IN THE ENVIRONMENT COURT OF NEW ZEALAND
AUCKLAND REGISTRY

I TE KŌTI TAIAO O AOTEAROA
TĀMAKI MAKAURAU ROHE

IN THE MATTER	of the Resource Management Act 1991
AND	of an appeal under clause 14 of Schedule 1 of the Act
BETWEEN	**ROYAL FOREST AND BIRD PRECTION SOCIETY OF NEW ZEALAND**
	BAY OF ISLANDS MARITIME PARK INCORPORATED
	Appellants
	NORTHLAND REGIONAL COUNCIL
	Respondent

EVIDENCE IN CHIEF OF ENRIQUE MANUEL PARDO DIAZ
ON BEHALF OF THE MINISTER OF CONSERVATION AND THE MINISTER FOR OCEANS AND FISHERIES
ECOLOGY
TOPIC 14 – MARINE PROTECTED AREAS
~~14 MAY~~ 22 JUNE 2021

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KEY:

~~Red strikethrough~~; deletion from 14 May 2021 Evidence in Chief arising out of changes to the proposed protection areas.

Blue; addition to 14 May 2021 Evidence in Chief arising out of changes to the proposed protection areas.

Green; new text/minor correction or update from 14 May 2021 Evidence in Chief.

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INTRODUCTION, QUALIFICATIONS AND EXPERIENCE

1. My full name is Enrique Manuel Pardo Diaz.

2. I hold a Bachelor of Science (Marine Science) and a Master of Science in Coastal Management from the University of Cadiz, Spain.

3. I have over 14 years' experience working in the field of marine science in four different countries (Spain, Finland, United Kingdom and New Zealand) in the private, public and non-governmental (NGO) sectors. My particular areas of expertise are benthic ecology, marine mammals, and the assessment of human activities on them.

4. I am employed by the Department of Conservation (DOC) as a Science Advisor (Marine), primarily collecting scientific information and advising on the implementation of a marine protected areas network in New Zealand. I have held this position for three years. My role spans the New Zealand marine environment including international aspects. Additionally, I provide research and technical input on RMA processes and the Department's marine reserve monitoring programme. I am part of the New Zealand delegation to the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), as a science advisor.

5. I was previously employed by DOC as a Technical Advisor leading the New Zealand Sea Lion Programme and Threat Management Plan. I have also been employed by the Joint Nature Conservation Committee (JNCC, statutory advisor of the United Kingdom, UK, government) to provide technical advice to the UK government on interactions between the offshore industries and benthic ecosystems and marine mammals.

6. I was part of the INTERMARES programme[1] as a science advisor at Oceana (an international NGO). This European Union programme was focused on identifying suitable areas to be designated as marine protected areas and part of the European network Natura 2000[2]. In that role, I participated in several surveys with remotely operated vehicles (ROV) and other oceanographic

[1] INTERMARES - Integrated, Innovative and Participatory Management for N2000 network in the Marine Environment
https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=6101

[2] Natura 2000 is a network of core breeding and resting sites for rare and threatened species, and some rare natural habitat types which are protected in their own right.
https://ec.europa.eu/environment/nature/natura2000/index_en.htm

instruments to characterise benthic ecosystems and identify their ecological values. I also undertook a study on the fishing sector in the Western Mediterranean countries (Spain, France, Italy, Morocco and Tunisia) to assess the characteristic of the fishing feel and the impact on large pelagic species.

7. I led a dropdown camera DOC Survey in April 2021 (DOC Survey 2021, see Appendix 5) to ground-truth some of the information previously collected in the Bay of Islands and offshore coast to Mimiwhangata and to fill some knowledge gaps in this area.

Code of Conduct

8. I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses as contained in the Environment Court's Practice Note 2014.

9. The data, information, facts and assumptions I have considered in forming my opinions are set out in my evidence to follow. The reasons for the opinions expressed are also set out in my evidence to follow.

10. Unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Material Considered

11. In preparing this evidence, I have read and considered the following key reports and documents:

    a. Evidence in Chief (EIC) of Mr Brass on behalf of the Minister of Conservation and the Minister for Oceans and Fisheries.

    b. EIC of Mr Hore and Ms McKinnon for the Minister for Oceans and Fisheries.

    c. EIC of Dr Rebecca Liv Stirnemann on behalf of Royal Forest and Bird Protection Society ("Forest & Bird") and Bay of Islands Maritime Park Inc ("BOIMP").

    d. EIC of Dr Nicholas Tony Shears on behalf of Forest & Bird and BOIMP.

e. EIC of Dr Mark Andrew Morrison on behalf of Forest & Bird and BOIMP.

f. EIC of Dr Victoria Ann Froude on behalf of Forest & Bird and BOIMP.

g. EIC of Mr Vincent Kerr on behalf of Te Uri o Hikihiki.

h. EIC of Dr Philip Maxwell Ross on behalf of the Northland Regional Council.

i. The New Zealand Coastal Policy Statement 2010.

j. Ocean Survey 20/20 reports and available data online.

12. I have also considered information collected and analysed from a recent DOC dropdown camera survey.

SCOPE OF EVIDENCE

13. In my evidence I cover:

a. Marine ecology and protection in Northland.

b. Description of biogenic habitats distributed in the areas proposed for protection, including their ecological values and vulnerabilities.

c. The biogenic habitats described in the proposed protected areas that meet the criteria of Policy 11 of the New Zealand Costal Policy Statement 2010 (NZCPS).

d. An analysis of the ecological values and habitat representativeness in the areas proposed for protection. In this section, I incorporate the survey information collected during the April 2021 dropdown camera survey undertaken by DOC.

e. In the last part of my evidence, I summarise the information above and the applicability of Policy 11 of the NZCPS for each of the proposed protected areas.

EXECUTIVE SUMMARY

14. The areas proposed for protection include diverse coastal and open water environments from shallow estuaries, sheltered bays, to exposed coastal areas and deep rocky reefs.

15. The northern and eastern coast of the Northland territorial sea are part of the North-eastern Bioregion (DOC/MFish, 2005; Mfish/DOC, 2008). Collectively, the marine reserves in this Bioregion cover 7,900 hectares and 0.2% of the bioregion. Within Northland Region, the two no-take marine reserves plus the Type 2 Marine Protected Area (MPA) Mimiwhangata Marine Park represent a total MPA area in Northland of 3,981.51 hectares, equivalent to 0.2% of Northland's territorial sea (1,756,860 hectares).

16. The Bay of Islands and Mimiwhangata area contain several examples of biogenic habitats that in most cases support other indigenous species or contribute to maintain their populations. These biogenic habitats are primarily: (a) seagrass meadows, (b) rhodolith beds, (c) large shellfish beds, (d) macro-algae beds, (e) sponge aggregations, (f) coral species and aggregations and (g) bryozoan beds.

17. The main threats to these values noted in this evidence include global ones such as climate change and carbon cycle alteration; and local and regional ones such as sedimentation, fishing activities (commercial and recreational), boating (i.e. anchoring) and pollution.

18. When assessed against NZCPS Policy 11, the biogenic habitats and the presence of ecologically important species and other habitats in the proposals meet at least NZCPS Policies 11 (a) (i)(iii)(iv) and (v) and 11 (b) (i)(ii) (iii) and (iv).

19. All the proposed areas contain one or more types of biogenic habitat. I summarise the relevant aspects of NZCPS Policy 11 for each area in the tables 4 and 5 below.

20. **Table 4.** Summary of the application of NZCPS Policy 11 (a) in each Sub-Area and rationale.

MPA Sub-area proposed	Policy 11(a)(i): New Zealand Threat Classification System lists	Policy 11(a)(iii): threatened in the coastal environment, or are naturally rare	Policy 11(a)(iv): species at the limit of their natural range, or naturally rare	Policy 11(a)(v): areas containing nationally significant examples of

				indigenous community types
Te Ha o Tangaroa: ~~Sub-~~Area A ~~and buffer~~	*Aeodes nitidissima* – NZTCS: At Risk, Naturally uncommon ~~Declining~~	Biogenic habitat threatened: sponge and coral aggregations; kelp forests.	-	-
Te Ha o Tangaroa: ~~Sub-~~Area B	*Zostera muelleri* – NZTCS: At Risk, Declining	Biogenic habitats: mussel beds and rhodolith beds	Biogenic habitats naturally rare: rhodolith beds	Biogenic habitat: seagrass meadows with rhodolith beds
Te Ha o Tangaroa: ~~Sub-~~Area C	*Oculina virgosa* – NTZCS: At Risk, Naturally Uncommon	Biogenic habitats threatened: sponge and coral aggregations	Biogenic habitats, coral reef with species at the limit of their range: *Oculina virgosa*	Biogenic habitats: high diversity of sponge and coral aggregations
Te Mana o Tangaroa: ~~Sub-~~Area A and buffer	*Zostera muelleri* – NZTCS: At Risk, Declining	Biogenic habitat threatened: sponges and coral aggregations; kelp forests.	-	-
Te Mana o Tangaroa: ~~Sub-~~Area B	-	Biogenic habitats threatened: sponge and coral aggregations	-	Biogenic habitats: high diversity of sponge and coral aggregations

21. **Table 5.** Summary of the application of NZCPS Policy 11 (b) in each ~~Sub-~~Area and rationale.

MPA Sub-area proposed	Policy 11(b)(i): areas of predominantly indigenous vegetation in the coastal environment	Policy 11(b)(ii): important during the vulnerable life stages of indigenous species	Policy 11(b)(iii): only found in the coastal environment and are particularly vulnerable to modification	Policy 11(b)(iv): important for recreational, commercial, traditional or cultural purposes
Te Ha o Tangaroa: ~~Sub-~~Area A ~~and buffer~~	Seagrass meadows, kelp (Ecklonia) forest, macroalgae beds and sponge aggregations	Shallow rocky reef and listed biogenic habitats	Shallow rocky reef, seagrass meadows, kelp (Ecklonia) forest, macroalgae beds and sponge aggregations	Rocky reefs and listed biogenic habitats
Te Ha o Tangaroa: ~~Sub-~~Area B	Shellfish beds, sea grass and rhodoliths beds and listed biogenic habitats	Listed biogenic habitats	Shellfish beds, sea grass and rhodoliths beds and listed biogenic habitats	Listed biogenic habitats
Te Ha o Tangaroa: ~~Sub-~~Area C	Sponge and coral aggregations, and kelp (Ecklonia) forests	Deep rocky reef and listed biogenic habitats	Deep rocky reefs, sponge and coral	Deep rocky reefs and listed biogenic habitats

			aggregations, and kelp (Ecklonia) forests	
Te Mana o Tangaroa: ~~Sub-~~Area A and buffer	Seagrass meadows and kelp (Ecklonia) forests	Shallow rocky reefs and listed biogenic habitats	Shallow rocky reefs, seagrass meadows and kelp (Ecklonia) forests	Shallow rocky reefs and listed biogenic habitats
Te Mana o Tangaroa: ~~Sub-~~Area B	Sponge and coral aggregations, and kelp (Ecklonia) forests	Deep reefs and listed biogenic habitats	Deep reefs, sponge and coral aggregations, and kelp (Ecklonia) forests	Deep rocky reefs and listed biogenic habitats

22. The ecological values and in particular the biogenic habitats and the species mentioned in the tables above found in the various proposals described in my evidence come within the matters included in NZCPS Policy 11(a)(i)(iii)(iv)(v) and (b) (i)(iii)(iv)(v).

CONTEXT

Ecological values of Northland

23. The Bay of Islands and the coastal area from Cape Brett to Mimiwhangata are ecologically distinct within the context of the North-eastern Coastal Biogeographic (DOC 2011).[3] These areas include a diversity of coastal and open water environments, from shallow estuaries, sheltered bays and beaches, to exposed coastal areas and deep rocky reefs. This complex geomorphology creates environmental gradients in depth, salinity, water clarity, exposure, tidal current speed, and substrates, resulting in a diverse array of marine habitats (Hewitt et *al*. 2010).

24. Based on my review of the available literature and other relevant information (see paragraphs 11 to 13 above), the coastal environments covered by Te Ha O Tangaroa Protected Areas proposals include soft-muddy seafloor in the ~~central area of the~~ Bay of Islands ~~(inner section of sub-area C)~~ surrounded by a combination of sandy, gravel and hard substrata (i.e. shallow rocky reef) around the edges of the inner islands and coastline of the Bay of Islands. In ~~sub-~~areas A ~~(+ buffer)~~ and B, hard substrata, muddy, coarse and sandy

[3] The North-eastern Coastal Biogeographic Region extends from Ahipara Bay, around Cape Reinga to East Cape (Gisborne).

seafloors are represented; these areas also contain different types of biogenic habitats and are predominantly shallower than 50 metres depth.

25. The ~~outer part of the Sub-~~Area C and the Te Mana O Tangaroa Protected Areas proposal extend from intertidal environments to deep rocky reef at around 150 metres depth, with extensive areas of rocky reef and muddy seafloor on exposed areas of the north east coast. Warm offshore waters from the East Auckland Current (EAUC) create similar conditions at Mimiwhangata, Cape Brett and Poor Knights allowing the development of subtropical habitats and species. These areas provide habitats for sessile and mobile marine species, including species of customary, recreational and commercial interest such as rock lobsters and various coastal fish species.

26. NIWA, in association with Land Information New Zealand, undertook an extensive bathymetric and biological survey between 2008 and 2012 (Ocean Survey 20/20, see Appendix 4, maps 4.b). Ocean Survey 20/20 described the geomorphological and biological assemblages and their relevance in the northeast of the Northland Region. NIWA used a combination of coastal multibeam surveys, side-scan sonar and aerial photography to map the benthic habitats within the Bay of Islands and on the adjacent continental shelf in Phase 1 of the project. Data obtained from benthic and pelagic sampling and imagery were used by NIWA to ground-truth the habitat mapping (Mitchel et at. 2010).

27. During April 2021, I led a dropdown camera survey with a DOC team to collect new data and replicate some of the stations sampled during Ocean Survey 20/20. I have relied on some of the information collected by NIWA and more recent publications in this evidence, together with the data we collected during DOC Survey 2021 in April (Appendix 5).

Marine protection in Northland

28. Habitat protection can be provided using a range of tools. The current Marine Protected Areas Policy (MPA Policy) recognises three types of protection tools: Marine Reserve MPAs (Type 1 MPAs), other Marine Protected Areas (Type 2 MPAs) and other Marine Protection Tools[4] (MFish/DOC, 2008). Only MPA types 1 and 2 are considered to be MPAs for the purpose of the MPA

[4] https://www.doc.govt.nz/about-us/science-publications/conservation-publications/marine-and-coastal/marine-protected-areas/marine-protected-areas-classification-protection-standard-and-implementation-guidelines/

Policy. Type 2 MPAs can be created using the Fisheries Act and other legislation. Whether the tool in an individual circumstance meets the protection standard, i.e. creates an MPA, must be assessed on a case by case basis.

29. Marine reserves (established under the Marine Reserves Act 1971) provide the highest form of marine protection; they are created to preserve and protect marine life.[5] The northern and eastern coast of the Northland territorial sea are part of the North-eastern Bioregion[6] (DOC/MFish, 2005; Mfish/DOC, 2008). Collectively, the marine reserves in this Bioregion cover 7,900 hectares and 0.2% of the bioregion.

30. Two of these marine reserves are in Northland: Poor Knights Islands Marine Reserve (1,890 ha) and Whangarei Harbour Marine Reserve (236.51 ha). I understand that the Mimiwhangata Marine Park was established in 1983 under regulations made under the Fisheries Act. Commercial fishing is prohibited but some non-commercial fishing still occurs; this area is recognised as a “Type 2 MPA.”

31. I am aware that in 2004, DOC developed a marine reserve proposal in the Mimiwhangata area. Boundaries were defined after collecting biological information and undertaking public consultation; however, the proposal never culminated in the creation of a marine reserve.

32. In addition to the marine protected areas quoted above, there are various spatial fisheries closures along Northland’s east coast (Table 1 and as described in the evidence of Ms McKinnon).

[5] Marine Reserves Act 1971 long title: An Act to provide for the setting up and management of areas of the sea and foreshore as marine reserves for the purpose of preserving them in their natural state as the habitat of marine life for scientific study.

[6] This region is a warm temperate region influenced by the warm subtropical East Auckland Current, particularly around island groups of Cavalli, Poor Knights, Mokohinau, Rakitu (east coast Great Barrier Island), Alderman, Mayor, Volkner and White, and also some headlands, including Cape Karikari, Cape Brett and Cape Runaway. Region characterised by endemic algae, molluscs, echinoids, antipatharians; assemblages of sponges, ascidians, molluscs, fish, echinoids. Southern boundary is the confluence of the warm East Cape current that moves south and the cool Wairarapa Current that flows north. Areas of special interest include: high tidal flows areas of North Cape. Areas of special interest include: hydrothermal vents. (Pg 32) https://www.doc.govt.nz/about-us/science-publications/conservation-publications/marine-and-coastal/marine-protected-areas/marine-protected-areas-classification-protection-standard-and-implementation-guidelines/

Table 1. list of spatial closures and management areas under different legislation

Marine Protected Area – Type 1			
Marine Reserve (MR)	Region	Area	Legislation
Poor Knights Islands MR	Northland	1,890 hectares	Marine Reserve (Poor Knights Islands) Order 1981
Whangarei Harbour MR: Waikaraka		210.5 hectares	Marine Reserve (Whangarei Harbour) Order 2006
Whangarei Harbour MR: Motukaroro		26.01 hectares	Marine Reserve (Whangarei Harbour) Order 2006
Marine Protected Area – Type 2			
Marine Park	Region	Area	Legislation
Mimiwhangata	Northland	1,855 hectares	Fisheries (Mimiwhangata Peninsula) Notice 1983
Fisheries Tools			
Mātaitai Reserve	Region	Area	Legislation
Te Puna	Northland	2,000 hectares	Fisheries (Declaration of Te Puna Mātaitai Reserve Bylaw) Notice 2020 (Notice No. MPI 1120)
Taiāpure	Region	Area	Legislation
Waikare Inlet	Northland	1,800 hectares	Fisheries (Waikare Inlet Taiapure) Order 1997
Temporary Closures	Region	Area	Legislation
Marsden bank and Mair Bank	Northland	146.69 hectares	Fisheries (Marsden Bank and Mair Bank Temporary Closure) Notice 2020 (MPI 1157)
Maunganui Bay		161.64 hectares	Fisheries (Maunganui Bay Temporary Closure) Notice 2018: revoked, on the close of 13 October 2020, by clause 3.

33. Together, the two no-take marine reserves plus the Type 2 MPA Mimiwhangata Marine Park represent a total MPA area in Northland of 3,981.51 hectares, equivalent to 0.2% of Northland's territorial sea (1,756,860 hectares).

34. No-take areas are considered to be the most efficient tool to restore ecosystems, biomass and fish assemblages to a more resilient state (Sala et. al. 2017).

Marine mammal sanctuary

35. Bay of Islands is a nationally significant bottlenose dolphin (*Tursiops truncatus*) habitat – the species forages throughout the Bay of Islands, although numbers have declined due to chronic disturbance by tourism and recreational vessels (Peters and Stockin 2016). Bottlenose dolphins are ranked as Threatened – Nationally Endangered under the New Zealand Threat Classification System (NZTCS). Regional populations of bottlenose dolphins around New Zealand are genetically isolated from each other. Common dolphins (Not Threatened) and Bryde's whales (Threatened – nationally critical) are common in the outer Bay of Islands. Killer whales

(Threatened – nationally critical) regularly visit the Bay of Islands and have been observed feeding on a variety of rays and sharks.

36. A proposed Marine Mammal Sanctuary in the Bay of Islands was announced by the Minister of Conservation for public consultation on 20 April 2021, in response to the dramatic decline of the local bottlenose population. The proposed ~~Sub-~~Areas A, B and partially C of Te Ha o Tangaroa proposal overlap and may have some benefits for the endangered bottlenose dolphin population in the Bay of Islands through improved foraging opportunities in the areas. The management proposal in the consultation paper do not include fisheries management measures.

BIOGENIC HABITATS – Values, sensitivity and vulnerability

37. In this section I describe the ecological relevance and sensitivity of biogenic habitats. The Bay of Islands and Mimiwhangata area contain several examples of biogenic habitats that in most cases support other indigenous species or contribute to maintain their populations.

Description and characteristics

38. Healthy biogenic habitats (as defined earlier in my evidence and at the glossary), and the communities and ecosystems associated with them, contribute to the indigenous biodiversity and the significance of an area (e.g. representativeness, rarity, diversity, distinctiveness, etc.). Some of the functions and services of the biogenic habitats benefit other species providing refugia, feeding grounds and nursery areas; some of these habitats increase primary productivity and carbon sequestration (i.e seagrass, algae meadows), others stabilise sedimentary substrata, improve water quality, and attract tourism.

39. Various studies from a range of locations have demonstrated the role of biogenic habitats in providing important habitat for indigenous species, especially during the vulnerable early life stages. Morrison et *al.* (2014) and Anderson et *al*. (2019) described associations between biogenic habitats and indigenous species, including harvested species such as snapper. This latter study highlighted how these habitats are indirectly valuable to the New Zealand economy and culturally, for tourism, commercial and recreational food harvesting. Biogenic habitats provide essential fish habitat for many

fisheries and taonga species, especially during crucial life stages (e.g. nursery and spawning grounds).

40. The environmental conditions and the type of substrata will determine the development of specific biogenic habitats. The Te Ha o Tangaroa and Te Mana o Tangaroa proposals between the Bay of Islands and the coastal area to Mimiwhangata extend across soft and hard substrata, in open and semi-closed waters. These areas contain at least the following known biogenic habitats:

    a. Seagrass meadows.

    b. Rhodolith beds.

    c. Large shellfish beds.

    d. Macro-algae beds.

    e. Sponge aggregations.

    f. Coral species and aggregations.

    g. Bryozoan beds.

41. Species of habitat-forming bryozoan and gastropods have been described in the proposed areas. In my opinion, it is possible that bryozoan beds and vermetid reefs would be found if a comprehensive survey is undertaken.

42. Sensitivity is defined by the United Kingdom's Marine Life Information Network (MarLIN) as 'the tolerance of a species or habitat to damage from an external factor, and the time taken for its subsequent recovery from damage sustained as a result of an external factor.' MacDiarmid et *al.* (2013) used this definition in their assessment of New Zealand sensitive habitats, and I have adopted it for this evidence.

43. Rhodolith beds, large bivalve beds, sponge gardens, stony coral reefs, macroalgae and bryozoan beds are described as sensitive habitats by MacDiarmid et *al.* (2013). This study initially focused on the Economic Exclusive Zone, but some of the habitats assessed are typical from the photic zone, and therefore shallower waters. I believe its general findings regarding habitat sensitivity to have parallels with similar habitats in coastal waters.

44. I describe these habitats and their significance in the areas proposed for protection below. In my opinion and after reviewing the material referenced in this evidence, the biogenic habitats distributed in these areas fall into the descriptors of the NZCPS Policy 11, in particular: NZCPS Policy 11(a)(i)(iii) and (v); and Policies 11(b)(i), (ii), (iii) and (iv) (see tables 4 and 5).

Seagrass meadows

45. The unique seagrass species in New Zealand is *Zostera muelleri*. This species is distributed in intertidal and shallow subtidal areas creating seagrass/eelgrass meadows. This species is classified as At Risk - Declining in the NZTCS.

46. In the Bay of Islands, seagrass meadows primarily occur in the Te Rawhiti Inlet and are included in the ~~Sub-~~Area B of the Ta Ha o Tangaroa proposal. Seagrass meadows have also been documented in Mimiwhangata bay[7]. Matheson et al (2010) estimated 97% of seagrass meadows were lost in the bays around the mainland of Te Rawhiti inlet between 1961 and 2004/5.

47. This habitat increases primary production, stores carbon and acts as a foraging habitat for fish and birds (e.g., see Turner&Schwarz 2004, 2006, Morrison et *al.* 2014). Subtidal seagrass meadows are also an indicator of good water quality as they need clear and clean water to function adequately. They are nursery areas for fish species like snapper with studies from the Bay of Islands showing higher growth rates of snapper in seagrass meadows, as described in Dr Morrison's EIC[8].

Rhodolith beds

48. Rhodolith beds, formed by calcareous red algae, are recognised as being very biodiverse (Nelson et *al* 2012). Nelson et *al*. (2010) identified two rhodolith species in the Bay of Islands, *Lithothamnion crispatum* (previously *L. indicum*) and *Sporolithon durum.* Their complex structure help to stabilise sedimentary substrata and provide habitat for a great variety of invertebrates and fishes, some as nursery areas for commercially harvested species (Kamenos et al. 2004; Nelson et al. 2012). This habitat is also home to high densities of broodstock bivalves (Nelson 2009), other algae, and many rare and unusual species (Nelson et *al* 2012; MacDiarmid et *al.* 2013).

[7] EIC of Mr Kerr at paragraph 64.
[8] Dr Morrison's EIC at paragraph 15.

49. Rhodoliths contribute to increased primary productivity, carbon sequestration, and erosion prevention (Geange et. al. 2019; Anderson et. al. 2019). The diversity and abundance of organisms supported by rhodolith beds significantly increase with complexity (branching density) and the space available (thallus volume) and hence fragmentation of this habitat will likely reduce these attributes (Steller et al. 2003). Typically, they are long-lived and slow growing (Nelson et al., 2012), and inhabit nearshore soft sediments, making them vulnerable to various forms of disturbance, including anchoring, dredging, trawling and sedimentation.

50. Rhodolith beds defined in the habitat mapping in the NE Sub-Bioregion totals 51.2 hectares (see Table 3). The distribution of this habitat in the Bay of Islands is limited to Te Rawhiti inlet, and wholly within ~~Sub-~~Area B.

51. The DOC Survey 2021 documented an unusual association of rhodolith beds with seagrass. The combination of these species seems to create a transitional area between the seagrass meadows and rhodolith beds. I consider this transition is rare and unusual in New Zealand and provides special significance to these areas. Both seagrass and rhodoliths are fish nursery habitats and contribute to carbon sequestration and sediment stabilisation; the combination of both habitats reinforces these functions.

52. Rhodolith beds are considered to be rare in New Zealand waters, and I would describe them as a threatened ecosystem in Northland and probably around New Zealand.

<u>Macroalgae beds</u>

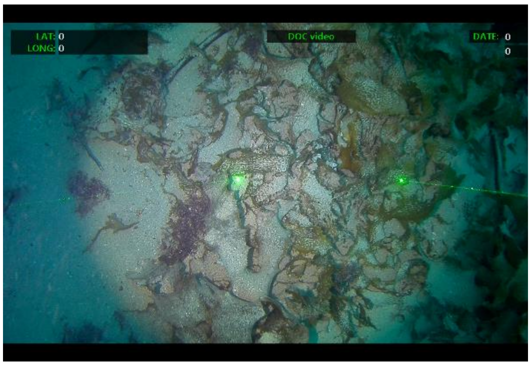
53. The Ocean Survey 20/20 identified 197 species of macroalgae in the Bay of Islands and adjacent shelf, including 25 undescribed genera or species. In my opinion, this high algae diversity is a significant feature in the Bay of Islands. Of particular note, large brown algae from the genera *Carpophyllum*, *Sargassum*, *Ecklonia* and *Lessonia* form distinctive dense beds or forest in subtidal reef areas. The At Risk species *Aeodes nitidissima* was also documented in some of aggregations described in the proposals (Nelson et *al.* 2010).

54. The algae *Ecklonia radiata* is the most common kelp in Northland and is notable in the shallow reef areas of the proposals. This habitat is currently

threatened in several areas by sea urchin overpopulation that drives the development of sea-urchin/kina barrens.

55. The kelp forests over rocky reef in north-eastern New Zealand provide nursery and refuge grounds for about 130 species (Francis 1988, Jones 2013) and several species of invertebrates.

Figure 1. images of kelp forest from the inner Bay of Islands (Sub-Area A, Te Ha o Tangaroa proposal).

	
Kelp forest, *Ecklonia radiata* (DOC Survey 2021)	Degraded/unhealthy Ecklonia (DOC Survey 2021)

Beds of large shellfish

56. The distribution of large shellfish beds in the area is predominantly in Te Rawhiti Inlet on sedimentary substrata. Three habitat-forming species are found in the area: horse mussels (*Atrina zelandica*), dog cockles (*Tucetona laticostata*) and New Zealand scallop (*Pecten novazelandiae*). The EIC of Dr Morrison[9] describes the distribution of these species based on the information collected during the Ocean Survey 20/20. The DOC Survey 2021 could not find that high density of these species in the area (see paragraph 105 below of this evidence).

57. Juvenile snapper are associated with horse mussel beds, as well as other biogenic habitats such as pits and burrows, kelp forest and sponge gardens in the Hauraki Gulf, and also with red algae and rhodoliths in the Bay of Islands (Morrison et *al.* 2014a). As well as providing fish habitat, shellfish beds stabilise sedimentary substrata, help increase water quality (they are filter feeder species) and provide hard substrata for other sessile species such as bryozoans, sponges and algae.

[9] EIC of Dr Morrison in paragraph 18 to 26.

58. In addition to their role as feeding grounds, nursery grounds and protection for some commercial species, Geange et. al. (2019) and Anderson et. al. (2019) describe ecosystem functions and services from horse mussel beds as increasing primary productivity and nutrients, and sediment composition and stabilisation, among others.

59. Horse mussels, dog cockles and scallops are widely distributed around the New Zealand coast and are not rare. However, they are vulnerable, especially horse mussel beds, to increased sedimentation and fishing activities in this area and other coastal locations (see Appendix 3 – Table 3-21). Horse mussels are especially vulnerable to the effects of towed fishing gear such as trawls, danish seines and dredges. As a habitat, horse mussel beds have been estimated to have declined nationally by 25-75% and this trend is likely to continue (Anderson et. al. 2019). Anderson et. al. (2019) concluded many horse mussel beds on the shelf "*have been damaged, reduced in extent or lost due to bottom fishing activities (including scallop dredging)*."

Figure 2. image of dense mussel bed from inner Bay of Islands (Sub-Area B, Te Ha o Tangaroa proposal)

Dense horse mussel bed (Ocean Survey 20/20)

<u>Sponge aggregations</u>

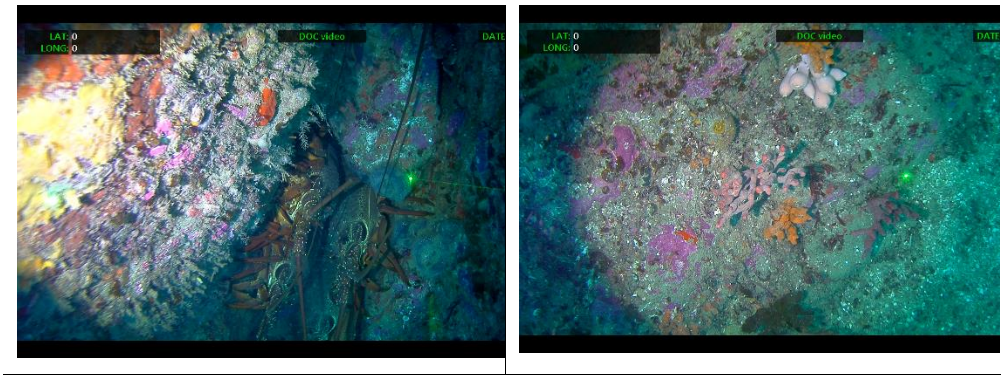
60. Around 1,400 species of sponges are distributed in New Zealand waters (Kelly et *al.* 2018) but only seven species are assessed as At Risk in the NZTCS and thirteen as 'Data Deficient', all of them from the Hexactinellidae class. In my view, it is likely there are threatened sponge species which have yet to be assessed under the NZTCS.

61. Sponge species from the classes Demospongiae and Hexactinellidae are common species in the inner Bay of Islands and widely present in the offshore

rocky reef within the proposed areas for protection. Some of these species develop over one-metre structures providing key functions such as feeding and refugia for other species. Sponges have been documented in the whole bathymetric range; they are not photic dependant. Some of the sponge and bryozoan species create three dimensional (3D) habitats that are vulnerable to bottom contact activities, especially in the outer Bay of Islands and Te Au o Morunga areas where bottom trawling occurs.

62. Although sponges and bryozoan species are common marine invertebrates around New Zealand, dense habitat-forming aggregations of sponges are less common and some species are uncommon and only known from one or a few locations (e.g. small fragile calcareous sponges) (Kelly et *al.* 2019). Not all data collected around the proposed areas have been analysed to species level, but the diversity found in some of the habitat-forming aggregation of sponges in some areas is rare in the context of the north east coast (Ocean Survey 20/20).

Figure 3. images of sponge aggregations in the Maunganui Bay and offshore areas.



DOC Survey 2021. Sponge aggregation with rock lobster in Maunganui Bay (~~Sub-~~Area A – Te Ha o Tangaroa)

DOC Survey 2021. Sponges (such as organ pipe sponges -*Iophon laevistylus*- and *Stelletta maori*) and gorgonian corals (*Perissogorgia vitrea*) aggregations (~~Sub-~~Area C – Te Ha o Tangaroa/ ~~Sub-~~Area C ~~B~~ Te Mana o Tangaroa)

Coral species and aggregations

63. The DOC Survey 2021 confirmed the distribution of several species of corals in the proposed areas. Tracey et *al.* 2019 describe the biology and distribution of species of corals, including those in the northeast coast, some of which were also documented by Ocean Survey 20/20.

64. Gorgonians (*Perissogorgia vitrea*, order Alcyonacea) were found by DOC in several location from 20 to 70m in the inner and outer Bay of Islands. They were localised in reduced areas but formed structuring three dimensional habitats in association with sponge species in rocky reefs. The known distribution of this species is predominantly reduced to Northland, NE coast and some examples in North Cape, north west coast, Three Kings and underwater elevations in offshore areas, north Three Kings (Carins 2016). This species is fragile and rare, with limited distribution in New Zealand.

65. Solitary hard and soft corals are present in several locations from around 60m, predominantly in the offshore areas. DOC Survey 2021 found stony cup corals (Orden Scleractinia) in some of the areas surveyed, in combinations with habitat-forming sponges. Cup corals species are vulnerable to physical disturbance.

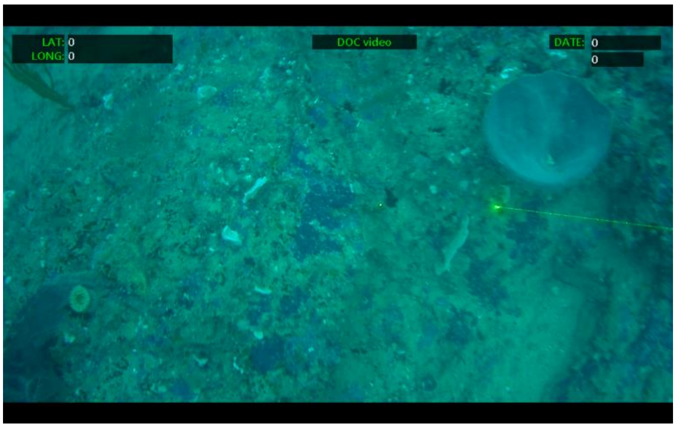
66. Black corals from the Order Antipatharia are generally distributed between 200-1000m, but in Northland and Fiordland they appear at shallower water (Tracey et *al.* 2019). DOC Survey 2021 documented a patch of black corals at 80m in the Area C Te Au o Morunga proposal and Ocean Survey 20/20 recorded them north Cape Brett and other locations.

67. Clark et al 2019 did not find evidence of recovery of communities on a seamount 15 years following a prohibition on bottom-contacting fishing methods. While this study was in a very different environment than the proposals, some species of corals from the order Scleractinia and Antipatharia are found in the deep reef areas of both proposals.

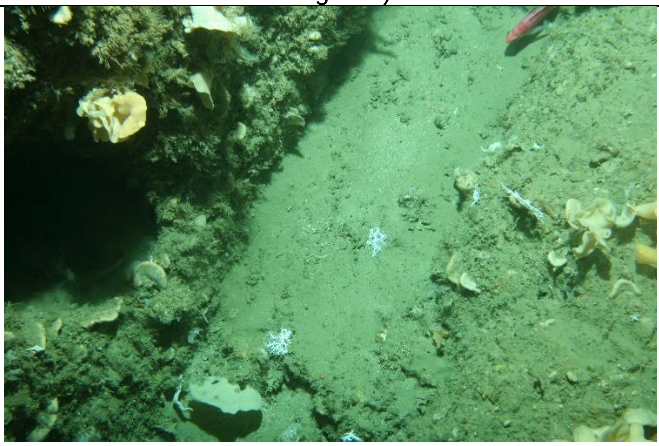
68. The species from the orders Antipatharia (black corals), Alcyonacea (gorgonians), Scleractinia (stony corals), and Family Stylasteridae in Order Anthoathecata (hydrocorals) are protected corals listed in Schedule 7A of the Wildlife Act 1953.

Figure 4. Coral aggregations in association with sponges in the offshore areas.

DOC Survey 2021. Corals and sponges aggregation on rocky reef. ~~Sub-~~Area A Mimiwahngata Rahui (Te Mana o Tangaroa)



DOC Survey 2021. Corals sponges aggregation and anemone on rocky reef. Boundery ~~Sub-~~Area A Mimiwahngata Rahui and Buffer (Te Mana o Tangaroa)



Ocean Survey 20/20. Coral (Stylasteridae) and sponge aggregations in rocky reef. Offshore areas, ~~Sub-~~Area C ~~B~~ (Te Mana o Tangaroa)

Ocean Survey 20/20. Coral (*Oculina virgosa,* black corals) and sponge aggregations in rocky reef. Offshore areas, ~~Sub-~~Area C (Te Ha o Tangaroa)

<u>Bryozoan beds (thickets)</u>

69. Around 1,000 species of bryozoans occur around New Zealand, some of them endemic, and a greater richness than any other country, with about 27 species growing to frame-building size, (i.e. they grow vertically enough to create a structure for other species of macrofauna) (Wood et al. 2012, Gordon et *al.* 2009). Bryozoans have been described in all of the proposed areas, but in most cases not to species level and, therefore, it is not always possible determine their threat classification level.

70. The endemic and calcareous Celleporaria aglutinans is one of the two largest habitat-forming bryozoan species in NZ, reaching up to 30cm.~~ This species occurs on rocky and shell gravel surfaces in the inner Bay of Islands (Sub-Area C)~~. The habitat forming *Smittoidea maunganuiensis* has been found in

the proposed Buffer area of the Mimiwhangata Rahui area. Both species are nationally distributed and provide substrata for epifauna and a nursery environment for various coastal fish species (Smith et *al.* 2011).

71. Neither of these bryozoan species are considered rare, but as a biogenic habitat I believe they are threatened due to the ongoing impacts of sedimentation and bottom contact activities in coastal waters, notably trawling and dredging. Anderson et *al*. (2019) records bryozoan thickets nationally to have decreased in coverage, to be in moderate to poor condition, and their future trajectory as declining (see Appendix 3 – Table 3-15).

Vulnerability and threats

72. Vulnerability is related to the likelihood that a population, community, or habitat will experience substantial alteration from short-term or chronic disturbance, and the likelihood that it would recover and in what time frame. These are, in turn, related to the characteristics of the ecosystems themselves, especially biological and structural aspects (FAO, 2009)[10].

73. MacDiarmid et *al.* (2012) assessed anthropogenic threats to New Zealand marine habitats. Ocean acidification (from increased CO_2 in the atmosphere) and increased sea temperature (due to climate change) were overall the most significant threats to marine habitats in New Zealand. Bottom trawling and sedimentation (from changing land-use) were the third-equal highest ranked threats overall. Shellfish dredging was ranked 7th overall (but second when assessing marine activities only). Other lesser-ranked threats included by MacDiarmid et *al.* (2012) are coastal engineering works, harbour dredging, dumping of spoil, vessel moorings and anchoring. Tuck et al. (2017) concluded shellfish dredges tend to cause greater direct damage than trawls (if assessed at the same spatial scale), with other fishing gear having less, but still detectable impacts.

74. I agree with the overall conclusions of MacDiarmid et al (2012) and Tuck et al. (2017) and consider they generally also apply at the scale of Northland.

[10] Vulnerable populations, communities, or habitats may be physically or functionally fragile. The most populations, communities, or habitats are those that are both easily disturbed and very slow to recover, or may never recover. The vulnerability of populations, communities and habitats must be assessed relative to specific threats. Some features, particularly those that are physically fragile or inherently rare, may be vulnerable to most forms of disturbance, but the vulnerability of some populations, communities and habitats may vary greatly depending on the kind of disturbance experienced. The risks to a population, community, or habitat is determined by its vulnerability, the probability of a threat occurring and the mitigation means applied to the threat.

However, due to the intensive boating and recreational fishing activities in the Bay of Islands, I believe fishing pressures more generally, as well as anchoring, will also be significant at a sub-regional scale and locally around the Bay of Islands.

75. Some of the benthic habitats such as seagrass meadows, kelp forest, corals, bryozoan, mussel and rhodolith beds are known to be particularly sensitive to the incremental effects of land-based pollution and especially excessive sedimentation. Swales et al. (2012) reported that coastal sedimentation rates were estimated to have increased in the Bay of Islands region by an order of magnitude following catchment deforestation. Bell et al. (2015), in their review on the effects of sedimentation, identified “critical gaps in our understanding of the physiological responses of sponges to sediment” questioning studies that infer sponges can tolerate higher sedimentation levels.

76. Photosynthetic species are particularly vulnerable to sedimentation because they are frequently distributed in shallower water near the coast and high turbidity can hinder their capacity for photosynthesis. In my view, the seagrass meadows and rhodolith beds on the mainland coast in Te Rawhiti Inlet are likely to be affected by this issue, and for this reason are less healthy than the ones distributed around the islands.

77. Impacts of sedimentation on the brown algae *Carpophyllum flexuosum* and the kelp *Ecklonia radiata* have been studied in the north-eastern North Island (e.g., Ainley 2013, Hughes 2011). D’Archino et *al.* 2019 found that prolonged exposure to accumulated sediments resulted in thalli (plural of thallus, plant body of the algae) decaying, especially under low light conditions.

78. Kelp forest and other algae species are also affected by the over-expansion of sea-urchin/kina barrens. The absence of *Ecklonia radiata* from some locations is probably the result of a combination of factors including water temperature, high wave action, turbidity and urchin grazing (Shears&Babcock, 2007). This is a known issue in north-eastern New Zealand, where high numbers of sea urchins can lead to the complete removal of macro-algal cover. National and international studies have analysed the cause for sea-urchin/kina barriers as a result of the decrease of abundance of key predators such as snapper, blue cod and rock lobster (Filbee-Dexter et *al.* 2014; Shears&Babcock 2002). Other studies suggest the increase in sea surface temperature can benefit the expansion of sea-urchin/kina barrens, and decline

of macroalgae beds (Hernanadez et *at.* 2010); and the effects of toxic cascades on the expansion of these habitats (Shears&Ross 2010)

79. International studies show that rhodoliths are slow growing (0.05-2 mm/yr) and are at risk from a range of human activities including physical disturbance (Hall-Spencer and Moore 2000), reduction in water quality (e.g. Wilson et al. 2004, Riul et al. 2008), alterations to water movement and aquaculture installations (Hall-Spencer et al. 2003, 2006). Rhodoliths (as well as other calcareous species such as stony corals, shellfishes and some bryozoans) will also be impacted by acidification of the oceans resulting from changes in the global climate and carbon cycles (MacDiarmid et *al.* 2013).

80. Physical disturbance of the seabed, including from trawling, dredging and anchoring, has the potential to affect benthic habitats and species distributed in the proposed areas. Species such as sponges, rhodoliths, corals, bryozoans, large shellfish and vermetids form biogenic structures vulnerable to physical impacts. Some of them are slow growing, can easily be damaged by short term, one-off events and have long recovery times (MacDiarmid et *al.* 2012; Morrison et *al.* 2014a). I concur with Dr Stirnemann EIC regarding her description of deep sea corals[11].

81. I am aware that commercial bottom trawling and dredging are not permitted in the inner Bay of Islands, but recreational dredging occurs. Recreational fishing occurs around much of the region (see Figure 6 of EIC Mr Hore on the impact of the proposals), and recreational dredging and anchoring is potentially impacting horse mussel beds and other shellfish beds, and other habitats such as seagrass meadows and rhodoliths in some cases associated to them. Fishing is possibly having some of the greatest past/present impacts on sponge assemblages, along with land-based sedimentation in coastal regions of New Zealand (Morrison et al. 2009).

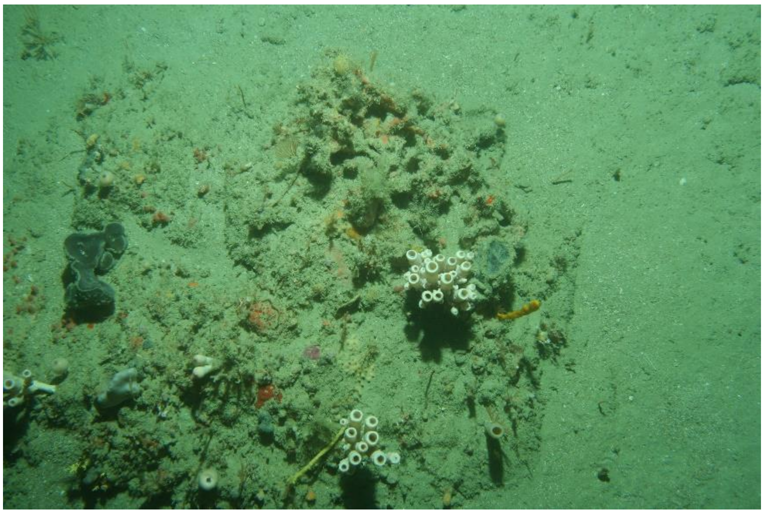
82. Scallops are common in the Bay of Islands including within this proposed area, but numbers have declined from historical times (Taylor & Morrison 2008). I understand that several temporary closures are in place or proposed in the North-eastern Bioregion as a response to the decline of this species.

83. In conclusion, I believe physical disturbance is a threat to biogenic habitats in the proposed areas for protection. Bottom contact towed fishing methods

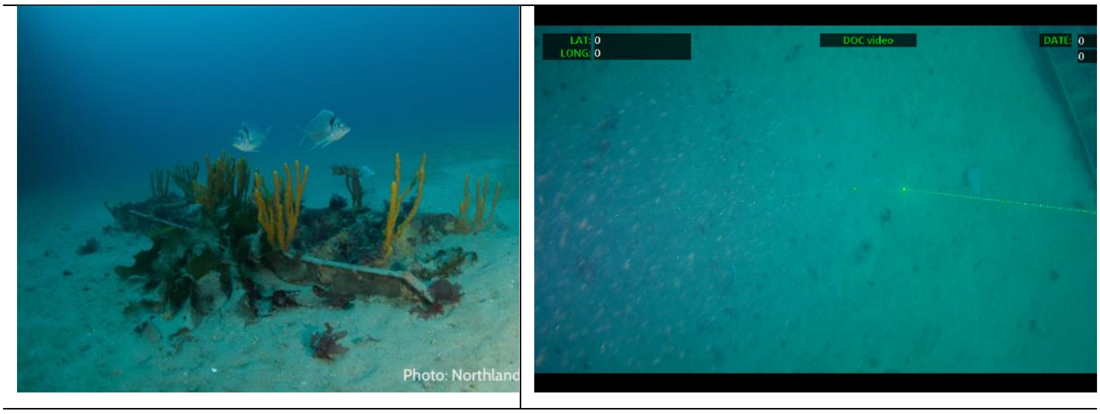
[11] Dr Stirnemann EIC from paragraphs 57 to 59

(trawling, danish seining or dredging; commercial and/or recreational) can potentially impact seagrass meadows, rhodoliths, sponges, bryozoan, corals, beds of large shellfish, and algae beds within any of the proposed areas (see Appendix 2 of EIC Mr Hore on the impact of the proposals). Anchoring will also be causing some of the impacts on seagrass meadows, rhodoliths and shellfish beds in the inner Bay of Islands.

Figure 5. Examples of degradation in biogenic habitat (~~Sub-~~Area A and C Te Ha o Tangaroa)



Ocean Survey 20/20. Example of deep rocky reef with benthic community affected by sedimentation issues.



Ladder in Maunganui Bay with epifauna (Northland Dive, left) and without visible epifauna (DOC Survey 2021, right)

NEW ZEALAND COASTAL POLICY STATEMENT (NZCPS)

84. My understanding of the key terms and concepts used in NZCPS Policy 11 are explained below:

a. Taxa: Named biological classification units assigned to individuals or sets of species (eg species, subspecies, genus, order, variety) (NZCPS 2010).

b. Communities: associations of two or more different species occupying the same geographical location at the same time. (MFish/DOC 2005, DOC/MFish 2011).

c. Habitat: the place or type of area in which an organism naturally occurs / The area or environment where an organism or ecological community normally lives or occurs (MFish/DOC 2005, DOC/MFish 2011).

d. Ecosystem: an interacting system of living and non-living parts such as sunlight, air, water, minerals and nutrients. Ecosystems can be small and short-lived, such as waterfilled tree holes or rotting logs on a forest floor, or large and long-lived, such as forests or lakes. (MFish/DOC 2005).

e. Biogenic habitat: means the natural habitat created by the physical structure of living or dead organisms or by the interaction of those organisms with the substrate, including either a hard (reef) or soft (sediment) substrate.[12]

f. ‘Threatened’ in the context of NZCPS Policy 11(a)(iii) is not defined. I understand it is distinct from the use of ‘threatened’ in NZCPS Policy 11(a)(i) and (ii) (which refers to taxa that are listed as threatened). A species or ecosystem might be threatened by an activity but not necessarily be ’threatened’, in the sense it is declining in numbers, area, or functionality.

g. Naturally rare. Originally rare: Rare before the arrival of humans in New Zealand (NZCPS 2010). I note the current distribution and conservation status of many marine species is not fully understood, and therefore there is only capacity to approximate their situation before the arrival of humans in New Zealand.

85. Under ‘Vulnerability and Threats’ above, I have described how some biogenic habitats and, in particular, some of the indigenous species that form them are

[12] Adapted from the Resource Management (National Environmental Standards for Marine Aquaculture) Regulations 2020.

sensitive to and threatened by certain pressures and activities in the marine environment.

86. In the next section of my evidence, I describe the different taxa, communities, habitats and ecosystems distributed in the areas proposed for protection, and their relevance in terms of as least NZCPS Policies 11 (a) (i)(iii)(iv) and (v) and 11 (b) (i)(ii) (iii) and (iv). I conclude that all the biogenic habitats in the various proposals described earlier in my evidence (i.e. rhodolith beds, bryozoan beds, sponge and coral aggregations, seagrass meadows and kelp forests) would be relevant for NZCPS Policy 11.

87. The rest of the sub-policies in NZCPS Policy 11 require further assessment or are less relevant in this case. For example, Policies 11 (b) (v) and (vii) relate to areas and routes important to migratory species, and to ecological corridors, which are probably less applicable for biogenic habitats in small areas like the ones proposed.

88. NZCPS Policy 11 (a)(i) refers to taxa which are Threatened or At Risk (in the NZTCS). The list of marine species assessed under NZTCS is not exhaustive and, in my opinion, some threatened species might not be included. Paragraphs 45, 53 and 112 note the presence of At Risk species which can form biogenic habitats, i.e. seagrass and algae beds. It is also likely that other biogenic habitats contain At Risk or Threatened species, but not all species have been identified.

89. While not specifically referred to in NZCPS Policy 11, I note all species from the orders Antipathies and Scleractinia (e.g. corals and gorgonians) are protected under the Wildlife Act 1953. Several species from these orders have been found in Sub-Area C of the Te Ha o Tangaroa proposal; and in Sub-Area B of the Te Au O Morunga of Te Mana o Tangaroa proposal.

ECOLOGICAL VALUES – Te Ha o Tangaroa Protected Areas

90. In this section, I describe the habitat composition of each of the sub-areas within the Te Ha o Tangaroa proposal, with particular emphasis on those biogenic habitats distributed in this area and their significance regionally and nationally.

91. In the inner Bay of Islands, benthic habitats are distributed on both softer-muddy substrata, predominantly in the central region of the bay, and hard substrata, including biogenic and rocky reef, closer to the coast and between the islands. The benthic habitats in this proposal are diverse, including rhodolith beds, seagrass meadows and cumulations of bivalves and gastropod shells, as shellfish beds.

92. The Ocean Survey 20/20 visual survey identified sponges (predominately Demospongiae and Hexactinelidae) and Anthozoans (gorgonian octocorals, soft corals) associated with hard substrata, as the most abundant sessile benthic invertebrates, especially in the proposed ~~Sub-~~Area C and ~~Sub-~~Area A. Sea urchin and starfish represent the most common mobile invertebrates in the inner bay (Bowden et al. 2010). The DOC Survey 2021 confirmed the distribution of some of these species and habitats, and especially the diversity of sponges.

93. I assessed the estimated seabed and habitat composition in each of the proposed sub-areas using the habitat classification from the *Marine Habitat Map of Northland: Mangawhai to Ahipara* developed by the Department of Conservation from a range of datasets (Kerr/DOC 2010, Table 2). I used this habitat classification instead of the DOC/MFish (2011) *Coastal Marine Habitats and Marine Protected Areas* classification because I consider it provides a more suitable description of benthic habitats at a regional and local scale.

94. Table 2 provides a summary of the habitats in the Te Ha o Tangaroa proposals in terms of their spatial extent (hectares) and proportion (%) of each habitat type in the NE Sub-Bioregion. The first row in table 2 represents the full extent of each area; for example, all Te Ha o Tangaroa proposals together represent 4.14% of the NE Sub-Bioregion (see Appendix 4).

Table 2. Estimated total spatial area and seabed composition (hectares/percentage) of the Te Ha o Tangaroa proposals including: (a) area (ha) of habitat contained within each proposal; and (b) proportion of each habitat type (from the NE Sub-Bioregion).

	Maunganui – Oke Bay Rahui Tapu. Area A ~~**Oke Bay Rahui Tapu. Sub-Area A**~~	~~**Buffer sub-Area A**~~	**Ipirpiri –** moana mara tipu rohe. Area B ~~**benthic protection area. Sub-Area B**~~	Rakaumangamanga moana mara tipu rohe. Area C ~~**Ipipiri Rakaumangamanga Protection Area. Sub-Area C**~~	**Total area and % of area or habitat type in the NE Sub-Bioregion***
Estimated total spatial area	616.5 / 0.04%	~~432 / 0.03%~~	5,763.8 / 0.42%	~~49,366.16 / 3.65%~~ 28,822.71 / 2.13%	~~56,178.46 / 4.14%~~ 35,203.01 / 2.60%
Rocky reef (deep)	18.9 / 3.06%	~~34 / 7.87%~~	1.1 / 0.02%	~~14,194.6 / 28.75%~~ 11,367.37 / 39.43%	~~14,248.6 / 8.8%~~ 11,387.37 / 7.05%
Rocky reef (shallow / intertidal)	132.2 / 21.44%	~~42.1 / 9.74%~~	928.3 / 16.11%	~~2,594.2 / 5.25%~~ 1,182.22 / 4.10%	~~3,696.8 / 10.8%~~ 2,242.72 / 6.11%
Sand	0.6 / 0.09%	-	34 / 0.59%	~~20.9 / 0.04%~~ 7.45 / 0.02%	~~55.5 / 0.67%~~ 42.5 / 0.51%
Coarse sediment	195.9 / 31.78%	~~83.6 / 19.35%~~	2,636.2 / 45.74%	~~3,875.5 / 7.85%~~ 1,508.81 / 5.23%	~~6,791.2 / 10.95%~~ 4,340.91 / 6.999%
Fine sediment	272.4 / 44.18%	~~272.2 / 63%~~	1,829.3 / 31.74%	~~27,141.2 / 48.90%~~ 14,381.05 / 48.89%	~~29,515.1 / 7.49%~~ 16,482.75 / 4.18%
Other soft sediments	-	-	-	94.7** / 0.19%	94.7 / 0.01%
Gravel	-	-	2.64 / 0.04%	~~17.7 / 0.03%~~	~~20.34 / 8.49%~~ 2.64 / 1.10%
Mud	-	-	199.7 / 3.46%	~~1,427.3 / 2.89%~~	~~1,627 / 18.27%~~ 199.7 / 2.24%
Rhodolith	-	-	51.2 / 0.88%	-	51.2 / 100%
Seagrass	-	-	28.5 / 0.49%[(a)]	-	28.5 / 0.54%

*see Appendix 1 for details of these data and map.
**the new estimation results in 108.8 hectares, but there's not been change in the extent of this habitat
(a) Booth (2019) describe the extent of seagrass in this area with higher accuracy

Maunganui - Oke Bay Rahui Tapu. Area A ~~Bay – Sub-Area A + 1km buffer~~

95. The EIC of Dr Shears describes the latest assessment of the temporary closure under section 186A of the Fisheries Act in Maunganui Bay.[13] I agree with his conclusion that the small size of this area is likely to be the reason for a lack of fully recovered species in the area[14].

[13] Dr Shears EIC at paragraph 19.
[14] Dr Shears EIC at paragraph 52.

96. Bowden et *al*. 2010 describe the highest diversity in Whakapae Bay and north of Deep Cove, both areas included in the proposed *Area A*, and Howe Point on the eastern part of the bay. The species diversity index from visual analysis the inner Bay of Islands is generally higher in the central part of the inner bay, concurrent rocky and heterogeneous substrata, particularly in the seaward part of the bay. The ~~Sub-~~Area A ~~and Buffer~~ hold significant examples of indigenous biodiversity. The DOC Survey 2021 documented association of rock lobsters with sponges and other sessile epifauna in Deep Cove bay.

97. Samples from the Ocean Survey 20/20 identified the At Risk, Naturally Uncommon ~~Declining~~ macroalgae *Aeodes nitidissima* in this ~~Sub-~~Area. The expansion of sea-urchin/kina barrens in this area is a known issue in this Sub-Area affecting the distribution of *Ecklonia radiata* kelp forest. The relationship between the decline in natural predators and the increase in sea-urchin/kina barrens is described by several researchers (Shears&Babcock 2002 and 2007; Filbee-Dexter at *al*. 2014).

98. The EIC of Dr Froude[15] and the EIC of Dr Shears[16] analyse the sea-urchin/kina barrens status in the areas, causes, and potential solutions for recovery of the kelp forests; I concur with the statements in their respective paragraphs. Kerr (2016) estimated that 5% of Maunganui Bay's shallow reef is kina barrens and Froude (2016) reported kina barrens covering up to half of the shallow reef in the southern bays of ~~Sub-~~Area A. The Ocean Survey 20/20 survey data and scientific publications I have reviewed confirm the presence of sea-urchin/kina barrens at different locations of the ~~Sub-~~Area A and Buffer as Froude 2016 suggests.

99. ~~Both Sub-~~Area A ~~and Buffer have similar~~ has ecological values, with examples of sponges and corals from the classes Demospongiae and Anthozoa. There is an historic record of protected coral species (Scleractinia) at the southern section of this area. Horse mussel beds have been documented in ~~Sub-~~Area A – smaller and less dense than in ~~Sub-~~Area B, but in my view, they still represent good examples of indigenous biodiversity and are relevant for NZCPS Policy 11.

<u>NZCPS Policy 11</u>

[15] Dr Froude in her paragraph 73 and subsequent paragraphs.
[16] Dr Shears evidence in his paragraph 32.

100. The presence of the At Risk, Naturally Uncommon ~~Declining~~ algae *Aeodes nitidissima* in this ~~Sub-~~Area A (see paragraph 53) is relevant to NZCPS Policy 11 (a)(i).

101. ~~Sub-~~Area A ~~and Buffer~~ also contains significant examples of indigenous biodiversity such as rock lobsters associated with sponge aggregations, and examples of Anthozoan corals such as gorgonians. In my view, this community composition in a confined geographical location is nationally unusual and would meet NZCPS Policy 11(a)(v).

Ipiriri moana mara tipu rohe. Area B ~~– benthic protection area. Sub-Area B~~

102. The seaward boundaries of ~~Sub-~~Area B approximately follow the 30 metre depth contour. The light penetration and shallow depth are good conditions for two biogenic habitats – rhodolith beds and seagrass meadows. ~~Sub-~~Area B is dominated by sedimentary substrata and shallow rocky reef adjacent to the coastline. These characteristics allow the development of different habitats, but the shallow waters also make the area accessible and the habitats more vulnerable to human impacts and environmental changes such as sedimentation, recreational fishing and anchoring.

103. Matheson et *al.* (2010) published that in the eastern Bay of Islands, near Rawhiti (Kaimarama Bay, Hauai Bay and Kaingahoa Bay), seagrass distribution decreased from 32 ha in 1961 to less than 1 ha in 2005-2006. Around the islands, Otiao and Urupukapuka, the seagrass meadows have been stable at around 17 ha from 1961 to recent years. Booth (2019) describes 20 seagrass meadows within ~~Sub-~~Area B (and partially A), and discuss the fluctuation of the distribution of seagrass in the area. In his paper, Booth suggests some recovery in some subtidal meadows as a response to historic improvements in the water quality.

104. As noted in paragraph 51, the DOC Survey 2021 documented very good examples of rhodolith beds around the islands within the ~~Sub-~~Area B, some of them in an unusual association with seagrass. These rhodolith beds at Kahuwera Bay and Te Miko Reef were also studied with greater detail in the past, as Dr Morrison details in his EIC[17].

105. Bowden et *at.* 2010 describe the highest density of horse mussels (*Atrina zealandica*), in Te Rawiti inlet within ~~Sub-~~Area B, in associations with shell

[17] EIC Dr Morrison in paragraph 17

hash and rhodolith beds. The DOC Survey 2021 recorded the presence of a horse mussel beds in Te Rawhiti Inlet, but in isolation and low density. DOC Survey 2021 targeted the sample stations previously studied by Ocean Survey 20/20 but the previously extraordinary high density of horse mussel beds was not found.

106. It appears to have been a significant reduction of horse mussel beds in this area over the last 10 years. In my opinion, sedimentation and potentially harvesting might have contributed to the observed decline. However, horse mussel beds are also known to be naturally variable with quite large fluctuations in density, extent, and population structure due to sporadic recruitment and natural die offs (Fletcher 2015). Therefore, while anthropogenic causes (e.g. from sedimentation or harvesting) are possible, the observed decline may also, wholly or in part, be due to natural causes.

NZCPS Policy 11

107. In the paragraph 45 of this evidence I note the presence of the species *Zostera muelleri*, classified as At-Risk Declining in the NZTCS, forming seagrass (eelgrass) meadows. I also note in paragraph 51 and 104 the unusual association of seagrass and rhodoliths, and note their threatened state due to impacts from sedimentation and bottom contact activities. All the species of rhodoliths found in the area are listed in the NZTCS as ‘Data Deficient’, mainly because they are poorly understood, and their conservation status is unable to be determined. Nelson et al. (2019) states that the Data Deficient list may include some of the most threatened species in New Zealand.

108. Hewitt et *al.* 2010 and the EIC of Dr Morrison[18] note the unusually common abundance of macroalgal meadows in ~~Sub-~~Area B of Te Ha o Tangaroa proposal compared to other areas regionally and nationally. This area also historically contained high density horse mussel beds (noting the conclusions reached after the DOC Survey 2021) and supports a significant number of intertidal and subtidal seagrass meadows distributed among the islands and adjacent to the coast.

109. Based on this evidence, in my opinion the described ecological values of this area meet NZCPS Policy 11 (a) (iii) and (v). Additionally, the presence of rocky

[18] EIC Dr Morrison paragraph 16

reef and biogenic habitats mean this area is relevant for NZCPS Policy 11(b) (i) (ii), (iii) and (iv).

Rakaumangamanga moana mara tipu rohe. Area C ~~Ipipiri Rakaumangamanga. Sub-Area C~~

110. ~~Sub-~~Area C is the largest area of the Te Ha O Tangaroa proposal and covers ~~3.65%~~ 2.13% of the NE Sub-Bioregion.

111. Kerr (2016) developed a more detailed habitat description and map of the inner face of Cape Brett, covering part for the ~~Sub-~~Area A and C. Kelp forest and algae meadows were described as well as habitat-forming sponges, gorgonians and bryozoans.

112. Cape Brett is a hotspot of marine biodiversity; the Ocean Survey 20/20 deep towed imaging system (DTIS) and other visual surveys described some of the highest biodiversity index in the NE Bioregion in some of the sample stations surveyed. This high diversity was also described by Brook (2002) with Cape Brett having the second highest reef fish diversity among three biogeographic groups (western North Island coast; north-eastern North Islands coast and offshore islands; and Three Kings Islands)[19]. Colonies of the At Risk, Naturally Uncommon (NZTCS) coral *Oculina virgosa* were found by Ocean Survey 20/20, north to Cape Brett within this ~~Sub-~~Area.

113. The DOC Survey 2021 sampled some areas around Cape Brett and confirmed the exceptional diversity of invertebrate benthic species such as hard and soft corals, habitat-forming sponges and crinoids.

114. Trawls, towed camera and baited video sampling undertaken as part of Ocean Survey 20/20 suggested that snapper (mostly juvenile), leatherjacket, red mullet, yellow eyed mullet and jack mackerel were the most abundant fishes in the inner Bay of Islands. The presence of these species was differently distributed in the area; for example, snapper were associated with muddy areas with horse mussel beds. Jones et *al*. (2010) identifies an increase of fish abundance across a gradient from the inner to the outer Bay of Islands, probably associated with water clarity, exposure and food availability. ~~Sub-~~Area C contains ~~intertidal and~~ shallow ~~inlet~~ environments to deep rocky reef;

[19] Brook, F J 2002. Biogeography of near-shore reef fishes in northern New Zealand*. Journal of Royal Society* 32: 243-274

both fine sediment and deep rocky reef are the best represented substrata in this area (see Table 3).

~~115.Intertidal soft sediments in Te Puna inlet are characterised by high density pipi (*Paphies australis*) beds. Pipi and cockles (*Austrovenus stutchburyi*) are less abundant in Kerikeri and Waikare Inlets (Hewitt et *al.* 2010). The intertidal area in Veronica channel supports high density patches of small tubes worms, gastropods (*Cominella glandiformis* and *Diloma subrostrata*), and very dense patches of cockles, wedge shells and pipi (Hewitt et *al.* 2010).~~

116.The additional ecological values of ~~the outer part of~~ the ~~Sub-~~Area C are described below in combination with the Te Au o Morunga proposal by Te Uri Hikihiki as both proposals partially overlap.

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117.The ~~outer part of~~ ~~Sub-~~Area C contains extensive offshore rocky reef with protected hard coral species (Scleractinia), black corals (Antipatharia) and gorgonian corals (Alcyonacea) and some rocky areas in the inner bay. Paragraph 92 describes the presence and relevance of sponges in this area, and the Ocean Survey 20/20 survey noted that Cape Brett has the highest biodiversity index from their study area after North Cape (see paragraphs 60-62, and 112 of this evidence).

118.In my opinion, the combination of these species in this area represents nationally significant examples of these indigenous community types which in the offshore areas are threatened by bottom contact fishing gears. Accordingly, I consider the area is relevant for NZCPS Policies 11 (a) (iii) and (v). Additionally, the presence of rocky reef and biogenic habitats mean this area is relevant for NZCPS Policy 11(b) (i) (ii), (iii) and (iv). The presence of colonies of the coral *Oculina virgosa* make the area relevant for NZCPS Policy 11(a)(i).

ECOLOGICAL VALUES – Te Mana o Tangaroa Protected Areas

119.In this section I describe the ecological values of the sub-areas proposed for protection as part of the Te Mana o Tangaroa proposal. This section like the previous one includes information from the biogenic habitats section above (see Paragraphs 37-83) and the material reviewed for this evidence.

120. The three sub-areas (Mimiwhangata Rahui Sub-Area; Buffer Sub-Areas; and Te Au O Morunga Sub-Area) in this proposal represent 5.32% of the NE Sub-Bioregion (Table 3). Most of these sub-areas, in particular Te Au o Morunga, are exposed to the open sea and include areas deeper than 50m, reaching over 150m (in Te Au o Morunga).

121. The Ocean Survey 20/20 fish study was undertaken using trawl, towed video, baited cameras and diver transects. In the adjacent areas of Bay of Islands up to Mimiwhangata, trawl samples showed that fish communities were generally similar to those described in previous trawl surveys: snapper, leatherjacket, gurnard and jack mackerel, with cucumber fish and scaly gurnard are more abundant in deeper waters (Jones et *al*. 2010).

122. The DTIS survey around the outer Bay of Islands described the area as highly diverse, with respect to both physical substrates and seabed fauna (Bowden et *al*. 2010). Rocky substrates extend to the mesophotic zone and support abundant populations of sponges, corals and hydroids, as well as mobile fauna. The diversity indices for the DTIS sampling stations in the outer Bay of Islands were among the highest recorded in the Ocean Survey 20/20 and were similar to those for North Cape samples (Bowden et *al*. 2010). The very high species diversity along some locations in the ~~outer Sub-~~Area C and Te Au o Morunga proposals was confirmed during the DOC Survey 2021 dropdown camera sampling.

Table 3. Estimated total spatial area and seabed composition (hectares/percentage) of the Te Mana o Tangaroa proposals including: (a) area (ha) of habitat contained within each proposal; and (b) proportion of each habitat type (from the NE Sub-Bioregion)

	Mimiwhangata Rahui Tapu. Area A	Mimiwhangata Rahui Tapu West/East Buffer	Au O Morunga. Area C ~~(offshore reef)~~	Total area and % of area or habitat type in the NE Sub-Bioregion*
Estimated total spatial area	4,609.08 / 0.34%	984.55 / 0.07%	66,438.48 / 4.91%	72,032.11 / 5.32%
Rocky reef (deep)	1,932.04 / 41.92%	192.86 / 19.58%	25,773.53 / 38.79%	27,898.43/ 17.23%
Rocky reef (shallow/intertidal)	906.21 / 19.66%	296.59 / 30.12%	2,200.18 / 3.31%	3,402.98 / 9.27%
Sand	21.56 / 0.46%	4.78 / 0.48%	12.14 / 0.02%	38.48 / 0.46%
Coarse sediment	362.86 / 7.87%	26.93 / 2.73%	1,265.01 / 1.90%	1,654.8 / 2.66%
Fine sediment	1,383.28 / 30.01%	462.84 / 47.01%	35,314.09 / 53.15%	37,160.21 / 0.094%

Other soft sediments	-	-	1,873.52 / 2.82%	1,873.52 / 0.29%
Gravel	3.13 / 0.07%	0.54 / 0.05%	-	3.67 / 1.52%

*see Appendix 1 for details of these data and map.

Mimiwhangata Rahui Tapu Sub-Area and East and West Buffer areas.

123.The Mimiwhangata Rahui Tapu ~~Sub-~~Area proposal represents 0.34% of the NE Sub-Bioregion; the associated Buffer adds a further 0.07%. The EIC of Mr Kerr[20] and EIC of Dr Shears[21] describes the coastal environment of these areas, and the DOC Survey 2021 confirmed the abundance of typical kelp forest and encrusting sponges with benthic fauna from shallow rocky reef.

124.The EIC of Dr Shears[22] describes the increase of kina barrens area in Mimiwhangata, based on a study undertaken by Kerr and Grace in 2005. Babcock et al (1999) and Shears & Babcock (2002) associated this increase in kina barrens with the drop in the populations of snapper and rock lobster, natural predators of this species. I concur with these conclusions.

125.A historical record (MBIS Bryozoan[23]) of the habitat forming bryozoan species *Smittoidea maunganuiensis* is noted in the proposed Buffer Area, but was not found in the DOC Survey 2021. The Wood et al (2013) habitat suitability model for this species showed likely distribution of bryozoan habitats in the Mimiwhangata and Cape Brett areas, but not hotspots compared to other areas in NZ. The same study analysed the spatial distribution of fishing trawling effort over 15 years (1989–90 to 2004–05) and showed how this activity was, in some cases, concentrated on identified bryozoan habitat hotspots.

126.Wood et al (2013) concludes there is a likely conflict between the conservation of habitat-forming bryozoans and associated fauna, and the continuation of trawling without suitable spatial management. I concur with the conclusion of this study given the vulnerability of this habitat, and although there is no scientific evidence of significant examples of this habitat in the particular area, habitat-forming species have been found and bryozoan beds are likely to be present.

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[20] EIC Mr Kerr paragraph 24
[21] Dr Shears EIC paragraph 14
[22] Dr Shears EIC paragraph 38
[23] https://obis.org/ MBIS: https://cmr.earthdata.nasa.gov/search/concepts/C1214621978-SCIOPS

127.The DOC Survey 2021 did not document high fish diversity or abundance at Mimiwhangata; fish were particularly lacking in deeper water. The species observed were typical coastal species widespread in the north-eastern North Island coastal biogeographic region. Silver drummer, Sandager's wrasse and half-banded perch were the only subtropical species observed.

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128.The subtidal rocky reefs recorded in this area are covered by kelp forest, partially affected by sea-urchin/kina barrens that are threatening the distribution of kelp forest in the area. This area includes deeper rocky reef area where sponge aggregations and the coral species described in ~~Sub-~~ Areas C of Te Ha and Te Mana Protection Areas proposals ~~Au o Morunga~~ occur.

129.In my opinion, the continuity of this area from shallow to deep rocky reef with the associated ecological values means this area meets NZCPS Policy 11 (a)(iii) and (v), and NZCPS Policy 11(b)(i), (ii), (iii) and (iv).

Te Au o Morunga. Area C~~, offshore reefs~~

130.The substrates between the Bay of Islands and Poor Knights Islands are heterogeneous with muddy sediments interrupted by sand, gravel, cobbles, fields of morning star shell, boulders and bed rock (Bowden et *al.* 2010). The area between the Bay of Islands and Mimiwhangata contains extensive deeper reefs that support diverse encrusting invertebrate assemblages with increasing biodiversity with depth (Bowden et *al*. 2010). Coarser sand and cobbles frequently support dense beds of the morning star shell (*Tawera spissa*), a bivalve shellfish 20 to 25 mm long with density exceeding 5000/m2 in places (Kerr and Grace 2005).

131.~~Sub-~~Area C Te Au O Morunga and ~~Sub-~~Area C of Te Ha o Tangaroa proposal potentially benefit the continuity and connectivity of habitats from shallow to deep water. The Ocean Survey 20/20 study found an increase in diversity with depth from the inner Bay of Islands. Some of the rocky reefs in this ~~Sub-~~Area extend continuously from shore to around 200m depth.

132.DTIS sampling stations within the proposed area show that the area is dominated by sponges (Demospongiae and Hexactinelidae). Hydrozoa and Anthozoa (including anemones, sea-pens and protected gorgonian coral species), and cup corals from order Scleractinia (hard corals) are notable in deeper rocky areas, along with smaller populations of protected black corals (*Antipatharia* spp.) (Kerr and Grace 2005; Bowden et *al*. 2010). The EIC of Dr Stirnemann[24] provide additional details about these species, I concur with this description. The species Antipathies n. sp. (black coral) is classified as At Risk, Naturally Uncommon in the NZTCS. Several black corals have been documented by Ocean Survey 20/20 and DOC Survey 2021 in this area and in ~~Sub-~~Area C of Te Ha o Tangaroa, but in most cases it has not been possible to identify them at species level, and therefore we cannot confirm their status in the NZTCS.

133.The DOC Survey 2021 replicated some of the Ocean Survey 20/20 DTIS sample stations and increased the sampling effort in the offshore proposed aeras. The areas sampled in the ~~Sub-~~Area C of Te Ha and Area C Te Au o Morunga of Te Mana proposals presented similar benthic species distribution, but we noted a richer benthic communities in the northern reef area, the extension from Cape Brett. The diversity of sponges was notable; e.g., species such as *Ecionemia alata, Geodia regina, Stelleta crater, Stelletta conulosa, Stelleta maori* (bowl form), *Polymastia crocea*, and finger sponges in some cases over one metre high.

134.I also noted stony cup corals from the family Caryophylliidae (order Scleractinia) were relatively common in the areas sampled, generally in association with habitat-forming sponges and soft corals from the order Alcyonacea. This community composition was documented in different locations between 60 and 90 metre depth, and I expect these species to be distributed in other locations of the deep reef at similar depth.

135.While the ecological values and protected species described above were significant finds in the offshore rocky reef, during this survey we also observed a relatively low presence of habitat-forming species in some areas compared to others. Bottom fishing activities (e.g. trawling) are a possible explanation for this observation; however, we did not witness any obvious signs of recent trawl damage (see Mr Hore EIC on the impact of the proposals, Appendix 2 and figures 1, 2, 3 and 6).

[24] EIC of Dr Stirnemann paragraphs 48 and 49

136. Jones et *al*. (2010) reported the deeper reef (up to 200m) was dominated by pink maomao, butterfly perch and scorpaenids when using camera surveys. In the deeper soft sediments, silver conger eels and red bandfish were some of the most abundant fish species recorded. In general, reef fish diversity increased with exposure. Baited camera recorded many species of carnivorous fishes such as hapuku and elasmobranchs, which are poorly sampled using other methods. The same study identified crustaceans as dominant benthic mobile species, with a notifiable abundance at station 26 of the Ocean Survey 20/20, located in the southern part of the proposed outer Mimiwhangata Rahui extension.

137. The DOC Survey 2021 found elevated areas (pinnacles) in the offshore rocky reef between Cape Brett and Mimiwhangata to have higher abundance and diversity of fish species compared with neighbouring flatter reef. We found big schools of kingfish, pink maomao, butterfly perch, splendid perch and golden snapper over these pinnacles, making them easier to target and therefore more vulnerable to fishing.

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138. This area partially overlaps with ~~Sub-~~Area C. The DOC Survey 2021 found similar habitats and communities in both areas, as describes in paragraphs 110-118. The southern part of this area shows signs of degradation, potentially related to physical disturbance. This area, like the ~~Sub-~~Area C of Te Ha proposal still contain significant indigenous biodiversity values, in some areas threatened by physical disturbance. In my opinion, this area is relevant for NZCPS Policy 11 (a) (iii) and (v) and NZCPS Policy 11(b) (ii), (iii) and (iv).

POLICIY 11 ASSESSMENT IN RELATION TO BIOGENIC HABITATS AND OTHER SPECIES OBSERVED IN THE PROPOSALS

139. In this section of my evidence, I summarise the information provided above regarding biogenic habitats and the presence of key species and habitats in the proposals against relevant criteria in NZCPS Policy 11 – specifically NZCPS Policies 11 (a) (i)(iii)(iv) and (v) and 11 (b) (i)(ii) (iii) and (iv).

140. All the proposed areas contain one or more types of biogenic habitat. I conclude all the biogenic habitats found in all the various proposals described earlier in my evidence would meet NZCPS Policy 11(b)(iii). Rhodolith beds,

bryozoan beds, sponge gardens, corals, seagrass meadows and kelp forests are only found in the coastal environment and are particularly vulnerable to modification. While among these biogenic habitats only seagrass (eelgrass) is specifically listed as an example in NZCPS Policy 11(b)(iii), this list is inclusive and does not exclude other vulnerable coastal habitats. I note saltmarsh, another biogenic habitat, is explicitly mentioned in NZCPS Policy 11.

141. I summarise the relevant aspects of NZCPS Policy 11 for each area in the tables 4 and 5 below.

Enrique Manuel Pardo Diaz
14 May 2020

Table 4. Summary of the application of NZCPS Policy 11 (a) in each Sub-Area and rationale.

MPA Sub-area proposed	Policy 11(a)(i): New Zealand Threat Classification System lists	Policy 11(a)(iii): threatened in the coastal environment, or are naturally rare	Policy 11(a)(iv): species at the limit of their natural range, or naturally rare	Policy 11(a)(v): areas containing nationally significant examples of indigenous community types
Te Ha o Tangaroa: Sub-Area A and buffer	*Aeodes nitidissima* – NZTCS: At Risk, Naturally Uncommon Declining	Biogenic habitat threatened: sponge and coral aggregations; kelp forests.	-	-
Te Ha o Tangaroa: Sub-Area B	*Zostera muelleri* – NZTCS: At Risk, Declining	Biogenic habitats: mussel beds and rhodolith beds	Biogenic habitats naturally rare: rhodolith beds	Biogenic habitat: seagrass meadows with rhodolith beds
Te Ha o Tangaroa: Sub-Area C	*Oculina virgosa* – NTZCS: At Risk, Naturally Uncommon	Biogenic habitats threatened: sponge and coral aggregations	Biogenic habitats, coral reef with species at the limit of their range: *Oculina virgosa*	Biogenic habitats: high diversity of sponge and coral aggregations
Te Mana o Tangaroa: Sub-Area A and buffer	*Zostera muelleri* – NZTCS: At Risk, Declining	Biogenic habitat threatened: sponges and coral aggregations; kelp forests.	-	-
Te Mana o Tangaroa: Sub-Area C B	-	Biogenic habitats threatened: sponge and coral aggregations	-	Biogenic habitats: high diversity of sponge and coral aggregations

Table 5. Summary of the application of NZCPS Policy 11 (b) in each Sub-Area and rationale.

MPA Sub-area proposed	Policy 11(b)(i): areas of predominantly indigenous vegetation in the coastal environment	Policy 11(b)(ii): important during the vulnerable life stages of indigenous species	Policy 11(b)(iii): only found in the coastal environment and are particularly vulnerable to modification	Policy 11(b)(iv): important for recreational, commercial, traditional or cultural purposes
Te Ha o Tangaroa: ~~Sub-~~ Area A ~~and buffer~~	Seagrass meadows, kelp (Ecklonia) forest, macroalgae beds and sponge aggregations	Shallow rocky reef and listed biogenic habitats	Shallow rocky reef, seagrass meadows, kelp (Ecklonia) forest, macroalgae beds and sponge aggregations	Rocky reefs and listed biogenic habitats
Te Ha o Tangaroa: ~~Sub-~~ Area B	Shellfish beds, sea grass and rhodoliths beds and listed biogenic habitats	Listed biogenic habitats	Shellfish beds, sea grass and rhodoliths beds and listed biogenic habitats	Listed biogenic habitats
Te Ha o Tangaroa: ~~Sub-~~ Area C	Sponge and coral aggregations, and kelp (Ecklonia) forests	Deep rocky reef and listed biogenic habitats	Deep rocky reefs, sponge and coral aggregations, and kelp (Ecklonia) forests	Deep rocky reefs and listed biogenic habitats
Te Mana o Tangaroa: ~~Sub-~~ Area A and buffer	Seagrass meadows and kelp (Ecklonia) forests	Shallow rocky reefs and listed biogenic habitats	Shallow rocky reefs, seagrass meadows and kelp (Ecklonia) forests	Shallow rocky reefs and listed biogenic habitats
Te Mana o Tangaroa: ~~Sub-~~ Area C ~~B~~	Sponge and coral aggregations, and kelp (Ecklonia) forests	Deep reefs and listed biogenic habitats	Deep reefs, sponge and coral aggregations, and kelp (Ecklonia) forests	Deep rocky reefs and listed biogenic habitats

GLOSSARY

Bathymetric/Bathymetry: the study of underwater depth of ocean floors or lake floors.

Benthic: of, relating to, or occurring at the bottom of a body of water / of, relating to, or occurring in the depths of the ocean.

Biogenic habitat is the natural habitat created by the physical structure of living or dead organisms or by the interaction of those organisms with the substrate, including either a hard (reef) or soft (sediment) substrate. Examples may include bryozoan, horse mussel beds, sponge, corals gardens, algal, seagrass meadows.

East Auckland Current (EAUC): a unique western boundary current (WBC) that originates as the reattachment of subtropical water flow along the continental margin of the New Zealand Northeastern Continental Slope.

Multibeam echosounder: a type of sonar that is used to map the seabed (undertaking multibeam surveys). Like other sonar systems, multibeam systems emit acoustic waves in a fan shape beneath the transceiver of the multibeam echosounder.

NE Sub-Bioregion: the proportion of the NE Bioregion within the Northland territorial sea. North-eastern Coastal Biogeographic Region (NE Bioregion): one of the 14 marine biogeographic regions defined in NZ coasts that extends from Ahipara Bay, around Cape Reinga to East Cape (Gisborne).

Photic dependant: organisms that need to be exposed to natural light to able to develop one or more of their vital functions.

Vermetids (Vermetidae): the worm snails or worm shells, are a taxonomic family of small to medium-sized sea snails, marine gastropod molluscs in the clade Littorinimorpha.

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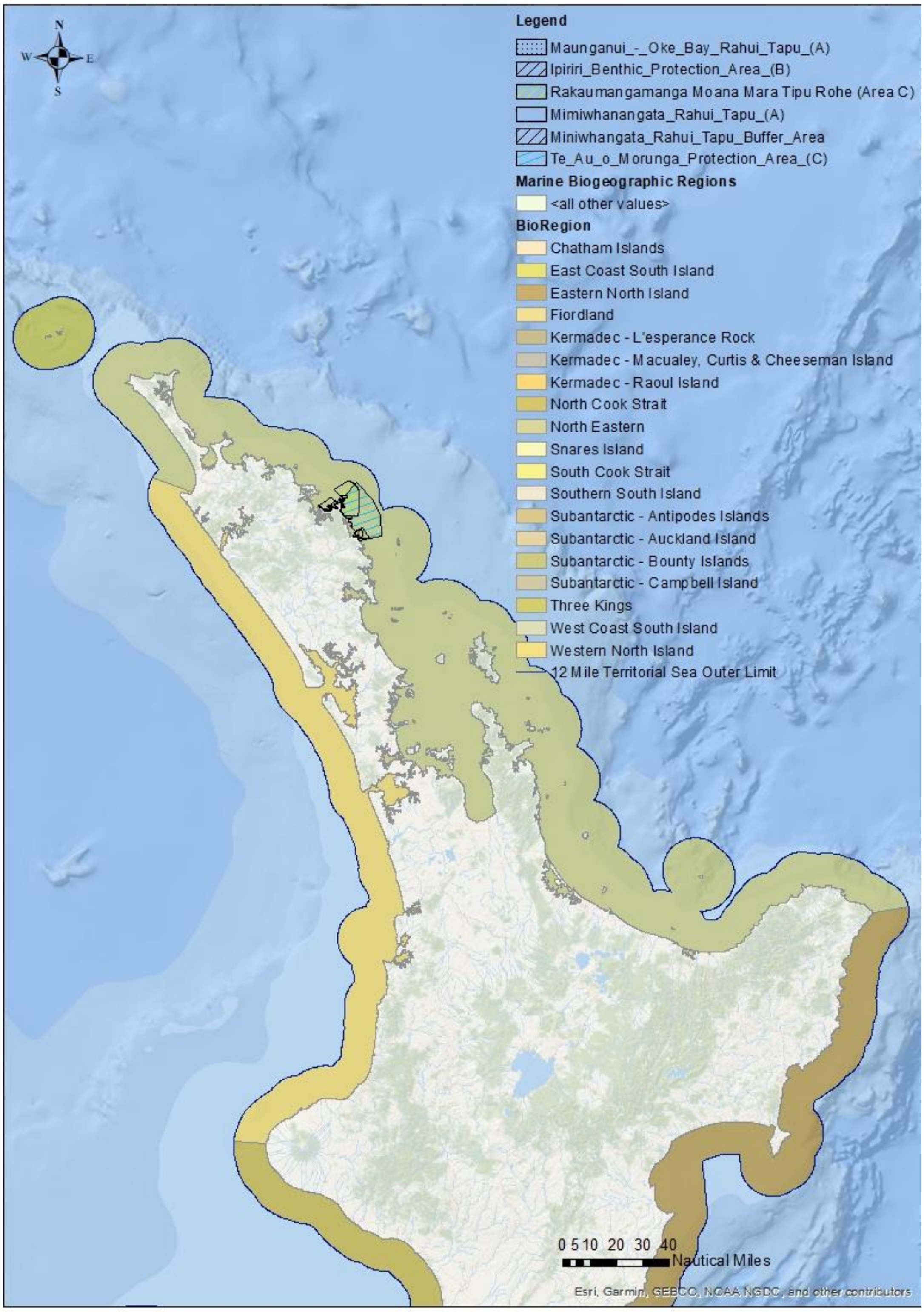
Appendix 1. Estimation of habitats represented in each of the proposal.

The estimation of the habitats represented in each ~~Sub-~~Area from both proposals has been undertaken using the Kerr/DOC 2010 Northland habitat layers. These layers provide suitable detail for habitat mapping at a Northland regional scale.

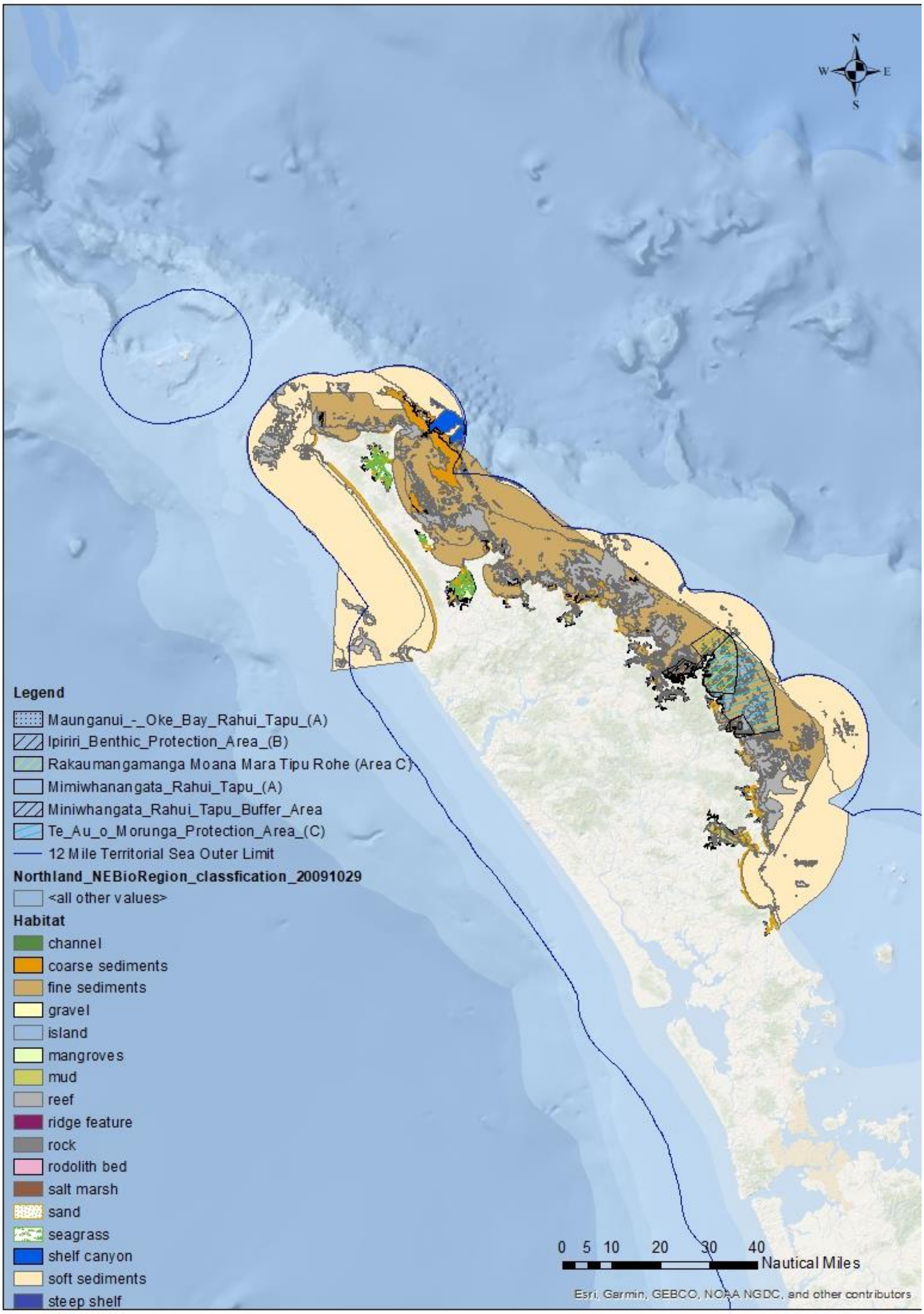
Habitat	Depth	Total (hectares)	Sum area Te Ha O Tangaroa proposals	Sum area Te Mana O Tangaroa proposals
channel	Shallow	7096.48	Excluded from the analysis	
coarse sediments	Deep	46802.24		
	Shallow	10768.13		
	Very Deep	4467.29		
coarse sediments Total		**62037.66**	~~6,791.2 / 10.95%~~ **4,340.91 / 6.99%**	1654.8 / 2.66%
fine sediments	Deep	259882.43		
	Shallow	77423.19		
	Very Deep	56607.37		
fine sediments Total		393912.99	~~29,515.1 / 7.49%~~ 16,482.75 / 4.18%	37160.21 / 0.094%
gravel	intertidal	239.48	~~20.34 / 8.49%~~ 2.64 / 1.10%	3.67 / 1.52%
mangroves	intertidal	9393.34	Excluded from the analysis	
mud	intertidal	8904.44	~~1,627 / 18.27%~~ 199.7 / 2.24%	
reef	Shallow	36,703.34	~~3,696.8 / 10.8%~~ 2,242.72 / 6.11%	27898.43/ 17.23%
	Deep	161,863.97	~~14,248.6 / 8.8%~~ 11,387.37 / 7.07%	3,402.98 / 9.27%
rodolith bed		51.2	51.2 / 100%	
salt marsh	intertidal	749.25	Excluded from the analysis	
sand	intertidal	8265.94	~~55.5 / 0.67%~~ 42.5 / 0.51%	38.48 / 0.46%
seagrass	intertidal	5191.91	28.5 / 0.54%	
shelf canyon	Deep	2.9		
	Very Deep	9758.17		
shelf canyon Total		9761.07	Not present	
soft sediments	Deep	405513.37		
	Shallow	42121.85		
	Very Deep	199537.52		
soft sediments Total		647172.75	94.7 / 0.01%	1873.52 / 0.29%
steep shelf	Very Deep	2476.89	Not present	
Grand Total		1,351,637.3		

Map 1.1 North-eastern (NE) Bioregion and NE Bioregion within Northland Territorial Sea (no changes, bigger map)

a. North-eastern Bioregion



b. NE Sub-Bioregion: North-eastern Bioregion within Northland territorial sea (no changes bigger map)



Appendix 2. Summary of proposed fisheries restrictions in each sub-area. [from Appendix 2 in EIC Ms McKinnon]

Proposed Protection Areas	Summary of proposed fisheries restrictions
Te Hā o Tangaroa Protection Area Rakaumangamanga - Ipipiri	
Sub-Area A – Maunganui Bay-Oke Bay rāhui tapu	No take of fish, aquatic life or seaweed *Except* kina harvest
Sub-Area A buffer – Maunganui Bay-Oke Bay rāhui tapu buffer area (1km)	No take of fish, aquatic life or seaweed *Except* kina harvest, hand fishing with one line/hook per person, hand gathering that does not involve the use of scuba or any implement (i.e. knife, hook or spear)
Sub-Area B – Ipipiri benthic protection area	No bottom trawling, bottom pair trawling, Danish seining, purse seining, drift netting or scallop/other dredging *Except* kina harvest, or longlining with approved seabird mitigation devices
Sub-Area C – Ipipiri-Rakaumangamanga protection area (with overlap with the Sub-Area B – Te Au o Morunga protection area)	<u>*Both sub-areas*</u> No bottom trawling, bottom pair trawling, Danish seining, or purse seining *Except* kina harvest/management, or longlining with approved seabird mitigation devices. <u>*Sub-Area C – Ipipiri-Rakaumangamanga only*</u> No drift netting <u>*Sub-Area B – Te Au o Morunga only*</u> No scallop dredging *Except* longlining with other technology to avoid seabird capture, and on-board monitoring cameras and devices.
Te Mana o Tangaroa Protection Area	
Sub-Area A – Mimiwhangata rāhui tapu	No take of fish, aquatic life or seaweed, including specified shark species *Except* kina management
Sub-Area A buffer - Mimiwhangata rāhui tapu buffer areas	No bottom trawling, bottom pair trawling, Danish seining, or purse seining *Except* kina management, customary marine management as provide in management plans, or longlining with approved seabird mitigation devices, other technology to avoid seabird capture, and on-board monitoring cameras and devices.
Sub-Area B – Te Au o Morunga protection area (with overlap with Sub-Area C – Ipipiri-Rakaumangamanga protection area)	<u>*Both sub-areas*</u> No bottom trawling, bottom pair trawling, Danish seining, or purse seining *Except* kina harvest/management, or longlining with approved seabird mitigation devices. <u>*Sub-Area B – Te Au o Morunga only*</u> No scallop dredging *Except* longlining with other technology to avoid seabird capture, and on-board monitoring cameras and devices. <u>*Sub-Area C – Ipipiri-Rakaumangamanga protection area only*</u> No drift netting

Appendix 3 – Anderson et *al.* 2019 NZ biogenic habitats summary assessment

The tables below have been extracted from Anderson et *al.* (2019). They summarise the condition of selected biogenic habitats in New Zealand. The information below should be read in conjunction with the rest of the paper to understand the full study undertaken by the authors.

I have relied on this information to assess the status of the biogenic habitats at a regional scale in the areas proposed for protection.

Table 3-3: Overall condition status of Seagrass within New Zealand.

Change in coverage	Habitat condition	Ecoservices Condition	Likely future trajectory	Confidence rating
Decreased 25–50%[1]	Good	Good	Stable/Increasing	Good-Moderate
Overall condition summary Wide spread seagrass distribution in estuaries and harbours, but condition variable, with best seagrass habitats occurring far away from populated urban areas (e.g. Rangaunu and Parengarenga harbours in the far north) (Morrison et al. 2014a). Limited historical evidence suggests New Zealand has experienced extensive declines in seagrass habitats since the late nineteenth and early twentieth centuries (Inglis 2003), but there is also evidence of recovery in some estuaries.				

1 But some recovery and increases in some areas.

Table 3-9: Overall condition status of Kelp forests within New Zealand.

Change in coverage	Habitat condition	Ecoservices Condition	Likely future trajectory	Evidence/confidence
Stable (some local losses[1])	Good	Very good	Stable[2] (but vulnerable)	Good
Overall summary within NZ Widespread distribution in low intertidal and subtidal rocky reefs, providing essential ecosystem services, from northern New Zealand to the Subantarctic Islands. Possibly some species maybe declining at local to regional scales, but overall kelp forests are in good condition and remains one of the most productive biogenic habitat in New Zealand. Climate change/increasing ocean temperatures likely to directly impact kelp forest distributions.				

1 E.g. losses of *M. pyrifera* have occurred within Tory Channel and other locations in the Marlborough Sounds
2 Stable under current conditions, but Kelp forests (especially *M. pyrifera*) vulnerable to climate change, with losses predicted to occur as ocean temperatures increase (as already seen in Australia).

Table 3-11: Overall condition status of Algal meadows within New Zealand.

Change in coverage	Habitat condition	Ecoservices Condition	Likely future trajectory	Evidence/confidence
Unknown[1]	Good[2] (where known)	Good[2] (where known)	Unknown[1]	Moderate[1,2]
Overall summary within NZ Wide spread distribution in harbours and sheltered bays, provide good ecosystem services but not enough data available on the distribution and size of the meadows, and little known about changes to meadows over time.				

1 Limited data available on the composition, extent and health of algal meadows,
2 Existing national information based mostly on expert descriptions or inferred from survey data.

Table 3-13: Overall condition status of Rhodolith beds within New Zealand.

Change in coverage	Habitat condition	Ecoservices Condition	Likely future trajectory	Evidence/confidence
Unknown1	unknown1	unknown1	Unknown/vulnerable1,2	Low/poor1
Overall condition status within NZ Rhodolith beds are poorly known in New Zealand with little known about distribution and size of the beds. They are expected to be more widespread than reflected in the currently known distribution data. Rhodolith beds provide critical ecosystem services including creating refugia and habitats for diverse and often rare species, and larvae settlement. They are known to occur in areas where increasing sedimentation exists, and where dredging and bottom fishing also occur, but it is unclear how vulnerable they are to these disturbances.				

1 Large gaps in national inventory for Rhodoliths, with little to no information available on extent, health or ecosystem status, although rhodolith beds in several locations are known to be important.
2 Considered a vulnerable biogenic habitat as overlapping sedimentation and/or benthic fishing activity threats exist in most places where rhodolith occur

Table 3-15: Overall condition status of Bryozoan thickets within New Zealand.

Change in coverage	Habitat condition	Ecoservices Condition	Likely future trajectory	Evidence/confidence
Decreased	Moderate-Poor1	Very Good2 (where known)	Declining3	Moderate/Low 1,2
Overall condition status within NZ Habitat-forming bryozoan species are widely distributed around New Zealand. Colonies can reproduce without attaining large sizes, but attaining habitat-forming status can be compromised by bottom-trawling and survival can be affected by sediment from the land. The Separation Point bryozoan beds are still recovering from benthic fishing activities; Foveaux Strait is compromised by oyster dredging; and affected parts of Otago Shelf are mooted for protection.				

1 Most thickets present in areas where fishing activity is frequent, with evidence of damage and removal based on research surveys, fishery bycatch, historic catches and long-time fisher's accounts relative to known distribution of thickets (e.g. Otago Shelf, Separation Point).
2 Biodiversity is extremely high in bryozoan thickets, even where damaged (e.g. Separation point, Patea Shoals).
3 Declines likely due to high sedimentation (especially inshore areas) and/or ongoing disturbance from benthic fishing activities (especially on mid-outer shelf areas).

Table 3-17: Overall condition status of Sponge Gardens within New Zealand.

Change in coverage	Habitat condition	Ecoservices Condition	Likely future trajectory	Evidence/confidence
Unknown-Stable1	Unknown-Moderate1	Good-Moderate2	Stable-Declining3	Moderate/Low 1,2
Overall condition status within NZ Wide spread distribution of habitat-forming species, provide good ecosystem services, but not enough data available on the distribution and size of sponge gardens, with little known about changes over time.				

1 Where known – as very few sponge gardens that have been mapped or monitored through time.
2 Biodiversity is high in sponge gardens, which are also often found growing on or in association with tubeworm fields, bryozoan thickets and/or beds of large shellfish (e.g. Morrison et al. 2014a; Jones et al. 2018).
3 Expected to be stable where sedimentation is low and benthic fishing activities are absent, but in sub-prime condition or declining where either or both these stressors are present.

Table 3-19: Overall condition status of Coral thickets and fields within New Zealand relative to benthic fishing history. NF=Not fished, FP=Fished but now protected, and F=Fished no benthic-protection.

	Change in coverage	Habitat condition	Ecoservices Condition	Likely future trajectory	Evidence/confidence
NF	No Change	Good	Very Good	Stable	Good/Moderate
FP	Decreased 25-75%	Poor	Poor	No-recovery1	Good/Moderate
F	Decreased 25-75%	Poor	Defunct	No-recovery2	Good/Moderate
Overall condition status within NZ There is a widespread distribution of stony- and other habitat-forming corals, but condition of coral thickets is variable based on past fishing impacts (Clark et al. 2018). Where trawling is regularly carried out, and in particular on seamount-like features where corals have localised high density, it is likely that populations have been damaged and are in poor condition. Outside the fishing footprint coral will be in better condition. The overall status throughout New Zealand is uncertain.					

1 The community structure of coral thickets in the Graveyard Knolls, Northwest Chatham Rise have been compared over time and there is no sign of recovery (e.g. Morgue seamount - following fishery closures in 2001). The scleractinian coral densities on Morgue remain much lower than those on the unfished seamounts.
2 Coral thickets on the seamount still being fished (Graveyard Seamount) shows little to no recovery, with persistently lower taxa richness, possibly due to a regular "resetting" of the community by disturbance from trawling (Clark et al. 2018).

Table 3-21: Overall condition status of Beds of large shellfish within New Zealand..

	Change in coverage	Habitat condition	Ecoservices condition	Likely future trajectory	Evidence/ Confidence
Robust Dog cockles	Unknown1	Good	Very Good	Stable	Moderate
Horse mussels	Decreased 25-75%	Poor	Poor	Declining	Good/Moderate
Scallops	Decreased 25-75%	Moderate	Poor	Variable??	Good
GL mussels	Decreased 75-100%	Defunct	Defunct	No-recovery2	Good

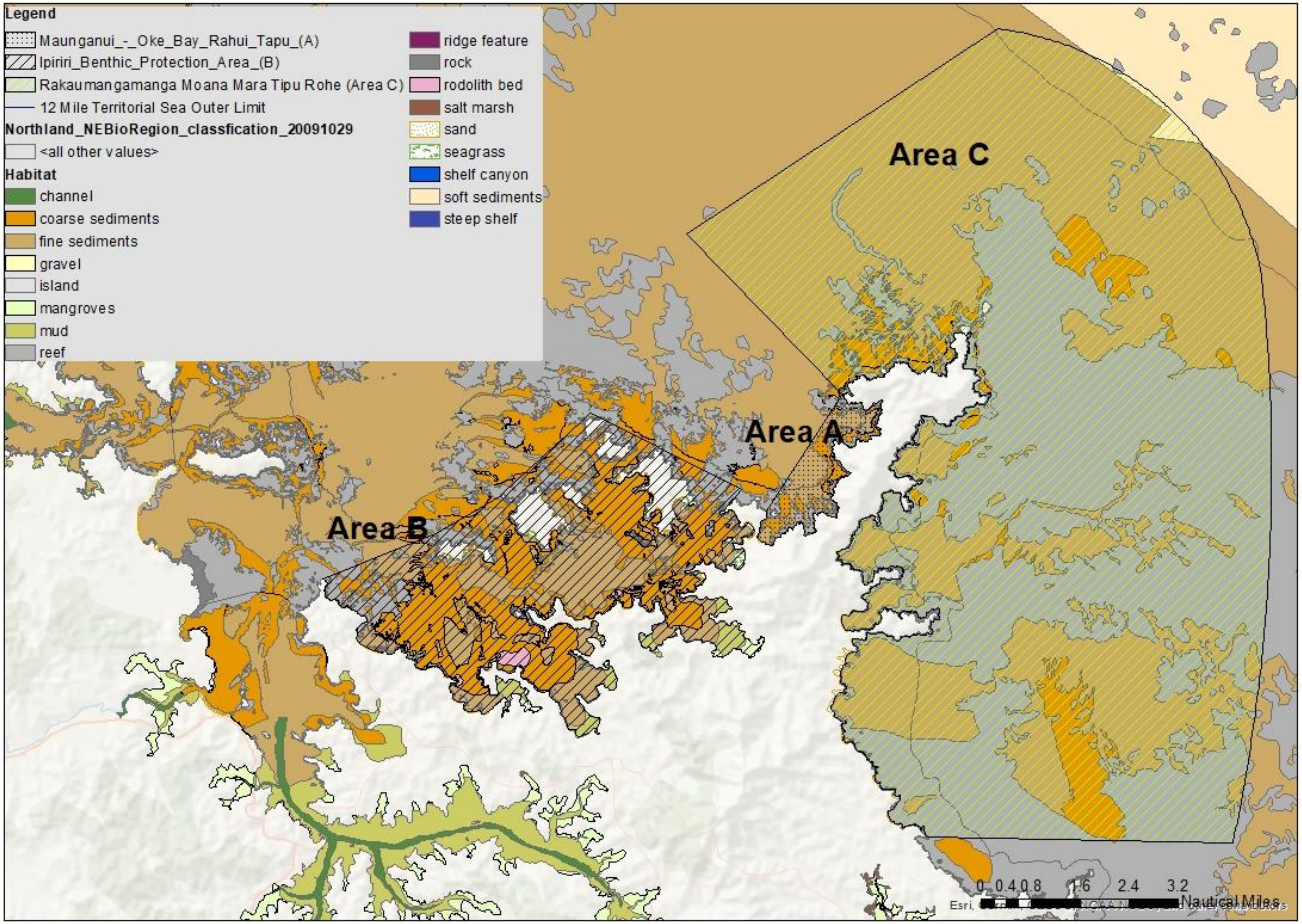
Robust Dog Cockle Beds. As it is unfished and resilient to the effects of bottom trawling and dredging, it is likely that beds of this species remain in overall good condition. However, little is known of its distribution on the continental shelf, particularly along the west coast of both main islands.	**Horse Mussel beds**. Several location may still provide good ecosystem services, however many beds on the shelf have been damaged, reduced in extent or lost due to bottom fishing activities (including scallop dredging).
NZ scallop beds. Extensive populations occurred in the mid-outer Marlborough Sounds and in the Haruaki Gulf, where they supported nationally important scallop dredge fisheries. Commercial and recreational fishing has reduced stocks leading to localised loss of distinct scallop habitat in some areas. Sedimentation is also an important threat to scallop habitat in some areas.	**Green-lipped mussels.** Though common on coastal reefs and on mussel farms, Green-lipped mussel beds are ecologically/ functional extinct from its native seabed habitats where it previously formed extensive beds.

1 National inventory on Robust dog cockles has large gaps, with little known on the spatial extent of beds or changes through time. Beds however are expected to be widespread and extensive, particularly in areas of high current flow on inner and mid-shelf locations.

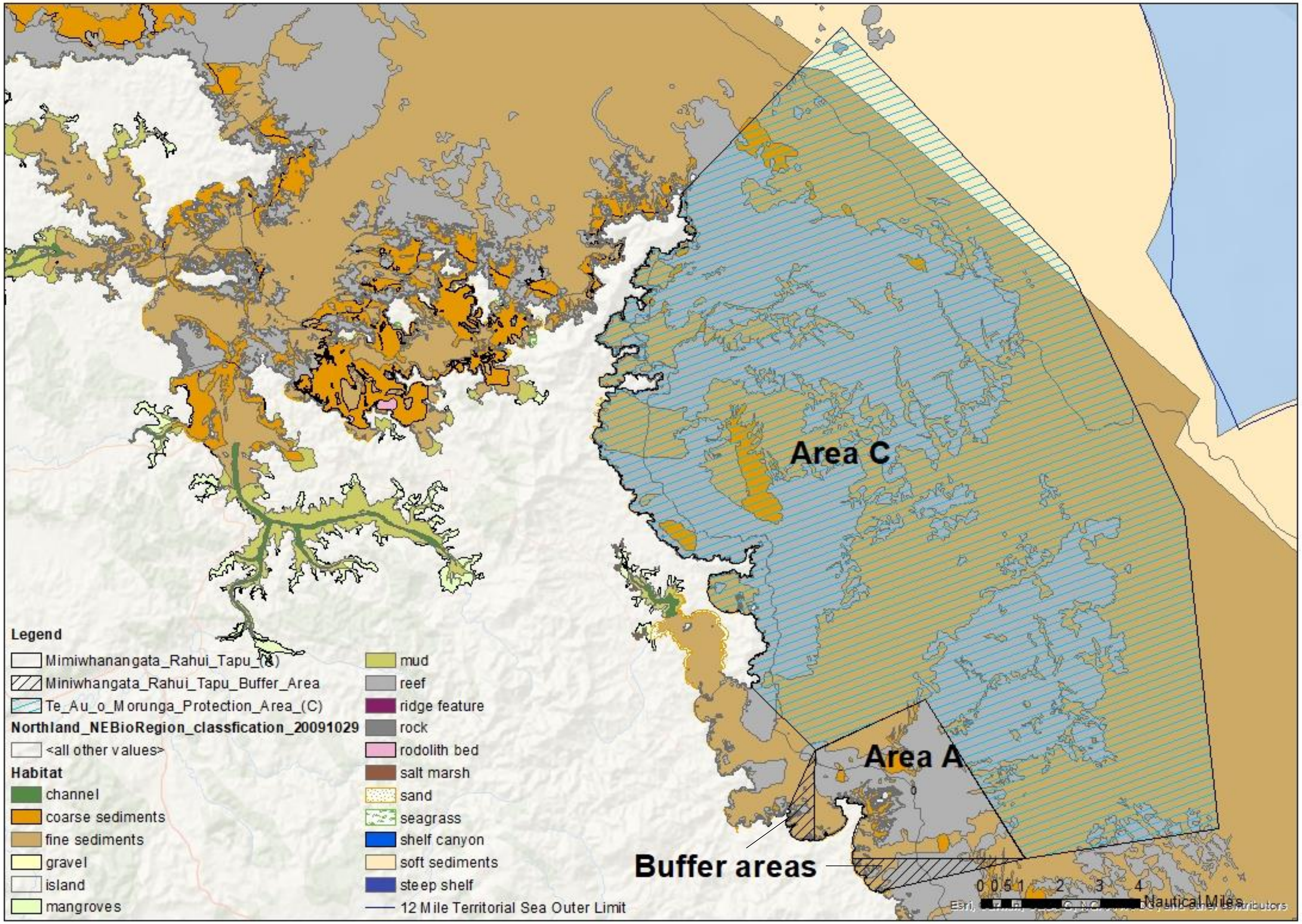
Appendix 4 – Maps: benthic habitats, species and substrata

4.a Maps of the proposal for marine protection with DOC habitats and substrata information (Kerr/DOC 2010)

Map 4.a.1 Te Ha o Tangaroa Marine Protected Area Proposal with benthic habitat/substrata representation **(map updated with new Area C)**

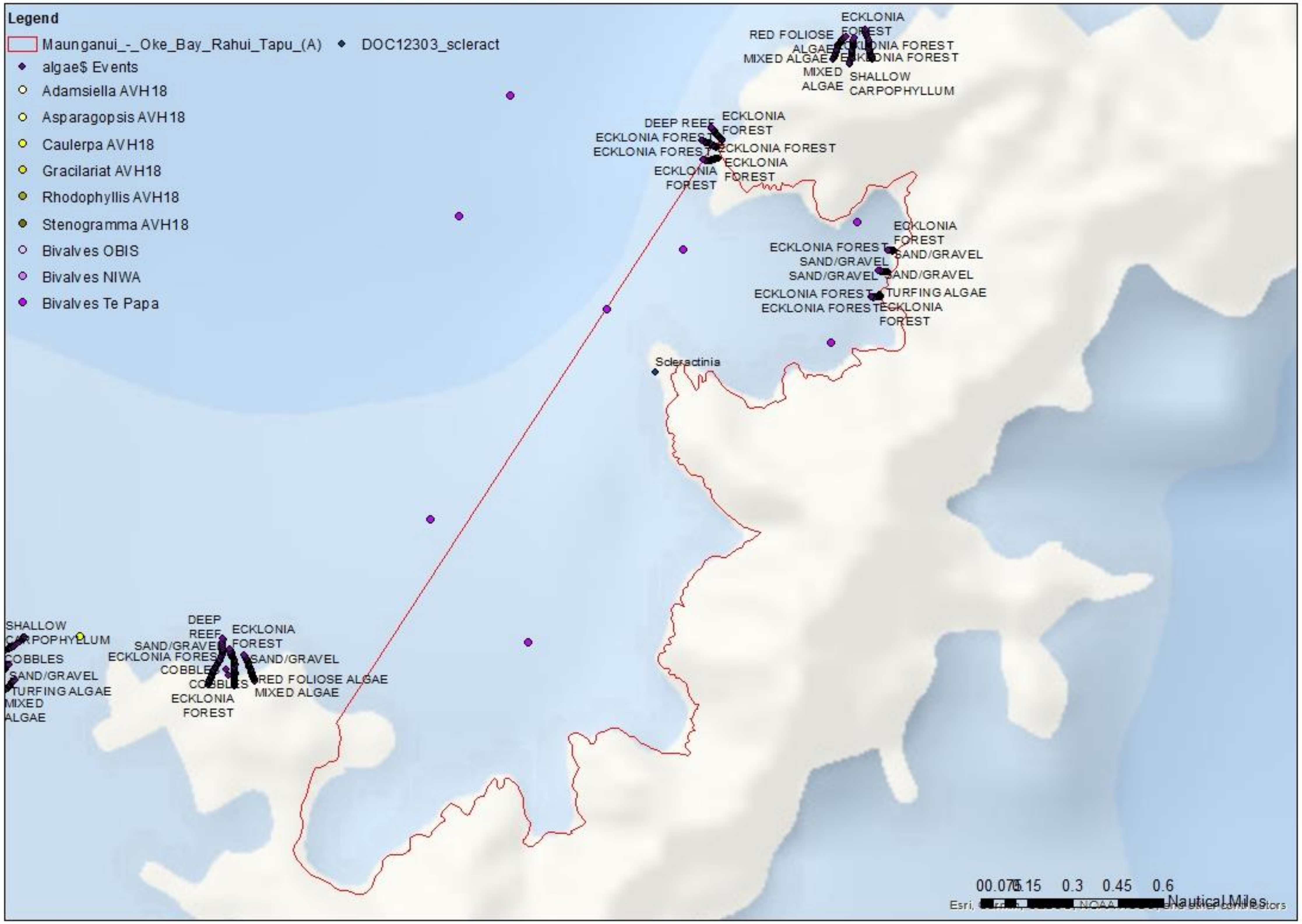


Map 4.a.2 Te Mana o Tangaroa Marine Protected Area Proposal with benthic habitat/substrata representation (map updated with new Area C)



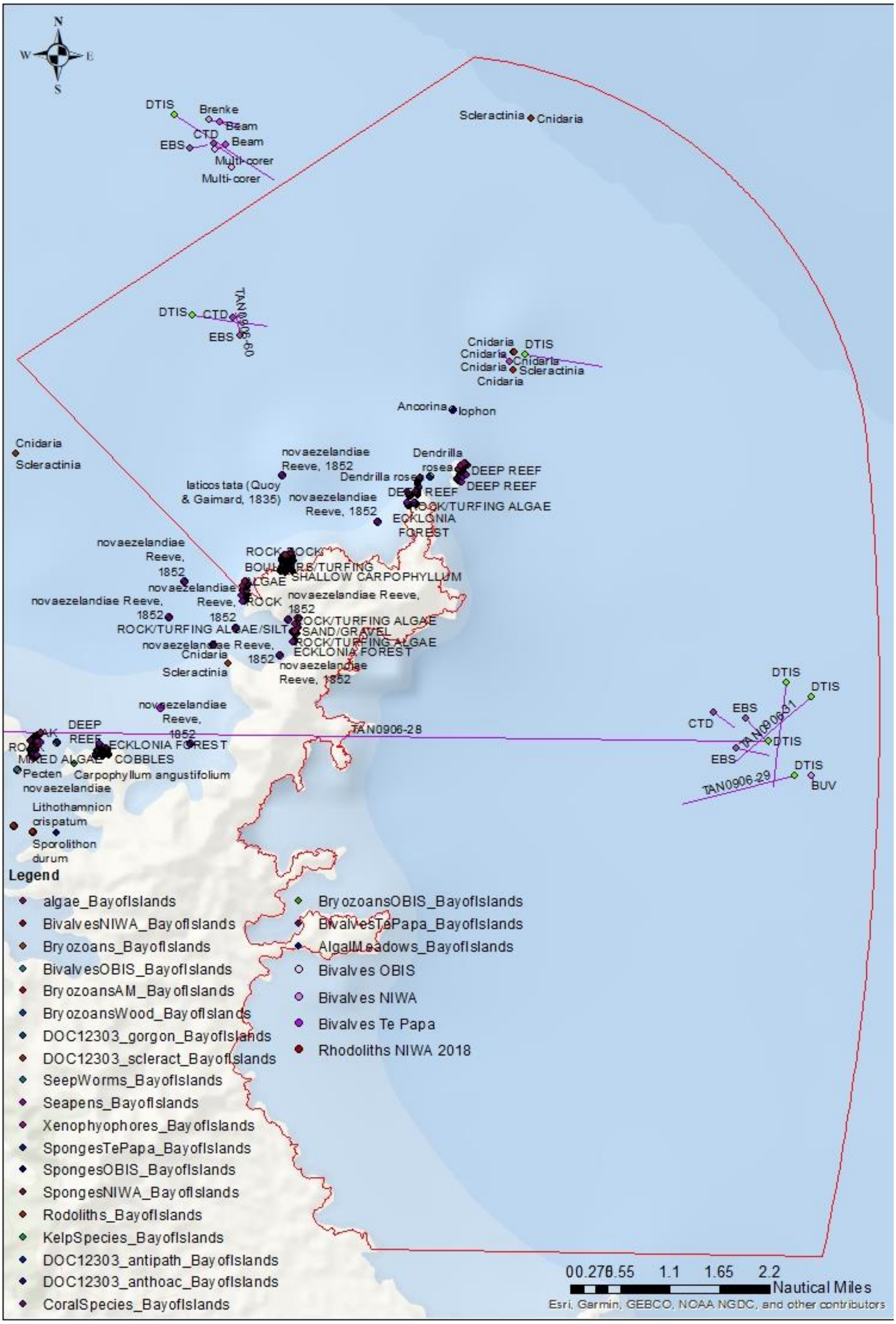
4.b Maps with protected and relevant species in the areas proposed for protection. (source: Ocean Survey 20/20, OBIS database, DOC, Te Papa Collection and other scientific publications)

Map 4.b.1 Te Ha o Tangaroa ~~Sub-~~Area A ~~+ buffer~~ (no changes, bigger map)

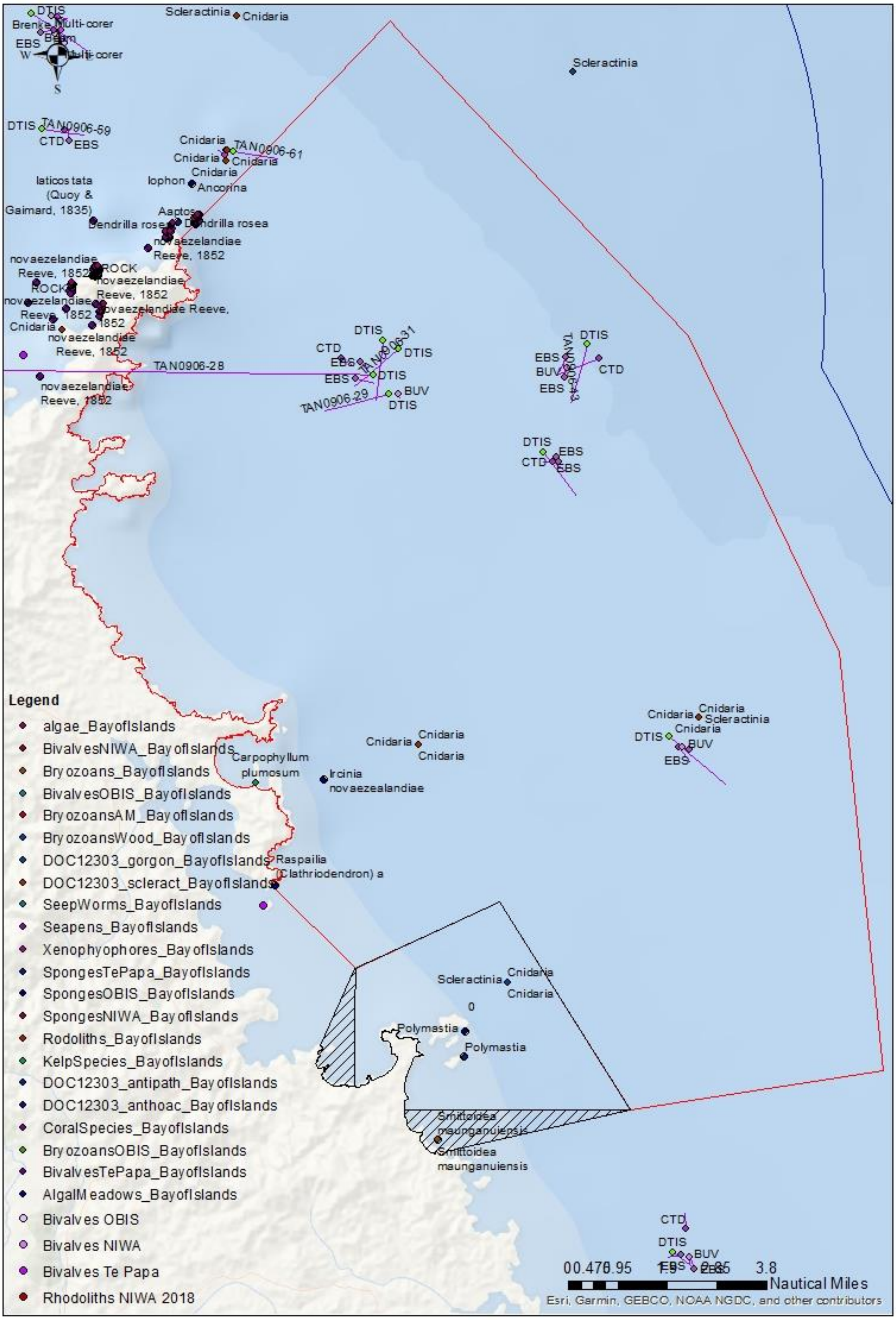


Map 4.b.2 Te Ha o Tangaroa ~~Sub-~~Area B (no changes, bigger map)

Map 4.b.3 Te Ha o Tangaroa ~~Sub-~~Area C (map updated with new Area C)



Map 4.b.4 Te Mana o Tangaroa all ~~Sub-~~Areas (no changes, bigger map)



Appendix 5 – Department of Conservation. Dropdown Camera Survey in Bay of Islands and Coastal Area to Mimiwhangata (DOC Survey 2021).

Team: Enrique Pardo (lead), Clinton Duffy, Cat Peters and Evan Davies (skipper)

Period: 12-16 April 2021

Location: Kerikeri

<u>Summary plan/survey</u>

The Department of Conservation undertook a dropdown camera Survey in Bay of Islands and offshore areas to Mimiwhangata in April 2021.

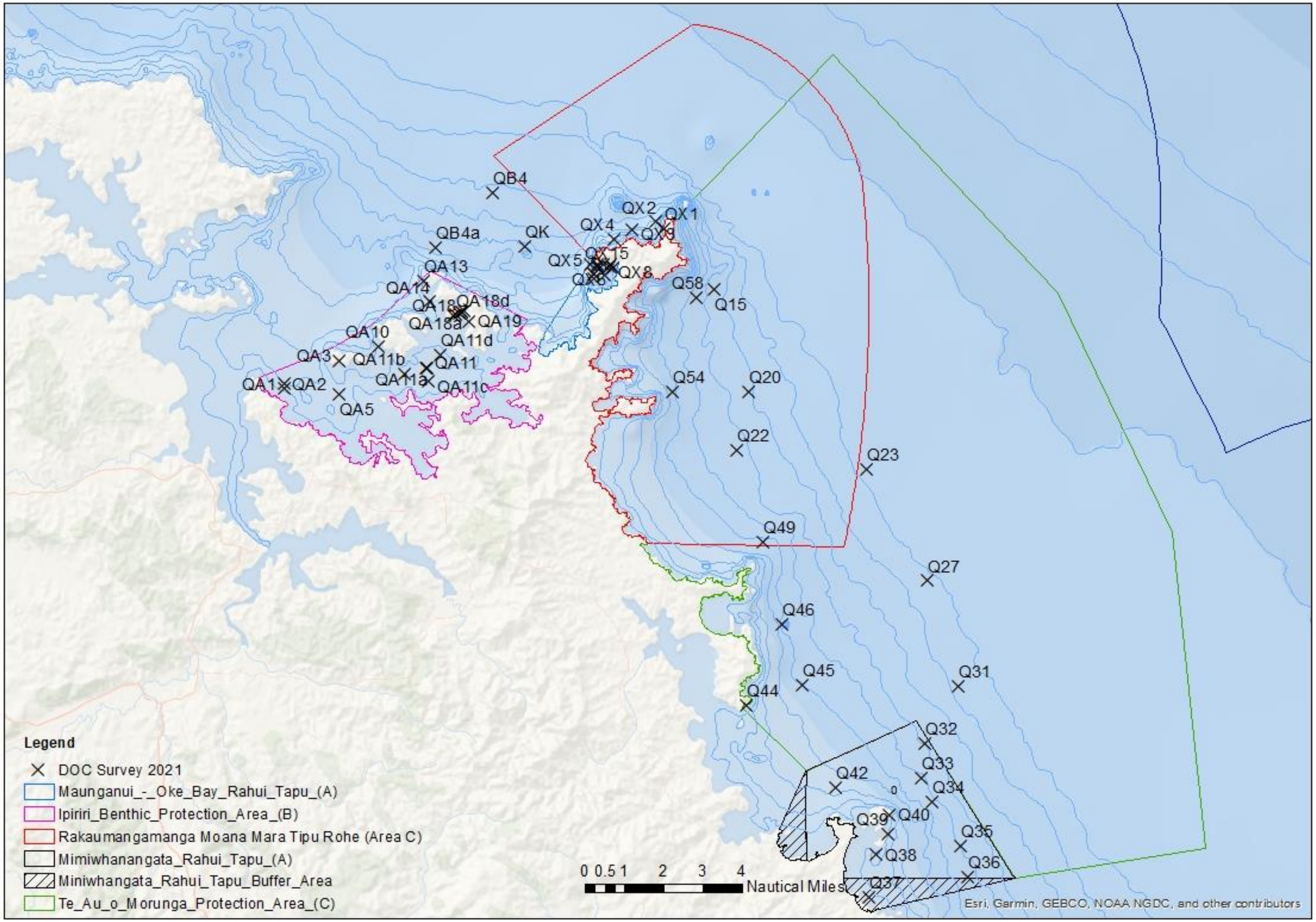
The purpose of the survey was to groundtruth some of the information previously collected in the area and fill some gaps of knowledge from these areas. The areas proposed for protection under the appeal of the Northland Regional Plan were prioritised during the design of the survey.

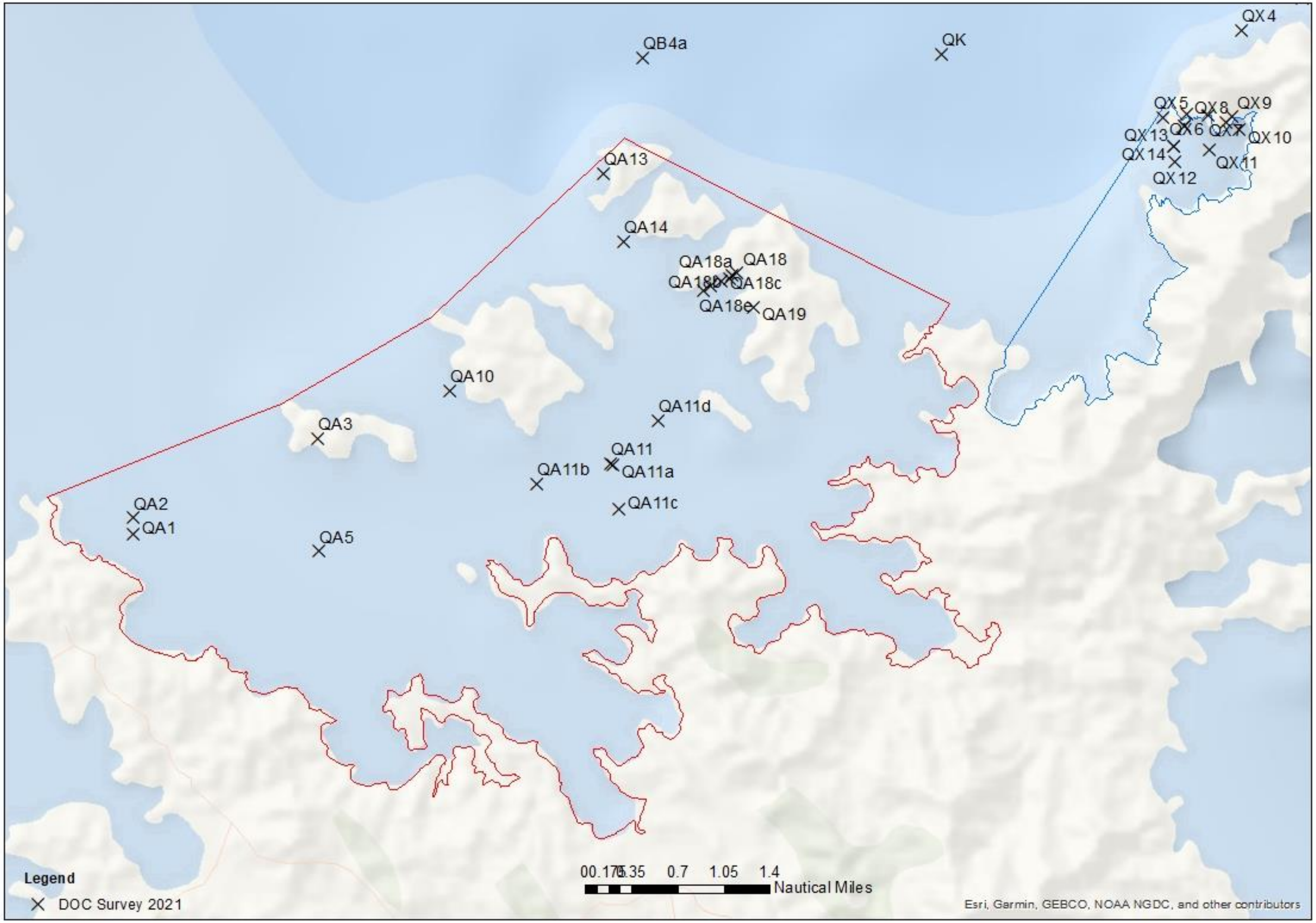
The survey was developed for five days, only one day had to be shorten due to weather conditions. Health and Safety plans and standard procedures were followed, and no incidents occurred.

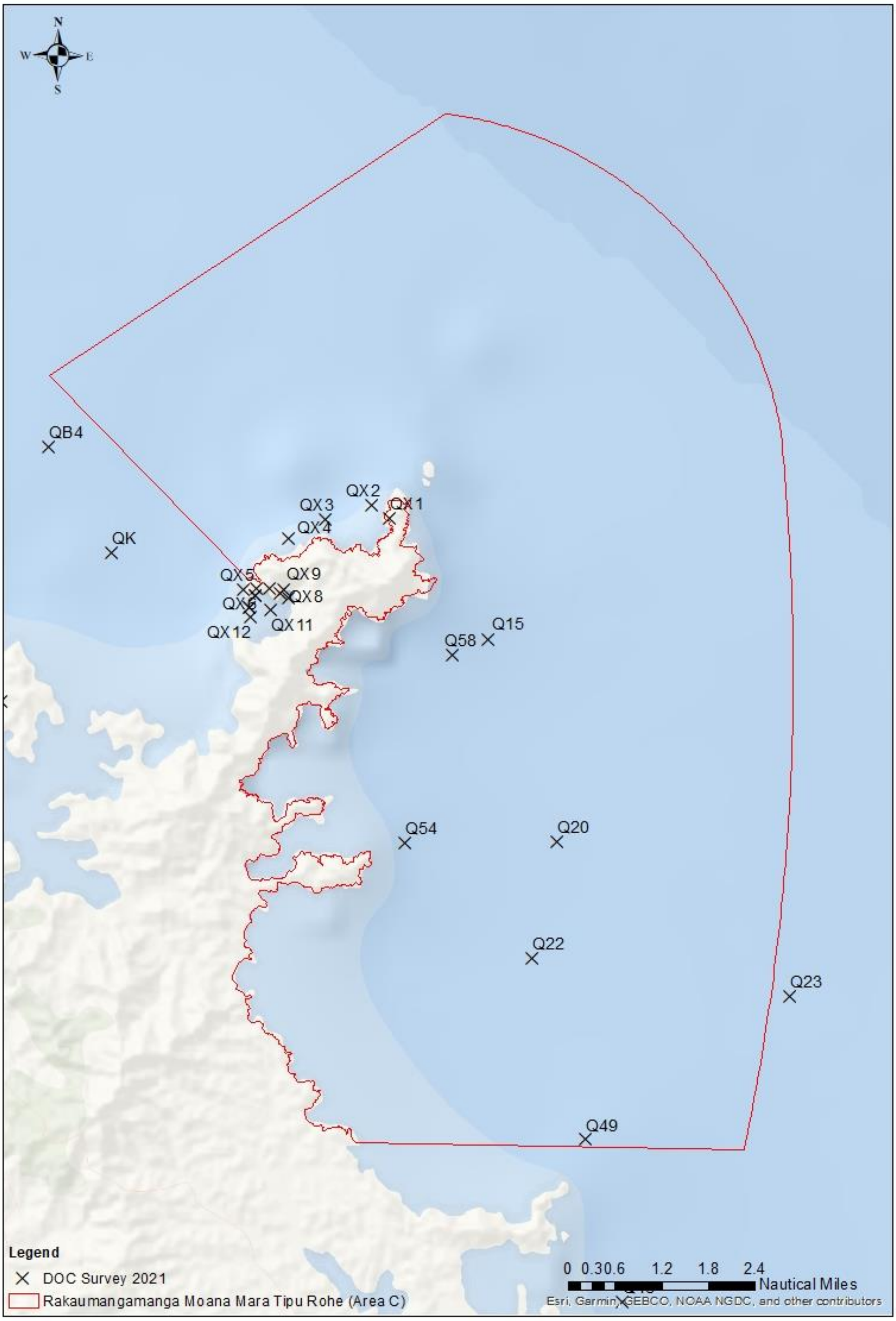
The DOC boat Rako, based in Whangarei, was used for this survey. Three to four DOC employees were on board. Two drop down cameras were used to visualised the benthic communities, HD Deepblue – Splashcam - underwater camera (~50m cable) and HD Delta Version Industrial -Spalshcam – underwater camera (~100m).

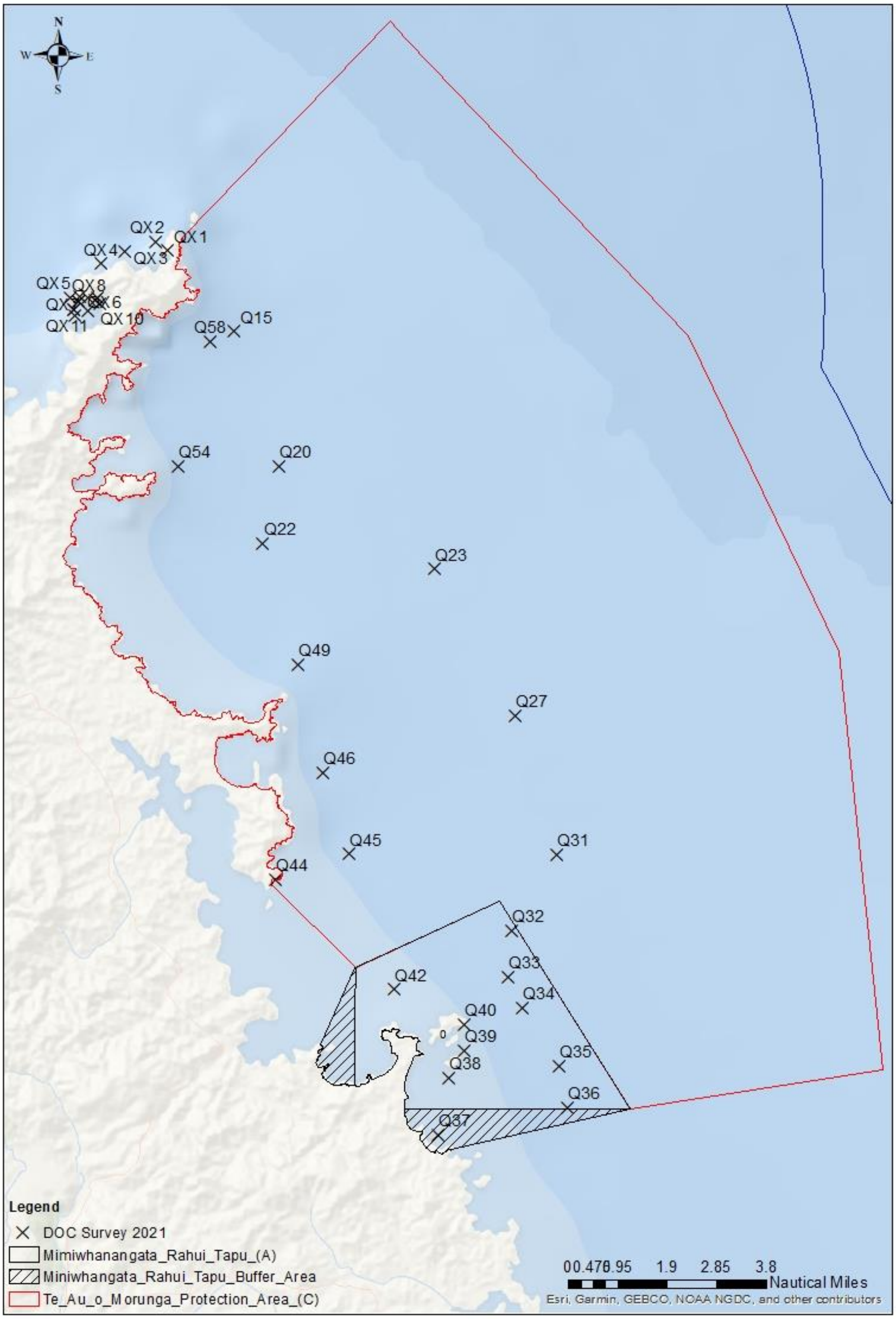
The survey targeted areas previously sampled to establish a before-after visual analysis, and also new sample stations where gaps of sampling were detected. The shallowest sample was on seagrass meadows at around 3m, and the deepest was in the offshore reefs at around 97m. The sample stations are plotted on the maps below

[maps below updated with new Area C]


QB4
QB4a
QK
QX2
QX1
QX4
QX5
QX8
QA13
QA14
QA18d
QA19
QA18a
QA10
QA11d
QA3
QA11b
QA11
QA1
QA2
QA11a
QA11c
QA5
Q58
Q15
Q54
Q20
Q22
Q23
Q49
Q27
Q46
Q45
Q31
Q44
Q32
Q33
Q42
Q34
Q39
Q40
Q35
Q38
Q36
Q37
Legend
DOC Survey 2021
Maunganui_-_Oke_Bay_Rahui_Tapu_(A)
Ipiriri_Benthic_Protection_Area_(B)
Rakaumangamanga Moana Mara Tipu Rohe (Area C)
Mimiwhanangata_Rahui_Tapu_(A)
Miniwhangata_Rahui_Tapu_Buffer_Area
Te_Au_o_Morunga_Protection_Area_(C)
0 0.5 1 2 3 4
Nautical Miles
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors


QB4a
QK
QX4
QX5
QX8
QX9
QX13
QX6
QX7
QX10
QX14
QX11
QX12
QA13
QA14
QA18a
QA18
QA18b
QA18c
QA18e
QA19
QA10
QA11d
QA3
QA11
QA11a
QA11b
QA11c
QA2
QA1
QA5
0 0.175 0.35 0.7 1.05 1.4
Nautical Miles
Legend
DOC Survey 2021
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors


N
S
W
E
QB4
QK
QX2
QX3
QX1
QX4
QX5
QX9
QX8
QX11
QX12
Q15
Q58
Q54
Q20
Q22
Q23
Q49
Legend
DOC Survey 2021
Rakaumangamanga Moana Mara Tipu Rohe (Area C)
0 0.30.6 1.2 1.8 2.4
Nautical Miles
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors


N
S
W
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QX2
QX1
QX4
QX3
QX5
QX8
QX6
QX11
QX10
Q58
Q15
Q54
Q20
Q22
Q23
Q49
Q27
Q46
Q45
Q31
Q44
Q32
Q42
Q33
Q34
Q40
Q39
Q38
Q35
Q36
Q37
Legend
DOC Survey 2021
Mimiwhanangata_Rahui_Tapu_(A)
Miniwhangata_Rahui_Tapu_Buffer_Area
Te_Au_o_Morunga_Protection_Area_(C)
1.9 2.85 3.8
Nautical Miles
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

Appendix 6 – DOC Survey 2021 and Ocean Survey 20/20 selected images

DOC Survey 2021

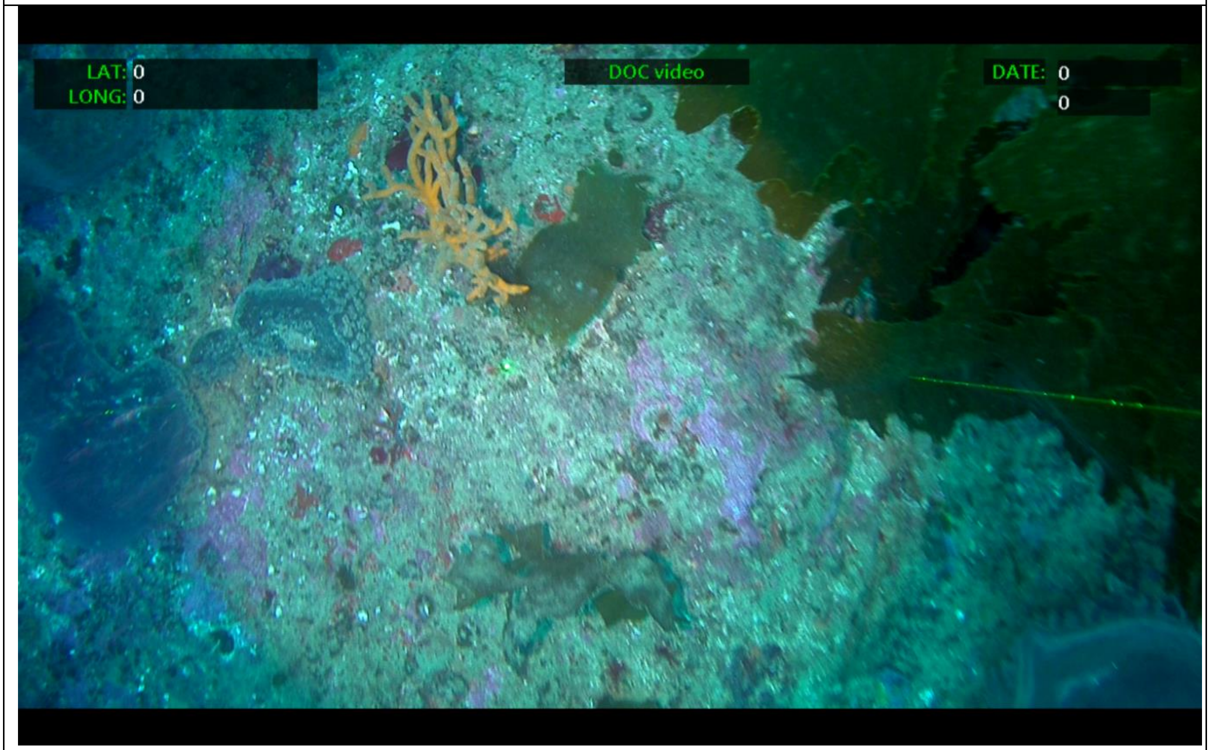

Photo 1 – Maunganui Bay. Example of sponge aggregation with *Ecklonia radiata* on rocky reef

Photo 2 – Maunganui Bay. Packhorse (*Jasus verreauxi*) ~~Crayfish (*Jasus edwardsii*)~~ in rocky reef with encrusting and habitat-forming sponge aggregations

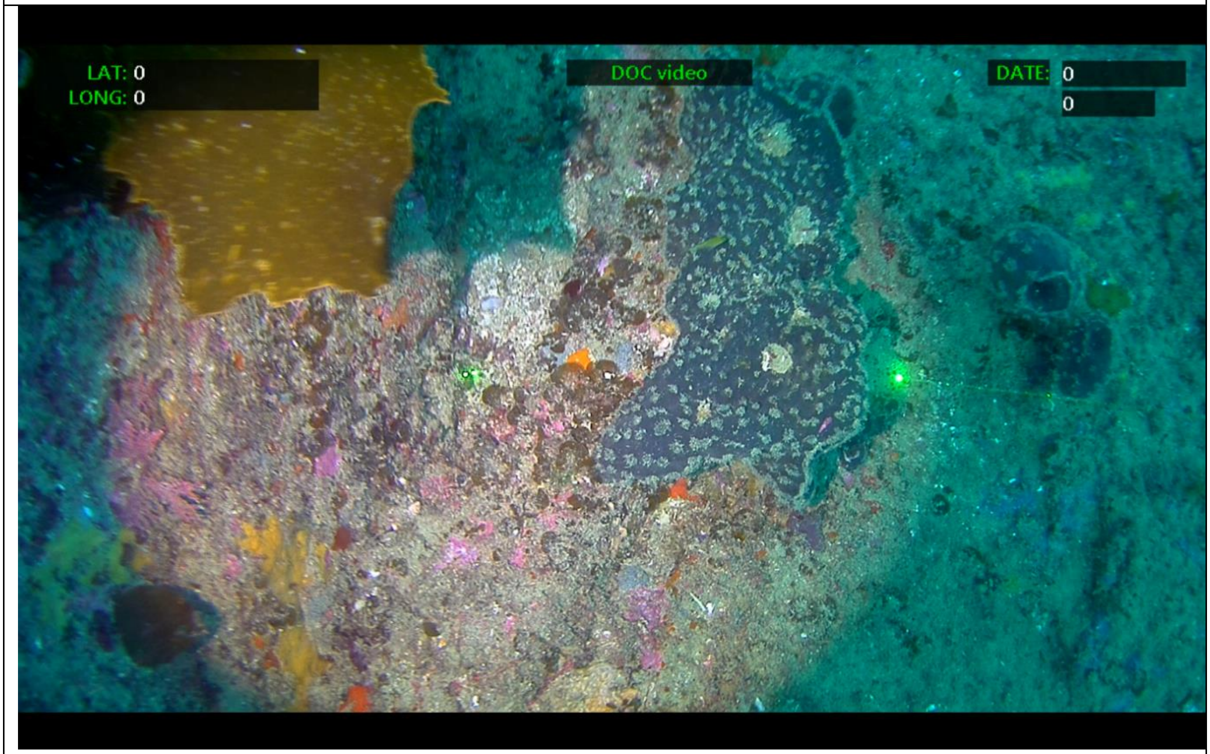

Photo 3 - Maunganui Bay. Sponge aggregation and *Ecklonia radiata* on rocky reef.

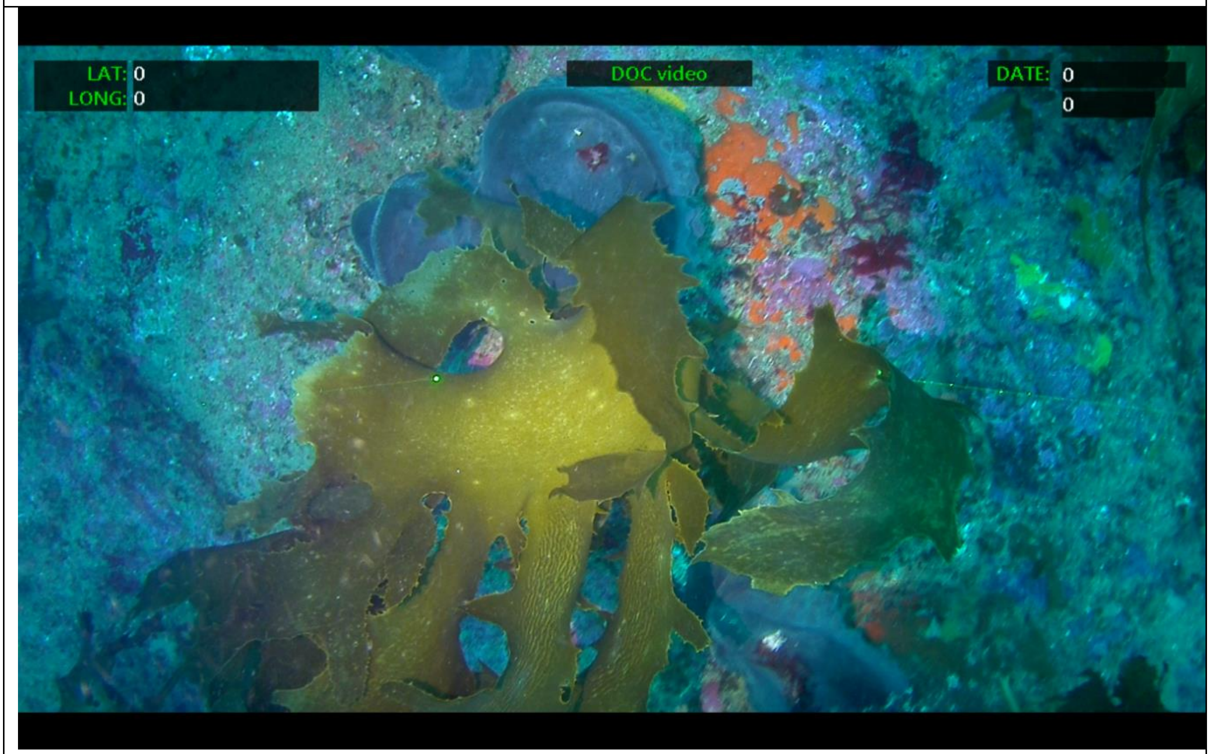

Photo 4 - Maunganui Bay. Cup sponge with *Ecklonia radiata* on rocky reef.

Photo 5 - Maunganui Bay. Sponge *Darwinella* sp. And other encrusting sponges with *Ecklonia radiata* on rocky reef.

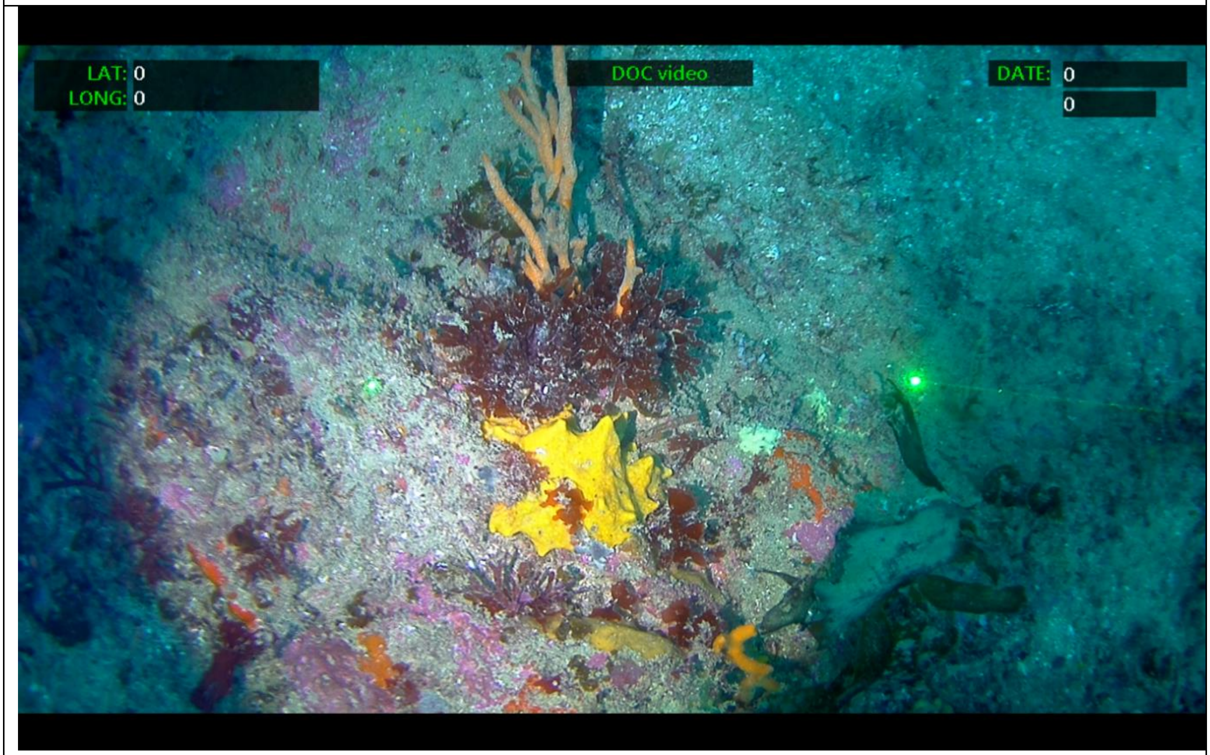

Photo 6 - Maunganui Bay. Sponge aggregation on rocky reef.

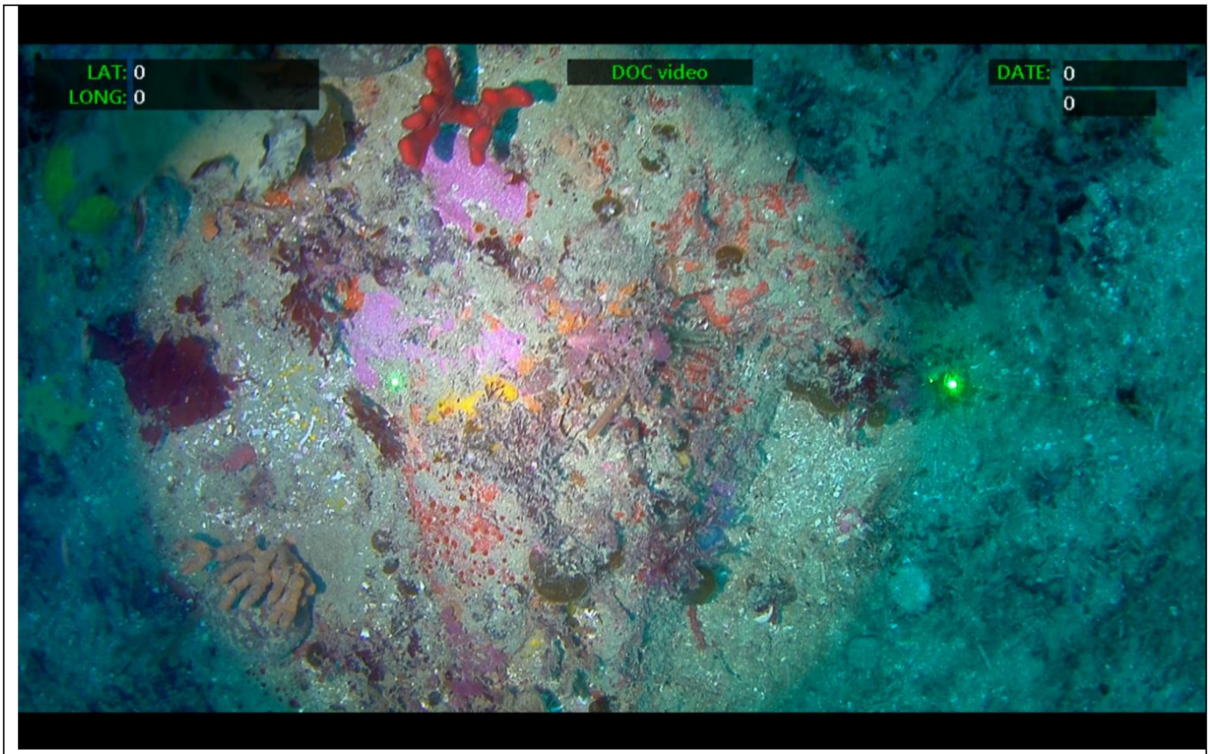

Photo 7 - Maunganui Bay. Sponge aggregation on rocky reef.

Photo 8 - Maunganui Bay. Sponge aggregation on rocky reef.

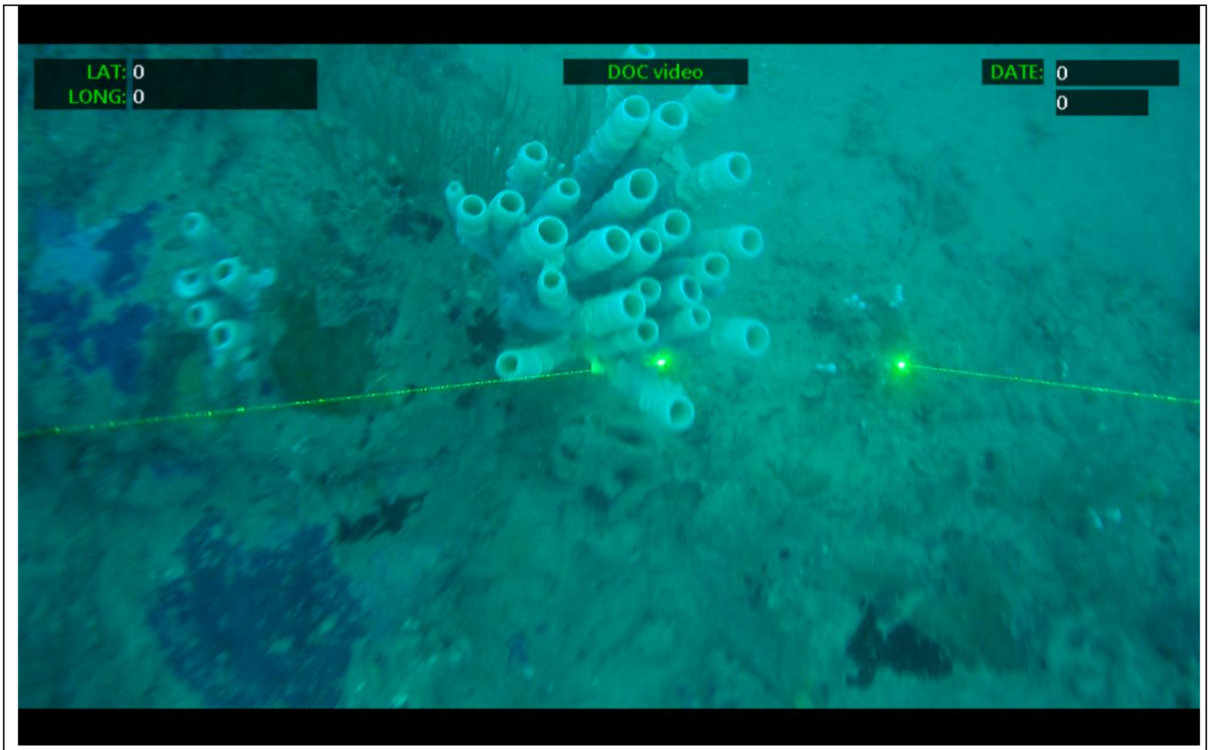

Photo 9 – Mimiwhangata. Habaitat formaing sponge *Iophon laevistylus* on hard substrata

Photo 10 – Mimiwahngata. cup sponges and gorgonian corals.

Photo 11 – Mimiwhangata. Gorgonian corals (*Perissogorgia vitrea*) on rocky reef

Photo 12 – Mimiwhangata. Gorgonian coral family Plexauridae (orden Alcyaonacea)

Photo 13 – sponge aggreagation on bulder.

Photo 14 – Kelp forest (*Ecklonia radiata*) with torpedo ray (top right)

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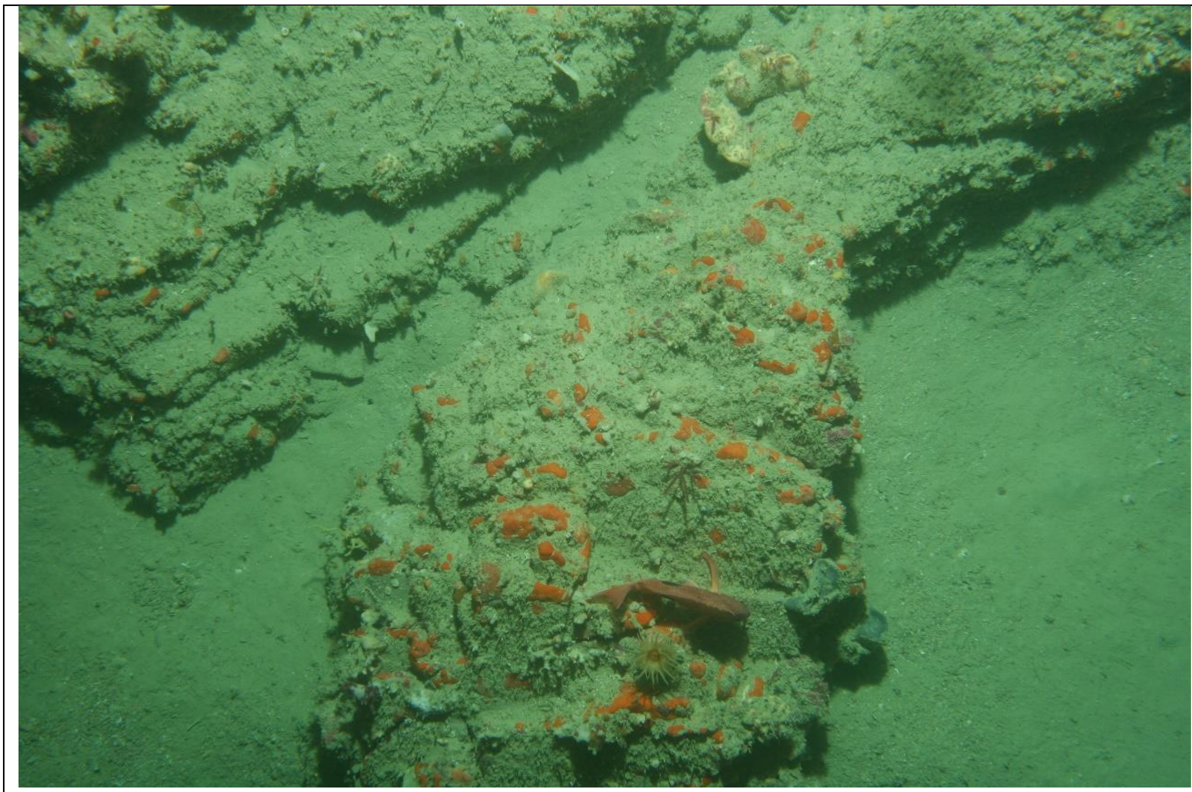

Photo 15 – central inner Bay of Islands. Anemonae and sponges on boulder

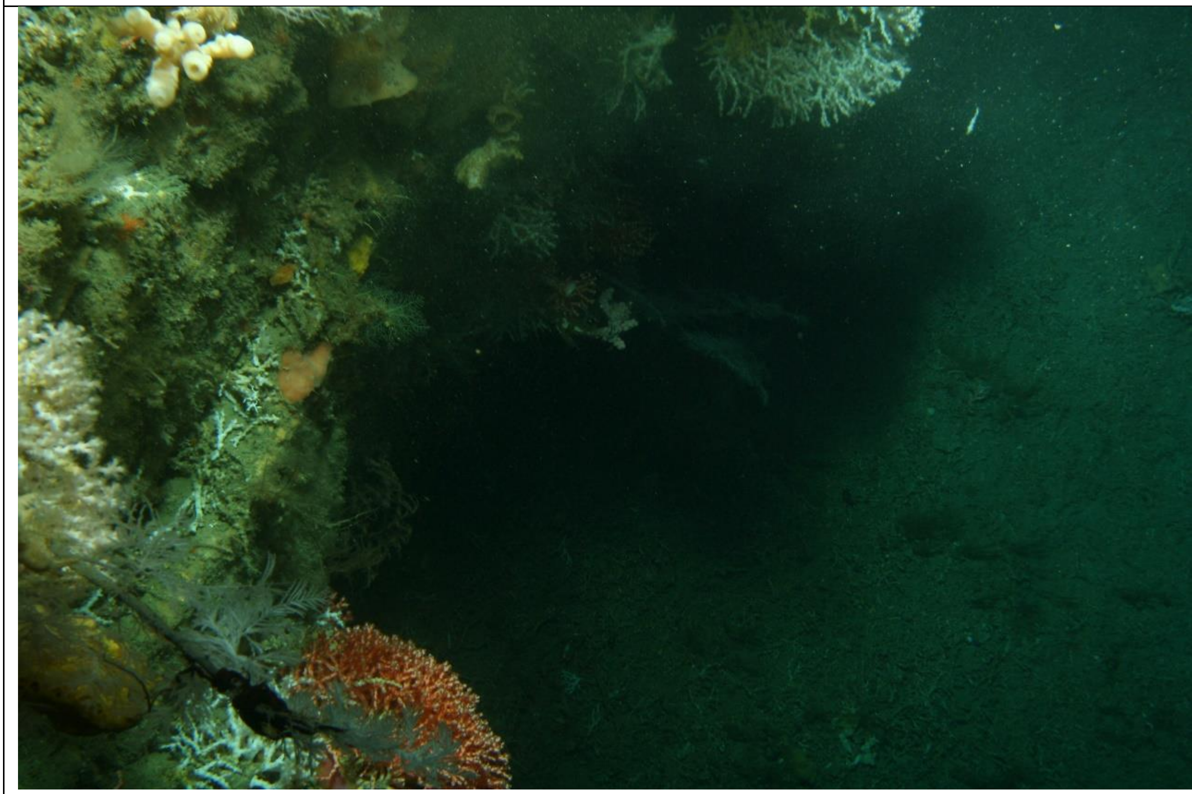

Photo 16 – North Cape Brett. Coral (such as *Oculina virgosa*, back coral) and sponge agrregation (such as *Iophon laevistylus*)

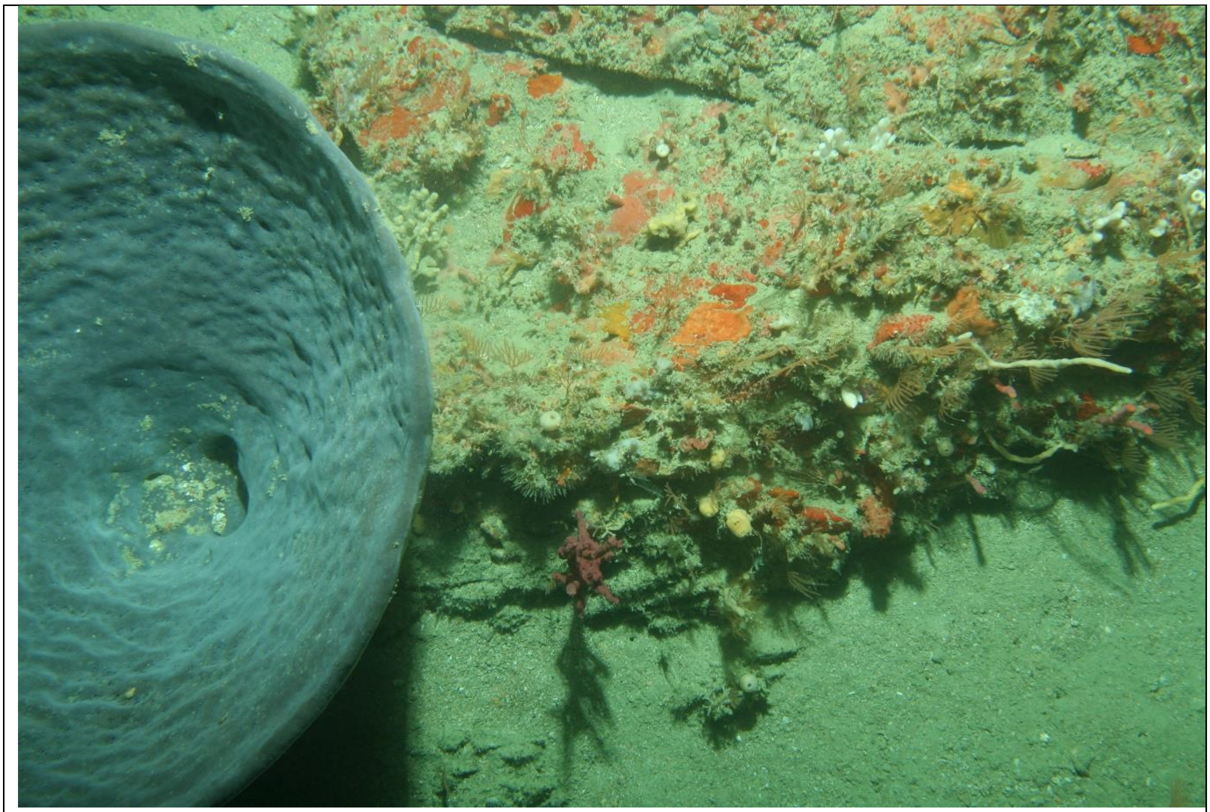

Photo 17 – Offhsore reef area. Diverse sponge and coral aggreagation

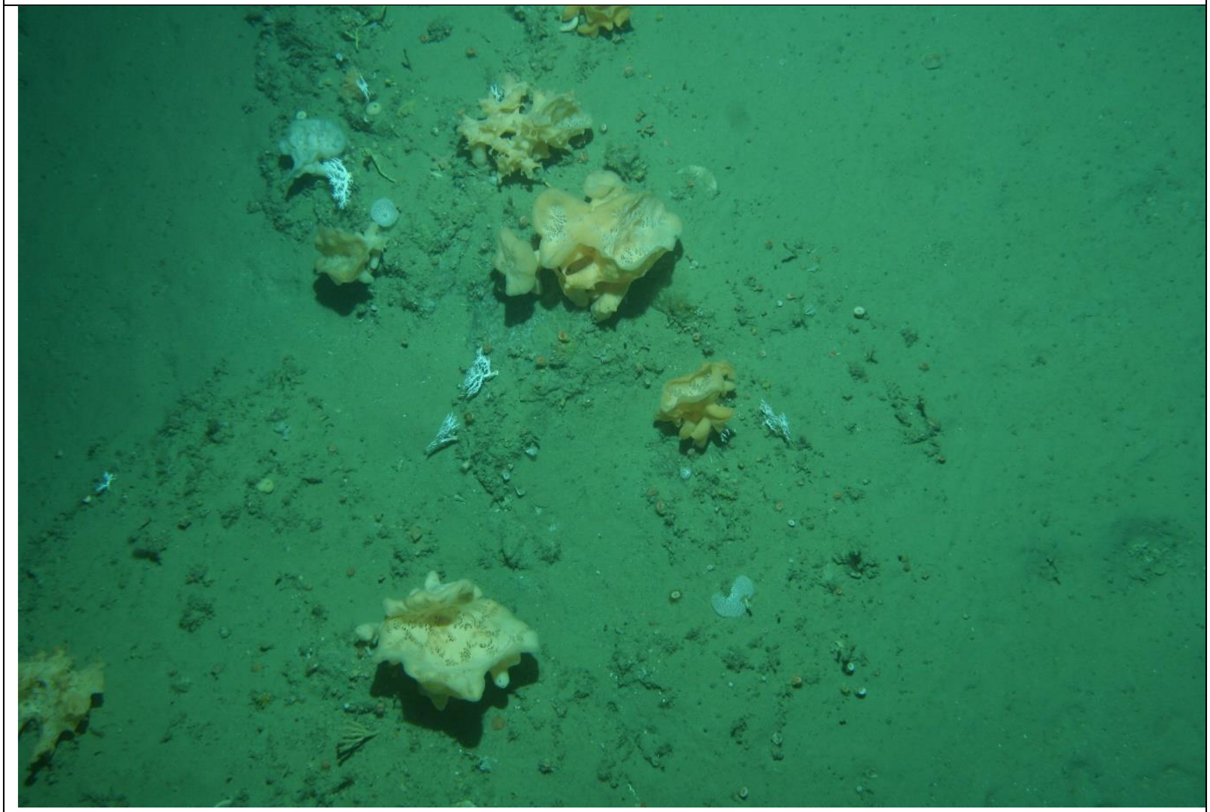

Photo 18 – Offshore reef area. Aggregation of the sponge (*Symplectella rowi*), among others, and corals from the family stylasteridae

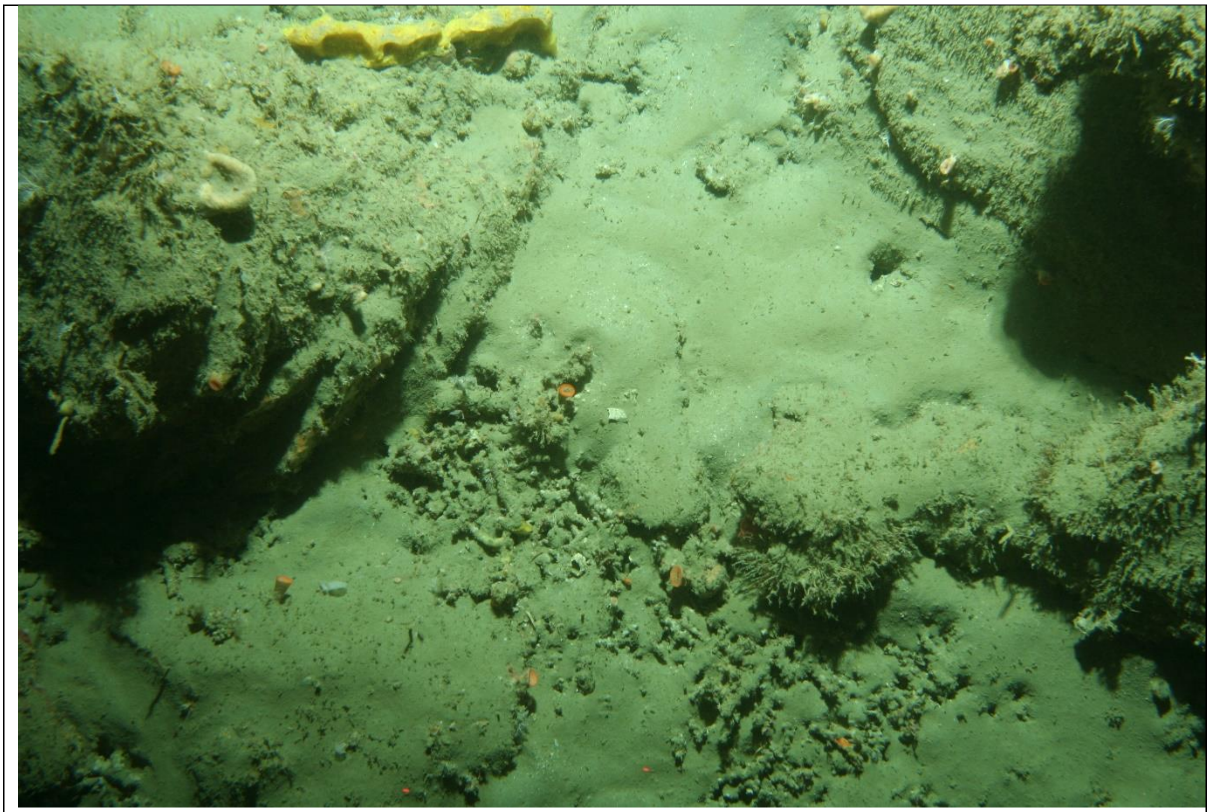

Photo 19 – Offshore area, east to Cape Brett. Cup corals and sponges on hard substrata affected by sediment deposition.