKSHOP ON BIOPHYSICALLY SPECIAL, UNIQUE MARINE AREAS IN TONGA

AGENDA

EXPERT MEETING ON PRIORITY BIODIVERSITY AREAS OF TONGA

VENUE: ENVIRONMENT DEPARTMENT CONFERENCE ROOM

DATE: 18 MAY 2016

TIME: 2:00PM-–4:30PM

TIME	ACTIVITIES	PRESENTERS
2:00PM	Opening Prayer	
2:05PM	Welcome Remarks	ASIPELI PALAKI (CEO, Lands and Natural Resouces)
2:10PM	Introductions of the participants	ALL
2:15PM	Background on MSP in Tonga and how this workshop outputs will contribute (10 min) Presentation on existing data (coral reefs, mangroves, bathymetry, geomorphology, EBSA, species richness, productivity, important bird areas)(15 min)	LUPE MATOTO (Director, Environment) HANS WENDT/JONAH SULLIVAN (MACBIO Project)
2:40PM	Assessment of important biodiversity areas: Tongatapu Island Group: inshore & offshore (~20 m) Ha'apai Island Group: inshore & offshore (~20m) Vava'u Island Group: inshore & offshore (~20m) Niuatoputapu Island Gp: inshore & offshore (~20m) Southern part of Tonga (around Ata & beyond): offshore (~20m)	
4:20PM	Next steps	LUPE MATOTO/LEANNE FERNANDES (MACBIO)
4:25PM	Closing remarks	ASIPELI PALAKI (CEO, Lands and Natural Resouces)
4:30PM	Closing Prayer	

APPENDIX 4
WORKSHOP SITE RESPONSE SHEET AND MAPS PROVIDED FOR PARTICIPANTS TO DRAW SITES UPON

1. RESPONSE SHEET FOR USE PER SITE

Tonga Biodiversity Priorities Workshop – Worksheet

18 MAY 2016

Group: **Site number:**

Site name:

Location/ geographic description:

Justification:

Sources:

Any legal obligations:

Follow-ups:

2. LIST OF MAPS TO DRAW SITES UPON

- Niuatoputapu Island Group – Inshore
- Niuatoputapu Island Group – Offshore
- Vava'u Island Group – Inshore
- Vava'u Island Group – Offshore
- Ha'apai Island Group – Inshore
- Ha'apai Island Group – Offshore
- Tongatapu Island Group – Inshore
- Tongatapu Island Group – Offshore
- Southern part of Tonga (around Ata & beyond) – Inshore
- Southern part of Tonga (around Ata & beyond) – Offshore

APPENDIX 5

LIST OF SPECIES KNOWN TO OCCUR IN TONGA WITH INTERNATIONAL AND NATIONAL OBLIGATIONS.

The species list was generated through a country- and region-specific search of Species + (www.speciesplus.net) and the IUCN Red List (www.iucnredlist.org). This table was used to verify the obligations for each site, where particular species were known to occur at the site. CITES: The Convention on International Trade in Endangered Species of Wild Fauna and Flora; CMS: Convention on Migratory Species; IUCN: International Union for the Conservation of Nature; NPOA: National Plan of Action; UNCLOS: United Nations Convention on the Law of the Sea; DD: Data Deficient; LC: Least Concern; NT: Near Threatened; VU: Vulnerable; EN: Endangered.

Category	Scientific Name	Common Name	CITES	CMS	IUCN Red List	Range (km²)	Migrant	Shark NPOA	UNCLOS
Albatross	*Diomedea exulans*	Wandering albatross	II		VU	128000000	yes		
Alfonsino	*Beryx splendens*	Alfonsino			LC	circumglobal	no		
Angelfish	*Centropyge bicolor*	Bicolor angelfish			LC	Indo-west Pacific	no		
Angelfish	*Centropyge bispinosus*	Two-spined angelfish			LC	Indo-Pacific	no		
Angelfish	*Centropyge fisheri*	Fisher's angelfish			LC	Indo-west Pacific, Pacific	no		
Angelfish	*Centropyge flavissima*	Lemonpeel angelfish			LC	Central Pacific	no		
Angelfish	*Centropyge heraldi*	Herald's angelfish			LC	Indo-west Pacific, Pacific	no		
Angelfish	*Centropyge loricula*	Flame angelfish			LC	Indo-west Pacific, Pacific	no		
Angelfish	*Centropyge tibicen*	Keyhole angelfish			LC	Indo-Pacific	no		
Angelfish	*Centropyge vrolikii*	Pearl-scaled angelfish			LC	Indo-west Pacific, Pacific	no		
Angelfish	*Pomacanthus imperator*	Emperor angelfish			LC	Indian Ocean, Indo-Pacific	no		
Angelfish	*Pomacanthus semicirculatus*	Semicircle angelfish			LC	Indian Ocean, Indo-Pacific	no		
Angelfish	*Pygoplites diacanthus*	Bluebanded angelfish			LC	Indo-west Pacific	no		
Anglerfish	*Ceratias holboelli*	Deepsea angler			LC	circumglobal, deep	no		
Anglerfish	*Chaenophryne draco*	Anglerfish			LC	circumglobal, deep	no		
Anglerfish	*Chaenophryne ramifera*	Anglerfish			LC	widespread, deep	no		
Anglerfish	*Cryptopsaras couesii*	Warty seadevil			LC	circumglobal, deep	no		
Anglerfish	*Histrio histrio*	Sargassum anglerfish			LC	circumtropical	no		
Anglerfish	*Microlophichthys microlophus*	Anglerfish			LC	widespread, deep	no		
Anglerfish	*Oneirodes eschrichtii*	Bulbous dreamer			LC	circumglobal, deep	no		
Anthias	*Pseudanthias cooperi*	Redbar anthias			LC	Indian Ocean, Indo-Pacific	no		
Anthias	*Pseudanthias gibbosus*	Anthias			LC	Indo-Pacific	no		
Anthias	*Pseudanthias hypselosoma*	Stocky anthias			LC	Indo-Pacific	no		
Anthias	*Pseudanthias pictilis*	Painted anthias			LC	restricted	no		
Anthias	*Pseudanthias squamipinnis*	Lyretail anthias			LC	Indo-west Pacific	no		
Barracuda	*Sphyraena barracuda*	Great barracuda			LC	circumtropical	no		
Barracudina	*Arctozenus risso*	Spotted barracudina			LC	widespread, deep	no		
Barracudina	*Lestrolepis intermedia*	Barracudina			LC	circumglobal, deep	no		
Barracudina	*Magnisudis atlantica*	Duckbill barracudina			LC	circumglobal, deep	no		
Barracudina	*Paralepis elongata*	Barracudina			LC	widespread, deep	no		
Barracudina	*Sudis atrox*	Hideous barracudina			LC	circumglobal, deep	no		
Barreleye	*Opisthoproctus grimaldii*	Grimaldi's barreleye			LC	circumtropical, deep	no		
Barreleye	*Winteria telescopa*	Barreleye			LC	circumtropical, deep	no		

Category	Scientific Name	Common Name	CITES	CMS	IUCN Red List	Range (km²)	Migrant	Shark NPOA	UNCLOS
Bigeye	*Cookeolus japonicus*	Deepwater bigeye			LC	circumglobal, deep	no		
Bigeye	*Heteropriacanthus cruentatus*	Glasseye snapper			LC	circumglobal, deep	no		
Bigeye	*Priacanthus hamrur*	Moontail bullseye			LC	Indo-west Pacific	no		
Billfish	*Tetrapturus angustirostris*	Shortbill spearfish			DD	widespread	yes		I
Billfish	*Xiphias gladius*	Swordfish			LC	circumglobal	yes		I
Black seadevil	*Melanocetus johnsonii*	Humpback anglerfish			LC	widespread, deep	no		
Black seadevil	*Melanocetus murrayi*	Black seadevil			LC	circumglobal, deep	no		
Blenny	*Cirripectes castaneus*	Chestnut blenny			LC	widespread	no		
Blenny	*Entomacrodus caudofasciatus*	Bartail blenny			LC	western and central Pacific	no		
Blenny	*Entomacrodus cymatobiotus*	Pacific rockskipper			LC	Pacific	no		
Blenny	*Petroscirtes mitratus*	Highfinned blenny			LC	Indo-west Pacific	no		
Blenny	*Plagiotremus tapeinosoma*	Piano fangblenny			LC	Indo-Pacific	no		
Blenny	*Salarias sinuosus*	Fringelip blenny			LC	restricted	no		
Boa	*Candoia bibroni*	Solomon Island tree boa	II		LC		no		
Boarfish	*Antigonia capros*	Deep-bodied boarfish			LC	widespread, deep	no		
Booby	*Sula sula*	Red-footed booby			LC	185000000	yes		
Booby	*Sula leucogaster*	Brown booby			LC	223000000	no		
Booby	*Sula dactylatra*	Masked booby			LC	211000000	no		
Bristlemouth	*Cyclothone acclinidens*	Bent-tooth bristlemouth			LC	circumglobal, deep	no		
Bristlemouth	*Cyclothone alba*	Pale bristlemouth			LC	circumglobal, deep	no		
Bristlemouth	*Cyclothone braueri*	Brauer's bristlemouth			LC	circumglobal, deep	no		
Bristlemouth	*Cyclothone microdon*	Smalltooth bristlemouth			LC	circumglobal, deep	no		
Bristlemouth	*Cyclothone pallida*	Bicolored bristlemouth			LC	circumglobal, deep	no		
Bristlemouth	*Cyclothone pseudopallida*	Slender bristlemouth			LC	circumglobal, deep	no		
Bristlemouth	*Diplophos taenia*	Pacific portholefish			LC	circumglobal	no		
Bristlemouth	*Gonostoma atlanticum*	Bristlemouth			LC	widespread, deep	no		
Bristlemouth	*Gonostoma elongatum*	Elongated bristlemouth			LC	circumglobal, deep	no		
Bristlemouth	*Manducus maderensis*	Bristlemouth			DD	widespread, deep	no		
Butterflyfish	*Chaetodon auriga*	Threadfin butterflyfish			LC	Indo-Pacific	no		
Butterflyfish	*Chaetodon bennetti*	Bennett's butterflyfish			DD	widespread, uncommon	no		
Butterflyfish	*Chaetodon citrinellus*	Citron butterflyfish			LC	Indo-Pacific	no		
Butterflyfish	*Chaetodon ephippium*	Saddleback butterflyfish			LC	Indo-Pacific	no		
Butterflyfish	*Chaetodon flavirostris*	Dusky butterflyfish			LC	widespread	no		
Butterflyfish	*Chaetodon guentheri*	Guentheri butterflyfish			LC	western Pacific	no		
Butterflyfish	*Chaetodon kleinii*	Whitespotted butterflyfish			LC	Indo-Pacific	no		
Butterflyfish	*Chaetodon lineolatus*	Lined butterflyfish			LC	Indo-Pacific	no		
Butterflyfish	*Chaetodon lunula*	Redstripe butterflyfish			LC	Indo-Pacific	no		
Butterflyfish	*Chaetodon lunulatus*	Oval butterflyfish			LC	western Pacific	no		
Butterflyfish	*Chaetodon melannotus*	Blackbacked butterflyfish			LC	Indo-west Pacific	no		
Butterflyfish	*Chaetodon mertensii*	Orangebar butterflyfish			LC	western Pacific	no		
Butterflyfish	*Chaetodon ornatissimus*	Ornate butterflyfish			LC	Indo-west Pacific	no		
Butterflyfish	*Chaetodon pelewensis*	Dot and dash butterflyfish			LC	south Pacific	no		
Butterflyfish	*Chaetodon plebius*	Blueblotch butterflyfish			LC	western Pacific	no		

Category	Scientific Name	Common Name	CITES	CMS	IUCN Red List	Range (km²)	Migrant	Shark NPOA	UNCLOS
Butterflyfish	*Chaetodon quadrimaculatus*	Fourspot butterflyfish			LC	Indo-west Pacific, Pacific, uncommon	no		
Butterflyfish	*Chaetodon speculum*	Oval-spot butterflyfish			LC	Indo-west Pacific	no		
Butterflyfish	*Chaetodon trifascialis*	Triangulate butterflyfish			LC	widespread	no		
Butterflyfish	*Chaetodon ulietensis*				LC				
Butterflyfish	*Chaetodon unimaculatus*	Teardrop butterflyfish			LC	Indo-Pacific	no		
Butterflyfish	*Chaetodon vagabundus*	Vagabond butterflyfish			LC	widespread	no		
Butterflyfish	*Forcipiger flavissimus*	Long-nosed butterflyfish			LC	widespread	no		
Butterflyfish	*Forcipiger longirostris*	Black long-nosed butterflyfish			LC	Indo-Pacific	no		
Butterflyfish	*Hemitaurichthys polylepis*	Pyramid butterflyfish			LC	Central western Pacific	no		
Butterflyfish	*Heniochus acuminatus*	Bannerfish			LC	Indo-Pacific	no		
Butterflyfish	*Heniochus chrysostomus*	Pennant bannerfish			LC	Indo-Pacific	no		
Butterflyfish	*Heniochus monoceros*	Masked bannerfish			LC	Indo-Pacific	no		
Butterflyfish	*Heniochus singularis*	Singular bannerfish			LC	Indo-Pacific, Pacific	no		
Cardinalfish	*Ostorhinchus lateralis*	Humpback cardinalfish			LC	Indian Ocean, Indo-Pacific	no		
Chub	*Kyphosus cinerascens*	Highfin chub			LC	widespread	no		
Chub	*Kyphosus sectatrix*	Bermuda chub			LC	widespread	no		
Clingfish	*Pherallodus indicus*	Smalldisc clingfish			LC	Indo-west Pacific	no		
Collared wriggler	*Xenisthmus eirospilus*	Spotted wriggler			LC	southwest Pacific	no		
Cone snail	*Conus terebra*	Cone snail			LC	Indo-Pacific	no		
Coral	*Antipathes dichotoma*		II			uncertain			
Coral	*Acropora abrotanoides*	Acropora species	II		LC		no		
Coral	*Acropora aculeus*	Acropora species	II		VU		no		
Coral	*Acropora acuminata*	Acropora species	II		VU		no		
Coral	*Acropora anthocercis*	Acropora species	II		VU		no		
Coral	*Acropora aspera*	Acropora species	II		VU		no		
Coral	*Acropora austera*	Acropora species	II		NT		no		
Coral	*Acropora brueggemanni*	Acropora species	II			uncertain			
Coral	*Acropora carduus*	Acropora species	II		NT		no		
Coral	*Acropora caroliniana*	Acropora species	II		VU		no		
Coral	*Acropora cerealis*	Acropora species	II		LC		no		
Coral	*Acropora chesterfieldensis*	Acropora species	II		LC		no		
Coral	*Acropora clathrata*	Acropora species	II		LC		no		
Coral	*Acropora copiosa*	Acropora species	II		DD		no		
Coral	*Acropora crateriformis*	Acropora species	II			uncertain			
Coral	*Acropora cuneata*	Acropora species	II			widespread			
Coral	*Acropora cytherea*	Acropora species	II		LC		no		
Coral	*Acropora dendrum*	Acropora species	II		VU		no		
Coral	*Acropora digitifera*	Acropora species	II		NT		no		
Coral	*Acropora divaricata*	Acropora species	II		NT		no		
Coral	*Acropora donei*	Acropora species	II		VU		no		
Coral	*Acropora echinata*	Acropora species	II		VU		no		
Coral	*Acropora elseyi*	Acropora species	II		LC		no		
Coral	*Acropora exquisita*	Acropora species	II		DD		no		
Coral	*Acropora florida*	Branching coral	II		NT		no		
Coral	*Acropora formosa*	Staghorn coral	II		NT		no		
Coral	*Acropora gemmifera*	Acropora species	II		LC		no		

Category	Scientific Name	Common Name	CITES	CMS	IUCN Red List	Range (km²)	Migrant	Shark NPOA	UNCLOS
Coral	*Acropora globiceps*	Acropora species	II		VU		no		
Coral	*Acropora grandis*	Acropora species	II		LC		no		
Coral	*Acropora granulosa*	Acropora species	II		NT		no		
Coral	*Acropora horrida*	Acropora species	II		VU		no		
Coral	*Acropora humilis*	Finger coral	II		NT		no		
Coral	*Acropora hyacinthus*	Brush coral	II		NT		no		
Coral	*Acropora inermis*	Acropora species	II		DD		no		
Coral	*Acropora insignis*	Acropora species	II		DD		no		
Coral	*Acropora intermedia*	Acropora species	II			widespread			
Coral	*Acropora kirstyae*	Acropora species	II		VU		no		
Coral	*Acropora latistella*	Acropora species	II		LC		no		
Coral	*Acropora listeri*	Acropora species	II		VU		no		
Coral	*Acropora longicyathus*	Acropora species	II		LC		no		
Coral	*Acropora loripes*	Acropora species	II		NT		no		
Coral	*Acropora lovelli*	Acropora species	II		VU		no		
Coral	*Acropora lutkeni*	Acropora species	II		NT		no		
Coral	*Acropora microclados*	Acropora species	II		VU		no		
Coral	*Acropora microphthalma*	Acropora species	II		LC		no		
Coral	*Acropora millepora*	Acropora species	II		NT		no		
Coral	*Acropora monticulosa*	Acropora species	II		NT		no		
Coral	*Acropora nana*	Acropora species	II		NT		no		
Coral	*Acropora nasuta*	Acropora species	II		NT		no		
Coral	*Acropora nobilis*	Acropora species	II		LC		no		
Coral	*Acropora palifera*	Acropora species	II			widespread			
Coral	*Acropora palmerae*	Acropora species	II		VU		no		
Coral	*Acropora paniculata*	Acropora species	II		VU		no		
Coral	*Acropora parilis*	Acropora species	II		DD		no		
Coral	*Acropora polystoma*	Acropora species	II		VU		no		
Coral	*Acropora prostrata*	Acropora species	II		DD		no		
Coral	*Acropora pulchra*	Acropora species	II		LC		no		
Coral	*Acropora retusa*	Acropora species	II		VU		no		
Coral	*Acropora robusta*	Acropora species	II		LC		no		
Coral	*Acropora rosaria*	Acropora species	II		DD		no		
Coral	*Acropora samoensis*	Acropora species	II		LC		no		
Coral	*Acropora sarmentosa*	Acropora species	II		LC		no		
Coral	*Acropora secale*	Acropora species	II		NT		no		
Coral	*Acropora selago*	Acropora species	II		NT		no		
Coral	*Acropora solitaryensis*	Acropora species	II		VU		no		
Coral	*Acropora speciosa*	Acropora species	II		VU		no		
Coral	*Acropora spicifera*	Acropora species	II		VU		no		
Coral	*Acropora subglabra*	Acropora species	II		LC		no		
Coral	*Acropora subulata*	Acropora species	II		LC		no		
Coral	*Acropora tenuis*	Acropora species	II		NT		no		
Coral	*Acropora tortuosa*	Acropora species	II		LC		no		
Coral	*Acropora tutuilensis*	Acropora species	II		DD		no		
Coral	*Acropora valenciennesi*	Acropora species	II		LC		no		
Coral	*Acropora valida*	Acropora species	II		LC		no		
Coral	*Acropora vaughani*	Acropora species	II		VU		no		
Coral	*Acropora verweyi*	Acropora species	II		VU		no		

Category	Scientific Name	Common Name	CITES	CMS	IUCN Red List	Range (km²)	Migrant	Shark NPOA	UNCLOS
Coral	*Acropora yongei*	Acropora species	II		LC		no		
Coral	*Astreopora cucullata*	Astreopora species	II		VU		no		
Coral	*Astreopora gracilis*	Astreopora species	II		LC		no		
Coral	*Astreopora listeri*	Astreopora species	II		LC		no		
Coral	*Astreopora myriophthalma*	Astreopora species	II		LC		no		
Coral	*Astreopora randalli*	Astreopora species	II		LC		no		
Coral	*Astreopora scabra*	Astreopora species	II		LC		no		
Coral	*Astreopora suggesta*	Astreopora species	II		LC		no		
Coral	*Montipora aequituberculata*	Montipora species	II		LC		no		
Coral	*Montipora angulata*	Montipora species	II		VU		no		
Coral	*Montipora australiensis*	Montipora species	II		VU		no		
Coral	*Montipora calcarea*	Montipora species	II		VU		no		
Coral	*Montipora caliculata*	Montipora species	II		VU		no		
Coral	*Montipora capitata*	Montipora species	II		NT		no		
Coral	*Montipora capricornis*	Montipora species	II		VU		no		
Coral	*Montipora corbettensis*	Montipora species	II		VU		no		
Coral	*Montipora crassituberculata*	Montipora species	II		VU		no		
Coral	*Montipora danae*	Montipora species	II		LC		no		
Coral	*Montipora digitata*	Montipora species	II		LC		no		
Coral	*Montipora efflorescens*	Montipora species	II		NT		no		
Coral	*Montipora effusa*	Montipora species	II		NT		no		
Coral	*Montipora floweri*	Montipora species	II		LC		no		
Coral	*Montipora foliosa*	Montipora species	II		NT		no		
Coral	*Montipora foveolata*	Montipora species	II		NT		no		
Coral	*Montipora gaimardi*	Montipora species	II		VU		no		
Coral	*Montipora grisea*	Montipora species	II		LC		no		
Coral	*Montipora hispida*	Montipora species	II		LC		no		
Coral	*Montipora hoffmeisteri*	Montipora species	II		LC		no		
Coral	*Montipora incrassata*	Montipora species	II		NT		no		
Coral	*Montipora informis*	Montipora species	II		LC		no		
Coral	*Montipora lobulata*	Montipora species	II		VU		no		
Coral	*Montipora millepora*	Montipora species	II		LC		no		
Coral	*Montipora mollis*	Montipora species	II		LC		no		
Coral	*Montipora monasteriata*	Montipora species	II		LC		no		
Coral	*Montipora nodosa*	Montipora species	II		NT		no		
Coral	*Montipora peltiformis*	Montipora species	II		NT		no		
Coral	*Montipora spongodes*	Montipora species	II		LC		no		
Coral	*Montipora spumosa*	Montipora species	II		LC		no		
Coral	*Montipora stellata*	Montipora species	II		LC		no		
Coral	*Montipora tuberculosa*	Montipora species	II		LC		no		
Coral	*Montipora turgescens*	Montipora species	II		LC		no		
Coral	*Montipora turtlensis*	Montipora species	II		VU		no		
Coral	*Montipora undata*	Montipora species	II		NT		no		
Coral	*Montipora venosa*	Montipora species	II		NT		no		
Coral	*Montipora verrucosa*	Montipora species	II		LC		no		
Coral	*Coeloseris mayeri*	Coeloseris species	II		LC		no		
Coral	*Gardineroseris planulata*	Gardineroseris species	II		LC		no		

Category	Scientific Name	Common Name	CITES	CMS	IUCN Red List	Range (km²)	Migrant	Shark NPOA	UNCLOS
Coral	*Leptoseris explanata*	Leptoseris species	II		LC		no		
Coral	*Leptoseris gardineri*	Leptoseris species	II		LC		no		
Coral	*Leptoseris hawaiiensis*	Leptoseris species	II		LC		no		
Coral	*Leptoseris incrustans*	Leptoseris species	II		VU		no		
Coral	*Leptoseris mycetoseroides*	Leptoseris species	II		LC		no		
Coral	*Leptoseris papyracea*	Leptoseris species	II		LC		no		
Coral	*Leptoseris scabra*	Leptoseris species	II		LC		no		
Coral	*Leptoseris solida*	Leptoseris species	II		LC		no		
Coral	*Leptoseris yabei*	Leptoseris species	II		VU		no		
Coral	*Pachyseris rugosa*	Pachyseris species	II		VU		no		
Coral	*Pachyseris speciosa*	Pachyseris species	II		LC		no		
Coral	*Pavona bipartita*	Pavona species	II		VU		no		
Coral	*Pavona cactus*	Pavona species	II		VU		no		
Coral	*Pavona clavus*	Pavona species	II		LC		no		
Coral	*Pavona decussata*	Pavona species	II		VU		no		
Coral	*Pavona divaricata*	Pavona species	II			widespread			
Coral	*Pavona duerdeni*	Pavona species	II		LC		no		
Coral	*Pavona explanulata*	Pavona species	II		LC		no		
Coral	*Pavona frondifera*	Pavona species	II		LC		no		
Coral	*Pavona maldivensis*	Pavona species	II		LC		no		
Coral	*Pavona minuta*	Pavona species	II		NT		no		
Coral	*Pavona varians*	Pavona species	II		LC		no		
Coral	*Pavona venosa*	Pavona species	II		VU		no		
Coral	*Stylocoeniella armata*	Stylocoeniella species	II		LC		no		
Coral	*Stylocoeniella guentheri*	Stylocoeniella species	II		LC		no		
Coral	*Caryophyllia scobinosa*	Caryophyllia species	II			widespread, uncommon			
Coral	*Euphyllia cristata*	Euphyllia species	II		VU		no		
Coral	*Euphyllia glabrescens*	Euphyllia species	II		NT		no		
Coral	*Heterocyathus aequicostatus*	Heterocyathus species	II		LC		no		
Coral	*Physogyra lichtensteini*	Physogyra species	II		VU		no		
Coral	*Plerogyra simplex*	Plerogyra species	II		NT		no		
Coral	*Plerogyra sinuosa*	Plerogyra species	II		NT		no		
Coral	*Enallopsammia rostrata*	Enallopsammia species	II			widespread			
Coral	*Heteropsammia cochlea*	Heteropsammia species	II		LC		no		
Coral	*Tubastraea micranthus*	Tubastrea species	II			uncertain			
Coral	*Turbinaria frondens*	Turbinaria species	II		LC		no		
Coral	*Turbinaria mesenterina*	Turbinaria species	II		VU		no		
Coral	*Turbinaria patula*	Turbinaria species	II		VU		no		
Coral	*Turbinaria peltata*	Turbinaria species	II		VU		no		
Coral	*Turbinaria radicalis*	Turbinaria species	II		NT		no		
Coral	*Turbinaria reniformis*	Turbinaria species	II		VU		no		
Coral	*Turbinaria stellulata*	Turbinaria species	II		VU		no		
Coral	*Barabattoia amicorum*	Barabattoia species	II		LC		no		
Coral	*Barabattoia laddi*	Barabattoia species	II		VU		no		
Coral	*Caulastraea furcata*	Caulastrea species	II			uncertain			
Coral	*Cyphastrea chalcidicum*	Cyphastrea species	II		LC		no		

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Coral	*Cyphastrea decadia*	Cyphastrea species	II		LC		no		
Coral	*Cyphastrea microphthalma*	Cyphastrea species	II		LC		no		
Coral	*Cyphastrea serailia*	Cyphastrea species	II		LC		no		
Coral	*Diploastrea heliopora*	Diploastrea species	II		NT		no		
Coral	*Echinopora gemmacea*	Echinopora species	II		LC		no		
Coral	*Echinopora hirsutissima*	Echinopora species	II		LC		no		
Coral	*Echinopora horrida*	Echinopora species	II		NT		no		
Coral	*Echinopora lamellosa*	Echinopora species	II		LC		no		
Coral	*Echinopora mammiformis*	Echinopora species	II		NT		no		
Coral	*Favia danae*	Favia species	II		LC		no		
Coral	*Favia danai*	Favia species	II			Indo-west Pacific, rare			
Coral	*Favia favus*	Favia species	II		LC		no		
Coral	*Favia helianthoides*	Favia species	II		NT		no		
Coral	*Favia lizardensis*	Favia species	II		NT		no		
Coral	*Favia maritima*	Favia species	II		NT		no		
Coral	*Favia matthaii*	Favia species	II		NT		no		
Coral	*Favia maxima*	Favia species	II		NT		no		
Coral	*Favia pallida*	Favia species	II		LC		no		
Coral	*Favia rotumana*	Favia species	II		LC		no		
Coral	*Favia rotundata*	Favia species	II		NT		no		
Coral	*Favia speciosa*	Favia species	II		LC		no		
Coral	*Favia stelligera*	Favia species	II		NT		no		
Coral	*Favia veroni*	Favia species	II		NT		no		
Coral	*Favites abdita*	Favites species	II		NT		no		
Coral	*Favites bestae*	Favites species	II		NT		no		
Coral	*Favites chinensis*	Favites species	II		NT		no		
Coral	*Favites complanata*	Favites species	II		NT		no		
Coral	*Favites flexuosa*	Favites species	II		NT		no		
Coral	*Favites halicora*	Favites species	II		NT		no		
Coral	*Favites pentagona*	Favites species	II		LC		no		
Coral	*Favites russelli*	Favites species	II		NT		no		
Coral	*Goniastrea aspera*	Goniastrea species	II		LC		no		
Coral	*Goniastrea australensis*	Goniastrea species	II		LC		no		
Coral	*Goniastrea edwardsi*	Goniastrea species	II		LC		no		
Coral	*Goniastrea favulus*	Goniastrea species	II		NT		no		
Coral	*Goniastrea palauensis*	Goniastrea species	II		NT		no		
Coral	*Goniastrea pectinata*	Goniastrea species	II		LC		no		
Coral	*Goniastrea retiformis*	Goniastrea species	II		LC		no		
Coral	*Leptastrea bottae*	Leptastrea species	II		NT		no		
Coral	*Leptastrea inaequalis*	Leptastrea species	II		NT		no		
Coral	*Leptastrea pruinosa*	Leptastrea species	II		LC		no		
Coral	*Leptastrea purpurea*	Leptastrea species	II		LC		no		
Coral	*Leptastrea transversa*	Leptastrea species	II		LC		no		
Coral	*Leptoria phrygia*	Leptoria species	II		NT		no		
Coral	*Montastrea annuligera*	Montastrea species	II		NT		no		
Coral	*Montastrea curta*	Montastrea species	II		LC		no		
Coral	*Montastrea magnistellata*	Montastrea species	II		NT		no		
Coral	*Montastrea valenciennesi*	Montastrea species	II		NT		no		

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Coral	*Oulophyllia bennettae*	Oulophyllia species	II		NT		no		
Coral	*Oulophyllia crispa*	Oulophyllia species	II		NT		no		
Coral	*Platygyra contorta*	Platygyra species	II		LC		no		
Coral	*Platygyra daedalea*	Platygyra species	II		LC		no		
Coral	*Platygyra lamellina*	Platygyra species	II		NT		no		
Coral	*Platygyra pini*	Platygyra species	II		LC		no		
Coral	*Platygyra ryukyuensis*	Platygyra species	II		NT		no		
Coral	*Platygyra sinensis*	Platygyra species	II		LC		no		
Coral	*Plesiastrea versipora*	Plesiastrea species	II		LC		no		
Coral	*Ctenactis albitentaculata*	Ctenactis species	II		NT		no		
Coral	*Ctenactis crassa*	Ctenactis species	II		LC		no		
Coral	*Ctenactis echinata*	Ctenactis species	II		LC		no		
Coral	*Fungia concinna*	Fungia species	II		LC		no		
Coral	*Fungia distorta*	Fungia species	II		LC		no		
Coral	*Fungia fragilis*	Fungia species	II		LC		no		
Coral	*Fungia fungites*	Fungia species	II		NT		no		
Coral	*Fungia granulosa*	Fungia species	II		LC		no		
Coral	*Fungia hexagonalis*	Fungia species	II		LC		no		
Coral	*Fungia horrida*	Fungia species	II		LC		no		
Coral	*Fungia klunzingeri*	Fungia species	II		LC		no		
Coral	*Fungia moluccensis*	Fungia species	II		LC		no		
Coral	*Fungia paumotensis*	Fungia species	II		LC		no		
Coral	*Fungia repanda*	Fungia species	II		LC		no		
Coral	*Fungia scruposa*	Fungia species	II		LC		no		
Coral	*Fungia scutaria*	Fungia species	II		LC		no		
Coral	*Fungia sinensis*	Fungia species	II		LC		no		
Coral	*Fungia tenuis*	Fungia species	II		LC		no		
Coral	*Fungia vaughani*	Fungia species	II		LC		no		
Coral	*Halomitra pileus*	Halomitra species	II		LC		no		
Coral	*Heliofungia actiniformis*	Heliofungia species	II		VU		no		
Coral	*Herpolitha limax*	Herpolitha species	II		LC		no		
Coral	*Herpolitha weberi*	Herpolitha species	II		LC		no		
Coral	*Lithophyllon mokai*	Lithophyllon species	II		LC		no		
Coral	*Lithophyllon undulatum*	Lithophyllon species	II		NT		no		
Coral	*Podabacia crustacea*	Podabacia species	II		LC		no		
Coral	*Podabacia motuporensis*	Podabacia species	II		NT		no		
Coral	*Polyphyllia novaehiberniae*	Polyphyllia species	II		NT		no		
Coral	*Polyphyllia talpina*	Polyphyllia species	II		LC		no		
Coral	*Sandalolitha dentata*	Sandalolitha species	II		LC		no		
Coral	*Sandalolitha robusta*	Sandalolitha species	II		LC		no		
Coral	*Zoopilus echinatus*	Zoopilus species	II		LC		no		
Coral	*Hydnophora exesa*	Hydnophora species	II		NT		no		
Coral	*Hydnophora grandis*	Hydnophora species	II		LC		no		
Coral	*Hydnophora microconos*	Hydnophora species	II		NT		no		
Coral	*Hydnophora pilosa*	Hydnophora species	II		LC		no		
Coral	*Hydnophora rigida*	Hydnophora species	II		LC		no		
Coral	*Merulina ampliata*	Merulina species	II		LC		no		
Coral	*Merulina scabricula*	Merulina species	II		LC		no		

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Coral	*Scapophyllia cylindrica*	Scapophyllia species	II		LC		no		
Coral	*Acanthastrea amakusensis*	Acanthastrea species	II			Indo-west Pacific			
Coral	*Acanthastrea bowerbanki*	Acanthastrea species	II		VU		no		
Coral	*Acanthastrea echinata*	Acanthastrea species	II		LC		no		
Coral	*Acanthastrea hemprichii*	Acanthastrea species	II		VU		no		
Coral	*Acanthastrea hillae*	Acanthastrea species	II		NT		no		
Coral	*Acanthastrea ishigakiensis*	Acanthastrea species	II		VU		no		
Coral	*Blastomussa wellsi*	Blastomussa species	II		NT		no		
Coral	*Cynarina lacrymalis*	Cynarina species	II		NT		no		
Coral	*Lobophyllia corymbosa*	Lobophyllia species	II		LC		no		
Coral	*Lobophyllia hataii*	Lobophyllia species	II		LC		no		
Coral	*Lobophyllia hemprichii*	Lobophyllia species	II		LC		no		
Coral	*Lobophyllia pachysepta*	Lobophyllia species	II		NT		no		
Coral	*Scolymia vitiensis*	Scolymia species	II		NT		no		
Coral	*Symphyllia agaricia*	Symphyllia species	II		LC		no		
Coral	*Symphyllia radians*	Symphyllia species	II		LC		no		
Coral	*Symphyllia recta*	Symphyllia species	II		LC		no		
Coral	*Symphyllia valenciennesii*	Symphyllia species	II		LC		no		
Coral	*Acrhelia horrescens*	Acrhelia species	II			Indo-west Pacific			
Coral	*Galaxea astreata*	Galaxea species	II		VU		no		
Coral	*Galaxea fascicularis*	Galaxea species	II		NT		no		
Coral	*Echinophyllia aspera*	Echinophyllia species	II		LC		no		
Coral	*Echinophyllia echinata*	Echinophyllia species	II		LC		no		
Coral	*Echinophyllia echinoporoides*	Echinophyllia species	II		LC		no		
Coral	*Mycedium elephantotus*	Mycedium species	II		LC		no		
Coral	*Mycedium mancaoi*	Mycedium species	II		LC		no		
Coral	*Oxypora glabra*	Oxypora species	II		LC		no		
Coral	*Oxypora lacera*	Oxypora species	II		LC		no		
Coral	*Pectinia alcicornis*	Pectinia species	II		VU		no		
Coral	*Pectinia elongata*	Pectinia species	II		NT		no		
Coral	*Pectinia lactuca*	Pectinia species	II		VU		no		
Coral	*Pectinia paeonia*	Pectinia species	II		NT		no		
Coral	*Madracis kirbyi*	Madracis species	II		LC		no		
Coral	*Pocillopora capitata*	Pocillopora species	II		LC		no		
Coral	*Pocillopora damicornis*	Cauliflower coral	II		LC		no		
Coral	*Pocillopora elegans*	Pocillopora species	II		VU		no		
Coral	*Pocillopora eydouxi*	Pocillopora species	II		NT		no		
Coral	*Pocillopora ligulata*	Pocillopora species	II		LC		no		
Coral	*Pocillopora meandrina*	Pocillopora species	II		LC		no		
Coral	*Pocillopora verrucosa*	Pocillopora species	II		LC		no		
Coral	*Pocillopora woodjonesi*	Pocillopora species	II		LC		no		
Coral	*Seriatopora caliendrum*	Birdnest coral	II		NT		no		
Coral	*Seriatopora hystrix*	Thin birdsnest coral	II		LC		no		
Coral	*Seriatopora stellata*	Seriatopora species	II		NT		no		
Coral	*Stylophora pistillata*	Smooth cauliflower coral	II		NT		no		
Coral	*Stylophora subseriata*	Stylophora species	II		LC		no		

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Coral	*Alveopora allingi*	Alveopora species	II		VU		no		
Coral	*Alveopora fenestrata*	Alveopora species	II		VU		no		
Coral	*Alveopora ocellata*	Alveopora species	II		DD		no		
Coral	*Alveopora spongiosa*	Alveopora species	II		NT		no		
Coral	*Alveopora verrilliana*	Alveopora species	II		VU		no		
Coral	*Goniopora columna*	Goniopora species	II		NT		no		
Coral	*Goniopora djiboutiensis*	Goniopora species	II		LC		no		
Coral	*Goniopora lobata*	Goniopora species	II		NT		no		
Coral	*Goniopora minor*	Goniopora species	II		NT		no		
Coral	*Goniopora pandoraensis*	Goniopora species	II		LC		no		
Coral	*Goniopora somaliensis*	Goniopora species	II		LC		no		
Coral	*Goniopora stokesi*	Goniopora species	II		NT		no		
Coral	*Goniopora stutchburyi*	Goniopora species	II		LC		no		
Coral	*Goniopora tenuidens*	Goniopora species	II		LC		no		
Coral	*Porites annae*	Porites species	II		NT		no		
Coral	*Porites arnaudi*	Porites species	II		LC		no		
Coral	*Porites australiensis*	Porites species	II		LC		no		
Coral	*Porites cylindrica*	Porites species	II		NT		no		
Coral	*Porites horizontalata*	Porites species	II		VU		no		
Coral	*Porites latistellata*	Porites species	II			uncertain			
Coral	*Porites lichen*	Porites species	II		LC		no		
Coral	*Porites lobata*	Porites species	II		NT		no		
Coral	*Porites lutea*	Porites species	II		LC		no		
Coral	*Porites monticulosa*	Porites species	II		LC		no		
Coral	*Porites murrayensis*	Porites species	II		NT		no		
Coral	*Porites nigrescens*	Porites species	II		VU		no		
Coral	*Porites rus*	Porites species	II		LC		no		
Coral	*Porites solida*	Porites species	II		LC		no		
Coral	*Porites vaughani*	Porites species	II		LC		no		
Coral	*Coscinaraea columna*	Coscinaraea species	II		LC		no		
Coral	*Coscinaraea exaesa*	Coscinaraea species	II			uncertain			
Coral	*Coscinaraea wellsi*	Coscinaraea species	II		LC		no		
Coral	*Psammocora contigua*	Psammocora species	II		NT		no		
Coral	*Psammocora digitata*	Psammocora species	II		NT		no		
Coral	*Psammocora explanulata*	Psammocora species	II		LC		no		
Coral	*Psammocora haimeana*	Psammocora species	II		LC		no		
Coral	*Psammocora nierstraszi*	Psammocora species	II		LC		no		
Coral	*Psammocora profundacella*	Psammocora species	II		LC		no		
Coral	*Psammocora superficialis*	Psammocora species	II		LC		no		
Coral	*Trachyphyllia geoffroyi*	Trachyphyllia species	II		NT		no		
Coral	*Tubipora musica*	Organ pipe coral	II		NT		no		
Coral	*Millepora alcicornis*	Millepora species	II		LC		no		
Coral	*Millepora dichotoma*	Millepora species	II		LC		no		
Coral	*Millepora exaesa*	Millepora species	II		LC		no		
Coral	*Millepora platyphylla*	Fire coral	II		LC		no		
Coral	*Crypthelia pudica*	Crypthelia species	II			widespread			
Coral	*Distichopora livida*	Distichopora species	II			Indo-west Pacific, rare			
Coral	*Coscinaraea exesa*	Coral			LC	central Indo-Pacific	no		

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Coral	*Galaxea horrescens*	Coral	II		LC	no			
Coral	*Heliopora coerulea*	Blue coral	I/II		VU	no			
Coral	*Millepora tenera*	Coral	II		LC	no			
Coral	*Paraclavarina triangularis*	Coral			NT	restricted	no		
Curlew	*Numenius tahitiensis*	Bristle-thighed curlew	I/II		VU	95900	yes		
Cusk-eel	*Abyssobrotula galatheae*	Cusk-eel			LC	cosmopolitan, deep waters	no		
Cusk-eel	*Bassozetus compressus*	Abyssal cusk-eel			LC	widespread, deep	no		
Cusk-eel	*Spectrunculus grandis*	Giant cusk-eel			LC	circumglobal, deep	no		
Cutlassfish	*Trichiurus lepturus*	Common hairtail			LC	circumglobal	no		
Cycad	*Cycas seemannii*	Cycad	II		VU	no			
Dartfish	*Ptereleotris evides*	Blackfin dartfish			LC	Indian Ocean, Indo-Pacific	no		
Dartfish	*Ptereleotris heteroptera*	Blacktail goby			LC	Indian Ocean, Indo-Pacific	no		
Dolphin	*Globicephala macrorhynchus*	Short-finned pilot whale	II		DD	unknown			I
Dolphin	*Grampus griseus*	Risso's dolphin	II	II	LC	cosmopolitan, deep waters	unknown		I
Dolphin	*Stenella longirostris*	Spiner dolphin	II	II	DD	circumtropical and subtropical	unknown		I
Dolphin	*Steno bredanensis*	Rough-toothed dolphin	II		LC	unknown			I
Dolphin	*Peponocephala electra*	Melon-headed whale	II		LC	no			I
Dolphin	*Stenella attenuata*	Pantropical spotted dolphin	II	II	LC	circumtropical	no		I
Dolphin	*Stenella coeruleoalba*	Striped dolphin	II	II	LC	widespread	no		I
Dolphin	*Tursiops truncatus*	Common bottlenose dolphin	II	I/II	LC	circumglobal	no		I
Dolphinfish	*Coryphaena hippurus*	Dolphinfish			LC	widespread	yes		I
Dottyback	*Cypho purpurascens*	Oblique-lined dottyback			LC	restricted	no		
Dottyback	*Pseudochromis cyanotaenia*	Bluebarred dottyback			LC	western Pacific	no		
Dragnofish	*Aristostomias lunifer*	Dragonfish			LC	circumglobal, deep	no		
Dragonfish	*Astronesthes gemmifer*	Snaggletooth			DD	circumglobal, deep	no		
Dragonfish	*Astronesthes indicus*	Dragonfish			LC	circumglobal, deep	no		
Dragonfish	*Eustomias braueri*	Dragonfish			DD	widespread, deep	no		
Dragonfish	*Eustomias enbarbatus*	Dragonfish			LC	widespread, deep	no		
Dragonfish	*Eustomias macrurus*	Scaleless dragonfish			LC	circumglobal, deep	no		
Dragonfish	*Eustomias satterleei*	Dragonfish			LC	Subtropical, temperate, deep	no		
Dragonfish	*Eustomias simplex*	Dragonfish			LC	Subtropical, temperate, deep	no		
Dragonfish	*Idiacanthus fasciola*	Black dragonfish			LC	circumglobal, temperate, subtropical	no		
Dragonfish	*Malacosteus niger*	Black loosejaw			LC	circumglobal, deep	no		
Dragonfish	*Melanostomias melanops*	Dragonfish			LC	circumglobal, deep	no		
Dragonfish	*Melanostomias valdiviae*	Valdivia black dragonfish			LC	circumglobal, deep	no		
Dragonfish	*Photonectes margarita*	Dragonfish			LC	widespread, deep	no		
Dragonfish	*Photonectes parvimanus*	Dragonfish			LC	Subtropical, temperate, deep	no		
Dragonfish	*Stomias affinis*	Dragonfish			LC	circumglobal, deep	no		
Dragonfish	*Thysanactis dentex*	Dragonfish			LC	widespread, deep	no		
Driftfish	*Cubiceps capensis*	Cape cigarfish			LC	circumtropical, rare	no		

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Driftfish	*Nomeus gronovii*	Man-of-war fish			LC	circumglobal, deep	no		
Driftfish	*Psenes cyanophrys*	Freckled driftfish			LC	circumglobal	no		
Driftfish	*Psenes pellucidus*	Bluefin driftfish			LC	circumglobal	no		
Eel	*Anguilla obscura*	Pacific shortfin eel			LC	Pacific	yes		
Emperor	*Gnathodentex aureolineatus*	Goldspot emperor			LC	widespread	no		
Emperor	*Gymnocranius euanus*	Japanese large-eyed bream			LC	western Pacific	no		
Emperor	*Lethrinus atkinsoni*	Pacific yellowtail emperor			LC	Indo-west Pacific	no		
Emperor	*Lethrinus nebulosus*	Spangled emperor			LC	Indo-west Pacific	no		
Emperor	*Lethrinus rubrioperculatus*	Spotcheek emperor			LC	Indo-west Pacific	no		
Emperor	*Lethrinus xanthochilus*	Yellowlip emperor			LC	Indo-west Pacific	no		
Emperor	*Monotaxis grandoculis*	Bigeye bream			LC	Indo-west Pacific	no		
Euphorbia	*Excoecaria agallocha*	Euphorbia			LC	Indo-Pacific	no		
Fangtooth	*Anoplogaster cornuta*	Common fangtooth			LC	widespread, deep	no		
Fern	*Acrostichum speciosum*	Fern			LC	Indo-west Pacific	no		
Flounder	*Asterorhombus intermedius*	Blotched fliunder			LC	Indo-west Pacific	no		
Flutemouth	*Aulostomus chinensis*	Flutemouth			LC	widespread	no		
Flutemouth	*Fistularia commersonii*	Flutemouth			LC	Indo-Pacific	no		
Flutemouth	*Fistularia petimba*	Red cornetfish			LC	Indo-Pacific	no		
Flying fish	*Cheilopogon furcatus*	Spotfin flying fish			LC	circumtropical	no		
Flying fish	*Cheilopogon heterurus*	Blotchwing flying fish			LC	widespread	no		
Flying fish	*Exocoetus volitans*	Two-winged flying fish			LC	circumtropical	yes		
Flying fish	*Hirundichthys speculiger*	Black-finned flying fish			LC	circumtropical	yes		
Flying fox	*Pteropus tonganus*	Pacific flying fox	I		LC	unknown			
Flying gurnard	*Dactyloptera orientalis*	Oriental flying gurnard			LC	Indo-west Pacific	no		
Frigatebird	*Fregata ariel*	Lesser frigatebird			LC	167000000	no		
Frigatebird	*Fregata minor*	Great frigatebird			LC	126000000	no		
Fusilier	*Pterocaesio digramma*	Double-lined fusilier			LC	Indo-Pacific	no		
Fusilier	*Pterocaesio tile*	Dark-banded fusilier			LC	Indian Ocean, Indo-Pacific	no		
Fusilier	*Pterocaesio trilineata*	Three-lined fusilier			LC	western Pacific	no		
Giant clam	*Hippopus hippopus*	Horse's hoof clam	II		LR/cd		no		
Giant clam	*Tridacna crocea*	Boring clam	II		LR/lc		no		
Giant clam	*Tridacna derasa*	Southern giant clam	II		VU		no		
Giant clam	*Tridacna gigas*	Giant clam	II		VU		no		
Giant clam	*Tridacna maxima*	Small giant clam	II		LR/cd		no		
Giant clam	*Tridacna squamosa*	Fluted giant clam	II		LR/cd		no		
Giant clam	*Tridacna tevoroa*	Tevoro clam	II		VU		no		
Goatfish	*Mulloidichthys flavolineatus*	Yellowstripe goatfish			LC	Indo-west Pacific	no		
Goatfish	*Mulloidichthys vanicolensis*	Yellowfin goatfish			LC	Indo-Pacific	no		
Goatfish	*Parupeneus barberinoides*	Bicolor goatfish			LC	Indo-west Pacific	no		
Goatfish	*Parupeneus barnerinus*	Dash-and-dot goatfish			LC	Indo-Pacific	no		
Goatfish	*Parupeneus ciliatus*	Whitesaddle goatfish			LC	Indian Ocean, Indo-Pacific	no		
Goatfish	*Parupeneus cyclostomus*	Goldsaddle goatfish			LC	Indo-west Pacific	no		
Goatfish	*Parupeneus heptacanthus*	Cinnabar goatfish			LC	Indo-west Pacific	no		

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Goatfish	*Parupeneus multifasciatus*	Banded goatfish			LC	Indo-Pacific	no		
Goatfish	*Parupeneus pleurostigma*	Sidespot goatfish			LC	Indian Ocean, Indo-Pacific	no		
Goatfish	*Parupeneus spilurus*	Tailspot goatfish			LC	western Pacific	no		
Goby	*Bryaninops loki*	Loki whip-goby			LC	Indo-Pacific	no		
Goby	*Bryaninops yongei*	Seawhip goby			LC	Indo-Pacific	no		
Goby	*Ctenogobiops crocineus*	Silverspot shrimpgoby			LC	Indo-Pacific	no		
Goby	*Eviota queenslandica*	Queensland dwarfgoby			LC	Indo-Pacific	no		
Goby	*Eviota saipanensis*	Saipan pygmy goby			LC	Central western Pacific	no		
Goby	*Eviota sigillata*	Adorned dwarfgoby			LC	Indo-west Pacific	no		
Goby	*Eviota smaragdus*	Earspot pygmy goby			LC	western Pacific	no		
Goby	*Eviota sparsa*	Speckled pygmy goby			LC	western Pacific	no		
Goby	*Eviota zebrina*	Zebra dwarfgoby			LC	Indo-Pacific	no		
Goby	*Eviota zonura*	Zoned dwarfgoby			LC	western Pacific	no		
Goby	*Feia nympha*	Nymph goby			LC	Indo-west Pacific	no		
Goby	*Fusigobius duospilus*	Barenaped goby			LC	Indo-west Pacific	no		
Goby	*Fusigobius neophytus*	Sand goby			LC	Indo-Pacific	no		
Goby	*Macrodontogobius wilburi*	Largetooth goby			LC	Indo-Pacific	no		
Goby	*Paragobiodon echinocephalus*	Redhead coral goby			LC	Indo-Pacific	no		
Goby	*Paragobiodon lacunicolus*	Blackfin coral goby			LC	Indo-Pacific	no		
Goby	*Paragobiodon xanthosomus*	Emerald coral goby			LC	Indo-Pacific	no		
Goby	*Pleurosicya mossambica*	Toothy goby			LC	Indo-Pacific	no		
Goby	*Priolepis semidoliata*	Barrel goby			LC	Indo-Pacific	no		
Goby	*Trimmatom nanus*	Midget dwarfgoby			LC	Indo-Pacific	no		
Greeneye	*Chlorophthalmus agassizi*	Agassiz's thread-sail fish			LC	circumglobal, deep	no		
Grenadier	*Malacocephalus laevis*	Armed grenadier			LC	widespread, deep	no		
Grouper	*Epinephelus hexagonatus*	Hexagon grouper			LC	Indo-Pacific	no		
Grouper	*Epinephelus lanceolatus*	Queensland grouper			VU	widespread	no		
Grouper	*Epinephelus polyphekadion*	Camouflage grouper			NT	Indo-Pacific	no		
Grouper	*Grammistes sexlineatus*	Sixlined soapfish			LC	Indo-Pacific	no		
Grouper	*Epinephelus octofasciatus*	Eightbar grouper			DD	Indo-west Pacific	no		
Grouper	*Lipropoma susumi*	Meteor perch			LC	Indo-Pacific	no		
Grouper	*Plectranthias nanus*	Pygmy basslet			LC	Indian Ocean, Indo-Pacific	no		
Grouper	*Plectranthias winniensis*	Redblotch basslet			LC	Indo-west Pacific	no		
Grouper	*Pseudogramma polyacantha*	Boldspot soapfish			LC	Indian Ocean, Indo-Pacific	no		
Grouper	*Pseudogramma xantha*	Yellow podge			LC	restricted	no		
Gulper eels	*Eurypharynx pelecanoides*	Pelican gulper eel			LC	circumglobal, deep	no		
Hake	*Antimora rostrata*	Blue hake			LC	widespread, deep	no		
Halosaur	*Aldrovandia affinis*	Allied halosaur			LC	widespread, deep	no		
Hammerjaw	*Omosudis lowii*	Hammerjaw			LC	circumglobal, deep	no		
Harrier	*Circus approximans*	Swamp harrier	II	II	LC	17500000	yes		
Hatchetfish	*Argyropelecus aculeatus*	Lovely hatchetfish			LC	circumglobal, deep	no		
Hatchetfish	*Argyropelecus gigas*	Giant hatchetfish			LC	circumglobal, deep	no		
Hatchetfish	*Argyropelecus sladeni*	Hatchetfish			LC	circumglobal, deep	no		

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Hatchetfish	*Sternoptyx diaphana*	Diaphanous hatchetfish			LC	widespread, deep	no		
Hatchetfish	*Sternoptyx pseudobscura*	Highliht hatchetfish			LC	circumtropical, deep	no		
Hatchetfish	*Sternoptyx pseudodiaphana*	False oblique hatchetfish			LC	circumglobal, deep	no		
Hatchetfish	*Valenciennellus tripunctulatus*	Constellationfisah			LC	widespread, deep	no		
Hawkfish	*Amblycirrhitus bimacula*	Twinspot hawkfish			LC	widespread	no		
Hawkfish	*Amblycirrhitus unimacula*	Hawkfish			LC	Indo-Pacific, Pacific	no		
Hawkfish	*Cirrhitichthys falco*	Dwarf hawkfish			LC	Indo-Pacific	no		
Hawkfish	*Cirrhitichthys oxycephalus*	Coral hawkfish			LC	Indo-Pacific	no		
Hawkfish	*Cirrhitops hubbardi*	Hawkfish			LC	restricted	no		
Hawkfish	*Cirrhitus pinnulatus*	Stocky hawkfish			LC	Indo-Pacific	no		
Hawkfish	*Neocirrhites armatus*	Flame hawkfish			LC	western Pacific	no		
Hawkfish	*Paracirrhites arcatus*	Arc-eye hawkfish			LC	Indian Ocean, Indo-Pacific	no		
Hawkfish	*Paracirrhites forsteri*	Blackside hawkfish			LC	Indian Ocean, Indo-Pacific	no		
Hawkfish	*Paracirrhites hemistictus*	Whitespot hawkfish			LC	Indo-Pacific	no		
Herring	*Elops hawaiiensis*	Giant herring			DD	Indo-west Pacific	no		
Iguana	*Brachylophus fasciatus*	Fiji banded iguana	I		EN		no		
Lancetfish	*Alepisaurus brevirostris*	Lancetfish			LC	widespread, deep	no		
Lanternfish	*Benthosema suborbitale*	Lanternfish			LC	widespread, mesopelagic	no		
Lanternfish	*Centrobranchus nigroocellatus*	Lanternfish			LC	widespread	no		
Lanternfish	*Ceratoscopelus warmingii*	Lanternfish			LC	widespread	no		
Lanternfish	*Diaphus anderseni*	Andersen's lanternfish			LC	widespread, deep	no		
Lanternfish	*Diaphus brachycephalus*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Diaphus effulgens*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Diaphus fragilis*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Diaphus lucidus*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Diaphus lucidus*	Lutken's lanternfish			LC	widespread, deep	no		
Lanternfish	*Diaphus mollis*	Soft lanternfish			LC	widespread, deep	no		
Lanternfish	*Diaphus perspicillatus*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Diaphus splendidus*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Diogenichthys atlanticus*	Longfin lanternfish			LC	circumtropical	no		
Lanternfish	*Hygophum reinhardtii*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Lampadena luminosa*	Lanternfish			LC	circumglobal, deep	no		
Lanternfish	*Lampanyctus alatus*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Lampanyctus festivus*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Lampanyctus nobilis*	Noble lanternfish			LC	widespread, deep	no		
Lanternfish	*Lampanyctus pusillus*	Pygmy lanternfish			LC	widespread, deep	yes		
Lanternfish	*Lampanyctus tenuiformis*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Lobianchia gemellarii*	Gemellar's lanternfish			LC	widespread, deep	yes		
Lanternfish	*Myctophum asperum*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Myctophum nictidulum*	Spotted lanternfish			LC	widespread, deep	no		
Lanternfish	*Myctophum obtusirostre*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Myctophum selenops*	Lanternfish			LC	widespread, deep	no		
Lanternfish	*Nannobrachium lineatum*	Lanternfish			LC	circumglobal, deep	no		
Lanternfish	*Norolychnus valdiviae*	Topside lanternfish			LC	widespread, deep	no		
Lanternfish	*Notoscopelus resplendens*	Patchwork lanternfish			LC	widespread, deep	no		

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Lanternfish	*Taaningichthys bathyphilus*	Deepwater lanternfish			LC	widespread, deep	no		
Leatherjacket	*Acreichthys tomentosus*	Bristletail filefish			LC	Indo-west Pacific	no		
Leatherjacket	*Aluterus monoceros*	Unicorn leatherjacket			LC	widespread	no		
Leatherjacket	*Aluterus scriptus*	Scribbled leatherjacket			LC	widespread	no		
Leatherjacket	*Cantherhines dumerilii*	Whitespotted filefish			LC	Indo-Pacific	no		
Leatherjacket	*Cantherhines fronticinctus*	Spectacled filefish			LC	Indo-west Pacific, uncommon	no		
Leatherjacket	*Cantherhines pardalis*	Honeycomb filefish			LC	widespread	no		
Leatherjacket	*Oxymonacanthus longirostris*	Harlequin filefish			VU	Indo-west Pacific	no		
Leatherjacket	*Paraluteres prionurus*	Blacksaddled leatherjacket			LC	Indo-Pacific	no		
Leatherjacket	*Pervagor alternans*	Yelloweye filefish			LC	restricted	no		
Leatherjacket	*Pervagor janthinosoma*	Ear-spot filefish			LC	Indo-west Pacific	no		
Lightfish	*Ichthyococcus ovatus*	Ovate lightfish			LC	circumglobal, deep	no		
Lightfish	*Vinciguerria nimbaria*	Oceanic lightfish			LC	circumglobal, deep	no		
Lionfish	*Dencrochirus brachypterus*	Dwarf lionfish			LC	Indo-west Pacific	no		
Lionfish	*Dencrochirus zebra*	Zebra lionfish			LC	Indo-west Pacific	no		
Lionfish	*Pterois antennata*	Banded lionfish			LC	Indo-west Pacific	no		
Lionfish	*Pterois volitans*	Common lionfish			LC	Indo-west Pacific	no		
Lizardfish	*Saurida gracilis*	Gracile lizardfish			LC	Indo-Pacific, Pacific	no		
Lizardfish	*Saurida nebulosa*	Cloudy lizardfish			LC	Indo-Pacific	no		
Lizardfish	*Synodus capricornis*	Capricorn lizardfish			LC	widespread	no		
Lizardfish	*Synodus dermatogenys*	Sand lizardfish			LC	Indo-west Pacific	no		
Lizardfish	*Synodus jaculum*	Blackspot lizardfish			LC	Indo-west Pacific	no		
Lizardfish	*Synodus variegatus*	Variegated lizardfish			LC	Indo-west Pacific	no		
Lizardfish	*Trachinocephalus myops*	Snakefish			LC	circumtropical	no		
Lobster	*Panulirus longipes*	Longlegged spiny lobster			LC	Indian Ocean, Indo-Pacific	no		
Lobster	*Panulirus penicillatus*	Pronghorn spiny lobster			LC	widespread	no		
Lobster	*Polycheles martini*	Lobster			LC	restricted, deep	no		
Lobster	*Puerulus angulatus*	Banded whip lobster			LC	Indo-west Pacific	no		
Lorikeet	*Vini australis*	Blue-crowned lorikeet	II		LC		no		
Louvar	*Luvarus imperialis*	Louvar			LC	circumglobal	no		
Mackerel	*Acanthocybium solandri*	Wahoo			LC	cosmopolitan, tropical, warm temperate	yes		
Mackerel	*Lepidocybium flavobrunneum*	Escolar			LC	widespread	no		
Mackerel	*Scomberomorus commerson*				NT				
Mangrove	*Bruguiera gymnorhiza*	Oriental mangrove			LC	widespread	no		
Mangrove	*Rhizophora stylosa*	Red mangrove			LC	Indo-west Pacific	no		
Marlin	*Makaira indica*	Black marlin			DD	Indo-Pacific	yes		I
Marlin	*Kajikia audax*	Striped marlin			NT	widespread	yes		I
Marlin	*Makaira nigricans*	Blue marlin			LC	circumtropical	yes		I
Mola	*Masturus lanceolatus*	Sharptailed sunfish			LC	circumglobal	no		
Mola	*Mola mola*	Ocean sunfish			VU	circumglobal	no		
Moorish idol	*Zanclus cornutus*	Moorish idol			LC	Indo-west Pacific	no		
Needlefish	*Ablennes hians*	Flat needlefish			LC	widespread	no		
Oarfish	*Regalecus glesne*	Giant oarfish			LC	circumglobal, deep	no		
Octopus	*Amphitretus pelagicus*	Octopus			LC	widespread, deep	no		

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Octopus	*Argonauta argo*	Octopus			LC	widespread	no		
Octopus	*Argonauta boettigeri*	Octopus			LC	Indo-west Pacific	no		
Octopus	*Argonauta hians*	Octopus			LC	widespread	no		
Octopus	*Argonauta nodosa*	Octopus			LC	Indo-west Pacific	no		
Octopus	*Bolitaena pygmaea*	Octopus			LC	circumtropical, deep	no		
Octopus	*Haliphron atlanticus*	Octopus			LC	circumglobal	no		
Octopus	*Japetella diaphana*	Octopus			LC	widespread, deep	no		
Octopus	*Tremoctopus gracilis*	Palmate octopus			LC	Indian Ocean, Indo-Pacific	no		
Octopus	*Vitreledonella richardi*	Octopus			LC	widespread, deep	no		
Orchid	*Bulbophyllum longiscapum*	Orchid	II			restricted			
Orchid	*Bulbophyllum membranaceum*	Orchid	II			Indo-west Pacific			
Orchid	*Bulbophyllum pachyanthum*	Orchid	II			restricted			
Orchid	*Calanthe hololeuca*	Orchid	II			restricted			
Orchid	*Coelogyne lycastoides*	Orchid	II			restricted			
Orchid	*Dendrobium calcaratum*	Orchid	II			restricted			
Orchid	*Dendrobium tokai*	Orchid	II			restricted			
Orchid	*Phaius graeffei*	Orchid	II			restricted			
Orchid	*Phreatia graeffei*	Orchid	II			restricted			
Orchid	*Taeniophyllum fasciola*	Orchid	II			Indo-west Pacific			
Owl	*Tyto alba*	Common barn-owl	II		LC		no		
Parrot	*Prosopeia tabuensis*	Maroon shining-parrot	II		LC		no		
Parrotfish	*Calotomus carolinus*	Starry-eye parrotfish			LC	widespread	no		
Parrotfish	*Chlorurus frontalis*	Tanfaced parrotfish			LC	Indo-Pacific, rare	no		
Parrotfish	*Chlorurus microrhinus*	Steephead parrotfish			LC	Indo-Pacific	no		
Parrotfish	*Chlorurus spilurus*	Bullethead parrotfish			LC	Indo-Pacific	no		
Parrotfish	*Leptoscarus vaigiensis*	Marbled parrotfish			LC	Indo-Pacific	no		
Parrotfish	*Scarus altipinnis*	Filament-fin parrotfish			LC	Indo-Pacific	no		
Parrotfish	*Scarus forsteni*	Forsten's parrotfish			LC	Indo-Pacific	no		
Parrotfish	*Scarus frenatus*	Bridled parrotfish			LC	Indo-Pacific	no		
Parrotfish	*Scarus globiceps*	Globehead parrotfish			LC	Indo-Pacific	no		
Parrotfish	*Scarus longipinnis*	Highfin parrotfish			LC	southwest Pacific	no		
Parrotfish	*Scarus niger*	Swarthy parrotfish			LC	Indian Ocean, Indo-Pacific	no		
Parrotfish	*Scarus pyrrostethus*	Blue-banded parrotfish			LC	Indian Ocean, Indo-Pacific	no		
Parrotfish	*Scarus rivulatus*	Surf parrotfish			LC	Indo-Pacific	no		
Parrotfish	*Scarus rubroviolaceus*	Redlip parrotfish			LC	Indian Ocean, Indo-Pacific	no		
Parrotfish	*Scarus tricolor*	Tricolour parrotfish			LC	Indo-Pacific	no		
Pearleye	*Benthalbella infans*	Zugmeyer's pearleye			LC	circumglobal, deep	no		
Pearleye	*Scopelarchoides danae*	Pearleye			LC	circumglobal, deep	no		
Pearleye	*Scopelarchus analis*	Blackbelly pearleye			LC	circumglobal, deep	no		
Pearleye	*Scopelarchus guentheri*	Staring pearleye			LC	circumtropical, subtropical	no		
Petrel	*Pterodroma nigripennis*	Black-winged petrel			LC	176000000	yes		
Petrel	*Pterodroma heraldica*	Herald petrel			LC	91000000	yes		
Petrel	*Pterodroma alba*	Phoenix petrel			EN	28800000	yes		

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Petrel	*Pterodroma parkinsoni*	Black petrel		II	VU	54300000	yes		
Pintail	*Anas acuta*	Northern pintail		II	LC	69100000	yes		
Pipefish	*Choeroichthys cinctus*	Barred shortbody pipefish			LC	western Pacific	no		
Pipefish	*Cosmocampus maxweberi*	Maxweber's pipefish			LC	Indo-Pacific	no		
Pipefish	*Solenostomus paradoxus*	Ornate ghost pipefish			LC	Indo-Pacific	no		
Pipefish	*Syngnathoides biaculeatus*	Alligator pipefish			DD	widespread	no		
Plover	*Arenaria interpres*	Ruddy turnstone		II	LC	27600000	yes		
Plover	*Calidris acuminata*	Sharp-tailed sandpiper	II		LC	667000	yes		
Plover	*Pluvialis fulva*	Pacific golden plover	II		LC	>20000	yes		
Plover	*Limosa lapponica*	Bar-tailed godwit		II	NT	9050000	yes		
Pufferfish	*Arothron hispidus*	Whitespotted puffer			LC	widespread	no		
Pufferfish	*Arothron manilensis*	Narrowlined puffer			LC	Indo-west Pacific	no		
Pufferfish	*Arothron meleagris*	Guineafowl puffer			LC	widespread	no		
Pufferfish	*Arothron nigropunctatus*	Black-spotted puffer			LC	Indo-Pacific	no		
Pufferfish	*Arothron stellatus*	Star puffer			LC	widespread	no		
Pufferfish	*Canthigaster amboinensis*	Canthigaster amboinensis			LC	widespread	no		
Pufferfish	*Canthigaster axiologus*	Pufferfish			LC	Indo-Pacific	no		
Pufferfish	*Canthigaster bennetti*	Bennet's pufferfish			LC	widespread	no		
Pufferfish	*Canthigaster janthinoptera*	Honeycomb toby			LC	widespread	no		
Pufferfish	*Canthigaster valentini*	Blacksaddled toby			LC	widespread	no		
Pufferfish	*Chilomycterus reticulatus*	Fewspined porcupinefish			LC	circumtropical	no		
Pufferfish	*Diodon eydouxi*	Pelagic porcupinefish			LC	circumglobal	no		
Pufferfish	*Diodon holocanthus*	Balloon porcupinefish			LC	circumglobal	no		
Pufferfish	*Diodon hystrix*	Spotfish porcupinefish			LC	circumtropical	no		
Pufferfish	*Lagocephalus lagocephalus*	Oceanic puffer			LC	widespread	no		
Pufferfish	*Lagocephalus sceleratus*	Sivercheeked toadfish			LC	widespread	no		
Pufferfish	*Sphoeroides pachygaster*	Blunthead pufferfish			LC	circumglobal	no		
Pufferfish	*Takifugu oblongus*	Oblong blow fish			LC	Indian Ocean, Indo-Pacific	no		
Rabbitfish	*Siganus argenteus*	Forktail rabbitfish			LC	Indo-west Pacific	no		
Rabbitfish	*Siganus doliatus*	Barred rabbitfish			LC	western Pacific	no		
Rabbitfish	*Siganus puellus*	Masked rabbitfish			LC	Indo-west Pacific	no		
Rabbitfish	*Siganus punctatus*	Gold-spotted rabbitfish			LC	Indo-west Pacific	no		
Rabbitfish	*Siganus spinus*	Mottled rabbitfish			LC	western Pacific	no		
Ray	*Manta alfredi*	Reef mata ray	II		VU		yes		
Remora	*Echeneis naucrates*	Remora			LC	circumtropical	no		
Remora	*Phtheirichthys lineatus*	Slender suckerfish			LC	circumglobal	no		
Remora	*Remora australis*	Whale remora			LC	circumtropical, subtropical	no		
Remora	*Remora osteochir*	Marlin suckerfish			LC	circumtropical, subtropical	no		
Remora	*Remora remora*	Common remora			LC	circumtropical, subtropical	no		
Ribbonfish	*Desmodema polystictum*	Polkadot ribbonfish			LC	circumglobal, deep, rare	no		
Ribbonfish	*Zu cristatus*	Scalloped ribbonfish			LC	circumglobal, deep	no		
Ridgehead	*Melamphaes longivelis*	Ridgehead			DD	widespread, deep	no		
Ridgehead	*Melamphaes polylepis*	Ridgehead			DD	circumtropical, deep	no		
Ridgehead	*Melamphaes simus*	Ridgehead			LC	circumglobal, deep	no		

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Ridgehead	*Poromitra crassiceps*	Crested bigscale			LC	widespread, deep	no		
Ridgehead	*Poromitra megalops*	Ridgehead			DD	widespread, deep	no		
Ridgehead	*Scopeloberyx opisthopterus*	Ridgehead			LC	widespread, deep	no		
Ridgehead	*Scopeloberyx robustus*	Longjaw bigscale			DD	circumtropical, subtropical, deep	no		
Rudderfish	*Centrolophus niger*	Rudderfish			LC	widespread, deep	no		
Sabretooth fish	*Odontostomops normalops*	Sabretooth fish			LC	widespread, deep	no		
Sailfish	*Istiophorus platypterus*	Sailfish			LC	widespread	yes		I
Sandburrower	*Limnichthys fasciatus*	Barred sandburrower			LC	south Pacific	no		
Sandburrower	*Limnichthys nitidus*	Donaldson's sandburrower			LC	Indo-Pacific	no		
Sawtooth eel	*Stemonidium hypomelas*	Black sawtooth eel			LC	Pacific, deep	no		
Scat	*Scatophagus argus*	Spotted scat			LC	Indian Ocean, Indo-Pacific	no		
Scorpionfish	*Caracanthus maculatus*	Spotted coral croucher			LC	Indo-west Pacific	no		
Scorpionfish	*Caracanthus unipinna*	Pygmy coral croucher			LC	Indo-west Pacific	no		
Scorpionfish	*Scorpaenoides albaiensis*	Splitfin scorpionfish			LC	Indo-west Pacific	no		
Scorpionfish	*Scorpaenoides guamensis*	Guam scorpionfish			LC	Indo-west Pacific	no		
Scorpionfish	*Scorpaenoides hirsutus*	Hairy scorpionfish			LC	Indian Ocean, Indo-Pacific	no		
Scorpionfish	*Scorpaenoides parvipinnis*	Shortfinned scorpionfish			LC	Indo-west Pacific	no		
Scorpionfish	*Sebastapistes fowleri*	Dwarf scorpionfish			LC	Indo-west Pacific	no		
Scorpionfish	*Sebastapistes mauritiana*	Spineblotch scorpionfish			LC	Indo-west Pacific	no		
Scorpionfish	*Setarches guentheri*	Deepwater scorpionfish			LC	circumglobal, deep	no		
Scorpionfish	*Taenianotus triacanthus*	Leaf scorpionfish			LC	Indo-Pacific	no		
Sea cucumber	*Holothuria fuscogilva*	White teatfish			VU	Indian Ocean, Indo-Pacific	no		
Sea snake	*Pelamis platura*	Yellow-bellied sea snake			LC	Indian Ocean, Indo-Pacific	no		
Sea turtle	*Chelonia mydas*	Green turtle	I	I/II	EN	circumglobal	yes		
Sea turtle	*Eretmochelys imbricata*	Hawksbill turtle	I	I/II	CR	circumtropical and subtropical	yes		
Sea turtle	*Dermochelys coriacea*	Leatherback turtle	I	I/II	VU	circumglobal	yes		
Sea turtle	*Caretta caretta*	Loggerhead turtle	I	I/II	VU	circumglobal, temperate, subtropical	yes		
Seagrass	*Halodule uninervis*	Seagrass			LC	Indo-Pacific	no		
Seagrass	*Halophila ovalis*	Seagrass			LC	Indo-Pacific	no		
Seagrass	*Syringodium isoetifolium*	Seagrass			LC	Indo-Pacific	no		
Seahorse	*Hippocampus histrix*	Spiny seahorse	II		VU		no		
Seahorse	*Hippocampus kuda*	Spotted seahorse	II		VU		no		
Shark	*Carcharhinus longimanus*	Oceanic whitetip shark	II		VU		no	WCPO shark	I
Shark	*Sphyrna lewini*	Scalloped hammerhead	II		EN		yes	WCPO shark	I
Shark	*Carcharodon carcharias*	Great white shark	II	I/II	VU	cosmopolitan, temperate	yes	WCPO shark	I
Shark	*Isurus oxyrinchus*	Shortfin mako		II	VU	circumglobal, temperate, tropical	yes	WCPO shark	I
Shark	*Rhincodon typus*	Whale shark	II	II	VU	cosmopolitan, tropical, warm temperate	yes	WCPO shark	I
Shark	*Prionace glauca*	Blue shark			NT	widespread	no	WCPO shark	I

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Shark	*Stegostoma fasciatum*	Zebra shark			EN	widespread	no		
Shark	*Coryphaena hippurus*	Whitetip reef shark			NT	Indo-Pacific	no	I	
Shark	*Carcharhinus falciformis*	Silky shark	II	II	NT	circumglobal	yes	WCPO shark	I
Shark	*Alopias vulpinus*	Common thresher shark	II	II	VU	circumglobal	yes	WCPO shark	I
Shark	*Sphyrna zygaena*	Smooth hammerhead	II		VU		no	WCPO shark	I
Shearwater	*Ardenna pacifica*	Wedge-tailed shearwater			LC	160000000	yes		
Shearwater	*Ardenna carneipes*	Flesh-footed shearwater			NT	188000000	yes		
Shearwater	*Puffinus bailloni*	Tropical shearwater			LC	94600000	yes		
Slickhead	*Talismania antillarum*	Antillean slickhead			LC	circumglobal, deep	no		
Slipper lobster	*Parribacus caledonicus*	Caledonian mitten lobster			LC	Indo-west Pacific	no		
Snake mackerel	*Diplospinus multistriatus*	Striped escolar			LC	circumtropical	no		
Snake mackerel	*Gempylus serpens*	Snake mackerel			LC	circumtropical	no		
Snake mackerel	*Nealotus tripes*	Black snake mackerel			LC	widespread	no		
Snake mackerel	*Promethichthys prometheus*	Promethean escolar			LC	circumtropical	no		
Snaketooth	*Kali kerberti*	Snaketooth			LC	widespread, deep	no		
Snaketooth	*Pseudoscopelus altipinnis*	Snaketooth			LC	circumglobal, deep	no		
Snapper	*Aphareus furca*	Small-toothed jobfish			LC	widespread	no		
Snapper	*Aphareus rutilans*	Rusty jobfish			LC	widespread	no		
Snapper	*Aprion virescens*	Green jobfish			LC	widespread	no		
Snapper	*Etelis carbunculus*	Deepwater red snapper			LC	widespread, deep	no		
Snapper	*Etelis coruscans*	Deepwater longtail red snapper			LC	Indo-Pacific	no		
Snapper	*Lutjanus argentimaculatus*	Mangrove jack			LC	Indo-Pacific	yes		
Snapper	*Lutjanus bohar*	Red bass			LC	Indo-west Pacific	no		
Snapper	*Lutjanus fulviflamma*	Blackspot snapper			LC	Indo-Pacific	no		
Snapper	*Lutjanus fulvus*	Blacktail snapper			LC	Indo-Pacific	no		
Snapper	*Lutjanus kasmira*	Bluebanded snapper			LC	Indo-Pacific	no		
Snapper	*Lutjanus monostigma*	Onespot snapper			LC	Indo-Pacific	no		
Snapper	*Lutjanus quinquelineatus*	Five-lined snapper			LC	Indo-Pacific	no		
Snapper	*Lutjanus rufolineatus*	Golden-lined snapper			LC	western Pacific	no		
Snapper	*Lutjanus russellii*	Russell's snapper			LC	western Pacific	no		
Snapper	*Macolor niger*	Black and white snapper			LC	Indo-Pacific	no		
Snapper	*Paracaesio sordida*	Blue snapper			LC	Indo-Pacific	no		
Snapper	*Paracaesio xanthura*	Yellowtail blue snapper			LC	Indo-Pacific	no		
Snapper	*Parapristipomoides squamimaxillaris*	Scalemouth jobfish			LC	restricted	no		
Snapper	*Pristipomoides argyrogrammicus*	Ornate jobfish			LC	Indo-Pacific	no		
Snapper	*Pristipomoides auricilla*	Goldflag jobfish			LC	Indo-Pacific	no		
Snapper	*Pristipomoides filamentosus*	Crimson jobfish			LC	Indo-Pacific	no		
Snapper	*Pristipomoides multidens*	Goldbanded jobfish			LC	Indo-Pacific	no		
Snapper	*Pristipomoides sieboldii*	Lavender jobfish			LC	Indo-Pacific	no		
Snapper	*Pristipomoides zonatus*	Oblique-banded jobfish			LC	Indo-Pacific	no		
Snipe eel	*Nemichthys curvirostris*	Spotted snipe eel			LC	widespread, deep	no		

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Snipe eel	*Nemichthys scolopaceus*	Slender snipe eel			LC	circumglobal, deep	yes		
Soldierfish	*Myripristis berndti*	Bigscale soldierfish			LC	widespread	no		
Soldierfish	*Myripristis hexagona*	Blacktip soldierfish			LC	Indo-Pacific, Pacific	no		
Soldierfish	*Myripristis kuntee*	Shoulderbar soldierfish			LC	Indo-Pacific	no		
Soldierfish	*Myripristis murdjan*	Pinecone soldierfish			LC	Indo-Pacific, Pacific	no		
Soldierfish	*Myripristis randalli*	Randall's soldierfish			LC	restricted	no		
Soldierfish	*Plectrypops lima*	Shy soldierfish			LC	Indian Ocean, Indo-Pacific	no		
Sole	*Pardachirus pavoninus*	Peacock sole			LC	Indo-Pacific	no		
Sole	*Soleichthys heterorhinus*	Banded sole			LC	Indo-west Pacific	no		
Spinyfin	*Diretmus argenteus*	Siver spinyfin			LC	circumglobal, deep, uncommon	no		
Sprat	*Spratelloides gracilis*	Silver sprat			LC	widespread	no		
Squid	*Ommastrephes bartramii*	Squid			LC	circumglobal, temperate, subtropical	yes		
Squid	*Sthenoteuthis oualaniensis*	Squid			LC	circumtropical	no		
Squid	*Thysanoteuthis rhombus*	Diamondback squid			LC	circumtropical, subtropical	no		
Squirrelfish	*Neoniphon argenteus*	Clearfin squirrelfish			LC	Indo-Pacific	no		
Squirrelfish	*Neoniphon opercularis*	Blackfin squirrelfish			LC	Indo-west Pacific	no		
Squirrelfish	*Neoniphon sammara*	Spotfin squirrelfish			LC	Indo-Pacific	no		
Squirrelfish	*Ostichthys kaianus*	Deepwater squirrelfish			LC	widespread, deep	no		
Squirrelfish	*Sargocentron caudimaculatum*	Tailspot squirrelfish			LC	Indo-Pacific	no		
Squirrelfish	*Sargocentron diadema*	Crowned squirrelfish			LC	Indian Ocean, Indo-Pacific	no		
Squirrelfish	*Sargocentron lepros*	Spiny squirrelfish			LC	Indo-Pacific	no		
Squirrelfish	*Sargocentron punctatissimum*	White-spotted squirrelfish			LC	Indo-Pacific	no		
Squirrelfish	*Sargocentron rubrum*	Redcoat squirrelfish			LC	Indian Ocean, Indo-Pacific	no		
Squirrelfish	*Sargocentron spiniferum*	Spinecheek squirrelfish			LC	Indo-west Pacific	no		
Squirrelfish	*Sargocentron tiere*	Blue-lined squirrelfish			LC	Indo-west Pacific	no		
Stargazer	*Genyagnus monopterygius*	spotted stargazer			LC	restricted	no		
Stingray	*Neotrygon kuhlii*	Bluespotted stingray			LC	widespread	no		
Sunfish	*Ranzania laevis*	Dwarf sunfish			LC	circumtropical	no		
Surgeonfish	*Acanthurus achilles*	Achilles tang			LC	widespread, uncommon	no		
Surgeonfish	*Acanthurus albipectoralis*	Whitefin surgeonfish			LC	Indo-Pacific	no		
Surgeonfish	*Acanthurus blochii*	Ringtail surgeonfish			LC	Indian Ocean, Indo-Pacific, Pacific	no		
Surgeonfish	*Acanthurus dussumieri*	Eyestripe surgeonfish			LC	widespread	no		
Surgeonfish	*Acanthurus guttatus*	Whitespotted surgeonfish			LC	widespread	no		
Surgeonfish	*Acanthurus lineatus*	Striped surgeonfish			LC	Indo-west Pacific, Pacific	no		
Surgeonfish	*Acanthurus mata*	Elongate surgeonfish			LC	widespread	no		
Surgeonfish	*Acanthurus nigrofuscus*	Brown surgeonfish			LC	widespread	no		
Surgeonfish	*Acanthurus olivaceus*	Orange band surgeonfish			LC	widespread	no		
Surgeonfish	*Acanthurus pyroferus*	Mimic surgeonfish			LC	widespread	no		
Surgeonfish	*Acanthurus thompsoni*	Thompson's surgeonfish			LC	widespread	no		
Surgeonfish	*Acanthurus triostegus*	Convict tang			LC	widespread	no		
Surgeonfish	*Ctenochaetus binotatus*	Twospot bristletooth			LC	Indo-Pacific	no		
Surgeonfish	*Ctenochaetus hawaiiensis*	Hawaiian bristletooth			LC	Pacific	no		

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Surgeonfish	*Ctenochaetus striatus*	Striped bristletooth			LC	widespread	no		
Surgeonfish	*Naso annulatus*	Whitemargin unicornfish			LC	Indo-Pacific	no		
Surgeonfish	*Naso brevirostris*	Palefin unicornfish			LC	widespread	no		
Surgeonfish	*Naso caesius*	Gray unicornfish			LC	western Pacific	no		
Surgeonfish	*Naso hexacanthus*	Sleek unicornfish			LC	Indo-Pacific	no		
Surgeonfish	*Naso lituratus*	Orangespine unicornfish			LC	Indo-Pacific	no		
Surgeonfish	*Naso unicornis*	Bluespine unicornfish			LC	Indo-Pacific	no		
Surgeonfish	*Paracanthurus hepatus*	Blue tang			LC	Indian Ocean, Indo-Pacific	no		
Surgeonfish	*Zebrasoma scopas*	Brushtail tang			LC	Indian Ocean, Indo-Pacific	no		
Surgeonfish	*Zebrasoma veliferum*	Sailfin tang			LC	Indo-west Pacific	no		
Tapertail	*Radiicephalus elongatus*	Tapertail			LC	circumglobal, deep	no		
Tarpon	*Megalops cyprinoides*	Indo-Pacific tarpon			DD	Indo-west Pacific	yes		
Tattler	*Tringa incana*	Wandering tattler		II	LC	2450000	yes		
Telescopefish	*Gigantura elegans*	Indian telescopefish			LC	widespread	no		
Tern	*Anous stolidus*	Brown noddy			LC	215000000	no		
Tern	*Anous tenuirostris*	Lesser noddy			LC	19500000	no		
Tern	*Anous minutus*	Black noddy			LC	164000000	no		
Tern	*Procelsterna albivitta*	Grey noddy			LC	21600000	no		
Tern	*Gygis alba*	Common white tern			LC	137000000	no		
Tern	*Onychoprion fuscatus*	Sooty tern			LC	195000000	yes		
Tern	*Sterna sumatrana*	Black-naped tern			LC	61800000	yes		
Tern	*Thalasseus bergii*	Lesser crested tern			LC	142000000	yes		
Threadfin bream	*Scolopsis bilineata*	Two-lined monocle bream			LC	Indian Ocean, Indo-Pacific	no		
Tinselfish	*Xenolepidichthys dalgleishi*	Spotted tinselfish			LC	circumglobal, deep	no		
Toothed seadevil	*Neoceratias spinifer*	Toothed seadevil			LC	circumglobal, deep	no		
Trevally	*Alectis ciliaris*	African Pompano			LC	circumtropical	no		
Trevally	*Carangoides coeruleopinnatus*	Bluefin kingfish			LC	widespread	no		
Trevally	*Carangoides ferdau*	Banded trevally			LC	widespread	no		
Trevally	*Carangoides fulvoguttatus*	Yellow-spotted trevally			LC	widespread	no		
Trevally	*Carangoides orthogrammus*	Island jack			LC	Indo-Pacific	no		
Trevally	*Caranx ignobilis*	Giant trevally			LC	widespread	no		
Trevally	*Caranx lugubris*	Black trevally			LC	circumtropical	no		
Trevally	*Caranx melampygus*	Bluefin trevally			LC	Indo-Pacific	no		
Trevally	*Caranx sexfasciatus*	Bigeye trevally			LC	Indo-west Pacific	no		
Trevally	*Decapterus macarellus*	Mackerel scad			LC	circumtropical	no		
Trevally	*Decapterus macrosoma*	Shortfin scad			LC	Indo-Pacific	no		
Trevally	*Decapterus tabl*	Roughear scad			LC	circumtropical	no		
Trevally	*Elegatis bipinnulata*	Rainbow runner			LC	circumtropical	no		
Trevally	*Megalaspis cordyla*	Torpedo scad			LC	Indo-west Pacific	no		
Trevally	*Naucrates ductor*	Pilotfish			LC	circumtropical	no		
Trevally	*Scomberoides lysan*	Doublespotted queenfish			LC	Indo-Pacific	no		
Trevally	*Selar crumenophthalmus*	Bigeye scad			LC	circumglobal	no		
Trevally	*Seriola dumerilii*	Greater amberjack			LC	circumglobal	no		
Trevally	*Seriola rivoliana*	Longfin yellowtail			LC	circumtropical	no		

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Trevally	*Trachinotus bailloni*	Small spotted dart			LC	Indo-west Pacific	no		
Trevally	*Trachinotus blochii*	Snubnose pompano			LC	Indian Ocean, Indo-Pacific	no		
Trevally	*Uraspis helvola*	Whitetongue jack			LC	Indo-Pacific	no		
Triggerfish	*Sufflamen fraenatum*	Bridled triggerfish			LC	Indian Ocean, Indo-Pacific	no		
Triplefin	*Ceratobregma helenae*	Helena's triplefin			LC	Pacific	no		
Triplefin	*Enneapterygius atrogulare*	Blackthroat triplefin			LC	restricted	no		
Triplefin	*Enneapterygius rufopilus*	Redcap triplefin			LC	restricted	no		
Triplefin	*Enneapterygius triserialis*	Whitespotted triplefin			LC	restricted	no		
Triplefin	*Norfolkia thomasi*	Thomas' triplefin			LC	restricted	no		
Triplefin	*Ucla xenogrammus*	Largemouth triplefin			LC	Indo-Pacific	no		
Tropicbird	*Phaethon rubricauda*	Red-tailed tropicbird			LC	95100000	yes		
Tropicbird	*Phaethon lepturus*	White-tailed tropicbird			LC	161000000	yes		
Tuna	*Thunnus albacares*	Yellowfin tuna			NT	worldwide	yes		I
Tuna	*Euthynnus affinis*	Little tuna			LC	Indo-west Pacific	yes		I
Tuna	*Gymnosarda unicolor*	Dogtooth tuna			LC	Indo-Pacific	yes		
Tuna	*Thunnus alalunga*	Albacore			NT	circumglobal	yes		I
Tuna	*Thunnus obesus*	Bigeye tuna			VU	circumtropical	yes		I
Tuna	*Katsuwonus pelamis*	Skipjack tuna			LC	circumglobal	yes		I
Viperfish	*Chauliodus sloani*	Sloan's viperfish			LC	circumglobal, deep	no		
Waryfish	*Ahliesaurus berryi*	Waryfish			LC	widespread, deep	no		
Whale	*Megaptera novaeangliae*	Humpback whale	I	I	LC	cosmopolitan	yes		I
Whale	*Kogia sima*	Dwarf sperm whale	II		DD		unknown		I
Whale	*Balaenoptera edeni*	Bryde's whale	I	II	DD	circumglobal, warm	uncertain		I
Whale	*Feresa attenuata*	Pygmy killer whale	II		DD		no		I
Whale	*Kogia breviceps*	Pygmy sperm whale	II		DD		no		I
Whale	*Mesoplodon densirostris*	Blainville's beaked whale	II		DD		no		I
Whale	*Mesoplodon ginkgodens*	Ginkgo-toothed beaked whale	II		DD		no		I
Whale	*Orcinus orca*	Killer whale	II	II	DD	circumglobal	no		I
Whale	*Physeter macrocephalus*	Sperm whale	I	I/II	VU	circumglobal	no		I
Whale	*Pseudorca crassidens*	Flase killer whale	II		DD		no		I
Whale	*Ziphius cavirostris*	Cuvier's beaked whale	II	I	LC	circumglobal	no		I
Whalefish	*Barbourisia rufa*	Redvelvet whalefish			LC	circumglobal, deep, rare	no		
Whalefish	*Ditropichthys storeri*	Doublekeeled whalefish			DD	circumglobal, deep	no		
Whalefish	*Rondeletia loricata*	Redmouth whalefish			LC	circumglobal, deep	no		
Wrasse	*Cheilinus undulatus*	Humphead wrasse	II		EN	no			
Wrasse	*Anampses caeruleopunctatus*	Bluespotted wrasse			LC	Indian Ocean, Indo-Pacific	no		
Wrasse	*Anampses femininus*	Feminine wrasse			LC	Indo-Pacific, Pacific	no		
Wrasse	*Anampses melanurus*	Blacktailed wrasse			LC	Indo-west Pacific	no		
Wrasse	*Anampses neoguinaicus*	Black-banded wrasse			LC	Indo-west Pacific	no		
Wrasse	*Anampses twistii*	Yellowbreasted wrasse			LC	widespread	no		
Wrasse	*Bodianus anthioides*	Lyre-tail hogfish			LC	Indo-Pacific	no		
Wrasse	*Bodianus axillaris*	Turncoat hogfish			LC	Indo-Pacific	no		
Wrasse	*Bodianus dictynna*	Hogfish			LC	Indo-west Pacific	no		
Wrasse	*Bodianus loxozonus*	Blackfin hogfish			LC	Indo-Pacific	no		
Wrasse	*Bodianus mesothorax*	Yellowspotted hogfish			LC	Indo-Pacific	no		

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Wrasse	*Bodianus perditio*	Goldspot hogfish			LC	Indo-west Pacific	no		
Wrasse	*Cheilinus chlorurus*	Floral wrasse			LC	Indo-Pacific	no		
Wrasse	*Cheilio inermis*	Cigar wrasse			LC	widespread	no		
Wrasse	*Cirrhilabrus punctatus*	Dotted wrasse			LC	restricted	no		
Wrasse	*Cirrhilabrus scottorum*	Scott's wrasse			LC	Indo-Pacific	no		
Wrasse	*Coris aygula*	Humphead wrasse			LC	Indo-Pacific	no		
Wrasse	*Coris batuensis*	Schroeder's wrasse			LC	Indo-Pacific	no		
Wrasse	*Coris dorsomacula*	Spotfin wrasse			LC	Indo-Pacific	no		
Wrasse	*Coris gaimard*	Clown wrasse			LC	Indo-Pacific, Pacific	no		
Wrasse	*Cymolutes praetextatus*	Knife razorfish			LC	Indo-Pacific	no		
Wrasse	*Gomphosus varius*	Bird wrasse			LC	Indo-Pacific	no		
Wrasse	*Halichoeres biocellatus*	Biocellate wrasse			LC	Indo-west Pacific	no		
Wrasse	*Halichoeres chrysus*	Golden wrasse			LC	Indo-west Pacific	no		
Wrasse	*Halichoeres hartzfeldii*	Orange-lined wrasse			LC	western Pacific	no		
Wrasse	*Halichoeres hortulanus*	Checkerboard wrasse			LC	Indo-Pacific	no		
Wrasse	*Halichoeres margaritaceus*	Pearlspot wrasse			LC	Indo-Pacific	no		
Wrasse	*Halichoeres marginatus*	Dusky wrasse			LC	Indo-Pacific	no		
Wrasse	*Halichoeres prosopeion*	Twotone wrasse			LC	Indo-west Pacific	no		
Wrasse	*Halichoeres trimaculatus*	Three-spot wrasse			LC	Indo-Pacific	no		
Wrasse	*Hemigymnus fasciatus*	Banded thicklip wrasse			LC	Indo-Pacific	no		
Wrasse	*Hemigymnus melapterus*	Blackedge thicklip wrasse			LC	Indo-Pacific	no		
Wrasse	*Hologymnosus annulatus*	Ringed wrasse			LC	Indo-Pacific	no		
Wrasse	*Hologymnosus doliatus*	Narrow-banded wrasse			LC	Indo-Pacific	no		
Wrasse	*Iniistius aneitensis*	Pale razorfish			LC	Indo-Pacific	no		
Wrasse	*Iniistius celebicus*	Bronzespot razorfish			LC	Indo-west Pacific	no		
Wrasse	*Iniistius pavo*	Peacock razorfish			LC	Indo-Pacific	no		
Wrasse	*Labrichthys unilineatus*	Tubelip wrasse			LC	Indo-Pacific	no		
Wrasse	*Labroides bicolor*	Bicolor cleanerfish			LC	widespread	no		
Wrasse	*Labroides dimidiatus*	Cleaner wrasse			LC	Indo-Pacific	no		
Wrasse	*Labroides rubrolabiatus*	Redlip cleaner wrasse			LC	western and central Pacific	no		
Wrasse	*Labropsis australis*	Southern tubelip			LC	restricted	no		
Wrasse	*Macropharyngodon kuiteri*	Black leopard wrasse			LC	restricted	no		
Wrasse	*Macropharyngodon meleagris*	Blackspotted wrasse			LC	Indo-Pacific	no		
Wrasse	*Macropharyngodon negrosensis*	Yellowspotted wrasse			LC	Indo-Pacific	no		
Wrasse	*Novaculichthys taeniorus*	Rockmover wrasse			LC	widespread	no		
Wrasse	*Oxycheilinus bimaculatus*	Comettailed wrasse			LC	Indo-Pacific	no		
Wrasse	*Oxycheilinus digramma*	Cheeklined wrasse			LC	Indian Ocean, Indo-Pacific	no		
Wrasse	*Oxycheilinus nigromarginatus*	Blackmargin maori wrasse			DD	restricted	no		

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