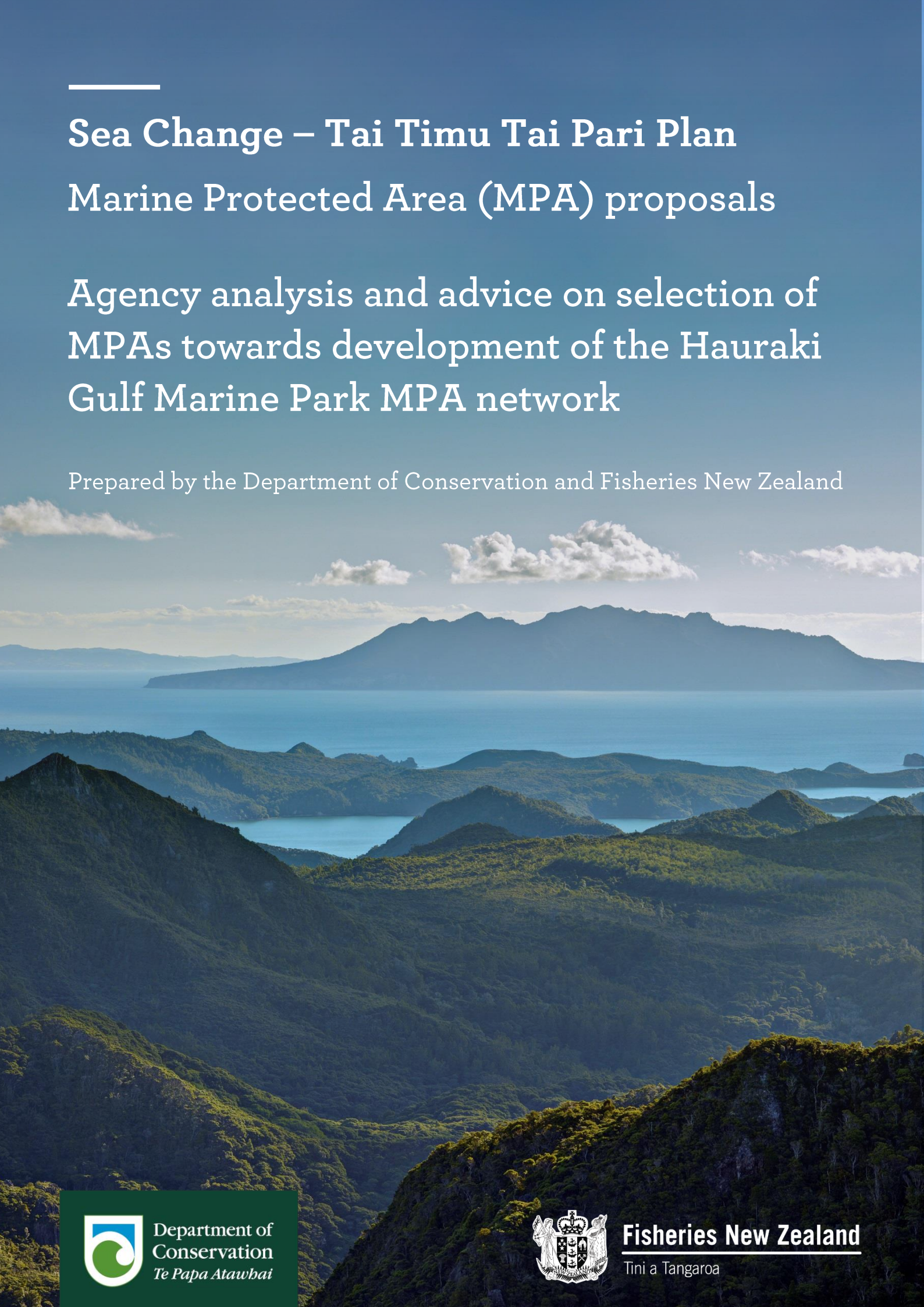
Sea Change – Tai Timu Tai Pari Plan

Marine Protected Area (MPA) proposals

Agency analysis and advice on selection of MPAs towards development of the Hauraki Gulf Marine Park MPA network

Prepared by the Department of Conservation and Fisheries New Zealand



Department of Conservation
Te Papa Atawhai

Fisheries New Zealand
Tini a Tangaroa

Cover: Te Hauturu-o-Toi /Little Barrier Island seen from Aotea/Great Barrier Island. Photo: Andris Apse

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Executive summary

In response to the ongoing decline of the health of the Hauraki Gulf Marine Park, the Sea Change – Tai Timu Tai Pari process brought together a range of stakeholders and Treaty partners with the sole purpose of developing a marine spatial plan to address the environmental decline in the Hauraki Gulf / Tīkapa Moana and provide for social, cultural and economic wellbeing. Developed over 3 years, the Sea Change – Tai Timu Tai Pari Plan (hereafter referred to as the Sea Change Plan), New Zealand's first marine spatial plan, was launched at the end of 2016.

The Sea Change Plan provides an aspirational blueprint to inform and guide statutory agencies with a role in the management of the Hauraki Gulf Marine Park. The Sea Change Plan's proposals sought to integrate and improve management across a variety of domains, including fisheries management, and seeks to integrate management measures to holistically improve the environmental health outcomes of the Hauraki Gulf. To this end, the Sea Change Plan proposes a range of marine protected areas (MPAs) to protect and restore habitats and ecosystems.

In 2019 the Ministers of Conservation and Fisheries announced the development of a Government Response Strategy to the Sea Change Plan's proposals falling under their respective remits. This report brings together the technical and scientific assessments of the Sea Change MPA proposals, giving regard to best-practice guidance on MPA planning.

Preferred options for MPAs are identified, which are expected to be further discussed and refined with input of Treaty partners and stakeholders. The preferred options include extending two existing marine reserves, 11 high protection areas and five seafloor protection areas. Gaps in establishing a network of MPAs are discussed, but recommendations of additional sites to complete the Hauraki Gulf Marine Park network is outside the scope of the assessment.

The proposals aim to lay a foundation for an MPA network that progresses the protection and restoration of ecological and societal/spiritual values as envisioned in the Sea Change Plan.

Purpose of this report

The purpose of this document is to assess the Sea Change Plan's proposals for marine protection in the Hauraki Gulf Marine Park and to summarise the advice developed by the Department of Conservation (DOC) and Fisheries New Zealand (FNZ) as part of the development of the Government Response Strategy to the Sea Change Plan.

The report is structured to:

- Provide a brief overview of the Hauraki Gulf Marine Park and the existing MPAs it contains.
- Provide an overview of the process, outcomes, objectives and proposals made through the Sea Change Plan for MPAs.
- Describe how agencies carried out the assessment of the Sea Change Plan proposals.
- Provide a detailed assessment of each site proposed within the Sea Change Plan, and how proposals align with the Sea Change Plan's objectives for marine protection and with national best-practice MPA design principles.
- Provide agencies' response on which proposals to progress, including where any modifications could improve overarching biodiversity protection and restoration outcomes.
- Provide an indicative assessment of affected users and potential associated costs.
- Provide an assessment of how the proposed sites, along with existing MPAs, contribute to a representative network of MPAs.

Glossary

Buffer – an area adjacent to a habitat and/or MPA that has management that lessens the impact of activities on the habitat/MPA. Establishing a 'buffer' around a marine reserve stems from the concept of reducing the pressure on the boundary of the reserve. For most marine reserves this pressure is exerted by extractive uses. That is, fishing the reserve boundary (fishing-the-line) results in an impact on the reserve efficacy, whereas a buffer mitigates this to some degree.

Benthic – community or organisms that live on, in or near the seabed.

Biogenic habitats – habitats created by plants and animals. Biogenic habitats can provide important ecosystem services, tend to have higher biodiversity values and are also generally sensitive to disturbance. Biogenic habitats are well recognised in terms of ecological value and benefits[1].

Edge effects – the negative effects on an MPA due to the use of the surrounding/adjacent area.

Intertidal – the area of the seashore between the high and low tide mark.

Physical habitats – within this report 'physical habitat' refers to the habitat classification derived from the New Zealand MPA Policy guidelines[2] methodology. It utilises depth, substrate type and exposure to determine different habitat types. For the Hauraki Gulf, this habitat classification was updated in 2014 (Jackson 2014) and forms the basis for habitat representation.

Marine protected area (MPA) – an area of the marine environment especially dedicated to, or achieving, through adequate protection, the maintenance and/or recovery of biological diversity at the habitat and ecosystem level in a healthy functioning state (DOC & MFish 2005[3]).

Marine reserve – within this report 'marine reserve' refers to reserves established under the Marine Reserves Act 1971. To distinguish between existing marine reserves from proposals in the Sea Change Plan (which are termed marine reserves but may not be consistent with the Marine Reserves Act 1971), 'high protection areas' are used as a substitute in agencies' response to the proposals.

Network of MPAs – collection of individual MPAs operating cooperatively and synergistically, at various spatial scales, and with a range of protection levels, in order to fulfil ecological aims more effectively and comprehensively than individual sites could alone. Networks aim to also deliver on social and economic benefits, though the latter may only become fully developed over long timeframes as ecosystems recover[4].

Subtidal – the area below the intertidal zone, which is submerged most of the time except during extreme low tides.

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[1] Morrison, M.; Consalvey, M.; Berkenbusch, K.; Jones, E. 2008: Biogenic habitats and their value to New Zealand fisheries. *Water and Atmosphere 16(4)*: 20–21. https://niwa.co.nz/sites/niwa.co.nz/files/import/attachments/biogenic.pdf (accessed 22 October 2020).

[2] Ministry of Fisheries and Department of Conservation. 2008: Marine Protected Areas: Classification, Protection Standard and Implementation Guidelines. Ministry of Fisheries and Department of Conservation, Wellington, New Zealand. 54 p.

[3] DOC & MFish 2005: Marine protected areas: policy and implementation plan. Department of Conservation and Ministry of Fisheries, Wellington.

[4] Based on International Union for the Conservation of Nature (IUCN) definition (WCPA/IUCN 2007).

The Hauraki Gulf Marine Park

Background

The Hauraki Gulf Marine Park (HGMP) covers 14 000 km^2 of sea, including the Hauraki Gulf / Tīkapa Moana (hereafter Hauraki Gulf), Waitematā Harbour, Firth of Thames and east coast of the Coromandel Peninsula out to the 12 nautical mile territorial sea boundary (Fig. 1). It is characterised by many bays, estuaries and harbours, the shallow sea of the inner Hauraki Gulf and Firth of Thames, down to deeper waters marking the continental shelf slope. The complexity and nature of the physical environment underpins the diverse and highly productive marine ecosystem. Appendix 3 of the Sea Change Plan provides a detailed description of the distribution of physical habitats and associated biodiversity values in the HGMP, as well as an overview of the history of usage of the park and the multiple threats putting the HGMP ecosystem under stress.

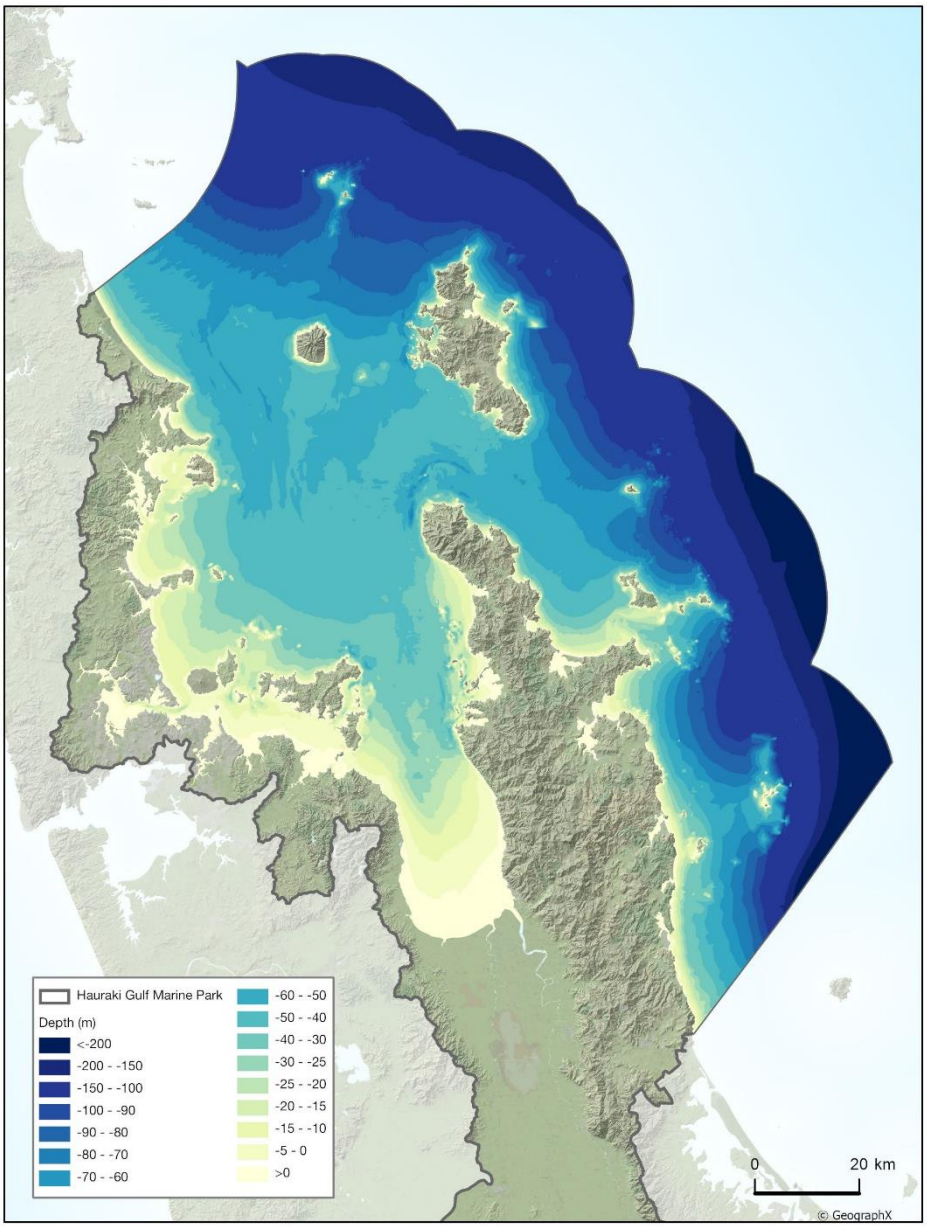

Figure 1. Extent of Hauraki Gulf Marine Park waters, including depth.

The marine environment of the Hauraki Gulf

Environmental factors (depth, temperature and exposure), habitats and associated species, and the influence of land are not uniformly distributed across the HGMP. Four indicative subregions with generally different characteristics have been identified (based on Paul (1968) and expert knowledge).

Outer Hauraki Gulf (oceanic influence, exposed, >40 m deep waters): The 40 m depth contour marks a change in marine communities, with environmental variables primarily driven by oceanic processes associated with the subtropical East Auckland Current and predominant winds. Northerly and westerly winds drive seasonal upwelling along the continental shelf break in winter and spring. Seasonal temperature variability is lower than the inner Hauraki Gulf and coastal areas. Nutrient rich water is driven onto the shelf by easterly winds in summer and drives pelagic production in the Hauraki Gulf. La Niña conditions further complicate the hydrological processes by shutting down seasonal upwelling. This subregion encompasses most larger islands and surrounding waters found towards the outer HGMP, i.e. Mokohinau Islands, Te Hauturu-o-Toi / Little Barrier Island, Great Barrier Island (Aotea Island), Cuvier Island (Repanga Island) and the Aldermen Islands.

Inner Hauraki Gulf (coastal, sheltered, <40 m): shallow and sheltered inner Hauraki Gulf waters spanning from the Cape Rodney to Cape Colville line south. The inner Hauraki Gulf has marked seasonal temperature ranges. The inner Hauraki Gulf is a unique embayment within the New Zealand context, encompassing many harbours and estuaries, and the Firth of Thames, surrounded by highly urbanised and modified catchments. This area is characterised by a considerable inflow of land-originated sediments and nutrients and is generally considered more degraded than other more open water settings. The inner Hauraki Gulf is the most highly used body of water in New Zealand.

Western Hauraki Gulf coastal exposed (coastal, exposed, <40 m): exposed mainland coast north of the inner Hauraki Gulf and extending up to the northern boundary of the HGMP. This is the smallest of the HGMP subregions and is probably more comparable to the Northland coast.

Eastern Coromandel Inshore (coastal, exposed, <40 m): coastal area extending from the northern tip of Coromandel Peninsula to the southernmost extent of the HGMP. This area is characterised as rugged and more open and exposed than the western side of Coromandel. It includes many harbours, estuaries and coves. The Mercury Islands are more influenced by coastal processes compared to nearby offshore islands (i.e. Cuvier Island/Repanga or the Aldermen Islands), which are more influenced by oceanic processes.

Existing marine protected areas – the MPA network's foundational building blocks

There are six existing marine reserves within the HGMP (established under the Marine Reserves Act 1971), which cover 0.28% of the HGMP area. In addition, there are four cable protection zones (CPZs)[5] that are recognised under the MPA Policy[6] as Type 2 MPAs and cover 6.3% of the HGMP (Table 1; Fig. 2).

Table 1. Existing marine protected areas in the Hauraki Gulf Marine Park. MPA = marine protected area, CPZ = cable protection zone.

SITE	MPA TYPE	YEAR CREATED	AREA (km^2)
Cape Rodney-Okakari Point	Marine reserve	1971	5.6
Tāwharanui	Marine reserve	2011	4.0
Long Bay-Okura	Marine reserve	1995	9.6
Motu Manawa–Pollen Island	Marine reserve	1995	5.0
Te Matuku	Marine reserve	2005	6.9
Whanganui A Hei (Cathedral Cove)	Marine reserve	1992	8.8
Hauraki Gulf CPZ	Type 2 MPA	2009	850.0
Kawau Island CPZ	Type 2 MPA	2009	3.8
Whangaparaoa Peninsula CPZ	Type 2 MPA	2009	0.7
Great Barrier Island CPZ	Type 2 MPA	2009	23.7

[5] The CPZs are established under the Submarine Cables and Pipelines Protection Act 1996 through an Order in Council (Submarine Cables and Pipelines Protection Order 2009). The CPZs within the Hauraki Gulf effectively prohibit all fishing that involves towing or suspending gear from a vessel, from the low water mark.

[6] DOC & MFish 2005. Marine protected areas: policy and implementation plan. Department of Conservation and Ministry of Fisheries, Wellington.

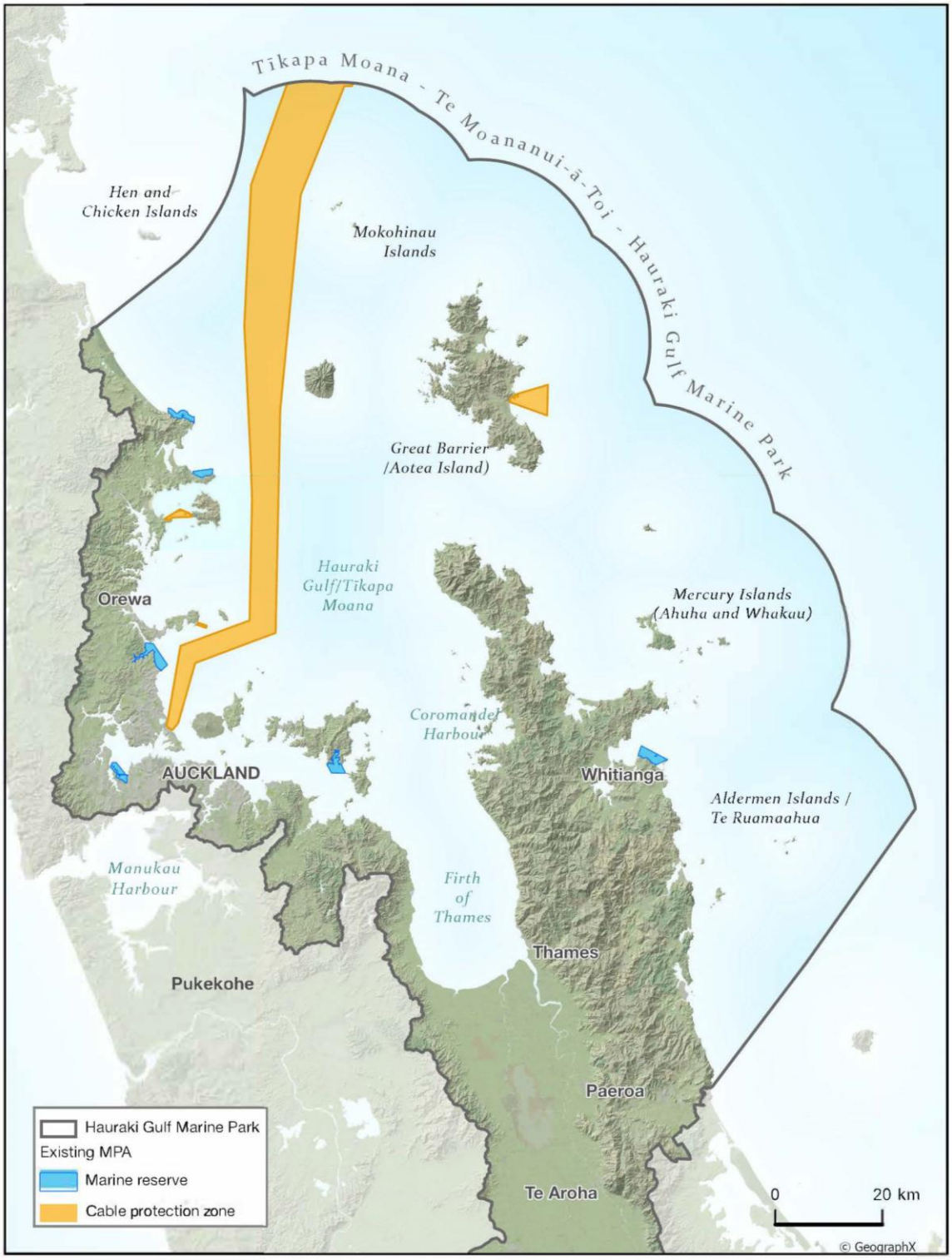

Figure 2. Existing marine protected areas (MPAs) in the Hauraki Gulf Marine Park.

The Sea Change – Tai Timu Tai Pari Plan proposals for marine protection

The Sea Change Plan provides a detailed description on the role of MPAs in biodiversity protection. It further remarks that although not part of formal fisheries management frameworks in New Zealand, MPAs are likely to be a critical part of the toolbox for moving towards more ecosystem based (fisheries) management.

The MPA section of the Sea Change Plan proposes to ***establish a network of MPAs to assist the protection and passive restoration of at risk, high value and representative ecosystems in the HGMP and to boost the abundance of fish stocks.***[7] To this end, the Sea Change Plan proposes a 'nested approach to MPA establishment, recognising that some areas should be heavily restricted in the uses allowed to best enable ecosystems to recover and these high protection areas should be nested within larger areas that allow greater levels of recreational and commercial activity whilst protecting the benthic habitats from damaging ecosystems.'

MPA tools defined in the Sea Change Plan

Type 1 MPA – no take marine reserves (other than for customary purposes on a case-by-case basis by special permit)[8]
Purpose: To protect, enhance and restore the full range of marine communities and ecosystems and outstanding, rare, distinctive or nationally important marine habitats in order to protect the mauri of the Hauraki Gulf.

Stated Sea Change Plan objectives for no-take marine reserves are:

- Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life.
- Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna.
- Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020.
- Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience.
- Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the HGMP, including progressing the knowledge on impacts of human activities.
- Provide reference areas for marine research, monitoring and education.
- Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism.

[7] See Sea Change – Tai Timu Tai Pari Plan, p. 117. https://www.seachange.org.nz/read-the-plan
[8] Note: While these areas are referred to as marine reserves in the Plan, they are not necessarily consistent with the no-take status and purpose of marine reserves currently present in New Zealand legislation and policy.

Type 2 MPA benthic protection[9]

Purpose: maintain, restore and protect ecologically important habitat while allowing for compatible uses.

Stated Sea Change Plan objectives for benthic protection areas are:

- Identify, restore and protect key habitats (e.g. biogenic habitats) in order to maintain the integrity of ecosystems and their functioning by 2020.
- Significantly increase the productivity of the HGMP by 2035.
- Exclude activities (e.g. dredging, bottom trawling, Danish seining, dumping and sea bed mining) that damage habitats by 2025.
- Potentially serve as a buffer to areas with a higher level of protection (thereby implementing a nested approach).
- Potentially support restoration projects.

Special Management Areas (SMAs)

Commercial fishing would be banned in these areas, but restricted recreational fishing would be allowed. SMAs are designated as protected for almost all species and habitats, while allowing for carefully managed and targeted sport fishing of several high-value sport fish species under a 'low volume, high value' harvest regime. Their dual purpose would be to protect the integrity and healthy functioning of the system, while also allowing for high-value economic activity (sports fishing) to create economic returns. Other high-value economic activities, such as diving and eco-tourism, would also be encouraged.

Ahu Moana: mana whenua and community co-management of local near shore areas

Ahu Moana initiatives provide for strong kaitiakitanga and empowered mana whenua and local communities. The role of central and local government is to support mana whenua and communities to achieve their jointly held goals for positive environmental and fisheries changes in locally managed nearshore areas. Conservation or fisheries objectives that mana whenua and local communities may have for their local areas could require restrictions on particular harvest methods or the temporary closure of areas to allow species or habitat restoration. Ahu Moana initiatives could be applied in areas where it would complement or enhance other established methods such as MPAs.

Where required and appropriate, existing planning, statutory and legislative tools and processes, such as those under the Marine Reserves Act 1971 and the Fisheries Act 1996 (e.g. mahinga mātaitai (traditional food gathering area) reserves, taiāpure (local fisheries) and rāhui (temporary closures)), will be used to take Ahu Moana initiatives forward. That will ensure that, for customary fisheries that have been negotiated with Treaty partners, the integrity and value flowing from Treaty settlements are preserved, and it will recognise the government's obligations to Treaty partners established through those settlements. Alongside use of these tools, agencies will work with mana whenua and local communities to find ways to make these tools work more effectively to deliver the outcomes mana whenua and community are seeking in their local areas.

Agencies acknowledge the contribution towards marine protection by local initiatives and are supportive of this. The Ahu Moana concept is further developed in Section 6.8 of the Government Response Strategy.

[9] Note: While these areas are referred to as type 2 MPAs in the Plan, they are not necessarily consistent with the definition of type 2 MPAs in the New Zealand MPA Policy.

Sea Change MPA Proposals

There were 15 different locations identified in the Sea Change Plan as a priority for protection (Table 2; Fig. 3), some with multiple MPAs proposed. While some areas had consensus agreement on the extent and type of protection, other areas could not be agreed upon and different options were proposed. Ultimately, there were two scenarios presented.

Commonality between the two scenarios existed for nine marine reserves and four seafloor protection areas (i.e. both scenarios included these 13 proposals in full). A further four marine reserves were proposed in the same general location by both scenarios but were substantially different in size. Four additional seafloor protection areas and/or SMAs were proposed by the two scenarios over the same general areas, again with substantial differences in size, but also the level of protection (in relation to the SMAs). Scenario 1 also proposed a seafloor protection area within an estuary, where Scenario 2 did not.

Table 2. Locations identified for protection. Yellow indicates a marine reserve was proposed at that location, green a type 2 MPA and red a special management area.

MAP	LOCATION NAME	SCENARIO 1	SCENARIO 2
1	Mokohinau Islands		
2	Te Hauturu-o-Toi / Little Barrier & Craddock Channel		
3	Cape Colville		
4	Aldermen Islands / Te Ruamaahua		
5	Mercury Islands – Ahuahu & Whakau		
6	Whanganui-a-Hei (Cathedral Cove) marine reserve		
7	Slipper Island / Whakahau		
8	Cape Rodney Okakari Point (Leigh) marine reserve		
9	Whangateau Harbour		
10	Kawau Bay		
11	Tiritiri Matangi		
12	The Noises		
13	Rangitoto & Motutapu		
14	Firth of Thames & Rotoroa Island		
15	Motukawao Islands		

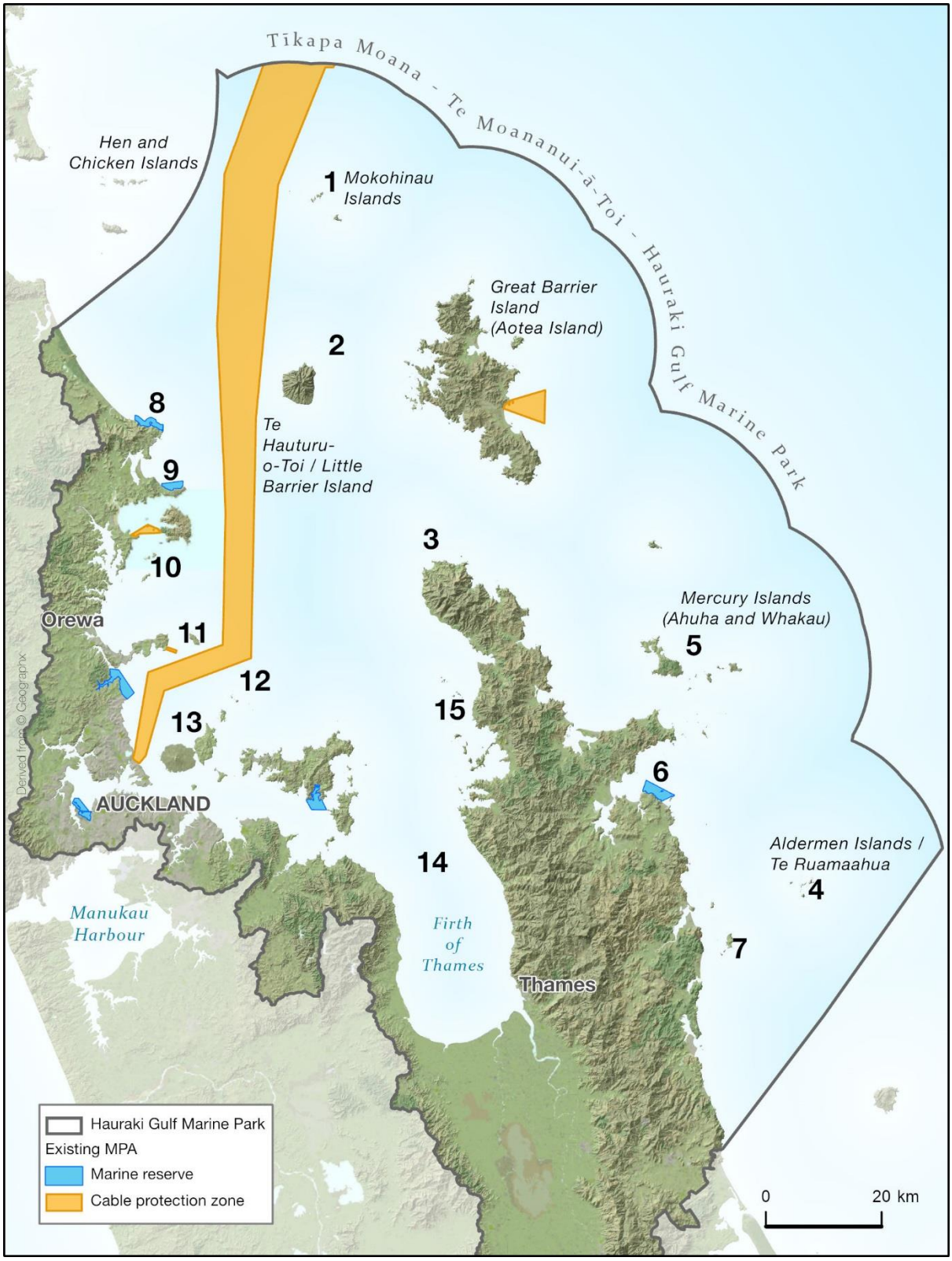

Figure 3. Location of Sea Change MPA proposals. See Table 2 for key to numbering.

Agency approach towards assessing the Sea Change MPA proposal

DOC and FNZ have sought to follow an evidence-based approach towards assessing the Sea Change MPA proposals. An assessment is provided on how the Sea Change MPA proposals align with the outcomes and objectives for area-based marine protection in the Sea Change Plan, and the contribution by proposals towards an ecologically coherent network of MPAs for the HGMP. Agencies' assessment of proposals, and advice underpinning our response, were based on several principles:

- Ensuring the best possible biodiversity benefits are provided for by those Sea Change Plan proposals we want to further engage on.
- Where possible, reduce impacts on existing users/fisheries without compromising biodiversity outcomes.
- Pragmatic considerations such as ease of compliance.
- That individually and collectively the proposals progressed contribute towards an ecologically coherent network of MPAs in the HGMP.
- Alignment between Sea Change Plan objectives for MPAs and outcomes sought (including defining site-specific objectives for each proposal).
- Alignment between the Sea Change Plan proposals and the MPA Policy.[10]

Best available information

Best available information encompasses all information, including scientific data, that is available to the MPA planning and/or evaluation process. A large volume of data was collated for use in the Sea Change – Tai Timu Tai Pari process by partner agencies, to give assurance that the data were the most up-to-date and accurate data possible (publicly accessible on seachange.seasketch.org, and listed in Appendix 1. Information relating to the Hauraki Gulf has continued to be developed since the Sea Change Plan was published, and agencies have undertaken best possible efforts to ensure the assessment and advice is based on the current best available information.

MPA network design

Agencies sought to align assessments with best available information on ecological design principles for MPAs and MPA networks. A range of international best-practice documents and agreements to which New Zealand is a party provide guidance for the establishment of MPA networks, all of which share some common elements. The Convention on Biological Diversity, United Nations Environment Programme and the International Union for Conservation of Nature (IUCN) all provide examples of established principles for designing MPA networks and provide advice on the network design process.

The following best-practice principles guide the design of the proposed network:

- Representation: includes elements of biodiversity (from genes to ecosystems) and associated environments that are characteristic of the larger marine area.
- Replication: an example of a given feature is protected at more than one site within a given biogeographic area.
- Connectivity: allows for larvae, juveniles and species to move from one protected site to another and to benefit one another.

[10] DOC & MFISH 2005. Marine protected areas: policy and implementation plan. Department of Conservation and Ministry of Fisheries, Wellington.

- Adequacy: each site is suitably placed and sufficiently large to protect the species, populations and ecology within it.
- Viability: each site can be self-sustaining even in the face of natural and human-induced variations.

The above best-practice principles determine if and how a proposal contributes towards an ecologically coherent network of MPAs. A detailed description of the above is provided in 'New Zealand Marine Protected Areas – Principles of Network Design' document[11].

Fisheries impacts

An assessment of the potential impacts on commercial and recreational fisheries of the final set of proposed protection areas has been undertaken by FNZ. The results have been summarised in Part 3 of this report and also described for each protection area in the 'activities that would be affected by the high protection and seafloor protection areas' section for each site.

These site-by-site summaries of the impacts should be treated with caution due to constraints associated with the best available information for some impacted methods (such as potting, set netting and dredging) and the assessment method used. The method and information used for this assessment is described in more detail in Part 3 of this report.

[11] New Zealand Marine Protected Areas – Principles for Network Design. Department of Conservation, Ministry for the Environment and Fisheries New Zealand (2019)

Part 1 – Site-by-site assessment of Sea Change MPA proposals and Agency response

1. Mokohinau Islands

Site description

The Mokohinau Islands archipelago consists of two main islands, Burgess Island (Pokohinu) and Fanal Island (Motukino), as well as many smaller islets, rock stacks and submerged reefs. It is located nearly 50 km from the mainland and approximately 22 km northwest of Great Barrier Island (Aotea Island). Almost all the islands are administered by DOC as nature reserves. Most of Burgess Island (Pokohinu) is scenic reserve with the rest administered as a lighthouse reserve. The three larger islands of the Flax Islands (the group that includes Burgess Island (Pokohinu)) have been extensively modified by human habitation and lack forest cover. In contrast, Fanal Island (Motukino) to the south supports diverse forested areas containing species such as karaka, pūriri, kohekohe, tawāpou, pigeonwood and nīkau. Seabirds breed on most of the islands and stacks, and the islands support the highest diversity of seabird species within the HGMP, making a major contribution to the park's reputation as an internationally recognised seabird hotspot.

Marine biodiversity values

The islands' distance from the mainland and Great Barrier Island (Aotea Island) means that the surrounding marine environment is little affected by runoff of terrestrial sediments and other contaminants. The complexity of the seafloor and influence of the subtropical waters of the East Auckland Current result in high benthic and pelagic biodiversity. High biological productivity driven by seasonal upwelling along the edge of the continental shelf sustain large populations of pelagic species, including migratory tunas, marlin and even manta rays. Biogeographically the marine species assemblages found at the Mokohinau Islands are comparable to those found at other northeast North Island offshore islands, such as the Poor Knights, Aldermen, Mayor (Tuhua) and Whakaari/White Islands (Berben & McCrone 1988).

Intertidal and subtidal habitats occurring around the islands include boulder beaches, cliffs and near-vertical rock walls, isolated pinnacles and reefs rising abruptly from deep water (70–100 m depth), complex systems of channels between islands and rock stacks, extensive areas of shallow rocky reef, semi-sheltered coves, sandy bottoms and deep muddy sediments. Due to the clear oceanic water surrounding the islands, common kelp (*Ecklonia radiata*) grows down to depths of more than 30 m. Encrusting invertebrate assemblages are diverse due to the lack of sedimentation and include numerous sponges, bryozoans, anemones, hard and soft corals and small turfing seaweeds. Black corals and gorgonians occur on deep reefs. The complexity of the seafloor also elevates the diversity of fishes found around the islands. These are a mixture of widespread and subtropical species and include snapper (*Pagrus auratus*), kingfish (*Seriola lalandi*), numerous wrasses and triplefins, and large schools of pink maomao (*Caprodon longimanus*) and blue maomao (*Scorpis violacea*), trevally (*Pseudocaranx dentex*), kōheru (*Decapterus koheru*) and two-spot demoiselles (*Chromis dispilus*). Hāpuku (*Polyprion oxygeneios*), boarfishes and Lord Howe coralfish (*Amphichaetodon howensis*) occur on the deep reefs, and during summer bronze whaler (*Carcharhinus brachyurus*) and mako sharks (*Isurus oxyrinchus*) are common.

Other notable ecological features include:

- High densities of small eels, red bandfish (*Cepola macrophthalma*) and the feather star *Argyrometra mortenseni* on deep muddy sediments, a potentially unique species assemblage within the HGMP but reported elsewhere at outer shelf depths between North Cape (Otou) and the Bay of Islands (Morrison et al. 2016).

- Adult and juvenile hāpuku still occur on reefs deeper than 40 m around the islands.
- Numerous sub-tropical species of fishes and invertebrates that are either rare or absent from coastal sites within the HGMP (Berben & McCrone 1988).
- High diversity of algae compared to elsewhere in the HGMP (Berben & McCrone 1988).
- Relatively unmodified intertidal and subtidal reef systems due to low levels of sedimentation and the absence of trampling and introduced predators such as rats.

Direct pressures

Soft sediment habitats around the islands and Simpson Rock are susceptible to bottom trawling. This fishing method can destroy vulnerable epifauna, resuspend fine sediments and affect nutrient recycling by disturbing surface sediments and killing important bioturbating organisms such as irregular sea urchins (Echinoidea: Euechinoidea: Irregularia). The actual effects of trawling on the seabed around the Mokohinau Islands has not been studied and little information is available on the sea floor assemblages in this part of the Hauraki Gulf. Static gear, such as pots, hooks, lines, nets and ropes have the potential to entangle, damage and dislodge sensitive species such as black corals. Whilst the individual impact of a single fishing operation may be small, the cumulative damage can be significant. Due to the slow growth rates of some species, they may take many decades to recover.

Kina (sea urchin) barrens occur at various locations around the Mokohinau Islands, indicating potential ecosystem effects from existing pressures.

Hāpuku is a popular commercial and recreational target species and was formerly caught in large numbers throughout much of the inner and outer Hauraki Gulf. Commercial and recreational fishing for hāpuku on reefs around the Mokohinau Islands can have knock-on ecosystem effects because hāpuku is a top-level predator on reef systems. It is also a large, slow growing species, making it vulnerable to overfishing.

Existing management

The Mokohinau Islands are a popular recreational fishing and diving destination and are commercially fished for rock lobster and a variety of finfish. Commercial fishing regulations[12] include a set netting prohibition within 1 km (0.5 nautical miles) of all islands, islets and rocks of the Mokohinau Islands group (including Simpson Rock), and a prohibition on trawling by vessels over 46 m length. Recreational set netting restrictions mirror the commercial set netting ban area[13].

The Mokohinau Islands and Simpson Rock are both classed as marine Significant Ecological Areas in the Auckland Unitary Plan (Auckland Council 2017).

Sea Change Plan proposals for the Mokohinau area

The Stakeholder Working Group (SWG) agreed that this area would benefit from protection, but a decision was not reached on a single size, location or shape of MPA. As a result, the SWG proposed two options for MPAs within the Mokohinau Islands area (Fig. 4; Table 3). Scenario 1 includes a larger marine reserve nested within a Type 2 benthic protection area, while Scenario 2 included a smaller marine reserve with an SMA. The alternative management regimes are intended to meet the different specific objectives associated with marine reserves and Type 2 MPAs, as described below.

[12] See http://www.legislation.govt.nz/regulation/public/1986/0216/43.0/whole.html#DLM105923 (accessed 23 October 2020).

[13] See https://www.mpi.govt.nz/dmsdocument/7275-auckland-kermadec-recreational-fishing-rules-printer-friendly (accessed 22 October 2020).

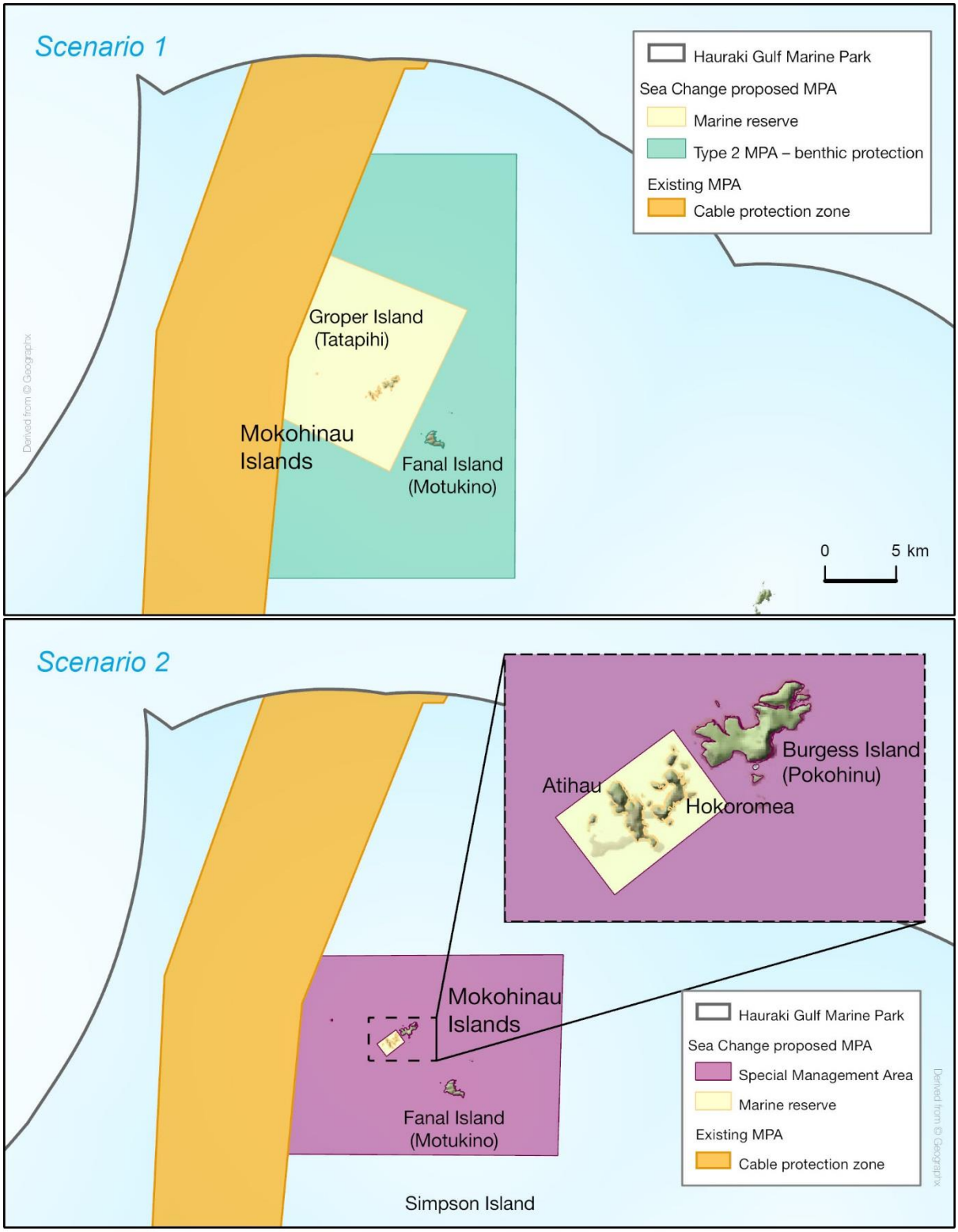

Figure 4. Sea Change proposals for the Mokohinau Islands.

Table 3. Description of Sea Change Plan scenarios for the Mokohinau Islands. HGMP = Hauraki Gulf Marine Park, MPA = marine protected area.

SCENARIO 1	SCENARIO 2
Marine reserve Scenario 1 (Sea Change Plan, p. 268) includes a marine reserve centred around Burgess Island (Pokohinu), Atihau Island and Hokoromea Island, spanning to the Cable Protection Zone to the west. It includes Groper Island (Tatapihi) to the west of the main island group, and deep reefs to the north. The proposal includes 118 km^2 of marine area (0.8% HGMP), with a minimum width of 10 km and approximately 16 km of island coastline. **Type 2 MPA – Benthic protection** The proposed marine reserve is nested within a larger benthic protection area (Sea Change Plan, p. 268) designed to act as buffer and protect habitats associated with the shallow to deep reef system of the archipelago. It includes Fanal Island (Motukino), extends to deep (>150 m) reef habitat in the north, and Simpson Rock to the south. Exclusion of all fishing methods that impact benthic habitats is proposed. The benthic protection area includes 317 km^2 of the marine area (2.3% HGMP), with a minimum width of 16 km and 7.2 km of island coastline.	**Marine reserve** Scenario 2 (Sea Change Plan, p. 269) includes a marine reserve centred around Hokoromea and Atihau Islands. The proposal includes 1 km^2 of marine area (0.01% HGMP), with a minimum width of 1 km and includes approximately 8 km of island coastline. **Special Management Area** The proposed marine reserve is nested within a Special Management Area to act as buffer and protect species and habitats associated with the Mokohinau Islands (including Groper Island (Tatapihi)) via the exclusion of commercial fishing and restriction of recreational fishing. The proposal includes 238 km^2 of marine area (1.7% HGMP), with a minimum width of 14 km and includes approximately 15 km of island coastline.

Agency assessment of habitats and ecologically significant features that would be protected in Scenario 1

Marine reserve

The proposed marine reserve in Scenario 1 would provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, 11 physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats), including shallow to deep rocky reefs and associated species (e.g. kelp, rock lobster, a variety of subtropical reef fish and hāpuku), and soft sediments providing substrate for a variety of sponges and corals (including black coral (*Antipathes* sp.)).

Agencies note that uncertainty remains regarding a few of the physical habitats present in the proposal being of viable size (i.e. to meaningfully afford protection to associated species and ecological processes). Future research and monitoring will allow this uncertainty to be addressed, should this proposal be implemented.

Type 2 MPA – Benthic Protection

In order to meet the objectives for the Type 2 MPA proposal at this site to protect the seafloor features, restrictions would be required on the following:

- Mobile bottom fishing methods (all dredging, bottom trawling and Danish seining).
- All fishing methods that interact substantially with the seafloor (including potting, set netting and bottom longlining).

These fishing methods are considered incompatible with the objective to protect sensitive species that this site is known for, such as black coral, and therefore need to be restricted.

The proposal would include nine physical habitat types that would be afforded some degree of protection. Those features sensitive to disturbance would be protected from physical displacement, but wider ecological benefits are less likely to occur. Further assessment based on the levels of extraction from remaining fishing methods, including from recreational extraction, would need to be undertaken to determine if the level of protection could allow for the maintenance and recovery of wider ecosystem values.

Combined

Overall, given the high level of protection afforded by the marine reserve, and the additional protection to seafloor habitats and species by the type 2 MPA, it is considered that this proposal at the Mokohinau Islands contributes to the overarching marine protection objectives of the Sea Change Plan.

Agency assessment of habitats and ecologically significant features that would be protected in Scenario 2

Marine reserve

The size of the proposed marine reserve in Scenario 2 is unlikely to be effective in meeting the objectives of the Sea Change Plan. The small size of the habitat patches included within the proposed marine reserve, along with the poor reserve design where reef is bisected by the reserve boundaries, would make the reserve unviable. That is, while the area would include 11 physical habitat types (see Appendix 3 for full list of habitats), this proposal would not contribute anything of significance beyond what the proposed SMA would achieve.

Special management area

The SMA proposal would limit all commercial fishing and most recreational fishing (with the exception of allowing for 'low volume/high value' catch). Given that the proposal includes a relatively high level of protection, it is considered that the proposal would enable the protection and restoration of habitats and associated biodiversity. The SMA as proposed would likely afford protection to 11 physical habitats (see Appendix 3 for full list of habitats), including shallow to deep rocky reefs and associated species (e.g. kelp, rock lobster, a variety of subtropical reef fish and hāpuku), and soft sediments providing substrate for a variety of sponges and corals (including black coral).

Combined

Despite the ineffectiveness of the proposed marine reserve, the relatively high level of protection afforded by the SMA suggests that the proposal at the Mokohinau Islands under Scenario 2 would contribute to the overarching marine protection objectives of the Sea Change Plan. However, given the uncertainty around the specific details around what an SMA would allow, ongoing monitoring would be required to ensure the level of protection continued to meet the Sea Change Plan objectives.

Agency assessment of proposals against Sea Change Plan objectives

Assessment against Sea Change Plan objectives

Tables 4 & 5 provide the objectives for the different MPAs (marine reserves and Type 2 MPAs) and an assessment on how well each scenario meets the MPA objectives.

Table 4. Assessment of Mokohinau Islands marine reserve proposals against Sea Change Plan objectives.

MARINE RESERVE SPECIFIC OBJECTIVES	SCENARIO 1	SCENARIO 2
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Would allow recovery to meet this objective	No
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	A number of significant features are identified at this site that would contribute to this objective	No
Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Would provide protection for several habitat types, would contribute to this objective	No
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	Would contribute to this objective	No
Provide reference areas for marine research, monitoring and education	Would contribute to this objective	No
Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism	Would contribute to this objective by allowing environmental restoration (limited as remote)	No

Table 5. Assessment of Mokohinau Islands Type 2 marine protected area benthic protection and special management area proposals against Sea Change Plan objectives.

PLAN TYPE 2 MARINE PROTECTED AREA SPECIFIC OBJECTIVES	SCENARIO 1 – TYPE 2 MARINE PROTECTED AREA	SCENARIO 2 – SPECIAL MANAGEMENT AREA
Identify, restore and protect key habitats (e.g. biogenic habitats) in order to maintain the integrity of ecosystems and their functioning by 2020	Contributes to objective by providing protection to soft sediment biogenic and reef features from physical disturbance	Contributes to objective by providing protection to soft sediment biogenic features and reef ecosystems
Significantly increase the productivity of the Hauraki Gulf Marine Park by 2035	Potentially protects key habitats important for fisheries productivity	Potentially protects key habitats important for fisheries productivity
Exclude activities (e.g. dredging, bottom trawling, Danish seining, dumping and sea bed mining) that damage habitats by 2025	Contributes to objective	Contributes to objective
Potentially serve as a buffer to areas with a higher level of protection	Partially. Reduces edge effects on the reserve boundary by	Theoretically. Reduces edge effects on the reserve

(thereby implementing a nested approach)	reducing some fishing pressure	boundary by reducing fishing pressure (but as noted, marine reserve itself is ineffective)
Potentially support restoration projects	Potentially. But no restoration projects are targeted for the area	Potentially. But no restoration projects are targeted for the area

The main contribution to overall ecosystem protection across the two scenarios would be from the marine reserve in Scenario 1 and the SMA in Scenario 2. The marine reserve in Scenario 2 is too small to provide effective protection and is not supported by the agencies.

Both scenarios contribute to representing 11 physical habitat types overall. However, Scenario 2 proposals have an overall lower level of protection (i.e. SMA compared to the marine reserve in Scenario 1).

Agency response to Sea Change Plan proposal

Agencies consider that the biodiversity values associated with the islands – together with the relative remoteness and good water quality – justify area-based protection. Area-based protection for the Mokohinau Islands has been previously considered, including by the Ministry of Agriculture and Fisheries (now Ministry for Primary Industries) (MAF 1985), Land Information New Zealand (LINZ) (Sewell 1985) and DOC (1995).

The marine reserve in Scenario 1 is of suitable size to likely be effective at providing for the maintenance and recovery of ecological systems, natural species composition and trophic linkages.

Scenario 1 provides better overall biodiversity benefits compared to Scenario 2, primarily due to the higher protection afforded by the marine reserve in Scenario 1, whereas the marine reserve in Scenario 2 is considered ineffective and does not contribute to objectives.

The SMA proposal in Scenario 2 would also afford effective protection, but agencies consider that the combination of a marine reserve and a larger seafloor protection area proposed in Scenario 1 would meet the objectives of the Sea Change Plan better than a single SMA (noting that the marine reserve in Scenario 2 is not supported).

As such, the agencies recommend progressing both proposals under Scenario 1.

Modifications to proposal

No modifications to this proposal are suggested.

Alignment with existing legislation and policy

While the proposed marine reserve in Scenario 1 offers a high level of protection, it is unlikely to be consistent with the Marine Reserves Act 1971, as the intention is to make provision for customary practises. As such, the proposal being taken forward to engagement with mana whenua will be defined as a **high protection area** rather than a marine reserve.

Given the restrictions provided under the proposed Type 2 MPA, agencies consider that the proposal would likely afford protection at a suitable level to provide for the maintenance and recovery of physical features and biogenic structures that support biodiversity. However, it does not fully meet the requirements for a Type 2 MPA under the MPA Policy as it is less likely to allow for the maintenance and recovery of wider ecological values due to ongoing extraction from remaining fishing methods, including from recreational fishing.

As such, the agencies consider that the Type 2 MPA proposed in the Sea Change Plan likely does not fully meet the definition of a Type 2 MPA under the MPA Policy, and it will be taken forward as a **seafloor protection area** (Fig. 5).

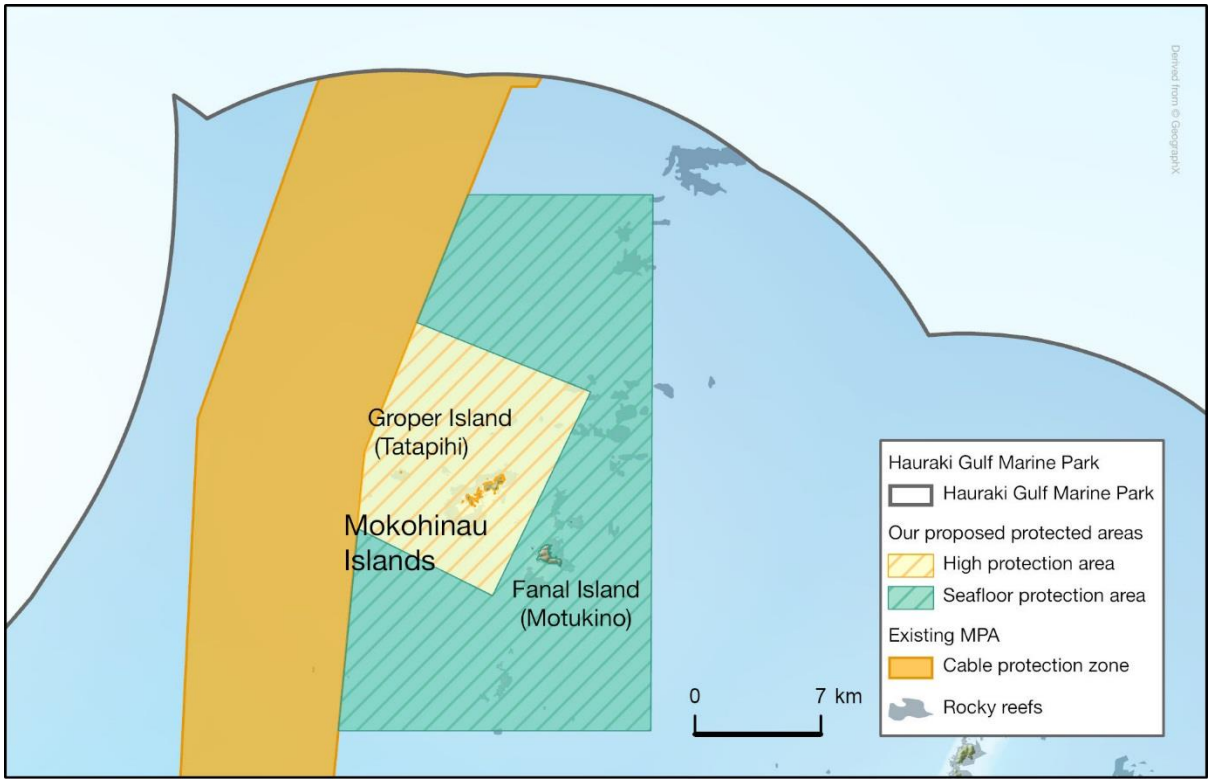

Figure 5. Preferred option for the Mokohinau Islands.

Activities that would be affected by the high protection and seafloor protection areas

A summary of the existing users that may be affected by the proposals is given in Table 6.

Table 6. Assessment of affected users for the proposed Mokohinau Islands high protection and seafloor protection areas.

ACTIVITY	HIGH PROTECTION AREA	SEAFLOOR PROTECTION AREA
Commercial fishing	All commercial fishing would be prohibited. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catch from the site to be $189,000 based on a total reported average yearly catch of 26.1 tonnes. The biggest displacement would be experienced by the snapper, blue mackerel and jack mackerel commercial fisheries, for each 7.5, 6.7 and 2.1 tonnes per year would be displaced, respectively. In terms of foregone revenue, the snapper and blue mackerel fisheries would be the most impacted.	Commercial fishing methods that impact the seafloor would be prohibited, such as trawling, Danish seining, dredging, potting, bottom long-lining and set netting. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $481,000 based on a total reported average yearly catch of 54.7 tonnes. The biggest displacement would be experienced by the snapper, trevally and John dory commercial fisheries, for each 27.3, 7.1 and 4.3 tonnes per year would be expected to be displaced, respectively. In terms of foregone revenue, the snapper and trevally fisheries would be the most impacted.

Recreational fishing	All recreational fishing would be prohibited. An analysis of the spatial distribution of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park indicates that 0.5% of recreational fishing effort and 0.14% and 0.53% of snapper and kahawai catch, would be displaced, respectively.	Recreational dredging, set netting and potting would be prohibited. The estimated impact on recreational fishing effort and catch for those methods cannot be quantified.
Mining and petroleum exploration	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	All commercial extractive activities would be prohibited. No current extraction of material is known to occur.	No additional restrictions from above.

2. Te Hauturu-o-Toi / Little Barrier Island and Cradock Channel

Te Hauturu-o-Toi / Little Barrier Island

Site description

Te Hauturu-o-Toi/Little Barrier Island Nature Reserve is New Zealand's first nature reserve, established in 1896, and is a safe haven for numerous threatened and endangered species, including the New Zealand storm petrel (*Fregetta maoriana*). The island is pest-free and covered by indigenous coastal and island vegetation, and often described as New Zealand's most intact ecosystem. The largest known dacite[14] volcano in New Zealand, the island displays many important geological features, particularly along its rugged northern coast (Lindsay & Moore 1995).

Marine biodiversity values

Marine habitats occurring in the waters off Te Hauturu-o-Toi / Little Barrier Island include semi-sheltered intertidal and subtidal rocky reef environments, with extensive subtidal sand and mud flats surrounding the island below approximately 18 m depth. North West Reef, located at 33–50 m depth within the Hauraki Gulf CPZ northwest of Te Hauturu-o-Toi / Little Barrier Island, is a series of low relief patch reefs surrounded by coarse sand. These reefs support a diverse encrusting assemblage characterised by crustose coralline algae, sponges, cup corals (*Monomyces rubrum* and *Culicia rubeola*), hydroids and bryozoans (*Steginoporella neozelanica*) (Shears & Usmar 2006; Jones et al. 2016). Smaller deep patch reefs located approximately 7 km north of the island form a part of another series, known as 'The Coral Patch,' extending northeast toward Simpson Rock and the Mokohinau Islands. Baited underwater video surveys of fish assemblages around the northern part of the island and the southern end of The Coral Patch recorded the highest fish species richness on the deep reef north of the island (Fig. 6, deep blue dots close to the 31.6° line). Species recorded there included carpet shark (*Cephaloscyllium isabellum*), school shark (*Galeorhinus galeus*), butterfly perch (*Caesioperca lepidoptera*), golden snapper (*Centroberyx affinis*) and splendid perch (*Callanthias australis*). The most diverse and heterogenous habitats were also associated with these deeper reefs. Sessile invertebrate species included black coral with commensal snake stars (*Astrobrachion constrictum*), encrusting sponges, ascidians and bryozoans (Howarth & Smith 2020).

[14] *Dacite* is a rock type usually found on continental crust above subduction zones, where a relatively young oceanic plate has melted.

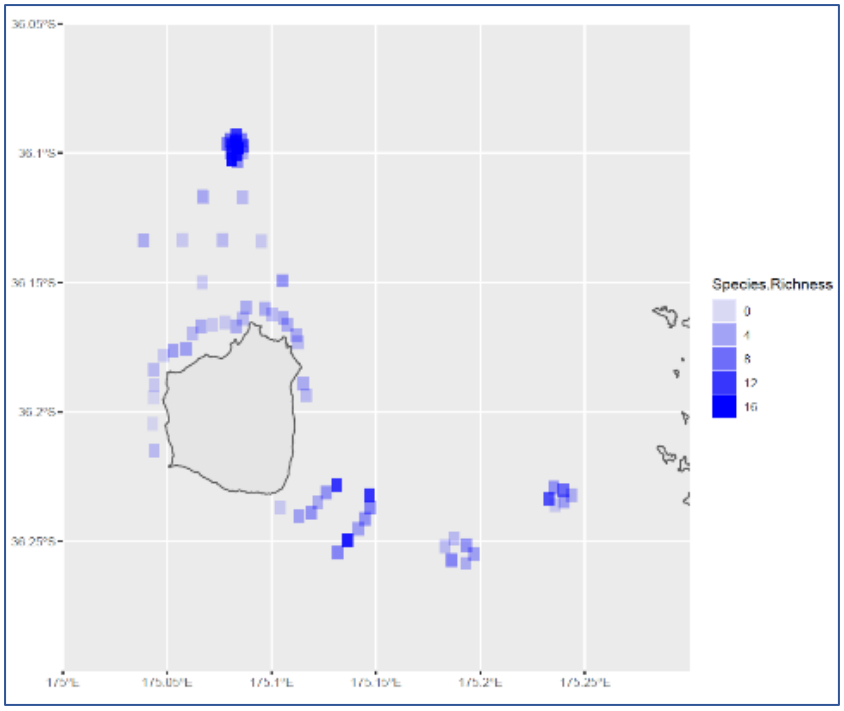

Figure 6. Species richness of demersal fishes observed with baited underwater video deployed in the vicinity of Cradock Channel and Te Hauturu-o-Toi/Little Barrier Island. Source: Howarth & Smith 2020. The area of high species richness to the north of the island is a small deep reef that occurs on the eastern boundary of the Type 1 MPA proposed in the Sea Change Plan. The Cradock Channel sites (those southeast of Te Hauturu-o-Toi/ Little Barrier Island) are within the proposed Type 2 MPA (see p. 37 below).

Shelly sand habitats close to the island support dense patches of amphipod tubes, small sponges, hydroids, ascidians, unidentified green algae and common kelp (Howarth & Smith 2020). Howarth & Smith (2020) observed few epifaunal organisms in video drops on deep muddy sand habitats north of the island (Fig. 7). Commercial scallop (*Pecten novaezelandiae*) grounds are found on the west and south. Extensive kina barrens occur on shallow reefs all around the islands (Nick Shears, University of Auckland, pers. comm.). Aggregations of smooth hammerhead sharks (*Sphyrna zygaena*) occur in summer.

Figure 7. Deep reef north of Te Hauturu-o-Toi/Little Barrier Island at 70 m *depth showing black coral (*Antipathes *sp.), commensal snake star (*Astrobrachion constrictum*), various encrusting sponges, carpet shark (*Cephaloscyllium isabellum*), butterfly perch (*Caesioperca lepidotera*) and splendid perch (*Callanthias australis*). Source: Howarth & Smith 2020.*

Direct pressures

Pressures on marine biodiversity around Te Hauturu-o-Toi/Little Barrier Island primarily involve fishing, including scallop dredging and trawling. Benthic impacts associated with bottom trawling and dredging include disturbance and removal of epibenthic and infaunal organisms, resuspension of sediments, homogenisation of the habitat and effects on nutrient recycling. The most vulnerable/fragile species are generally lost after the first pass of the gears, and ongoing disturbance prevents recovery. Research on the effects of shellfish dredging conducted in the Hauraki Gulf has shown that it results in reduced habitat complexity and compositional changes in the benthos, which in turn adversely affect biodiversity and the survival of juveniles of species such as scallops (Thrush et al. 1995, 1998; Talman et al. 2004; Tuck et al. 2017). Scallop dredging mainly occurs along the western and southern sides of the island. Species on low relief deep rocky reefs that are vulnerable to bottom trawling include sponges and black corals.

Fishing may also affect the abundance, age and size composition of target and non-target species, which can have indirect effects on community composition and ecosystem processes through effects on food webs (trophic cascades). The development of kina barrens on rocky reefs around Te Hauturu-o-Toi/Little Barrier Island suggest that depletion of kina predators such as rock lobster and snapper has occurred and is influencing community structure, alongside environmental factors such as water temperature.

Existing management

Te Hauturu-o-Toi/Little Barrier Island is a popular recreational fishing and diving destination and is commercially fished for scallops, rock lobster and a variety of finfish. Northwest Reef, an area of high marine biodiversity is located within the Hauraki Gulf CPZ, which due to its restrictions on most activities, including all forms of fishing, is recognised as a de facto MPA under the MPA Policy.

Both commercial and recreational set netting is prohibited within 1 km (0.5 nautical miles) of Te Hauturu-o-Toi/Little Barrier Island[15,16]. Trawling and Danish seining by fishing vessels over 20 m in length is prohibited in waters around the island, except where a fisher permit has been endorsed[17]. With the exception of the northern coast, waters off the island fall within the Coromandel scallop fishery.

Te Hauturu-o-Toi/Little Barrier Island is classed as a marine Significant Ecological Area in the Auckland Unitary Plan (Auckland Council 2017).

Sea Change Plan proposal for Te Hauturu-o-Toi / Little Barrier Island

The Sea Change Plan proposes a marine reserve located northwest of Te Hauturu-o-Toi/Little Barrier Island (Fig. 8). The western part of the proposal overlaps with the existing CPZ, recognised as a Type 2 MPA under the MPA Policy.

The proposal includes 194 km^2 of marine area (1.4% HGMP), with a minimum width of 13 km and approximately 8 km of island coastline.

[15] See http://www.legislation.govt.nz/regulation/public/1986/0216/latest/DLM105923.html (accessed 23 October 2020).
[16] See https://www.mpi.govt.nz/dmsdocument/7275-auckland-kermadec-recreational-fishing-rules-printer-friendly (accessed 22 October 2020).
[17] 6 (2) Auckland and Kermadec Areas Commercial Fishing Regulations 1986. http://www.legislation.govt.nz/regulation/public/1986/0216/43.0/DLM104498.html (accessed 22 October 2020).

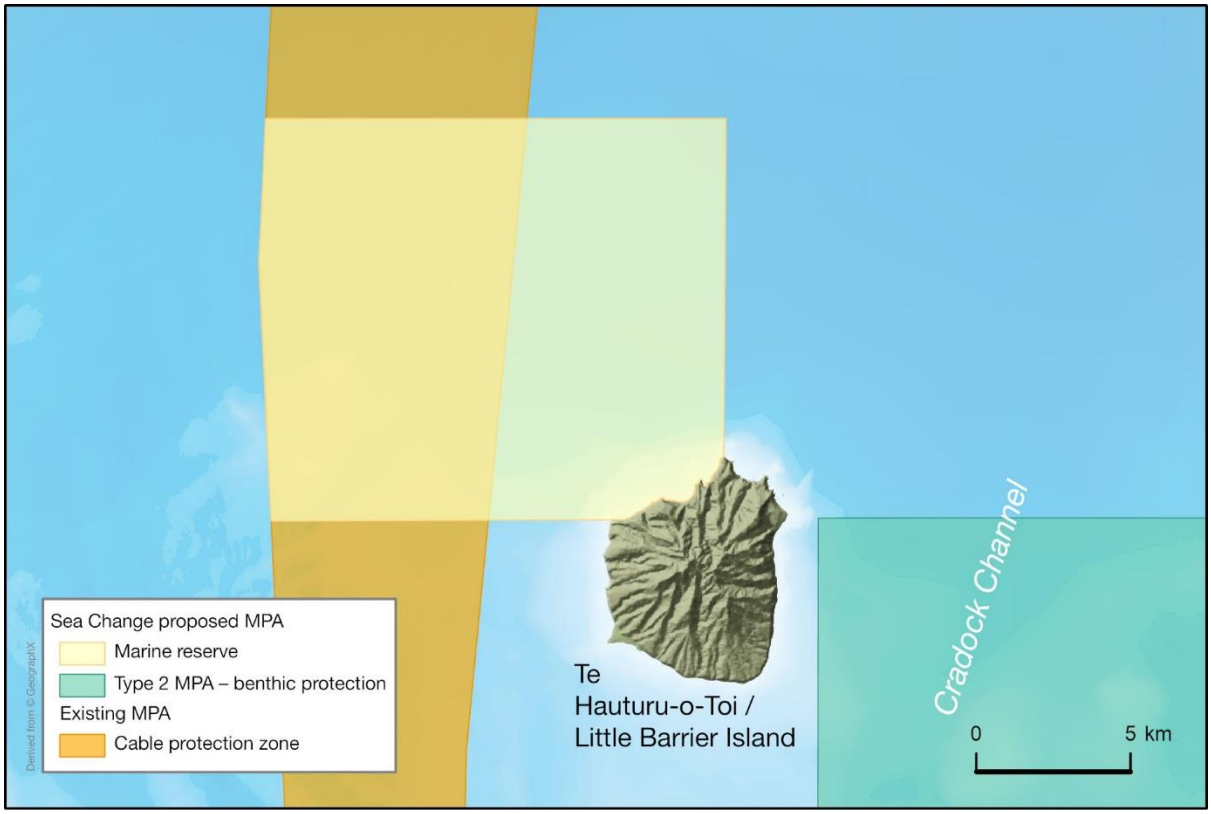

Figure 8. Sea Change Plan proposal for Te Hauturu-o-Toi/Little Barrier Island Marine Protected Area. Please note: the proposed marine reserve overlaps with the cable protection zone. The proposed Cradock Channel Type 2 Marine Protected Area is shown for reference.

Agency assessment of habitats and ecologically significant features that would be protected

The proposed marine reserve would provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, 10 physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats), including shallow to deep rocky reefs and associated species (e.g. sessile invertebrate species, including black coral, encrusting sponges, ascidians and bryozoans), and soft sediments that support dense patches of amphipod tubes, small sponges, hydroids and ascidians.

Agencies note that uncertainty remains in regard to a few of the physical habitats present in the proposal being of viable size (i.e. to meaningfully afford protection to associated species and ecological processes), and the potential for significant edge effects (at the boundary where it bisects the reef habitats). Future research and monitoring will allow this uncertainty to be addressed, should this proposal be implemented.

Agency assessment of proposals against Sea Change Plan objectives

Table 7 provides the Sea Change Plan objectives for marine reserves and whether the proposal contributes to the objectives.

Table 7. Assessment of Te Hauturu-o-Toi/Little Barrier Island marine reserve proposal against Sea Change Plan objectives.

MARINE RESERVE OBJECTIVES	TE HAUTURU-O-TOI/LITTLE BARRIER ISLAND – MARINE RESERVE
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Would allow some recovery to meet this objective
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	Deep reef features are identified at this site that would contribute to this objective
Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Would provide protection for several habitat types, would contribute to this objective
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	Would contribute to this objective
Provide reference areas for marine research, monitoring and education	Would contribute to this objective
Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism	Would contribute to this objective by allowing environmental restoration (limited as remote)

Agency response to Sea Change Plan proposal

Agencies consider that current and historic information on marine biodiversity associated with Te Hauturu-o-Toi/Little Barrier Island justifies area-based protection to allow for the protection and recovery of these long-recognised values (MAF 1985; LINZ (Sewell 1985); DOC (1995).

The marine reserve is of suitable size to likely be effective at providing for the maintenance and recovery of ecological systems, natural species composition and trophic linkages and would contribute to the overall objectives of the Sea Change Plan.

Modifications to proposal

Agencies consider that in order to better deliver on the purpose and outcomes for MPAs in the Sea Change Plan and follow best-practice MPA design criteria, agencies propose shifting the original proposal east in order to:

- Afford better protection to the area known as The Coral Patch (including black corals) stretching from north of Te Hauturu-o-Toi/Little Barrier Island towards Simpson Rock and the Mokohinau Islands.
- Afford better protection to the deep reef habitat that is close to the eastern boundary of the Sea Change Plan proposal. Recent surveys indicate high fish diversity (Howarth & Smith 2020) with this reef habitat and a shift of the boundary toward the east would better protect the area from edge effects.

- Include the area immediately east of the Sea Change Plan proposal that the zonation prioritization analysis[18] has identified as having a high priority.
- Improve the extent of inshore reef being protected and mitigate to some degree the anticipated edge effects expected from the Sea Change Plan proposal.

While the overall area of the proposal would not be altered by the shift east, the overall protection afforded to the network would be improved as the existing CPZ (a nationally designated Type 2 MPA) would effectively provide a buffer along the western boundary of the proposal, aligning the proposal with the nested protection approach in the Sea Change Plan.

Overall, agencies consider that the modifications to the proposal are likely to be more effective at providing for the maintenance and recovery of ecological systems, natural species composition and trophic linkages of the habitats contained within it.

Alignment with existing legislation and policy

While the proposed marine reserve in Scenario 1 offers a high level of protection, it is unlikely to be consistent with the Marine Reserves Act 1971, as the intention is to make provision for customary practises. As such, the proposal being taken forward to engagement with mana whenua will be defined as a **high protection area** rather than a marine reserve (Fig. 9).

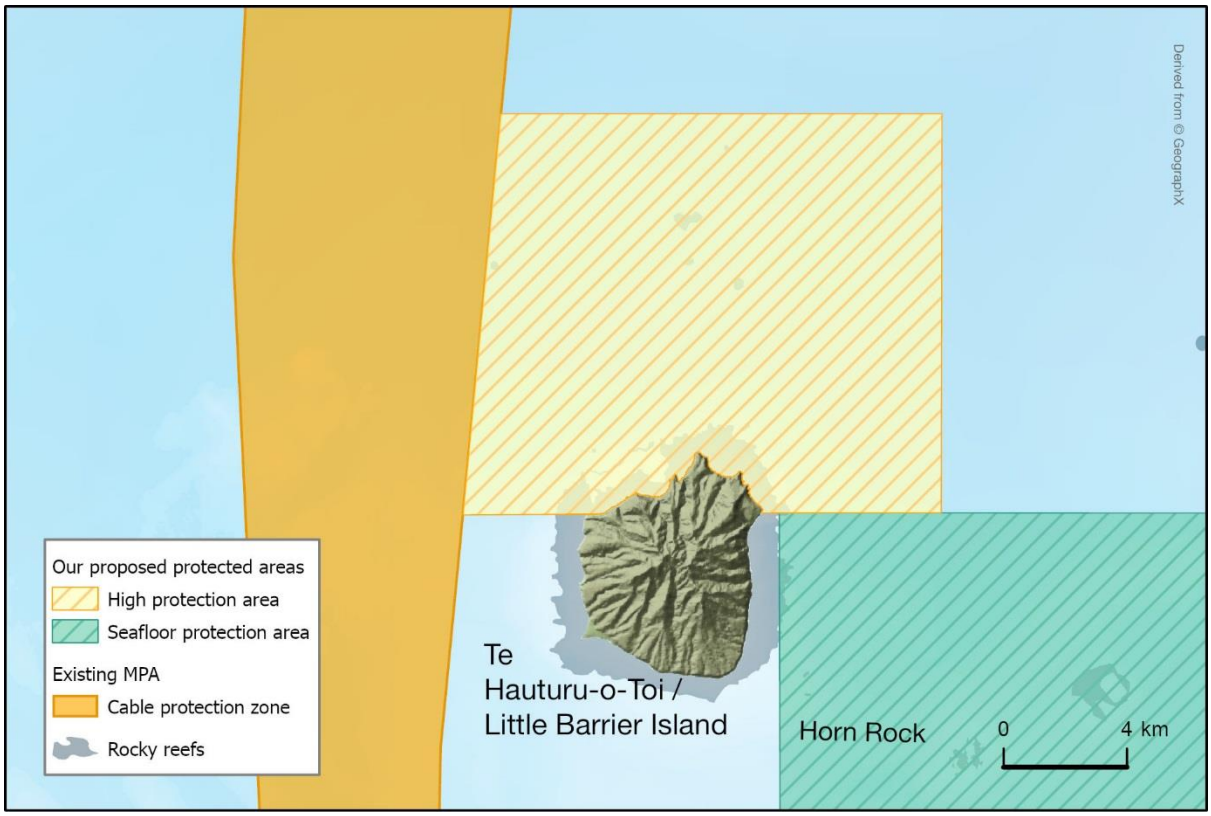

Figure 9. Preferred option for Te Hauturu-o-Toi/Little Barrier Island high protection area. Proposed Type 2 MPA at Cradock Channel shown for reference.

Activities that would be affected by the high protection area

A summary of the existing users that may be affected by the proposal is given in Table 8.

[18] Lundquist, C.; Tablada, J.; Watson, S. 2020: Evaluation of biodiversity protected by Sea Change Tai Timu Tai Pari – Marine Protected Area Proposals. Unpublished report prepared for Department of Conservation.

Table 8. Assessment of affected users for the proposed Te Hauturu-o-Toi/Little Barrier Island high protection area.

ACTIVITY	HIGH PROTECTION AREA
Commercial fishing	All commercial fishing would be prohibited. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $744,000 based on a total reported average yearly catch of 389.0 tonnes. The biggest displacement would be experienced by the blue mackerel, snapper and trevally commercial fisheries, for which 283.4, 38.0 and 26.1 tonnes per year would be displaced, respectively. In terms of foregone revenue, the snapper and blue mackerel fisheries would be the most impacted.
Recreational fishing	All recreational fishing would be prohibited. An analysis of the spatial distribution of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park indicates that 0.48% of recreational fishing effort and 0.48% and 0.22% of snapper and kahawai catch would be displaced, respectively.
Mining and petroleum exploration	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	All commercial extractive activities would be prohibited. No current extraction of material is known to occur.

Cradock Channel

Site description

Cradock Channel separates Te Hauturu-o-Toi/Little Barrier Island and Great Barrier Island (Aotea Island). The seafloor topography resembles an underwater saddle, with several reefs found along the top of the ridge in the middle of the channel. Depths range from 20–60 m, and the area is characterised by strong tidal currents.

Marine biodiversity values

Physical habitats of Cradock Channel are predominantly sands and muds, with areas of rocky reef occurring along the coastlines of Te Hauturu-o-Toi/Little Barrier Island and Great Barrier Island (Aotea Island) and in the central part of the channel (e.g. Horn Rock).

The area around Horn Rock is characterised by a mixture of sandy, rocky reef and cobble and sand habitats (Howarth & Smith 2020). Benthic species include a variety of sessile and mobile invertebrates such as massive and encrusting sponges, hydroids, anemones, colonial ascidians and bryozoans (Fig. 10). Algal assemblages contain *Ulva lactuca*, *Sargassum sinclairii*, *Carpophyllum plumosum,* and patchy and dense kelp (*E. radiata*) forests occur on the main reef (Townsend & Lohrer 2019; Howarth & Smith 2020). The demersal fish fauna is dominated by snapper and leatherjacket (*Meuschenia scaber*), and several species of shark are also common (Howarth & Smith 2020).

Townsend & Lohrer (2019) recorded one of the highest diversity sites sampled off the Great Barrier Island (Aotea Island) coast at the low-to-moderate relief rocky reef and pinnacle northeast of Horn Rock (Fig. 11). The bottom here consists of coarse shelly sand and invertebrate-encrusted shell rubble. The sponge garden consists of a variety of species, including *Geodia regina*, *Stelletta conulosa*, *Raspailia topsenti*, *Axinella australiensis*, *Leucettusa lancifera*, *Callyspongia ramosa* and golf ball sponges (*Tethya* and *Aaptos* species). Fish species include carpet shark, goatfish (*Upeneichthys porosus*), scarlet wrasse (*Pseudolabrus miles*), pigfish (*Bodianus unimaculatus*), red moki (*Cheilodactylus spectabilis*), leatherjacket (*Meuschenia scaber*) and triplefins.

The Cradock Channel / western Great Barrier Island / Aotea Island area is important for resident Bryde's whales (*Balaenoptera edeni*) and provides critical habitat for the nationally endangered bottlenose dolphin (*Tursiops truncatus*) (Dwyer 2014).

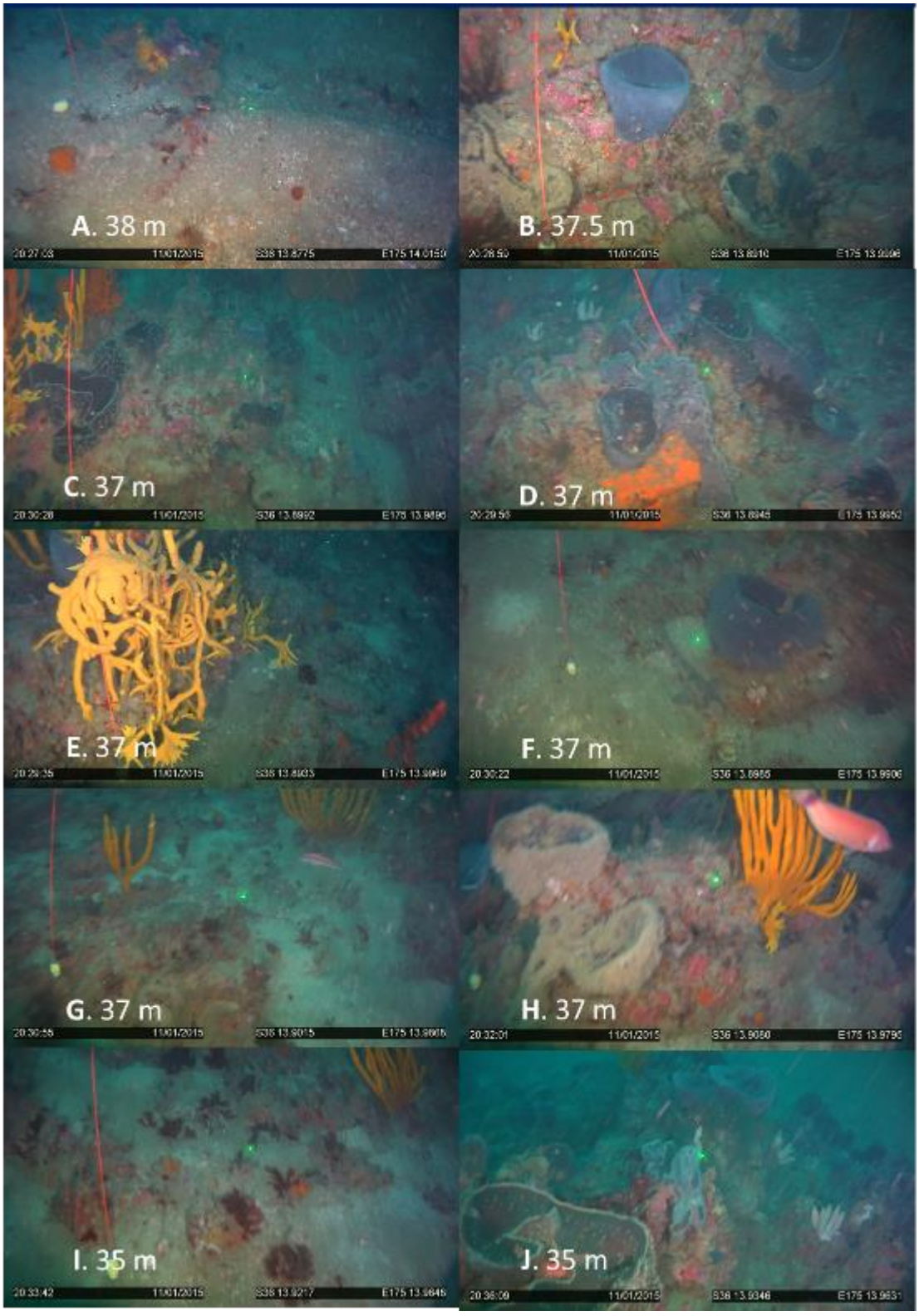

*Figure 10. Screen grabs of habitats and species observed in Cradock Channel: A. invertebrate-encrusted shell rubble, B. sponges, ascidians and feather stars, C., D. and E. finger sponges (*Callyspongia ramosa*), F. carpet shark (*Cephaloscyllium isabellum*), G. goatfish (*Upeneichthys porosus*), H. scarlet wrasse (*Pseudolabrus miles*), I. encrusting coralline algae, small brown algae (*Dictyotales*) and yellow finger sponges (*Iophon minor*) growing on cobbles and boulders, J. reef dominated by the massive grey sponge* Ecionemia alata *and* Leucettusa tubulosa*. Images courtesy Drew Lohrer/NIWA.*

*Figure 11. Horn Rock at 25.6 m depth showing kelp (*Ecklonia radiata*) forest, snapper (*Chrysophrys auratus*) and trevally (*Pseudocaranx georgianus*). Source: Howarth & Smith 2020.*

Direct pressures

Pressures are mostly related to fishing activities and include damage or direct removal of biomass of target and non-target species (such as slow-growing and fragile sponges). Anecdotal information indicates trawl bycatch in this area includes sponges and common kelp (Jones et al. 2016).

Existing management

Trawling and Danish seining by fishing vessels over 20 m in length is prohibited in Cradock Channel, except where a fisher's permit has been endorsed[19]. The channel is included within the Coromandel scallop fishery.

Sea Change Plan proposal for Cradock Channel

The Sea Change Plan proposes a Type 2 MPA spanning the channel to protect soft sediment habitats and the associated physical structures (Fig. 12).

The proposal includes 150 km^2 of marine area (1.1% HGMP), with a minimum width of 12 km. The proposal does not include coastline.

Given the objectives of the seafloor protection areas, at a minimum, the following methods are required to be prohibited:

- Mobile bottom fishing methods (all dredging, bottom trawling and Danish seining)

[19] 6 (2) Auckland and Kermadec Areas Commercial Fishing Regulations 1986. http://www.legislation.govt.nz/regulation/public/1986/0216/43.0/DLM104498.html (accessed 22 October 2020).

Agency assessment of habitats and ecologically significant features that would be protected

The proposal would include three physical habitat types that would be afforded protection (see Appendix 3 for full list of habitats), where features sensitive to disturbance would be protected from physical displacement. However, wider ecological benefits are less likely to occur due to the limited protection being proposed. Further assessment based on the levels of extraction from remaining fishing methods, including from recreational extraction, would need to be undertaken to determine if the level of protection could allow for the maintenance and recovery of wider ecosystem values. The proposed area would provide protection for some diverse biogenic habitats, particularly in the high current areas (e.g. a variety of sessile and mobile invertebrates such as massive and encrusting sponges, hydroids, anemones, colonial ascidians and bryozoans).

The site also includes shallow and deep rocky reef habitats, but they are unlikely to be afforded protection from this proposal as the prohibited fishing methods are generally not used over these habitats, while other fishing methods do target these reefs.

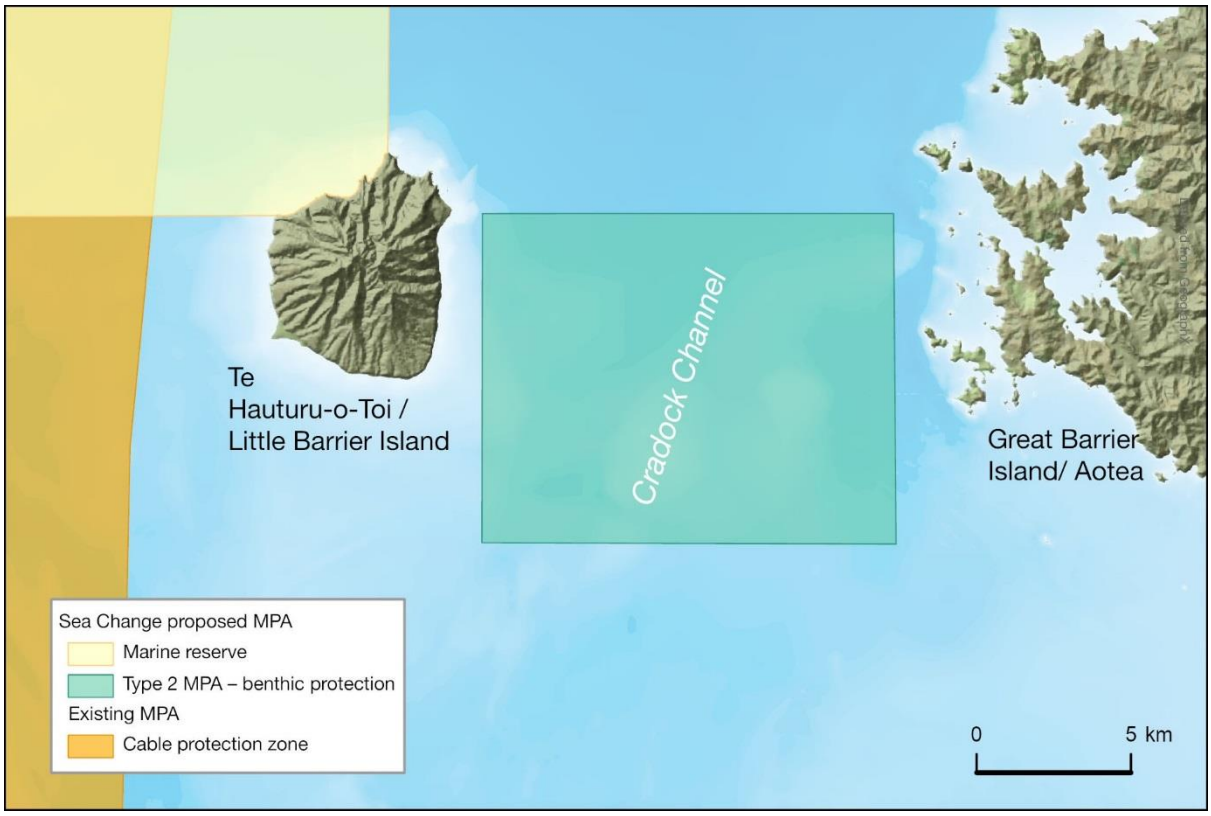

Figure 12. Cradock Channel Type 2 MPA proposal. Proposed Te Hauturu-o-Toi/Little Barrier Island marine reserve shown for reference.

Agency assessment of proposals against Sea Change Plan objectives

Table 9 provides the stated Sea Change Plan objectives and how the proposal meets these objectives.

Table 9. Assessment of Cradock Channel seafloor protection area proposal against Sea Change Plan objectives.

PLAN TYPE 2 MARINE PROTECTED AREA SPECIFIC OBJECTIVES	BENTHIC PROTECTION
Identify, restore and protect key habitats (e.g. biogenic habitats) in order to maintain the integrity of ecosystems and their functioning by 2020	Contributes to objective by providing protection to soft sediment biogenic features from physical disturbance
Significantly increase the productivity of the Hauraki Gulf Marine Park by 2035	Potentially protects key habitats important for fisheries productivity
Exclude activities (e.g. dredging, bottom trawling, Danish seining, dumping and sea bed mining) that damage habitats by 2025	Contributes to objective
Potentially serve as a buffer to areas with a higher level of protection (thereby implementing a nested approach)	Limited – largely separate from other proposals except for a small part of Te Hauturu-o-Toi / Little Barrier Island
Potentially support restoration projects	Limited

Agency response to the Sea Change proposal

The agencies consider that the biodiversity values associated with Cradock Channel, in particular the rich biogenic habitats (e.g. fragile sponge gardens and kelp forest) providing habitat for commercially important species such as snapper, justify area-based protection and recommend it progressing.

The proposal will afford protection at a suitable level to provide for the maintenance and recovery of physical features and biogenic structures that support biodiversity over the soft substrate habitats. The proposal has low potential to provide protection to reef habitats as it does not manage the pressures associated with those habitats (i.e. the prohibited methods do not generally occur over the reef habitats, while other fishing methods that interact with the seafloor would continue, e.g. potting).

Modifications to proposal

In order to align the proposal with the modified Te Hauturu-o-Toi / Little Barrier Island proposal to the north of it, agencies recommend adjusting the northern boundary by shifting it south. The resulting seafloor protection area would be 152 km^2 (Fig. 13).

Alignment with existing legislation and policy

Given the restrictions provided under the proposed Type 2 MPA, agencies consider that the proposal would likely afford protection at a suitable level to provide for the maintenance and recovery of physical features and biogenic structures that support biodiversity. However, it is less likely to allow for the maintenance and recovery of wider ecological values due to ongoing extraction from remaining fishing methods, including from recreational fishing.

As such, the agencies consider that the Type 2 MPA proposed in the Sea Change Plan likely does not fully meet the definition of a Type 2 MPA under the MPA Policy, and it will be taken forward as a **seafloor protection area.**

Activities that would be affected by the seafloor protection area

A summary of the existing users that may be affected by the proposals are given in Table 10.

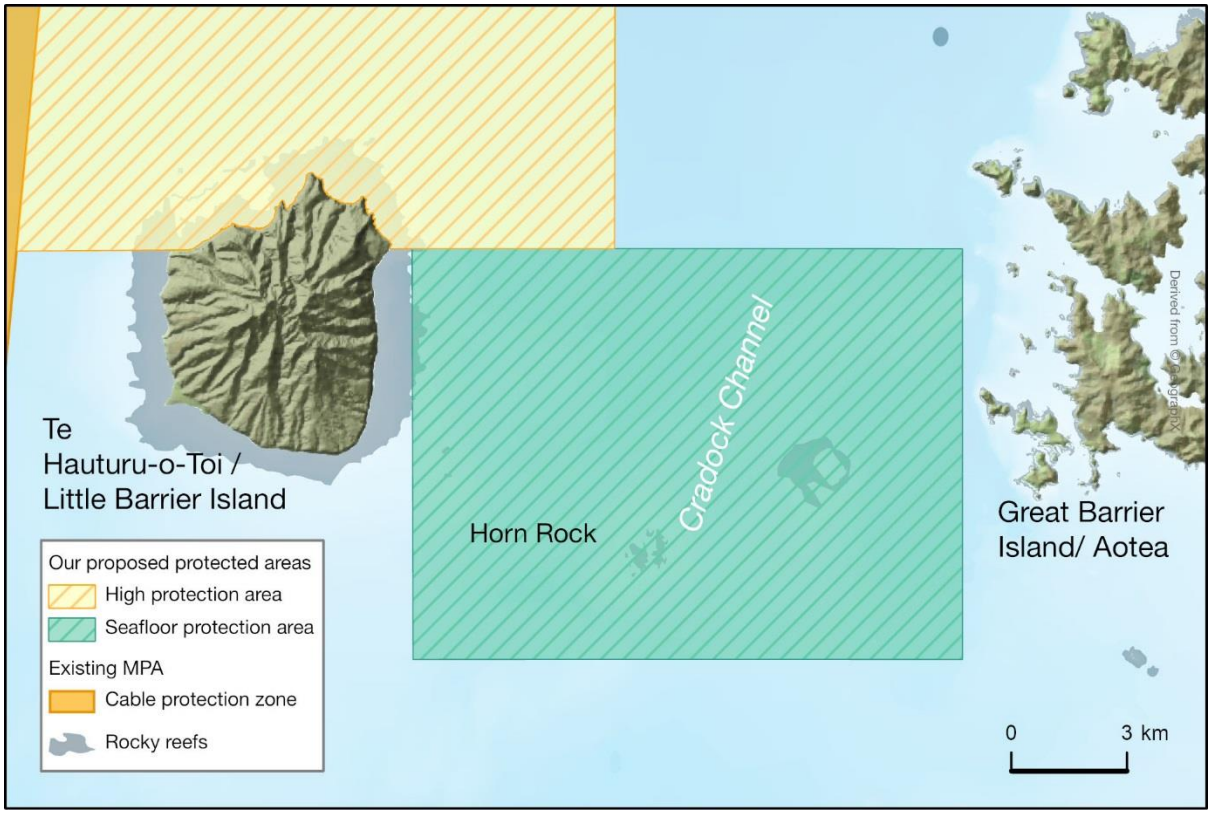

Figure 13. Preferred option for Cradock Channel seafloor protection area. The proposed Te Hauturu-o-Toi/Little Barrier Island high protection area is shown for reference.

Table 10. Assessment of affected users for the proposed Cradock Channel seafloor protection area.

ACTIVITY	SEAFLOOR PROTECTED AREA
Commercial fishing	Bottom trawling, dredging and Danish seining would be prohibited. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be 137,000 based on a total reported average yearly catch of 17.8 tonnes. The biggest displacement would be experienced by the snapper fishery, of which 12.3 tonnes per year would be displaced. In terms of foregone revenue, the snapper fishery would be the most impacted.
Recreational fishing	Recreational dredging would be prohibited, but the estimated impact on recreational fishing effort and landed catch for this method cannot be quantified. However, the impact is likely to be low with only 0.16% of all recreational fishing effort in the HGMP (based on the number of stationary boats) occurring in this area.
Mining and petroleum exploration	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	No additional restrictions from above.

3. Cape Colville

Site description

Cape Colville is the northernmost point of Coromandel Peninsula and is separated from Great Barrier Island (Aotea Island) by Colville Channel. This site extends from the coast offshore into the deep (50+ m) seafloor depression at the southwest entrance to Colville Channel. The seafloor off Cape Colville mostly consists of coarse clean sand, with large patches of dead shell (mainly dog cockle (*Tucetona laticostata*) valves) and large patch reef systems. The channel experiences strong tidal currents, and in offshore areas these have a greater influence on the seafloor than wave disturbance. Surface and bottom suspended sediment concentrations in the channel are much lower than in the southern (Firth of Thames) and western parts of the inner Hauraki Gulf. The adjacent catchment contains a mix of indigenous forests and high producing exotic grassland.

Marine biodiversity values

A highly diverse mosaic of physical habitats is found off Cape Colville (Fig. 14). Sheltered and very sheltered intertidal and subtidal rocky reefs interspersed with gravel along the coast give way to more high current environments towards the deeper channel (high current rocky reefs, gravel, sand and mud).

The complex seafloor morphology off Cape Colville provides for a rich variety of physical habitats, together with the strongest water flow recorded in the Hauraki Gulf (Greig 1990). Regular incursions of colder waters associated with upwelling of deeper offshore waters suggest that this area is likely to be one of the most productive and biologically diverse areas within the HGMP, with a high potential to develop biogenic habitats (Black et al. 2000; Townsend et al. 2014).

Exploratory trawl surveys in the early 20th century indicated the area west of Cape Colville was an area rich in biogenic habitats (Kelly et al. 2014). Notes taken at the time mentioned ‘a lot of marine growth’ and ‘rough bottom’ tearing the net. In some places old trawl nets were dragged across the seafloor to clear fishing grounds of biogenic habitats to reduce the impact on fishing gears (Jones et al. 2016). Interviews with commercial fishers and recent surveys indicate extensive horse mussel (*Atrina zelandica*) beds and tubeworm patches still occur along the coast from Coromandel to Cape Colville (Jones et al. 2016).

Other species assemblages observed in the Cape Colville area include extensive dog cockle beds. Dog cockle beds are known to elevate benthic biodiversity with greater abundance and diversity of infaunal invertebrates occurring inside the beds than outside them. Epifaunal organisms found attaching to the large, heavy valves include sponges (*Callyspongia* spp., *Raspailia* spp., *Polymastia crocea*), small hydroids and ascidians (*Synoicum kuranui*) (DOC & MFish 2011). Juvenile blue cod, goatfish, snapper and tarakihi (*Nemadactylus macropterus*) have been observed sheltering in these habitats, particularly those dominated by erect species of sponge. Rocky reefs are dominated by massive sponges (particularly *Ecionemia alata*, *Stelletta conulosa*, *Geodia* sp.), hydroids and anemones. Common reef fishes include blue cod (*Parapercis colias*), snapper, red moki, goatfish, scarlet wrasse, butterfly perch and two-spot demoiselles. Historically, hāpuku were also found on rocky reefs in the area.

In 2011**,** dense scallop beds were discovered west of the deep depression off Cape Colville and subsequently heavily fished. Morrison (2020) hypothesizes that this dense bed might have acted as a larval source for scallop beds elsewhere in the Hauraki Gulf.

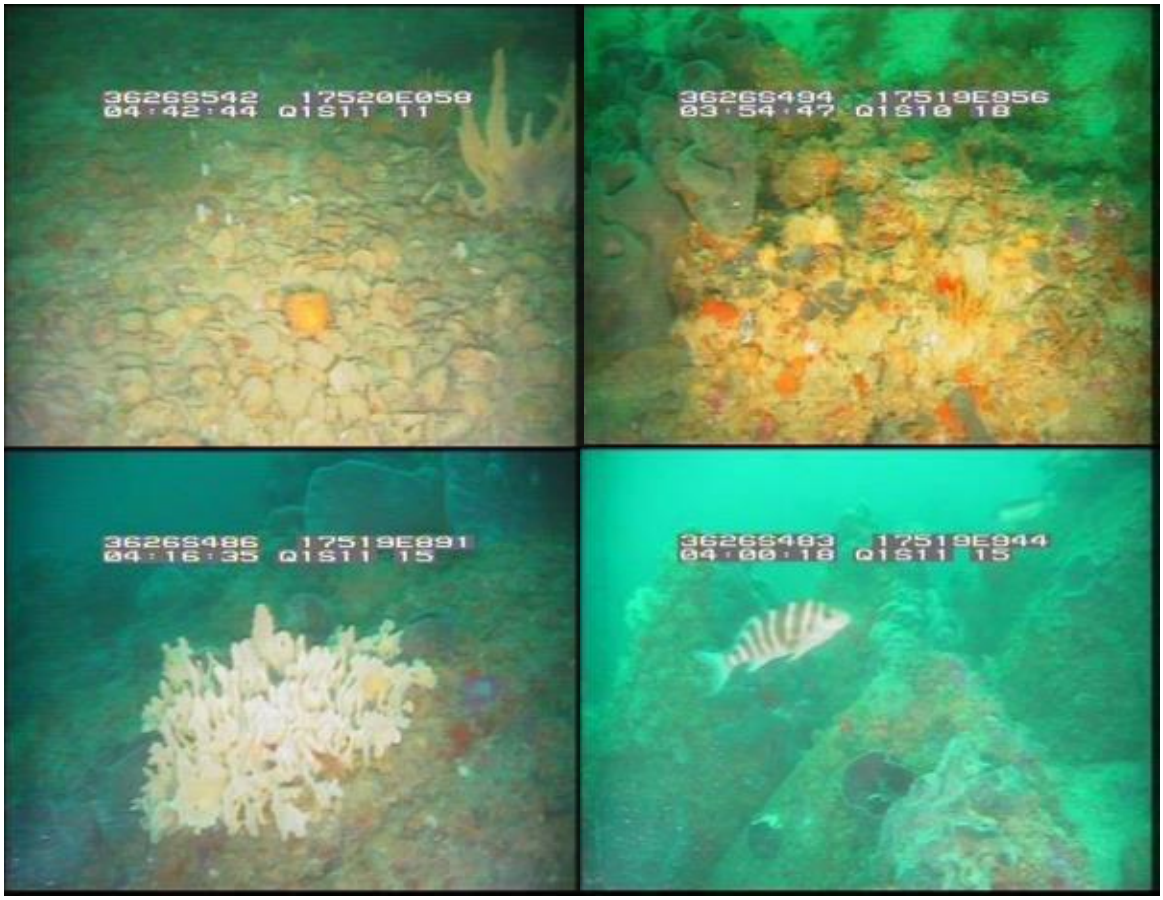

*Figure 14. Top left: dog cockle (*Tucetona laticostata*) bed and associated epifauna, 41 m depth, Colville Channel. Top right: sponges, ascidians and bryozoans (*Steganoporella neozelanica*) encrusting base of rocky reef, 34–36 m depth, Colville Channel. Bottom left: sponges encrusting rocky reef, 34–36 m depth, Colville Channel. Bottom right: red moki (*Cheilodactylus spectabilis*) and scarlet wrasse (*Pseudolabrus miles*) on rocky reef, 27–30 m depth, Colville Channel. Encrusting assemblage includes crustose coralline algae, large sponges (*Ecionemia alata*) and hydroid trees (*Solanderia ericopsis*). Photo: DOC*

Direct pressures

Biogenic habitats on soft sediments are vulnerable to shellfish dredging and bottom trawling. Although the extent to which these activities have modified biogenic assemblages in Colville Channel is unknown, the deep-water scallop beds located west of Cape Colville are reported to have died off and are no longer fished.

Existing management

Commercial and recreational set netting prohibitions extend along the north-facing coast around Cape Colville towards Channel Island, including a prohibition of 1 km (0.5 nautical miles) around Channel Island[20,21]. The area falls within the Coromandel scallop fishery. The Auckland Coromandel shellfish recreational daily bag limits and size restrictions apply.

[20] See http://www.legislation.govt.nz/regulation/public/1986/0216/latest/DLM105923.html (accessed 23 October 2020).
[21] See https://www.mpi.govt.nz/dmsdocument/7275-auckland-kermadec-recreational-fishing-rules-printer-friendly (accessed 22 October 2020).

The Cape Colville to Sandy Bay area is designated as an Area of Significant Conservation Value in the Waikato Regional Coastal Plan (Waikato Regional Council 2005).

Sea Change Plan proposals for the Cape Colville area

The Sea Change Plan proposes a marine reserve and a type 2 MPA (Fig. 15).

Marine reserve

The marine reserve proposal includes a triangular area of 22 km^2 (0.2% of the HGMP), with the eastern boundary just west of the Port Jackson camping ground and extending towards the north for approximately 6.3 km. The southwestern boundary extends from approximately 0.7 km south of the point and extends approximately 6 km in a northwest direction. The proposal includes approximately 3 km of coastline.

Type 2 MPA

The proposed Type 2 MPA for the most part surrounds the proposed marine reserve and is designed to act as a buffer to the reserve. It protects habitat associated with the high current typical of this area, in particular biogenic habitats, from physical disturbance. The Type 2 MPA proposal includes 71 km^2 of marine area (0.5% HGMP), with a minimum width of 9 km.

Given the objectives of the Type 2 MPAs, and to provide for the maintenance and recovery of physical features and biogenic structures that support biodiversity, the following methods should be prohibited:

- Mobile bottom fishing methods (all dredging, bottom trawling and Danish seining).

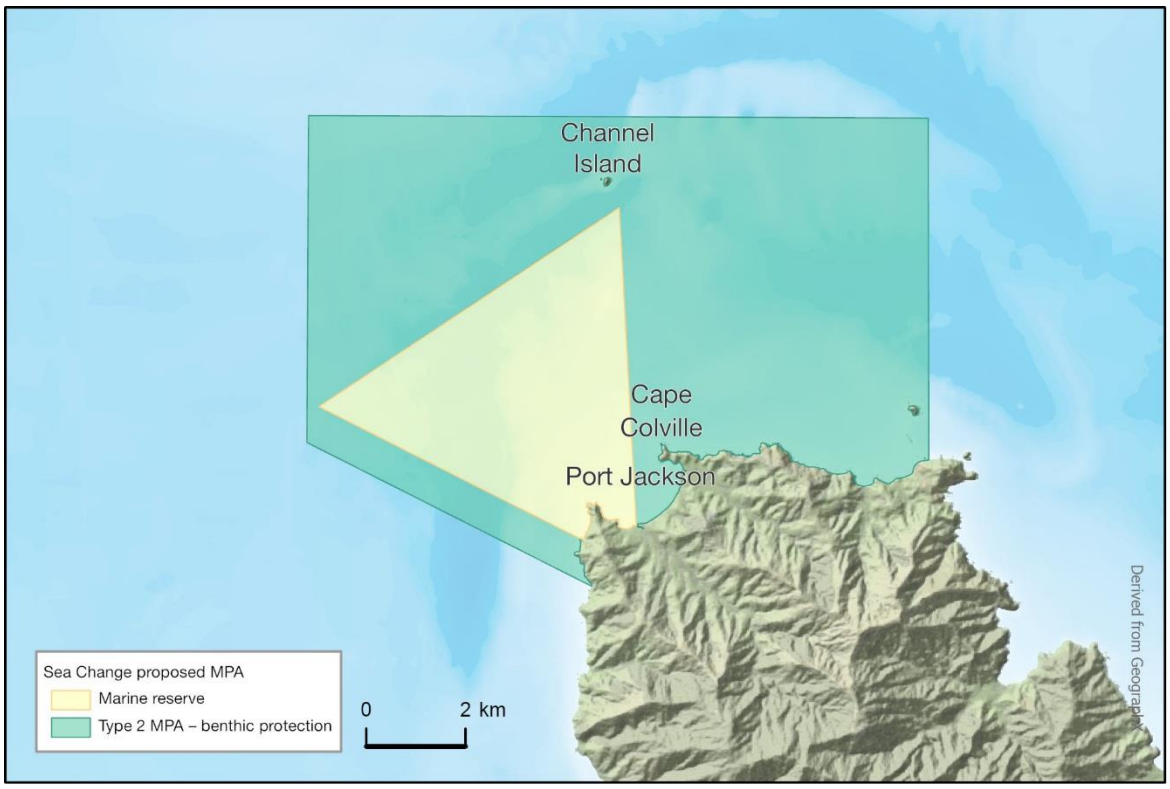

Figure 15. Sea Change Plan proposals for Cape Colville area.

Agency assessment of habitats and ecologically significant features that would be protected

Marine reserve

The proposed marine reserve would provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, 16 physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats). A feature of the proposal is the representation of high current reef, sand and gravel habitats. Species associated with these habitats include massive sponges, hydroids, anemones, horse mussel beds and tubeworm patches.

Agencies note that uncertainty remains in regard to some of the physical habitats present in the proposal being of viable size (i.e. to meaningfully afford protection to associated species and ecological processes), and edge effects along the reef where the boundary crosses it are likely to be significant. Future research and monitoring will allow this uncertainty to be addressed, should this proposal be implemented.

The proposal would protect 18.5 km^2 of biogenic dog cockle habitat. Other biogenic habitats are known from the high current areas of the site, but as the they are not mapped the extent covered by the proposal is unknown.

Type 2 MPA

The proposal would include 13 physical habitat types that would be afforded protection, where features sensitive to disturbance would be protected from physical displacement (see Appendix 3 for full list of habitats). However, wider ecological benefits are less likely to occur due to the limited protection being proposed. Further assessment based on the levels of extraction from remaining fishing methods, including from recreational extraction, would need to be undertaken to determine if the level of protection could allow for the maintenance and recovery of wider ecosystem values.

The seafloor protection area would also contribute to protecting the biogenic dog cockle habitat (6 km^2).

Agency assessment of proposals against Sea Change Plan objectives

Tables 11 & 12 provide an assessment of the proposed areas against the objectives for the different management options (marine reserves and Type 2 MPAs).

Table 11. Assessment of Cape Colville marine reserve proposal against Sea Change Plan objectives.

MARINE RESERVE SPECIFIC OBJECTIVES	CAPE COLVILLE – MARINE RESERVE
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Would allow recovery to meet this objective
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	A number of significant features are identified at this site that would contribute to this objective
Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Would provide effective protection for at least two habitat types. Would contribute to this objective
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems	Would contribute to this objective

within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	
Provide reference areas for marine research, monitoring and education	Would contribute to this objective
Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism.	Would contribute to this objective by allowing environmental restoration (limited as remote)

Table 12. Assessment of Cape Colville seafloor protection area proposal against Sea Change Plan objectives.

PLAN TYPE 2 MARINE PROTECTED AREA SPECIFIC OBJECTIVES	CAPE COLVILLE – TYPE 2 MARINE PROTECTED AREA
Identify, restore and protect key habitats (e.g. biogenic habitats) in order to maintain the integrity of ecosystems and their functioning by 2020	Contributes to objective by providing protection to soft sediment biogenic and reef features from physical disturbance
Significantly increase the productivity of the Hauraki Gulf Marine Park by 2035	Potentially protects key habitats important for fisheries productivity
Exclude activities (e.g. dredging, bottom trawling, Danish seining, dumping and sea bed mining) that damage habitats by 2025	Contributes to objective
Potentially serve as a buffer to areas with a higher level of protection (thereby implementing a nested approach)	Partially, for species caught by the prohibited fishing methods
Potentially support restoration projects	Potentially. But no restoration projects are targeted for the area

Agency response to Sea Change proposal

Agencies consider that current and historic information on biodiversity in the area justify area-based protection of these values. The physical setting of the deep and high current channel off Cape Colville, the complex seafloor and seasonal cold-water intrusions provide a unique marine environment that likely is significant even at a biogeographic (encompassing coastal marine environments from North Cape (Outou) to East Cape) setting.

The marine reserve is of a size to likely be effective at providing for the maintenance and recovery of ecological systems, natural species composition and trophic linkages, at least for some of the habitats contained within it.

The Type 2 MPA proposal will afford protection at a suitable level to provide for the maintenance and recovery of physical features and biogenic structures that support biodiversity over the soft substrate habitats. The proposal has low potential to provide protection to reef habitats as it does not manage the pressures associated with those habitats (i.e. the prohibited methods do not generally occur over the reef habitats, while other fishing methods that interact with the seafloor would continue, e.g. potting).

The two proposals together would offer suitable protection for a high-value area. As such, the agencies recommend progressing both proposals for Cape Colville.

Modifications to proposals

Agencies consider that in order to adequately deliver on the purpose and outcomes for MPAs in the Sea Change Plan and follow best-practice MPA design criteria, the following adjustments are recommended:

- Realign the eastern boundary of the proposed marine reserve to follow a clear north/south bearing to facilitate compliance.
- The current small extent of inshore reef being protected by the marine reserve proposal is a concern as to its viability. It is expected that there would be significant edge effects under the Sea Change Plan proposal that would likely undermine the objectives. As such, the agencies advise moving the southwestern boundary south to include a greater area of inshore reef, that may mitigate edge effects to some degree. Aligning the boundary of the reserve with that proposed for the seafloor protection area would provide the additional advantage of simplifying management (i.e. compliance).
- Consequently, align the boundaries of the seafloor protection area to accommodate the adjustments to the nested marine reserve proposal.

The areas of the proposals to progress are 26.7 km^2 (marine reserve) and 68.3 km^2 (Type 2 MPA).

Alignment with existing legislation and policy

While the proposed marine reserve in Scenario 1 offers a high level of protection, it is unlikely to be consistent with the Marine Reserves Act 1971, as the intention is to make provision for customary practises. As such, the proposal being taken forward to engagement with mana whenua will be defined as a **high protection area** rather than a marine reserve.

Given the restrictions provided under the proposed Type 2 MPA, agencies consider that the proposal would likely afford protection at a suitable level to provide for the maintenance and recovery of physical features and biogenic structures that support biodiversity for soft substrate habitats. However, it does not fully meet the requirements for a Type 2 MPA under the MPA Policy as it is less likely to allow for the maintenance and recovery of wider ecological values due to ongoing extraction from remaining fishing methods, including from recreational fishing.

As such, the agencies consider that the Type 2 MPA proposed in the Sea Change Plan likely does not fully meet the definition of a Type 2 MPA under the MPA Policy, and it will be taken forward as a **seafloor protection area** (Fig. 16).

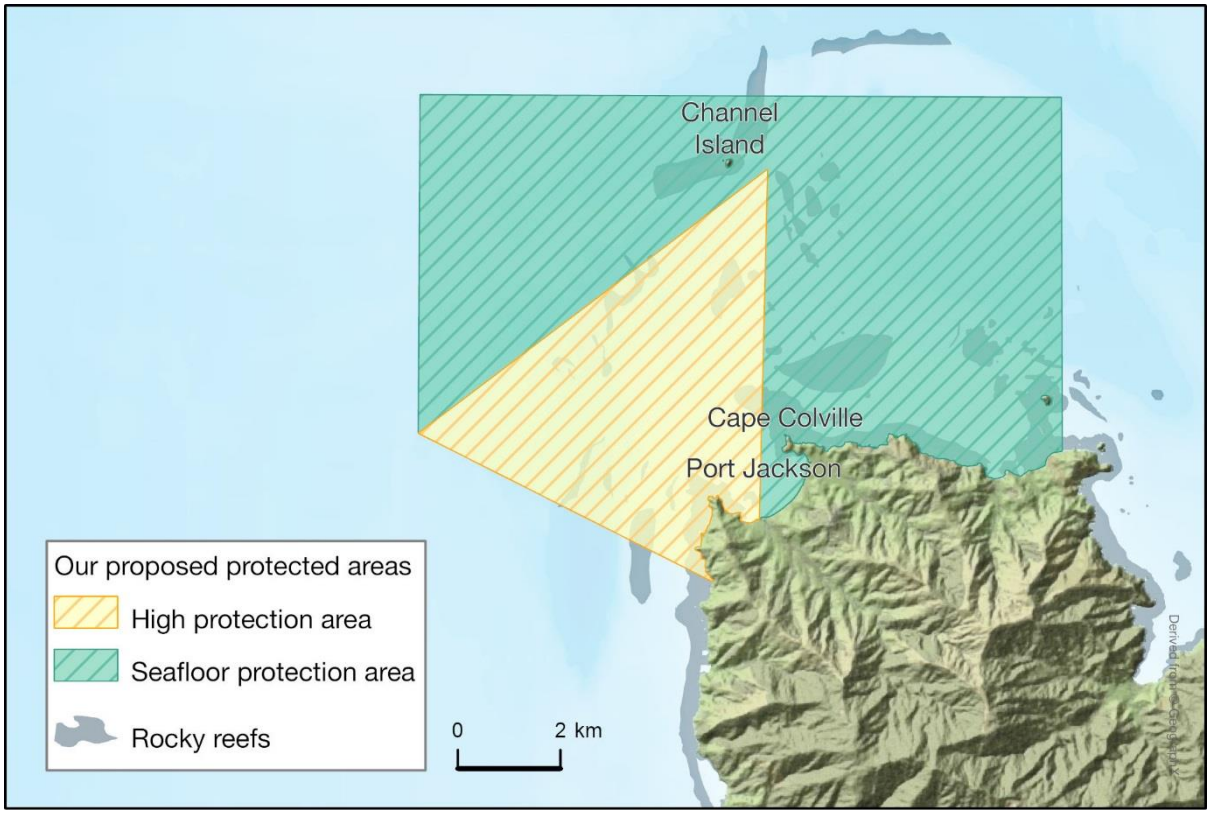

Figure 16. Preferred option for Cape Colville.

Activities that would be affected by the high-protection and seafloor protection areas

A summary of the existing users that may be affected by the proposals are given in Table 13.

Table 13. Assessment of affected users for the proposed Cape Colville high protection area and seafloor protection area.

ACTIVITY	HIGH PROTECTION AREA	SEAFLOOR PROTECTION AREA
Commercial fishing	All commercial fishing would be prohibited. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $64,000 based on a total reported average yearly catch of 8.6 tonnes. The biggest displacement would be experienced by the snapper fishery and blue mackerel fisheries, of which 3.3 and 2.5 tonnes per year would be displaced, respectively. In terms of foregone revenue, the snapper and blue mackerel fisheries would be the most impacted.	Bottom trawling, dredging and Danish seining would be prohibited. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be between NZ$37,000 and $57,000 based on a total reported average yearly catch of 7.5 tonnes. The biggest displacement would be experienced by the snapper fishery, of which 5.5 tonnes per year would be displaced. In terms of foregone revenue, the snapper fishery is the most impacted.
Recreational fishing	All recreational fishing would be prohibited. An analysis of the spatial distribution of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park indicates that 0.29% of recreational fishing effort and	Recreational dredging, set netting and potting would be prohibited. The estimated impact on recreational effort and landed catch for those methods cannot be quantified.

	0.52% and 0.41% of snapper and kahawai catch would be displaced, respectively.	
Mining and petroleum exploration	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	All commercial extractive activities would be prohibited. No current extraction of material is known to occur.	No additional restrictions from above.

4. Aldermen Islands

Site description

The Aldermen Islands are located approximately 20 km off the eastern Coromandel coast, and comprise the DOC-managed Aldermen Islands (Ruamaahu) Nature Reserve. Covered by regenerating coastal forest, the islands are pest-free and a hotspot for seabirds with numerous species (including the declining sooty shearwater (*Puffinus griseus*) and nationally vulnerable flesh-footed shearwater (*Puffinus carneipes*)) breeding on the islands.

The islands themselves are outcrops of an extensive reef system that spans approximately 30 km from north to south, roughly running in parallel to the Coromandel coast. The area is strongly influenced by oceanic, subtropical waters of the East Auckland Current and high biological productivity is driven by seasonal upwelling along the edge of the continental shelf. Known for its outstanding underwater scenery and abundance and diversity of marine life, the area is popular with recreational fishers and scuba divers.

Marine biodiversity values

Rocky reefs fringe the islands and extend down to depths of 100 m, with relatively steep slopes along the eastern (i.e. open ocean) side of the reef system. Interspersed are soft bottom habitats, including sheltered shallow sand close to the islands, deep gravel south of the islands and mud in upper slope areas.

Rocky reef species assemblages are diverse and include kelp (*E. radiata*) forests above 40 m depth, with rock walls and deeper reefs dominated by sponges, hydroids, anemones and ascidians. Species assemblages are typical of other northeast North Island offshore islands influenced by the sub-tropical East Auckland Current (Figs 17–22). Grace (1973) recorded 65 fish species from 38 families, including several shark species (bronze whaler, thresher, mako and hammerhead sharks), flying fish, hāpuku, several species of parrotfish and scorpionfish. Short-tail stingrays (*Bathytoshia brevicaudata*) are known to aggregate over the pinnacle south of Ruamahuaiti Island in the summer (similar aggregations at the Poor Knights Islands have been linked to mating). Other species of interest include kingfish, snapper, hāpuku, marlin and red (*Jasus edwardsii*) and packhorse (*Sagmariasus verreauxi*) rock lobsters. Protected fishes recorded from the Aldermen Islands include whale sharks (*Rhincodon typus*), great white sharks (*Carcharodon carcharias*), giant manta rays (*Mobula birostris*) and giant groupers (*Epinephelus lanceolatus*).

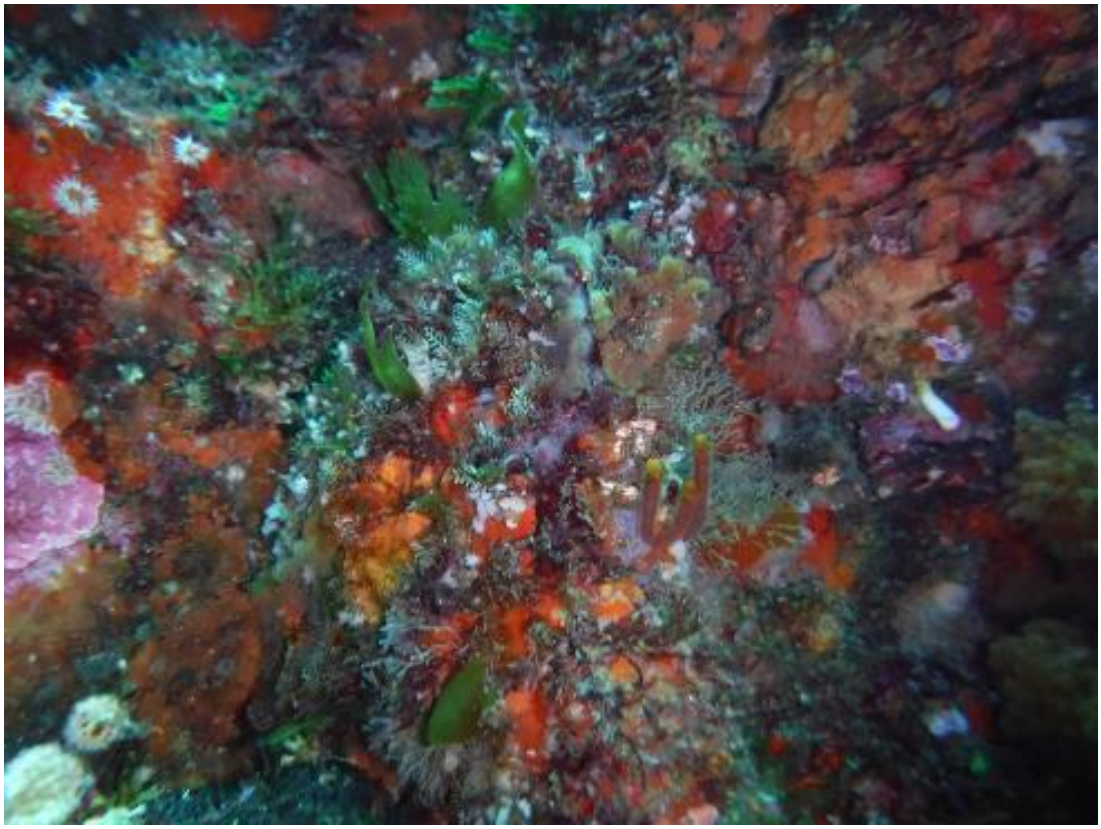

Figure 17. Three fingers of the bryozoan Steginoporella neozelandica *surrounded by red algae, sponges, bryozoans and hydroids. Photo: Luke van Helden.*

*Figure 18. Cup corals (*Monomyces rubrum*), bryozoans, ascidians and dorid nudibranch spawn mass. Photo: Luke van Helden.*

*Figure 19. Yellow moray eel (*Gymnothorax prasinus*) amidst algae.Photo: Luke van Helden.*

*Figure 20. Notchhead marblefish (*Aplodactylus etheridgii*), an uncommon subtropical species seen mainly around offshore islands in northern North Island. Photo: Luke Van Helden.*

*Figure 21. Cup coral (*Monomyces rubrum*), bryozoans, brachiopod and clown nudibranch (*Hypsistozoa fasmeriana*). Photo: Luke van Helden.*

*Figure 22. Sponge (*Monomyces rubrum*), red algae and ascidians. Credit: Luke van Halden*

Direct pressures

The Aldermen Islands and associated reefs are a popular recreational fishing and diving destination and are commercially fished for a variety of species, including rock lobster. Bottom trawlers fish around the islands, avoiding the reefs. The presence of extensive kina barrens on some sheltered reefs within the archipelago suggest that depletion of kina predators such as rock lobster and snapper has occurred and is influencing community structure, alongside environmental factors such as water temperature.

Droplines and rock lobster pots have the potential to damage or destroy fragile benthic invertebrates such as flask sponges, glass sponges and black coral.

Existing management

The islands are managed as a nature reserve/wildlife sanctuary. The Aldermen Islands group is designated as an Area of Significant Conservation Value in the Waikato Regional Coastal Plan (Waikato Regional Council 2005).

Trawling by vessels over 46 m is prohibited. The Auckland Coromandel shellfish recreational daily bag limits and size restrictions apply.

Sea Change Plan proposals for the Aldermen Islands

The Stakeholder Working Group (SWG) agreed that this area would benefit from protection, but a decision was not reached on a single size, location or shape of an MPA. As a result, the SWG proposed two options for MPAs within the Aldermen Islands area (Table 14, Fig. 23). Scenario 1 includes a marine reserve south of the islands with a Type 2 MPA to the north aimed at affording protection to the reef system. Scenario 2 includes the same marine reserve as in Scenario 1, but the adjoining benthic protection area is replaced by an SMA.

The proposed marine reserve does not include the immediate waters around the Aldermen Islands. This was in recognition of the special arrangements with the mana whenua that gifted the islands to the Crown in 1968.

Table 14. Description of Sea Change Plan scenarios for the Aldermen Islands. MPA = marine protected area, HGMP = Hauraki Gulf Marine Park.

SCENARIO 1	SCENARIO 2
Marine reserve Scenario 1 includes a marine reserve centred around, but excluding, Ruamahuaiti Island and Nga Horo Island in the north, and extends 11 km south. It includes complex reef systems to the south and spans east towards the 200 m depth contour. The proposal includes 170 km^2 of marine area (1.2% HGMP), with a minimum width of 11 km. **Type 2 MPA** The proposed Type 2 MPA bounds the proposed reserve on its southern boundary, and extend north for approximately 19 km. It was designed to protect habitat associated with the shallow to deep reef systems. It includes extensive deep rocky reef habitat down to approximately 150 m. Exclusion of all fishing methods that impact benthic habitats is proposed. The benthic protection area includes 344 km^2 of the marine area (2.5% HGMP), with a	**Marine reserve** Scenario 2 includes a marine reserve consistent with that for Scenario 1, centred around, but excluding, Ruamahuaiti Island and Nga Horo Island in the north, and extends 11 km south. It includes complex reef systems to the south and spans east towards the 200 m depth contour. The proposal includes 170 km^2 of marine area (1.2% HGMP), with a minimum width of 11 km. **Special management area** The proposed Special Management Area bounds the proposed reserve on its southern boundary, and extends north for approximately 19 km. The boundaries are consistent with the seafloor protection area in Scenario 1. It was designed to protect habitat associated with the shallow to deep reef systems. It includes extensive deep rocky reef habitat down to approximately 150 m. Exclusion of all commercial fishing and restriction of most

minimum width of 16 km and 15 km of island coastline.	recreational fishing is proposed, with provision for 'low volume/high value' extraction. The Special Management Area includes 344 km^2 of the marine area (2.5% HGMP), with a minimum width of 16 km and 15 km of island coastline.

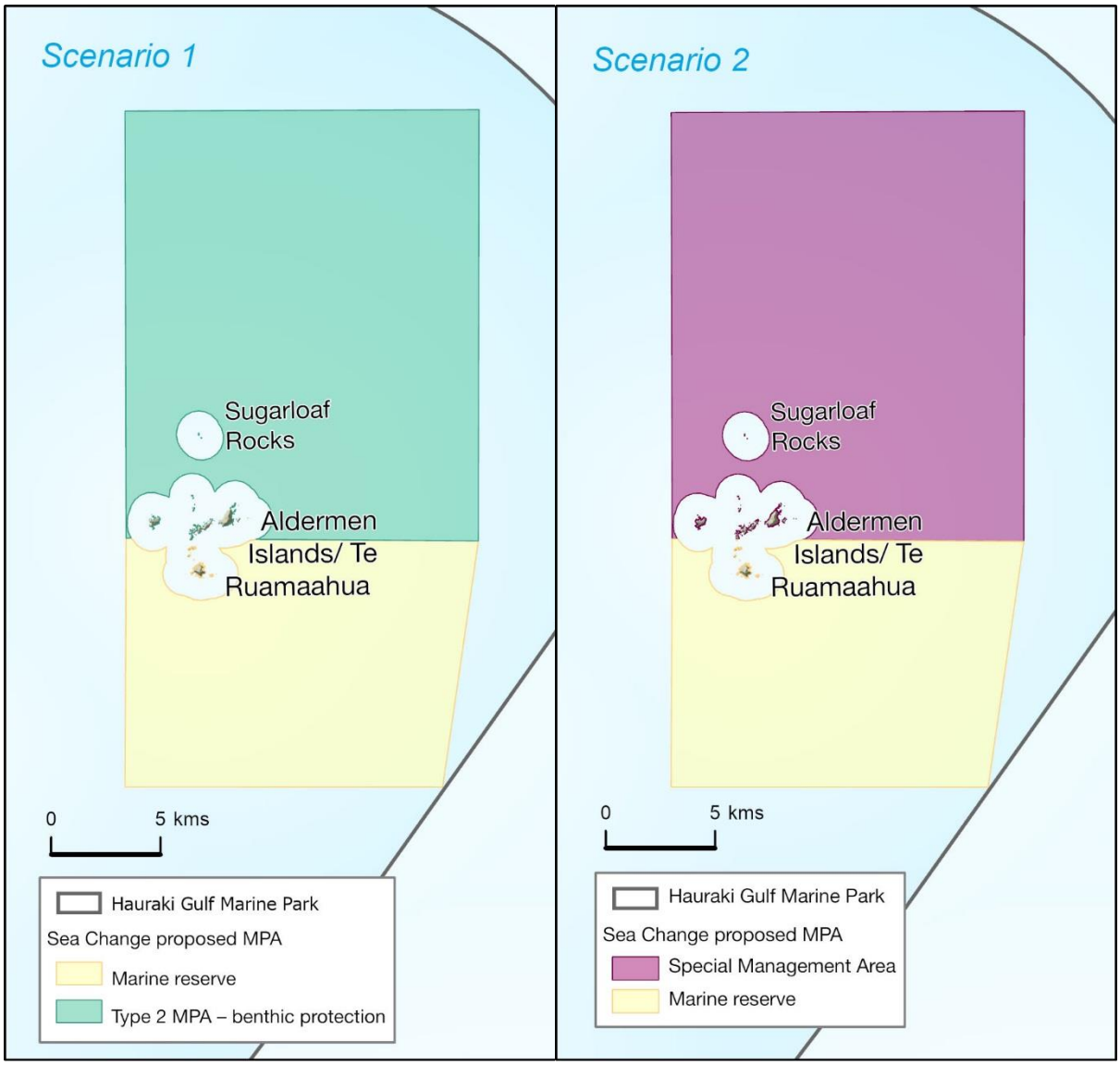

Figure 23. Sea Change MPA proposals for the Aldermen Islands.

Agency assessment of habitats and ecologically significant features that would be protected in Scenario 1

Marine reserve

The proposed marine reserve in Scenario 1 would provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, seven physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats). Of particular note for this proposal is the deep reef habitat (species associated with this habitat include sponges, hydroids, anemones and ascidians).

While seven habitats are identified as being protected by the site, the size of some individual habitat patches, and whether they are of suitable size to allow the maintenance of their ecological values, remains a concern and should be a focus of future monitoring and research. In particular, the shallow rocky reef habitat is of a size that is unlikely to respond substantially to protection due to edge effects that would be present under the proposed boundary.

Type 2 MPA

In order to meet the objectives for the Type 2 MPA proposal at this site, to protect the seafloor features, the following fishing methods would need to be prohibited:

- Mobile bottom fishing methods (all dredging, bottom trawling and Danish seining)
- All fishing methods that interact substantially with the seafloor (including potting, set netting and bottom longlining)

These fishing methods are considered incompatible with the objective to protect sensitive species that this site is known for, such as black coral, and therefore need to be restricted.

The proposal would include nine physical habitat types that would be afforded some degree of protection. Those features sensitive to disturbance would be protected from physical displacement, but wider ecological benefits are less likely to occur. Further assessment based on the levels of extraction from remaining fishing methods, including from recreational extraction, would need to be undertaken to determine if the level of protection could allow for the maintenance and recovery of wider ecosystem values.

Agency assessment of habitats and ecologically significant features that would be protected in Scenario 2

Marine reserve

The proposed marine reserve in Scenario 2 would provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, seven physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats). Of particular note for this proposal is the deep reef habitat (species associated with this habitat include sponges, hydroids, anemones and ascidians).

While seven habitats are identified as being protected by the site, the size of some individual habitat patches, and whether they are of suitable size to allow the maintenance of their ecological values, remains a concern and should be a focus of future monitoring and research. In particular, the shallow rocky reef habitat is of a size that is unlikely to respond substantially to protection due to edge effects that would be present under the proposed boundary.

Special management area

The SMA proposal would limit all commercial fishing, and in addition the restrictions would extend to most recreational fishing (with the exception allowing for ‘low volume/high value’ catch). Given that the proposal includes a relatively high level of protection, it is considered that the proposal would enable the protection and restoration of habitats and associated biodiversity.

The SMA would potentially provide protection to 15 of the physical habitat types present in the Hauraki Gulf, in particular, deep reef, sand and mud habitats. While 15 habitats are identified as being protected by the site, the size of some individual habitat patches, and whether they are of suitable size to allow the maintenance of their ecological processes, remains a concern and should be a focus of future monitoring and research (i.e. many of the habitats have less than 1 km^2 in total and/or cross the boundary of the proposal). For the rocky reef habitats, those areas that are entirely within the boundary of the proposed reserve are likely to be viable, even though the actual extent may be small, but those reefs that cross the boundary are likely to be compromised by edge effects.

Agency assessment of proposals against Sea Change Plan objectives

Tables 15 & 16 provide an assessment of the proposed areas against the objectives for the different management options (marine reserves and Type 2 MPA/SMA).

Table 15. Assessment of Aldermen Islands marine reserve proposal against Sea Change Plan objectives.

MARINE RESERVE SPECIFIC OBJECTIVES	SCENARIO 1 AND 2
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Would allow recovery to meet this objective
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	A number of significant features are identified at this site that would contribute to this objective
Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Would provide protection for several habitat types, would contribute to this objective
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	Would contribute to this objective
Provide reference areas for marine research, monitoring and education	Would contribute to this objective
Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism	Would contribute to this objective by allowing environmental restoration (limited as remote)

Table 16. Comparative assessment of Aldermen Islands seafloor protection area and Special Management Area proposals against Sea Change Plan objectives.

PLAN TYPE 2 MARINE PROTECTED AREA SPECIFIC OBJECTIVES	SCENARIO 1 – TYPE 2 MARINE PROTECTED AREA	SCENARIO 2 – SPECIAL MANAGEMENT AREA
Identify, restore and protect key habitats (e.g. biogenic habitats) in order to maintain the integrity of ecosystems and their functioning by 2020	Contributes to objective by providing protection to soft sediment biogenic and reef features from physical disturbance	Contributes to objective by providing protection to soft sediment biogenic features and reef ecosystems
Significantly increase the productivity of the Hauraki Gulf Marine Park by 2035	Potentially protects key habitats important for fisheries productivity	Potentially protects key habitats important for fisheries productivity
Exclude activities (e.g. dredging, bottom trawling, Danish seining, dumping and sea bed mining) that damage habitats by 2025	Contributes to objective	Contributes to objective
Potentially serve as a buffer to areas with a higher level of protection (thereby implementing a nested approach)	Partially. Reduces edge effects on the reserve boundary by reducing some fishing pressure	Contributes by reducing edge effects on the reserve boundary

Potentially support restoration projects	Potentially. But no restoration projects are targeted for the area	Potentially. But no restoration projects are targeted for the area

Agency response to Sea Change Plan proposal

Overall, agencies consider that the biodiversity values associated with the islands – together with the relative remoteness and good water quality – justify area-based protection. The area has been previously considered for some kind of protection, including by MAF (1985), LINZ (Sewell 1985) and DOC (1995).

The marine reserve (identical in both scenarios) is likely to be effective at providing for the maintenance and recovery of ecological systems, natural species composition and trophic linkages.

Given the restrictions provided under the Scenario 1 Type 2 MPA, agencies consider that the proposal in Scenario 1 will afford protection at a suitable level to provide for the maintenance and recovery of physical features and biogenic structures that support biodiversity but would be unlikely to allow for the maintenance and recovery of wider ecological values.

The SMA proposal in Scenario 2 would afford greater protection than the proposed seafloor protection area in Scenario 1. The SMAs would likely provide for maintenance and recovery of ecological systems, natural species composition and trophic linkages, rather than just protect the physical structures and sensitive species from direct disturbance. It would be consistent with a Type 2 MPA designation under the MPA Policy.

Overall, Scenario 2 would provide higher biodiversity benefits than Scenario 1.

Modifications to proposal

Agencies consider that in order to adequately deliver on the purpose and outcomes for MPAs in the Sea Change Plan and follow best-practice MPA design criteria, the following adjustment is preferred to the Sea Change marine reserve proposal:

- Realigning the eastern boundary to have a clear north/south bearing to facilitate compliance.
- Adjust the northern boundary (i.e. slight shift south of the northern boundary) for ease of compliance.

Further, agencies recognise that while Scenario 2 would provide effective protection over a range of habitats, there is less certainty around how effective an SMA will be. Given this uncertainty, and the potential for significant effects on commercial fishing, agencies recommend an alternative:

- In order to ensure adequate protection to deep reef areas in the north of the site (see Fig. 24), it is proposed that a marine reserve is established instead of an SMA or Type 2 MPA, but of a smaller size. This would provide greater certainty while maintaining effective protection and reducing the displacement and potential impact from restricting fishing over an area twice as large.

The areas of the proposals to progress are 163.3 km^2 (southern high protection area) and 133.9 km^2 (northern high protection area).

Alignment with existing legislation and policy

While the proposed marine reserve in Scenario 1 offers a high level of protection, it is unlikely to be consistent with the Marine Reserves Act 1971, as the intention is to make provision for customary practises. As such, the proposal being taken forward to engagement with mana whenua will be defined as a **high protection area** rather than a marine reserve.

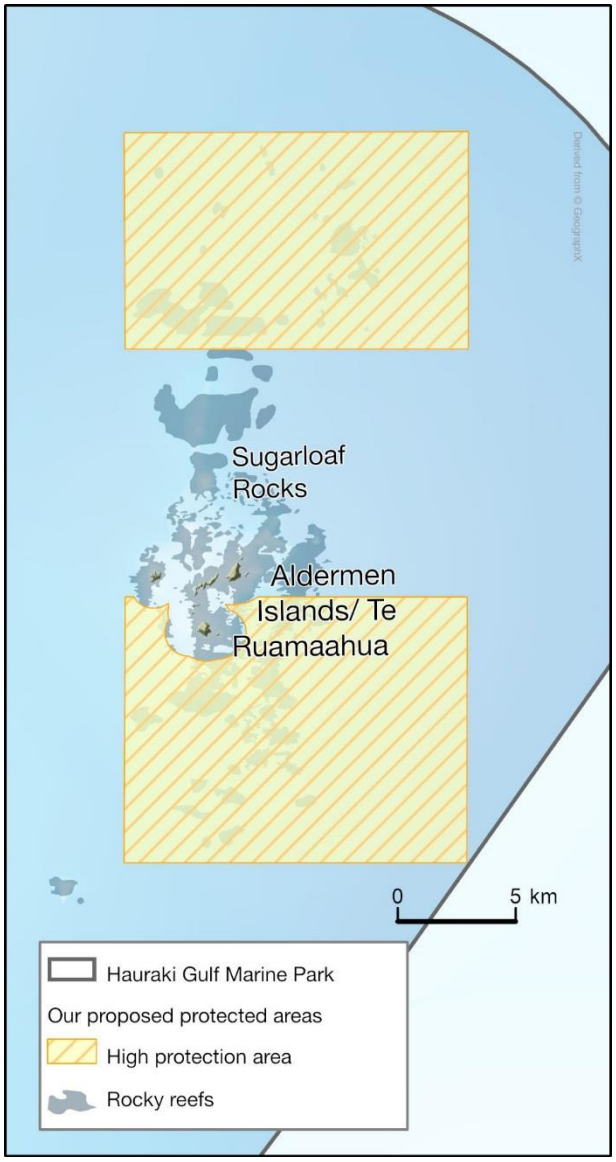

Figure 24. Preferred option to progress for Aldermen Islands.

Agency assessment of habitats that would be protected

The proposed marine reserves together would provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, seven physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats). Of particular note is the increased area of deep reef under high protection (species associated with this habitat include flask sponges, glass sponges, black coral, hydroids, anemones and ascidians).

While seven habitats are identified as being protected by the site, the size of some individual habitat patches, and whether they are of suitable size to allow the maintenance of their ecological values, remains a concern and should be a focus of future monitoring and research. In particular, the shallow rocky reef habitat in the southern high protection area is of a size that is unlikely to respond substantially to protection due to edge effects that would be present under the proposed boundary.

Activities that would be affected by the high protection areas

A summary of the existing users that may be affected by the proposals is given in Table 17.

Table 17. Assessment of affected users for the proposed Aldermen Islands high protection areas.

ACTIVITY	HIGH PROTECTION AREA – SOUTH	HIGH PROTECTION AREA – NORTH
Commercial fishing	All commercial fishing would be prohibited. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $516,000 based on a total reported average yearly catch of 236.7 tonnes. The biggest displacement would be experienced by the jack mackerel, skipjack tuna and blue mackerel fisheries, of which 122.1, 37.9 and 11.5 tonnes per year would be displaced, respectively. In terms of foregone revenue, the jack mackerel, skipjack tuna and blue mackerel fisheries would be the most impacted.	All commercial fishing would be prohibited. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $311,000 based on a total reported average yearly catch of 49.2 tonnes. The biggest displacement would be experienced by the snapper, skipjack tuna, gemfish, jack mackerel and tarakihi fisheries, of which 8.3, 7.2, 6.1, 6.0 and 5.0 tonnes per year would be displaced, respectively. In terms of foregone revenue, the snapper and skipjack tuna fisheries would be the most impacted.
Recreational fishing	All recreational fishing would be prohibited. An analysis of the spatial distribution of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park indicates that 0.03% of recreational fishing effort and 0.01% and 0.02% of snapper and kahawai landed catch would be displaced, respectively.	All recreational fishing would be prohibited. Spatial analysis of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park suggests there would be no impact on recreational fishing effort targeting snapper and kahawai by rod and line.
Mining and petroleum exploration	All mining and petroleum exploration would be prohibited.	All mining and petroleum exploration would be prohibited, with the possible exception of the activities listed in section 61(1A) of the Crown Minerals Act 1991. No mining occurs at this site and no active petroleum permits or open block offers are present. Foregone benefits from future potential mining or petroleum extraction in the area would not be significant as the area is not believed to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	All commercial extractive activities would be prohibited. No current extraction of material is known to occur.	All commercial extractive activities would be prohibited. No current extraction of material is known to occur.

5. Mercury Islands – Great Mercury Island (Ahuahu) and Red Mercury Island (Whakau)

Site description

The Mercury Islands are located 8 km off the Coromandel east coast. The main islands are Great Mercury Island (Ahuahu) to the west, and Red Mercury Island (Whakau) to the east. Great Mercury Island (Ahuahu) has a mix of exotic forest and grassland. The islands are pest-free and a hotspot for seabirds, of which several species breed on the islands. Offshore, the islands are surrounded by extensive reef systems, some of which extend from the shore to depths of more than 90 m, as well as coarse clean sandy substrates in shallow water, and muddy sediments below approximately 80 m depth. The reefs east of the islands form part of the largest system of deep reefs within the HGMP. This system extends northwest in a broken series to just north of Cuvier Island (Repanga Island).

Marine biodiversity values

The waters around the Mercury Islands sustain a great diversity of marine life due to the varied underwater terrain consisting of extensive reefs, sandy bottoms, pinnacles, caves and steep drop-offs. Their proximity to the mainland represents a relatively uncommon sequence from shallow coastal to deep outer shelf habitats. The complex bathymetry and varying levels of shelter provided by the islands and adjacent mainland contribute to the high habitat diversity, which is reflected in the diversity of marine species found here (see Figs 25 & 26). The influence of the subtropical East Auckland Current, (although not as strong as at the nearby Aldermen Islands) and high water clarity result in diverse algal and encrusting invertebrate assemblages (Grace 1973). Shallow rocky reefs are dominated by large brown seaweeds, mainly *E. radiata* (to 30–40 m depth) with an understorey of small red and brown algae, sponges and bryozoans (*Steginoporella neozelanica*). Below 40 m depth rocky reefs are dominated by highly diverse sponge assemblages, including rare deep-water sponges such as *Isodictya cavicornuta* and protected black and gorgonian corals. Rhodolith beds occur on coarse sands between the islands and between the islands and the mainland. Other notable species include red and packhorse rock lobster.

Grace (1976) recorded 51 species of fishes belonging to 32 families from the waters around the islands, with species composition reflecting their more coastal nature than the Aldermen Islands.

Huruhi Bay on Great Mercury Island (Ahuahu) holds one of the last examples of subtidal seagrass meadows in the North Island. These were once common in coastal and estuarine habitats around the mainland, but their extent has been greatly reduced by poor water quality and elevated sedimentation rates arising from catchment development. A comparative study by Schwarz et al. (2006) suggested Huruhi Bay (and a further seagrass meadow at Slipper Island/Whakahau) supported fish assemblages that differed substantially from their mainland, intertidal counterparts. Juvenile snapper densities recorded in Huruhi Bay are among the highest recorded from seagrass habitats in New Zealand, but the extent of the bed is relatively small and appears to be highly variable.

The area between the Mercury Islands and the mainland, known locally as ‘The Puddle’ supports several different biogenic habitats, including horse mussel and dog cockle beds (with associated sponges) and large areas of rhodoliths (Jones et al. 2016). A large proportion of the ‘Whitianga Beds,’ some of the most important commercial scallop grounds in the Coromandel scallop fishery and marine park, are located in this area.

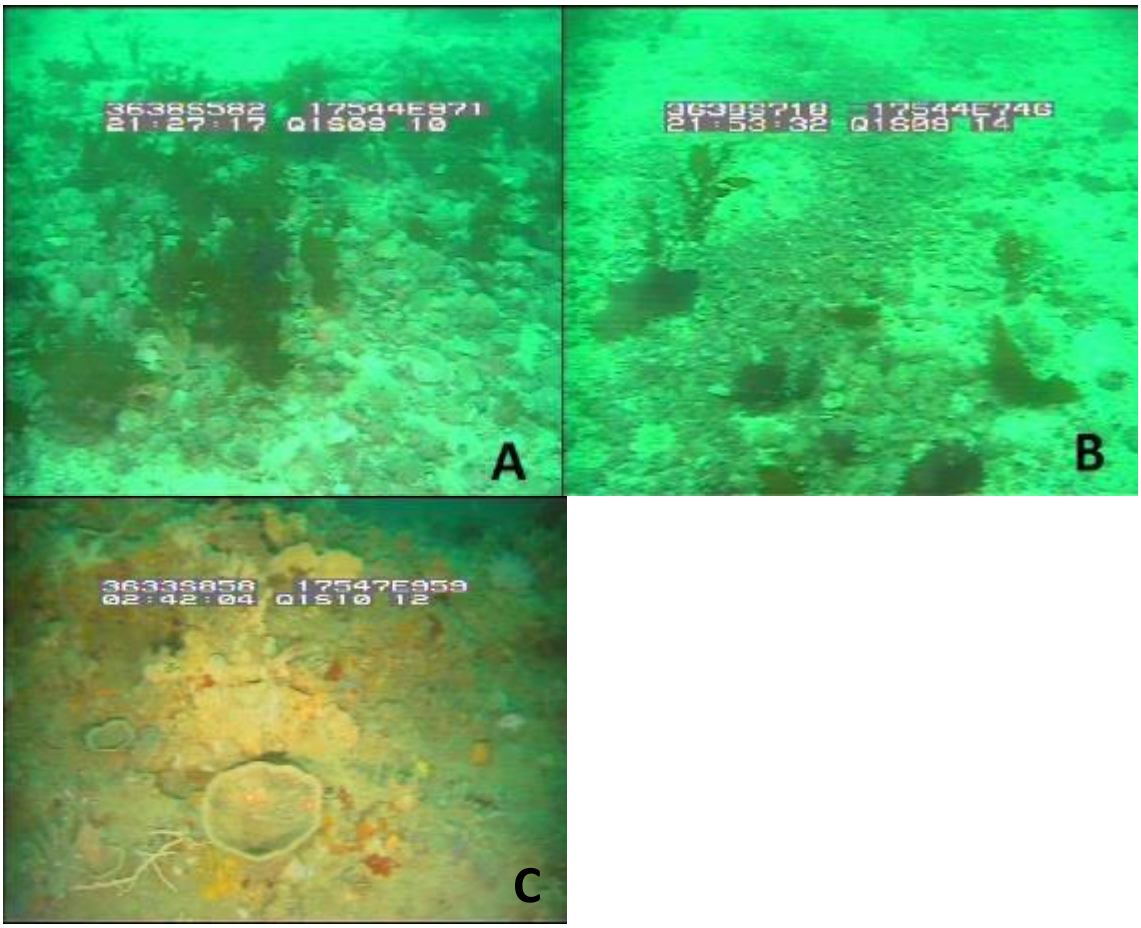

Figure 25. Biogenic habitats on coarse sand at 23–30 m depth southwest of Ahikopua Point, Great Mercury Island (Ahuahu), June 2008: A. Ecklonia radiata *and red algae growing on a dense dog cockle (*Tucetona laticostata*) shell, B. rhodoliths and dead dog cockle and scallop (*Pecten novaezelandiae*) shell with attached* E. radiata *and red algae, C. Sponge-dominated assemblage at 50–60 m depth on rocky reef north of Great Mercury Island (Ahuahu), June 2008. Photos: DOC.*

Figure 26. Encrusting invertebrates and moray eel. Photo: Dive Zone Whitianga.

Direct pressures

Towed underwater video observations of reefs deeper than 80 m east of the Mercury Islands suggest that although these are still dominated by sponges, including several rarely seen species, they are being adversely affected by terrestrially derived sediments (as predicted by NIWA sediment transport and deposition models, Hadfield et al. 2014).

The seagrass meadow in Huruhi Bay represents a rare example of what historically was a common habitat found along the mainland coast and estuaries. Threats to subtidal seagrass include damage from anchors and poorly designed moorings, poor water quality, disease/pathogens and global climate change. Recent surveys by Clark & Crossett (2019) suggest the health of the seagrass meadow in Huruhi Bay may be declining.

Existing management

Most of the islands are scenic or nature reserves. Great Mercury Island (Ahuahu) is privately owned. The waters around the islands are heavily fished.

Commercial and recreational set netting is excluded within 1 km (0.5 nautical miles) off large parts of the island group[22,23].

Trawling by vessels over 46 m is prohibited around the islands and both trawling and Danish seining are prohibited in Mercury Bay. Commercial and recreational scallop take is managed under the Coromandel scallop fishery. The Auckland Coromandel shellfish recreational daily bag limits and size restrictions apply.

The Mercury Islands area is designated as Area of Significant Conservation Value in the Waikato Regional Coastal Plan (Waikato Regional Council 2005).

Sea Change Plan proposal for the Mercury Islands area

The Sea Change Plan proposes a Type 2 MPA on Great Mercury Island (Ahuahu) spanning from south of Arimawhai Point to halfway between Omataonga and Oruaki Points, including Rocky, Coralie and Te Koru Bays. It proposes the prohibition of all fishing methods that impact benthic habitats, ring netting (set netting), potting and all commercial fishing (Sea Change Plan, p. 274). The proposal includes 5 km^2 of marine area (0.03% HGMP), with a minimum width of 2 km and approximately 13 km of coastline (Fig. 27)**.**

[22] See http://www.legislation.govt.nz/regulation/public/1986/0216/latest/DLM105923.html (accessed 22 October 2020).
[23] See https://www.mpi.govt.nz/dmsdocument/7275-auckland-kermadec-recreational-fishing-rules-printer-friendly (accessed 22 October 2020).

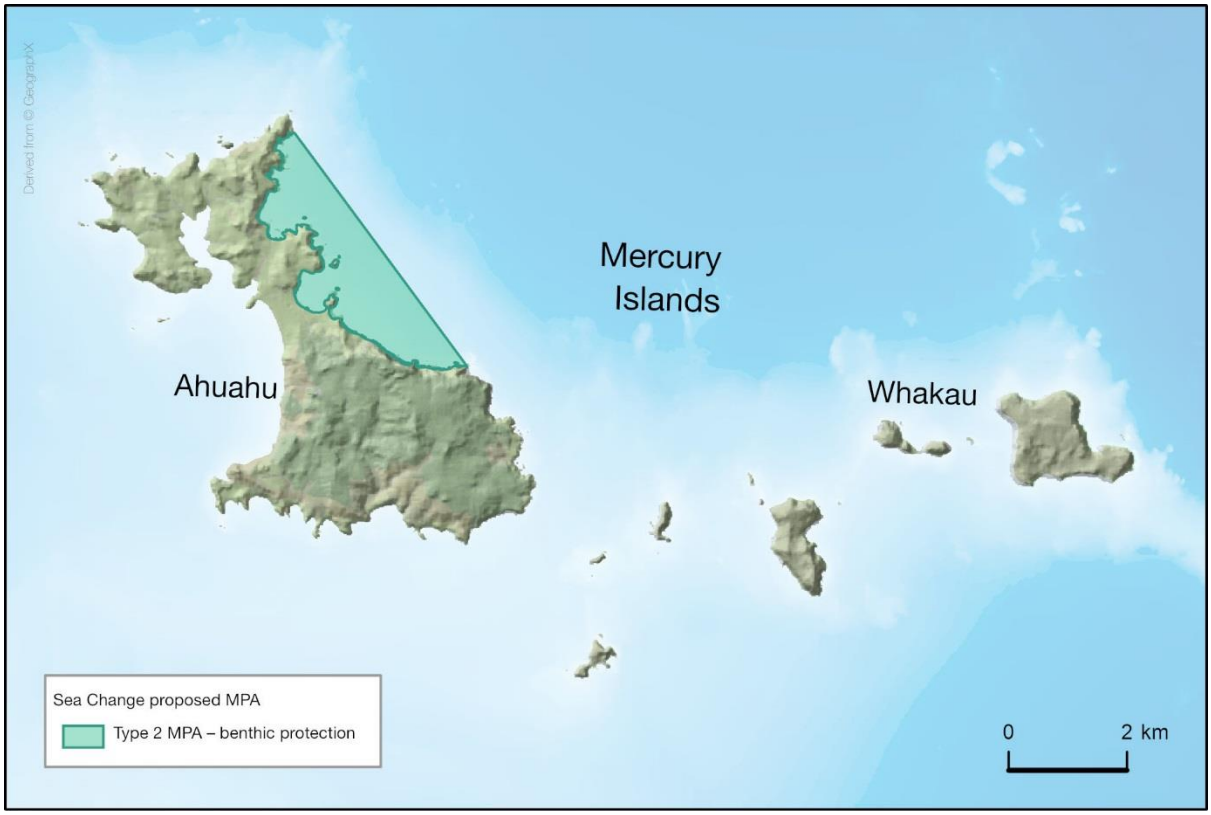

Figure 27. Sea Change Plan for the Mercury Islands.

Agency assessment of habitats and ecologically significant features that would be protected

The proposal would include 11 physical habitat types for which features sensitive to disturbance would be protected from physical displacement. However, wider ecological benefits are unlikely to occur at this site. The small size of the proposal would make the overall benefit of protection insignificant and questionable as to whether it would meet any of the proposed objectives.

Agency assessment of proposal against Sea Change Plan objectives

The table below provides the stated Sea Change Plan objectives.

Table 18. Assessment of Mercury Island seafloor protection area proposal against Sea Change Plan objectives.

PLAN TYPE 2 MARINE PROTECTED AREA SPECIFIC OBJECTIVES	BENTHIC PROTECTION
Identify, restore and protect key habitats (e.g. biogenic habitats) in order to maintain the integrity of ecosystems and their functioning by 2020	Unlikely to contribute significantly
Significantly increase the productivity of the Hauraki Gulf Marine Park by 2035	Unlikely
Exclude activities (e.g. dredging, bottom trawling, Danish seining, dumping and sea bed mining) that damage habitats by 2025	Minimal
Potentially serve as a buffer to areas with a higher level of protection (thereby implementing a nested approach)	No
Potentially support restoration projects	Potentially

Agency response to Sea Change Plan proposal

Agencies acknowledge the high biodiversity values associated with the Mercury Islands area that have been considered for some kind of protection in the past, including by MAF (1985) and LINZ (Sewell 1985). Agencies, however, consider the Sea Change Plan proposal for a Type 2 MPA too small to be an effective area. In addition, it is noted that most of the management proposed in the Sea Change Plan is already in place. Given its inadequacy, agencies will not progress this proposal and the Mercury Island area is flagged as a potential gap in the MPA network, given the area's outstanding biodiversity values.

6. Whanganui-A-Hei (Catheral Cove) marine reserve extension

Site description

Whanganui A Hei (Cathedral Cove) Marine Reserve is Coromandel Peninsula's only marine reserve. Established in 1992, it is located on the east coast just north of Hahei. It protects 8.8 km^2 of coastal waters, spanning 5 km of coastline and extending 1 km offshore. Several small nearshore islands and isolated patch reefs are included in the reserve. Ōi / grey-faced petrels (*Pterodroma macroptera*) are known to breed on Mahurangi Island (Goat Island) at the reserve's southern boundary. The reserve is adjacent to the Cathedral Cove Recreation Reserve, which attracts large numbers of visitors every year.

Marine biodiversity values

The habitats and biological assemblages in the marine reserve and surrounds are typical of coastal northeast North Island. Rocky reefs, soft sediments, intricate caves and underwater arches provide homes for complex communities of plants, crustaceans, molluscs and fishes (Fig. 28). The shallow rocky reefs within the reserve are dominated by large brown algae, particularly *E. radiata* and *Carpophyllum flexuosum*. Sponge-dominated assemblages occur on reefs below 30 m depth, and large green-lipped mussels (*Perna canaliculus*) cover much of the South Sunk Rock reef system (located just outside the reserve).

Low relief, almost flat, rocky platforms occur in some outer parts of the reserve. They are covered in a thin layer of sand, short turfing algae and small sponges.

Killer whales (*Orcinus orca*) visit the marine reserve at irregular intervals, possibly hunting short-tail stingrays and eagle rays (*Myliobatis tenuicaudatus*). Juvenile green turtles (*Chelonia mydas*) have occasionally been seen around the islands.

Figure 28. Clown nudibranch (Ceratosoma amoenum). Te Whanganui-a-Hei Marine Reserve. Photo: Brian Mackie

Direct pressures

Parts of the marine reserve, particularly Cathedral Cove and Stingray Bay, are heavily used recreationally, creating potential for trampling impacts on intertidal organisms and disturbance of coastal wildlife, particularly birds. Boat traffic includes kayaks and other vessels visiting the reserve or Cathedral Cove, as well as a large number that are just passing through. Launches occasionally anchor overnight off Cathedral Cove. The effect of this on coastal wildlife and species such as stingrays that use the shallows is unknown. Recreational fishing, including spear fishing and scuba diving for rock lobster, as well as commercial rock lobster fishing occurs around the boundary of the reserve. Recreational fishing can be intense during public holidays and illegal fishing in the reserve is not uncommon, particularly around the Mahurangi Island (Goat Island) boundary.

Existing management

Whanganui A Hei (Cathedral Cove) Marine Reserve is a no-take MPA in which all removal of marine life (alive or dead), habitat disturbance (including discharges of effluent) and introductions of organisms are prohibited. DOC undertakes systematic, long-term biological monitoring of rocky reef

communities and selected species such as red rock lobster within the marine reserve and at control sites outside it (Haggitt & Mead 2009).

In waters outside the reserve there are prohibitions on trawling, Danish seining and commercial scallop dredging[24].

The Auckland Coromandel shellfish recreational daily bag limits and size restrictions apply to recreational fishers outside the marine reserve.

The coastline, coastal waters and islands off Cathedral Cove are classed as an area of Outstanding Natural Character in the Waikato Regional Coastal Plan[25].

Sea Change Plan proposal for Whanganui A Hei (Cathedral Cove) Marine Reserve

The proposal seeks to extend the boundary of the existing marine reserve further offshore and along its eastern border to encompass Mahurangi Island (Goat Island) and Te Tio Island to the south of the existing reserve (Fig. 29). The objective of this proposal is twofold, first to improve protection to account for offshore rock lobster movement and second to provide direct access to the marine reserve from Hahei Beach. To this end, the proposal extends the southern border to encompass approximately half the length of Hahei Beach.

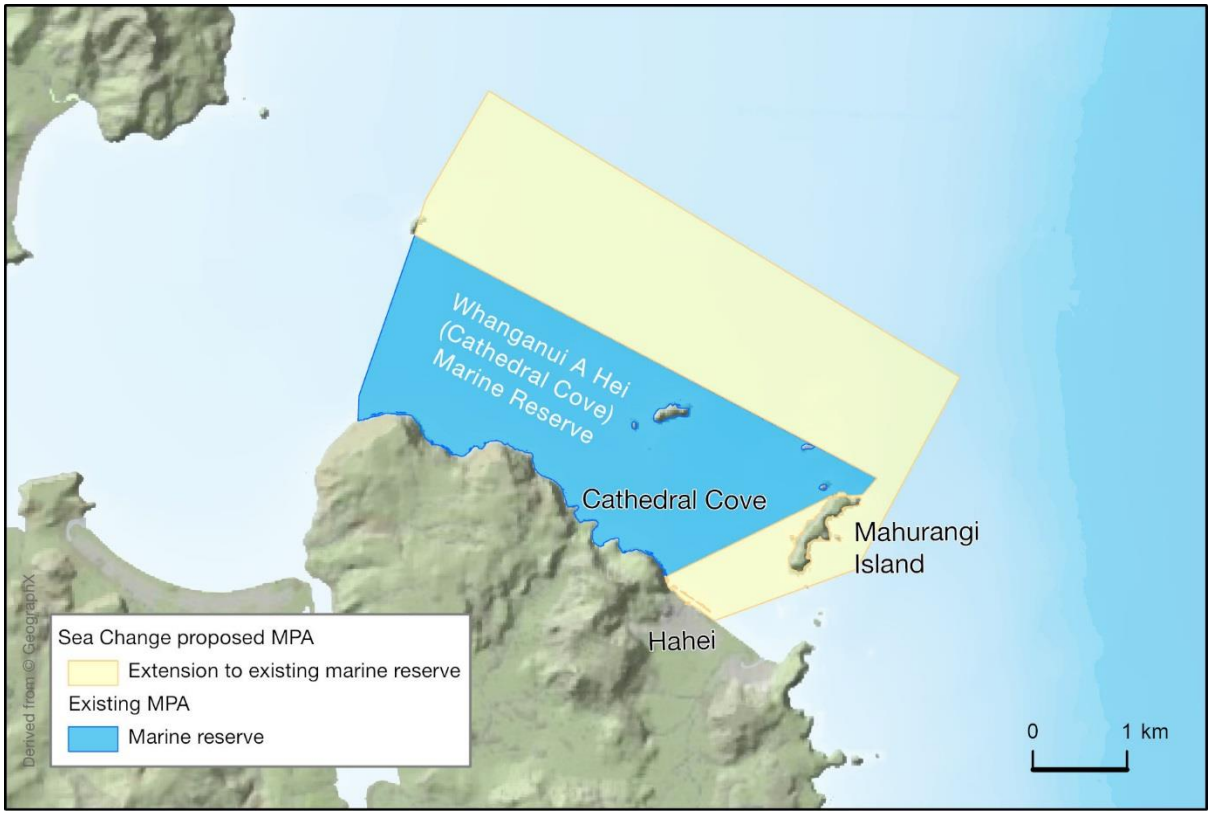

Figure 29. Sea Change Plan proposal for extension of Whanganui A Hei (Cathedral Cove) Marine Reserve.

[24] 6 (2) Auckland and Kermadec Areas Commercial Fishing Regulations 1986. http://www.legislation.govt.nz/regulation/public/1986/0216/43.0/DLM104498.html (accessed 22 October 2020).

[25] Waikato Regional Council 2005: Waikato Regional Coastal Plan. Waikato Regional Council. https://www.waikatoregion.govt.nz/Council/Policy-and-plans/Rules-and-regulation/Regional-Coastal-Plan/ (accessed 21 October 2020).

The proposal would extend the marine reserve by 9 km^2, taking the total area of marine reserve to approximately 18 km^2 marine area (0.13% HGMP), adding approximately 5 km of coastline (of which approximately 800 m are along Hahei Beach)**.**

Agency assessment of habitats and ecologically significant features that would be protected

The proposed marine reserve in Scenario 1 would provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, 11 physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats). Of particular note are the rocky reef associated with Mahurangi Island (Goat Island) and the additional protection for the offshore reefs (adding deep reef habitat to the marine reserve).

The extension would provide for a buffer around the outer edge of the reef system, increasing its efficacy in protecting reef ecosystems.

Agency assessment of proposal against Sea Change Plan objectives

Table 19 provides the Sea Change Plan objectives for marine reserves and whether the proposal contributes to the objectives.

Table 19. Assessment of Whanganui A Hei (Cathedral Cove) Marine Reserve extension against Sea Change Plan objectives.

MARINE RESERVE OBJECTIVES	WHANGANUI A HEI (CATHEDRAL COVE) MARINE RESERVE EXTENSION
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Would allow some recovery to meet this objective
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	Deep reef features are identified at this site that would contribute to this objective
Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Would provide protection for several habitat types, would contribute to this objective
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	Would contribute to this objective
Provide reference areas for marine research, monitoring and education	Would contribute to this objective
Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism	Would contribute to this objective by allowing environmental restoration

Agency response to Sea Change Plan proposal

Agencies support this proposal, noting that it would enhance the existing reserve by increasing the extent of some soft sediment habitats and reefs, and providing a buffer for other reef habitats encompassed in the existing marine reserve.

Modifications to proposal

Agencies consider that in order to better deliver on the purpose and outcomes for MPAs in the Sea Change Plan, follow best-practice MPA design criteria as well as minimising potential effects on existing users, the following adjustment is recommended to the proposed extension:

- Adjust the western boundary of the extension to follow the bearing of the existing marine reserve.
- Adjust the northern boundary further offshore (approximately 900 m) to provide an effective buffer to the reefs included in the extension.
- Adjust the southern extension so that the boundary runs along the western Mahurangi Island (Goat Island) coastline and crosses from the southern point of the island towards Hahei Beach, to minimise potential effects on existing users.

The area of the proposed extension to progress is 14.6 km^2.

Alignment with existing legislation and policy

As the proposed marine reserve would have the same protection status as the current marine reserve, it is likely to be consistent with the Marine Reserves Act 1971 and will be referred to as a **marine reserve** in recognition of this (Fig. 30).

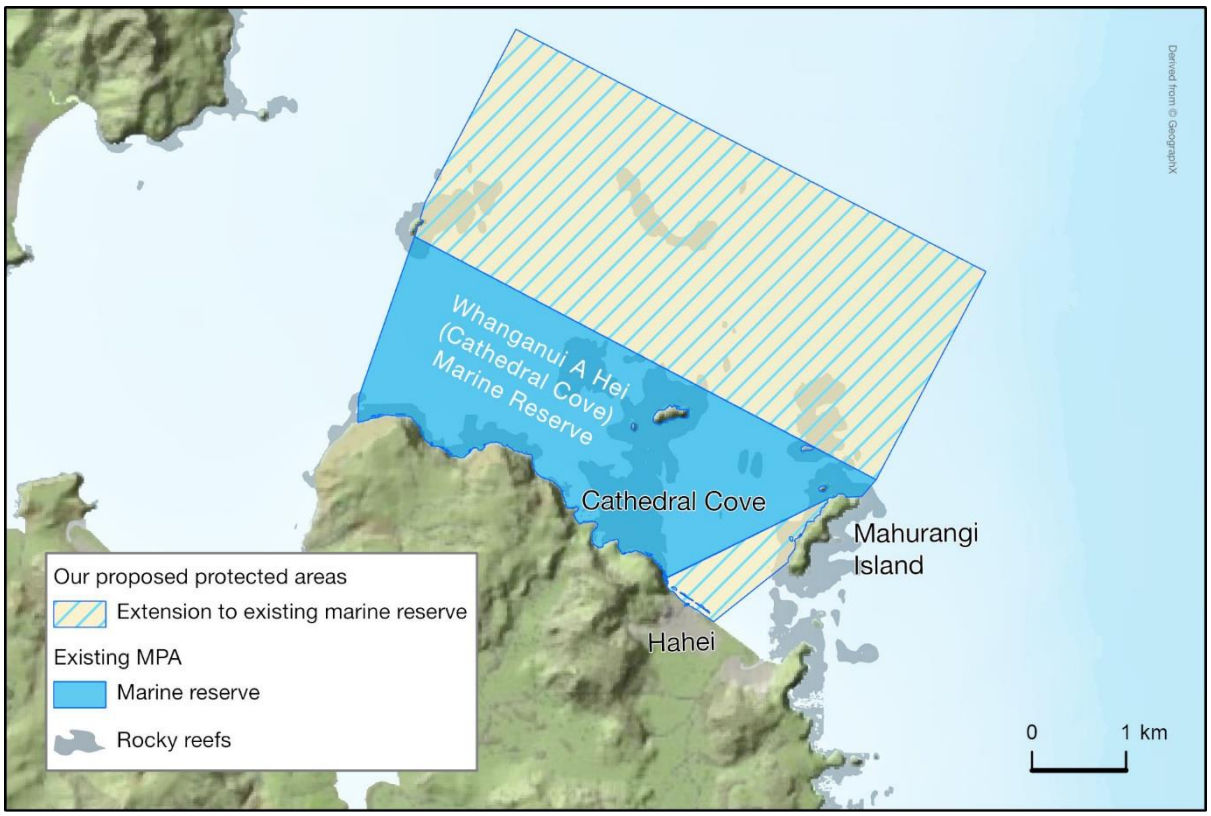

Figure 30. Preferred option for Whanganui A Hei (Cathedral Cove) Marine Reserve extension.

Activities that would be affected by the marine reserve extension

A summary of the existing users that may be affected by the proposal is given in Table 20.

Table 20. Assessment of affected users for the proposed Whanganui A Hei (Cathedral Cove) Marine Reserve extension.

ACTIVITY	MARINE RESERVE
Commercial fishing	All commercial fishing would be prohibited. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $31,000 based on a total reported average yearly catch of 3.8 tonnes. The biggest displacement would be experienced by the snapper fishery, of which 1.5 tonnes per year would be displaced. The economic impact would be small and impact mostly the snapper fishery.
Recreational fishing	All recreational fishing would be prohibited. An analysis of the spatial distribution of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park indicates that 0.34% of recreational fishing effort and 0.16% and 0.5% of snapper and kahawai landed catch would be displaced, respectively.
Mining and petroleum exploration	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	All commercial extractive activities would be prohibited. No current extraction of material is known to occur.

7. Slipper Island/Whakahau

Site description

Slipper Island/Whakahau is located 3 km off the eastern coast of the Coromandel Peninsula. Several smaller islets (including Penguin and Rabbit Islands) are found off its southern tip. Privately owned, the island is mainly covered in grassland except a few coastal fringes of indigenous vegetation. Ōi/grey-faced petrels and little shearwaters (*Puffinus assimilis*) breed on the islands.

Marine biodiversity values

Slipper Island/Whakahau marine habitats include an extensive shallow reef system and a rich mosaic of intertidal and subtidal soft sediment habitats, including coarse clean sands and shell gravel.

Grace & Whitten (1974) found coarse sand and shell gravel are characterised by dense beds of the morning star shell (*Tawera spissa*), a small widespread bivalve. Species associated with these beds include *Glycymeris modesta, Zemysia zelandica, Duplicaria tristis* and a number of polychaetes. Medium to fine sands are characterised by the bivalves *Myadora boltoni* and *Scalpomactra scalpellum*. Scallops are abundant on soft sediments at many places around the island. Rocky reefs are dominated by common kelp and *Carpophyllum* species.

South Bay contains an extensive subtidal seagrass (*Zostera muelleri*) meadow, that extends from just below low water to a depth of approximately 3 m (Fig. 31). This is one of the last and possibly best remnant seagrass meadows found in the HGMP. Subtidal seagrass meadows are thought to have been common in estuaries and harbours all around New Zealand, but permanently submerged seagrass meadows are now considered rare habitats and are primarily found around offshore islands and a small number of northern harbours with high water quality (Schwarz et al. 2006). The decline of subtidal seagrass meadows is largely attributed to declines in water quality, particularly clarity, arising from run-off of excess sediments and nutrients from land-based activities such as forest clearance, pastoral farming and urban development. Subtidal seagrass meadows are ecologically important habitats because they support diverse invertebrate assemblages and large numbers of certain species of juvenile fishes, particularly snapper. A recent study (Clark & Crossett 2019) of seagrass beds at Slipper Island/Whakahau and the Mercury Islands showed that the Slipper Island/Whakahau meadow was twice the size of the Mercury Islands one and extended into waters almost twice as deep. The Slipper Island/Whakahau meadow appears to be in better condition, which could potentially be attributed to sandier sediments and higher water clarity. Mapping done by Clark & Crossett (2019) indicates that the seagrass meadow has extended north into Stingray Bay since 2004.

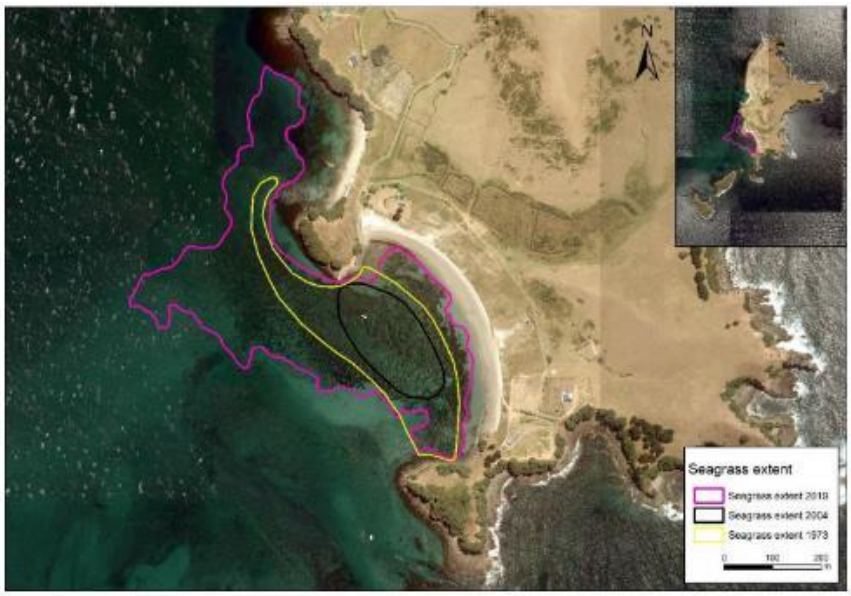

Figure 31. Extent of seagrass meadow at South Bay and adjacent Stingray Bay, estimated in 2019 (pink), 2004 (black) and 1973 (yellow). Source: Clark & Crossett (2019).

Direct pressures

Seagrass loss is often attributed to declines in water quality associated with human activities. Increased sediment and nutrient loads can degrade the availability of light through increased water turbidity, and elevated nutrient levels can result in plants being overgrown by microalgae. Seagrass beds can also be impacted by heavy metals in the water or direct mechanical damage such as dredging and anchoring. Fungal wasting disease caused by *Labyrinthula* sp. is also thought to have had a role in the decline of intertidal and subtidal seagrass beds in New Zealand. It remains to be determined weather adverse environmental conditions or anthropogenic stress increases the susceptibility of seagrass meadows to the disease.

South Bay is a popular anchorage and anchor damage to the bed has been observed, as has scouring around swing moorings (Fig. 32).

Figure 32. Evidence of scouring of seagrass surrounding swing moorings in South Bay, Slipper Island/Whakahau. Source: Clark & Crossett (2019).

Existing management
Trawling, Danish seining and set netting (both commercial and recreational) are prohibited off northwest Slipper Island/Whakahau. Commercial scallop take is prohibited over the same area.

The Auckland Coromandel daily shellfish and finfish bag limits and size restrictions apply to recreational fishers.

Sea Change Plan proposal for Slipper Island/Whakahau

The Sea Change Plan proposes a marine reserve on the southern half of Slipper Island/Whakahau, encompassing the lower half of the island and extending south towards the northern tip of Rabbit Island (Fig. 33). The proposal is nested within a larger Ahu Moana MPA around it.

The proposal includes 4 km^2 of marine area (0.03% HGMP), with a minimum width of 2 km and approximately 8 km of coastline**.**

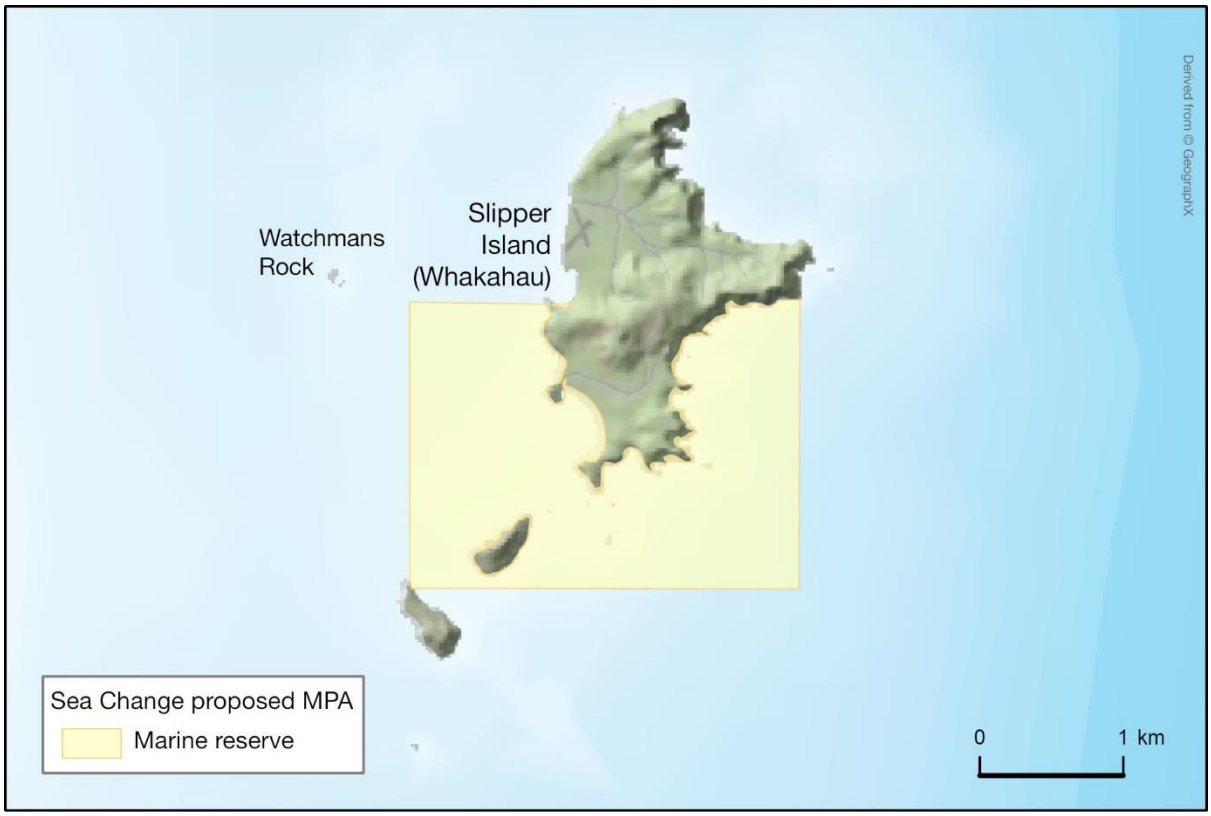

Figure 33. Sea Change Plan proposal for Slipper Island/Whakahau.

Agency assessment of habitats and ecologically significant features that would be protected

Based on the habitat classification, 13 physical habitats would be included within this proposal (see Appendix 3 for full list of habitats). However, due to the small size of the proposal and the extent to which the boundary crosses the reef (that will likely result in significant edge effects), the level of actual protection afforded to the ecosystem is questionable.

The ecologically important biogenic seagrass habitat would be afforded protection by the proposal.

Agency assessment of proposal against Sea Change Plan objectives

Table 21 provides the Sea Change Plan objectives for marine reserves and how well the proposal contributes to the objectives.

Table 21. Assessment of Slipper Island/Whakahau marine reserve proposals against Sea Change Plan objectives.

MARINE RESERVE OBJECTIVES	SLIPPER ISLAND/WHAKAHAU – MARINE RESERVE
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Uncertain if recovery would occur
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	Uncertain
Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Uncertain
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	Only if future monitoring shows recovery
Provide reference areas for marine research, monitoring and education	Only if future monitoring shows recovery
Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism	Uncertain

Agency response to Sea Change Plan proposal

The agencies consider that the biodiversity values associated with Slipper Island/Whakahau, and in particular the presence of rare and vulnerable biogenic habitats (i.e. subtidal seagrass meadow), justify area-based protection at Slipper Island/Whakahau. The area has been previously considered for some kind of protection (MAF 1985).

However, the marine reserve as proposed is likely to be impacted by edge effects and overall small extent of the habitat present.

Modifications to proposal

Agencies consider that in order to deliver on the purpose and outcomes for MPAs in the Sea Change Plan and follow best-practice MPA design criteria, the following adjustments are required to the proposal:

- Adjust the western, southern and eastern boundaries to improve reserve design and provide for improved protection of the reef ecosystem.
- Include measures to protect seagrass beds from direct physical disturbance (including anchoring).

Overall, agencies consider that the modifications to the proposal are more likely to make the reserve effective at providing for the maintenance and recovery of ecological systems, natural species composition and trophic linkages of the habitats contained within it.

In particular, while edge effects are still likely to be present on the northern boundary that may compromise the effectiveness of the reserve for those habitats, the extensive reef system to the south of the proposal is likely to be protected from the amended boundary, with a sand buffer between the boundary and reef edge.

The overall area of the proposal is 13.5 km^2.

Alignment with existing legislation and policy

While the proposed marine reserve in Scenario 1 offers a high level of protection, it is unlikely to be consistent with the Marine Reserves Act 1971, as the intention is to make provision for customary practises. As such, the proposal being taken forward to engagement with mana whenua will be defined as a **high protection area** rather than a marine reserve (Fig. 34).

Agency assessment of habitats that would be protected

The amended proposal would provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, 17 physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats); in particular, shallow rocky reef habitat.

Agencies note that uncertainty remains in regard to a few of the physical habitats present in the proposal being of viable size (i.e. to meaningfully afford protection to associated species and ecological processes). Future research and monitoring will allow this uncertainty to be addressed, should this proposal be implemented.

The proposal would afford protection to a relatively rare biogenic habitat, subtidal seagrass, and is the only MPA in the Sea Change Plan that includes it.

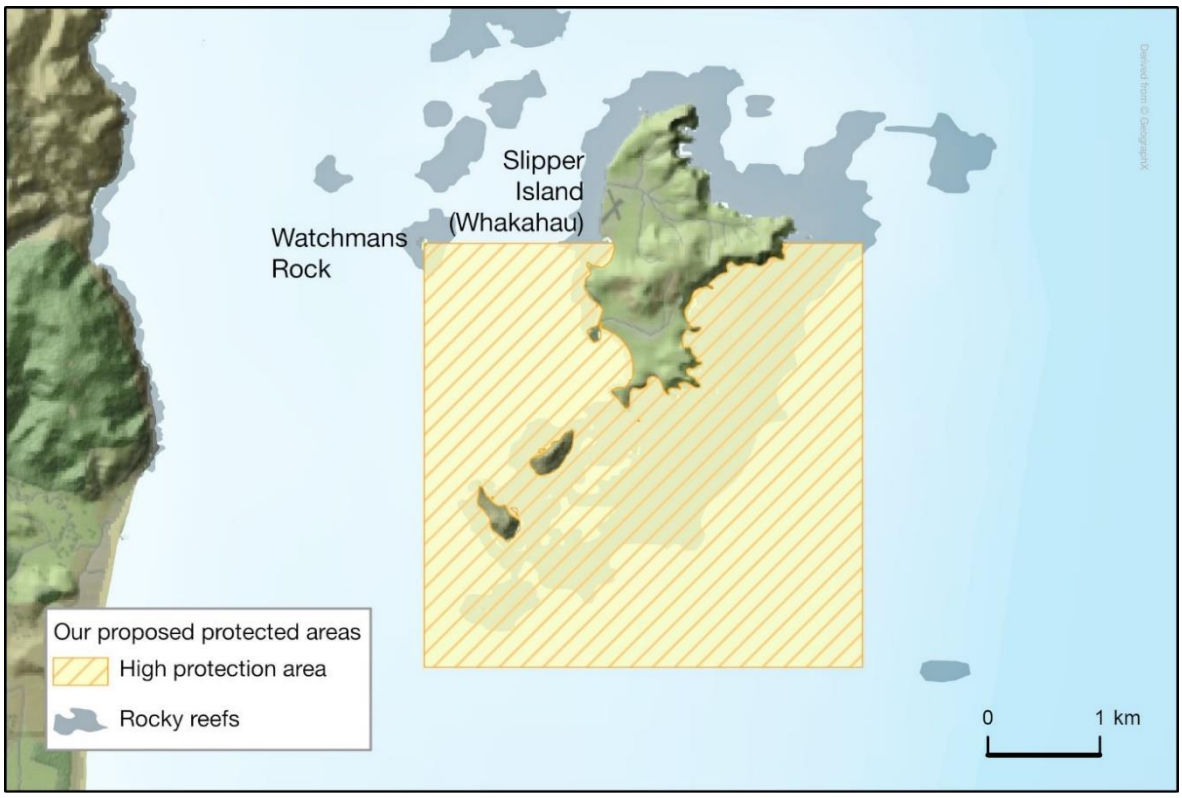

Figure 34. Preferred option for Slipper Island/Whakahau.

Activities that would be affected by the high protection area

A summary of the existing users that may be affected by the modified proposals is given in Table 22.

Table 22. Assessment of affected users for the proposed Slipper Island/Whakahau high protection area.

ACTIVITY	HIGH PROTECTION AREA
Commercial fishing	All commercial fishing would be prohibited. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $110,000 based on a total reported average yearly catch of 28.1 tonnes. The biggest displacement would be experienced by the jack mackerel, blue mackerel and snapper fisheries, of which 11.5, 5.2 and 2.9 tonnes per year is displaced, respectively. In terms of foregone revenue, the jack mackerel and blue mackerel fisheries would be the most impacted.
Recreational fishing	All recreational fishing would be prohibited. An analysis of the spatial distribution of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park indicates that 0.56% of recreational fishing effort and 0.26% and 0.52% of snapper and kahawai landed catch would be displaced, respectively.
Mining and petroleum exploration	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	All commercial extractive activities would be prohibited. No current extraction of material is known to occur.
Anchoring	Anchoring would be limited to specific areas to protect the subtidal seagrass.

8. Cape Rodney-Okakari Point Marine Reserve extension

Site description

Established in 1975, the Cape Rodney–Okakari Point Marine Reserve (also known as Goat Island Marine Reserve and Leigh Marine Reserve), located near Leigh on the HGMP's northwestern coast, was New Zealand's first no-take marine reserve. Managed by DOC, it protects 5.5 km^2 of coastal waters spanning 5 km of coastline and extending 800 m offshore. Offering some of the best snorkelling and scuba diving opportunities close to Auckland as well as a coastal walkway, the marine reserve is a popular destination for locals and visitors alike.

Most of the land surrounding the marine reserve is in forest (regenerating bush as well as pine plantation) and grassland (farmed pasture and uncultivated land). Vegetation around the coastal areas reduces the amount of sediment and nutrients entering the marine reserve via streams.

The reserve also provides endless opportunities to study marine wildlife and ecology to researchers at the University of Auckland's Leigh Marine Laboratory. Research on coastal ecological dynamics and the restoration of marine ecosystems stemming from New Zealand's oldest marine reserve keep providing the knowledge to inform management for both the reserve and North Island coastlines in general. Research topics include questions on resource management (particularly in regard to the primary effects of protection on the recovery of exploited species), food web dynamics (i.e. predation and trophic cascades), species-habitat interactions, natural variability, wider ecosystem-based management considerations such as MPA design principles and ecosystem-based management fisheries (Babcock 2013) and emerging fields such as ecosystem services valuation (Geange et al. 2019). Further research focuses on wider benefits of marine protection and visitor perceptions and experiences associated with marine protection (Race & Orams 2014).

Marine biodiversity values

Cape Rodney–Okakari Point Marine Reserve contains habitats and biodiversity typical of northeast New Zealand. Habitats within it include sandy and rocky coastline, shallow kelp forests and kina barrens, large areas of subtidal sands and deep reefs dominated by sponges. Reefs in the reserve are mostly covered by large brown algae with a mixture of fucoid algae (*Carpophyllum* and *Cystophora* spp.) dominating from low water to approximately 5 m depth, and common kelp predominating below this to approximately 20–25 m depth.

Research and monitoring undertaken in the marine reserve since its establishment in 1975 tells a well-documented story of ecosystem recovery following a complete ban on extractive uses. Many changes in community structure and the overall health of the marine environment have been observed over the years, but none exemplifies the ecosystem-level effects of protection as well as kina-kelp 'trophic cascade.' Prior to the establishment of the marine reserve, the removal of kina predators such as snapper and rock lobster by fishing resulted in an increase in the kina (*Evechinus chloroticus*) population. Eventually, kina grazed down large areas of kelp (*E. radiata*) forest, creating and maintaining these areas as kina barrens. In northern New Zealand kina barrens are a common feature of coastal reefs from approximately 5–10 m depth. Following establishment of the reserve, a reversal of this trend was observed, with predatory fish and rock lobster increasing in abundance, a reduction in the extent of kina barrens and the recovery of kelp forests. Whereas adjacent unprotected areas remain dominated by kina barrens (Babcock et al. 1999; Shears & Babcock 2002). Kina barren-dominated habitats are less productive ecosystems compared to the kelp ecosystems they replace (Filbee-Dexter & Scheibling 2014). A comparison of the seabed habitats and associated communities before and after the reserve had been in place for 30 years showed that areas grazed bare by kina were entirely replaced in the centre of the reserve by kelp (Leleu et al. 2012) (Fig. 35). A

study by Babcock et al. (2010) using data collected in the marine reserve over 30 years gives some insight into the timeframes required for natural species composition and ecological processes to be restored. Following full protection, levels of formerly exploited predatory species such as fish and/or rock lobster recovered within 5 years, followed by a decline in kina resulting in an increase in kelp within 10–15 years.

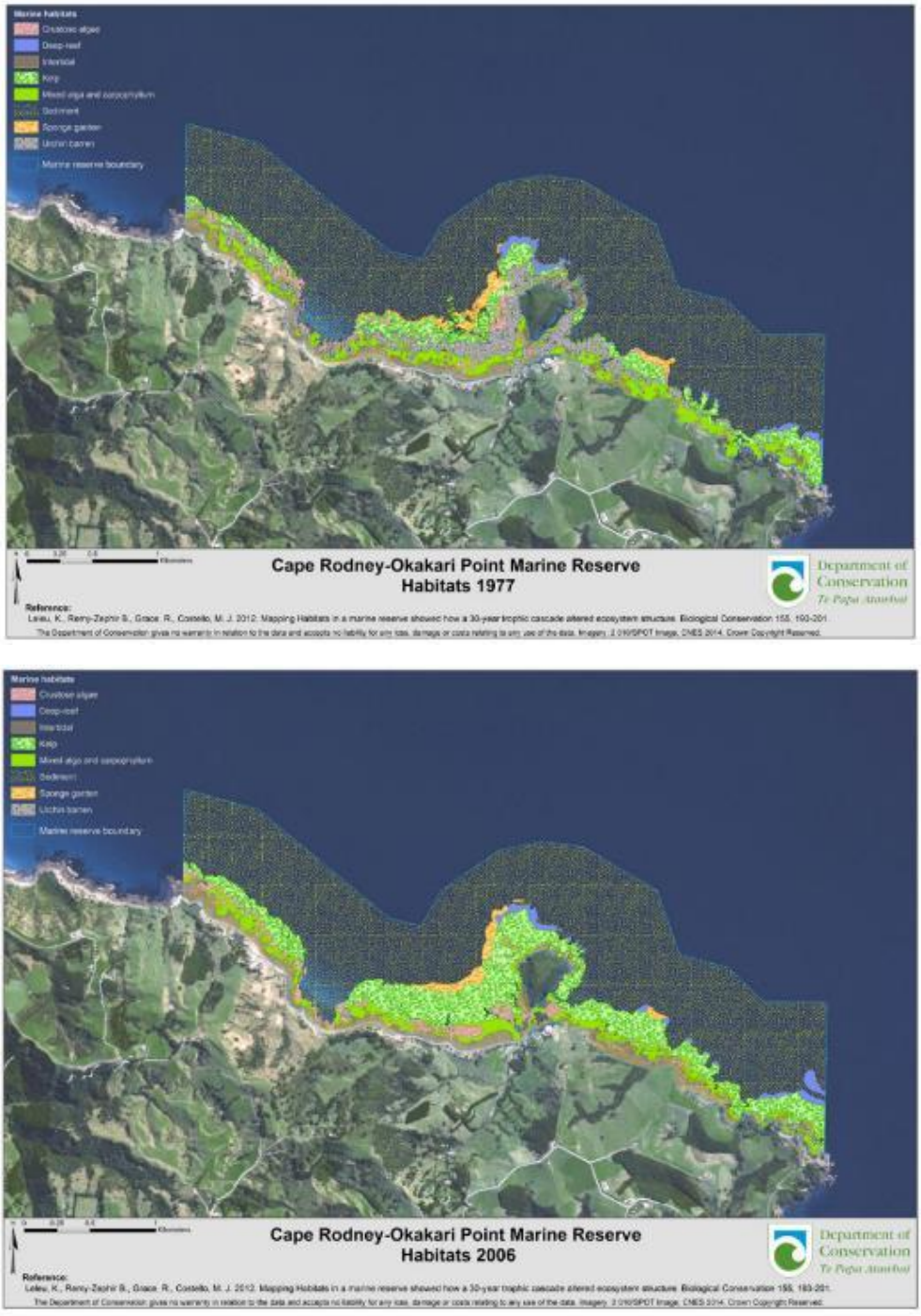

Figure 35. Distribution of habitats based on Leleu et al. 2012. Top image shows extent of kina barrens (grey) at time of marine reserve establishment. Bottom image shows replacement of kina barren by kelp and mixed algae.

Direct pressures

Despite the recovery of kelp forest habitats and populations of several exploited species within the marine reserve following initial protection, the movement of rock lobsters beyond its boundaries means their abundance within it mirrors population trends in the wider fishery. Although still more abundant within the reserve than outside it, rock lobster numbers have declined to pre-protection levels. Tagging of rock lobster within the reserve has shown that approximately 50% of mature rock lobsters regularly move beyond its boundaries, including offshore on to sandflats, to feed (Kelly & MacDiarmid 2003). These movements can take lobsters several kilometres from their dens. Once outside the reserve they are vulnerable to commercial and recreational fishers. If not caught, they generally return to their den within the reserve, although not necessarily directly. They may visit and become temporarily resident on other reef systems (Kelly & MacDiarmid 2003).

Fishing along the boundary of the reserve can be intense at times, potentially affecting fish populations within the reserve. The species probably most affected by this are snapper and rock lobster, although a variety of fishes will be taken across all fishing methods (e.g. carpet sharks, red moki, wrasses and conger eels are common bycatch in rock lobster pots).

As one of New Zealand's most popular marine reserves, Cape Rodney-Okakari Point Marine Reserve receives an estimated 300,000 visitors per year. Studies on the impact of walking over the intertidal reef flats suggest trampling by visitors damages algae and invertebrates growing on rocks. Although these effects are generally considered temporary, ongoing trampling has the potential to depress abundance and cover, and alter species composition of intertidal organisms for the duration of the disturbance.

Existing management

The Cape Rodney-Okakari Point Marine Reserve is a no-take MPA in which all removal of marine life (alive or dead), habitat disturbance (including discharges of effluent) and introductions of organisms are prohibited. Management of the marine reserve (including monitoring, compliance, permitting, etc.) is undertaken by DOC.

In the waters surrounding the reserve, trawling and Danish seining by fishing vessels over 20 m in length is prohibited, except where a fisher permit has been endorsed[26].

Cape Rodney-Okakari Point Marine Reserve is classed as a marine Significant Ecological Area in the Auckland Unitary Plan (Auckland Council 2017).

Sea Change Plan proposal for Cape Rodney-Okakari Point Marine Reserve

The Sea Change Plan seeks to extend the boundary of the existing marine reserve offshore by 3 km to account for offshore rock lobster movements (Fig. 36).

The proposal would extend the marine reserve by 14 km^2, taking the total area of marine reserve to approximately 20 km^2 marine area (0.14% HGMP)**.**

[26] 6 (2) Auckland and Kermadec Areas Commercial Fishing Regulations 1986. http://www.legislation.govt.nz/regulation/public/1986/0216/43.0/DLM104498.html (accessed 22 October 2020).

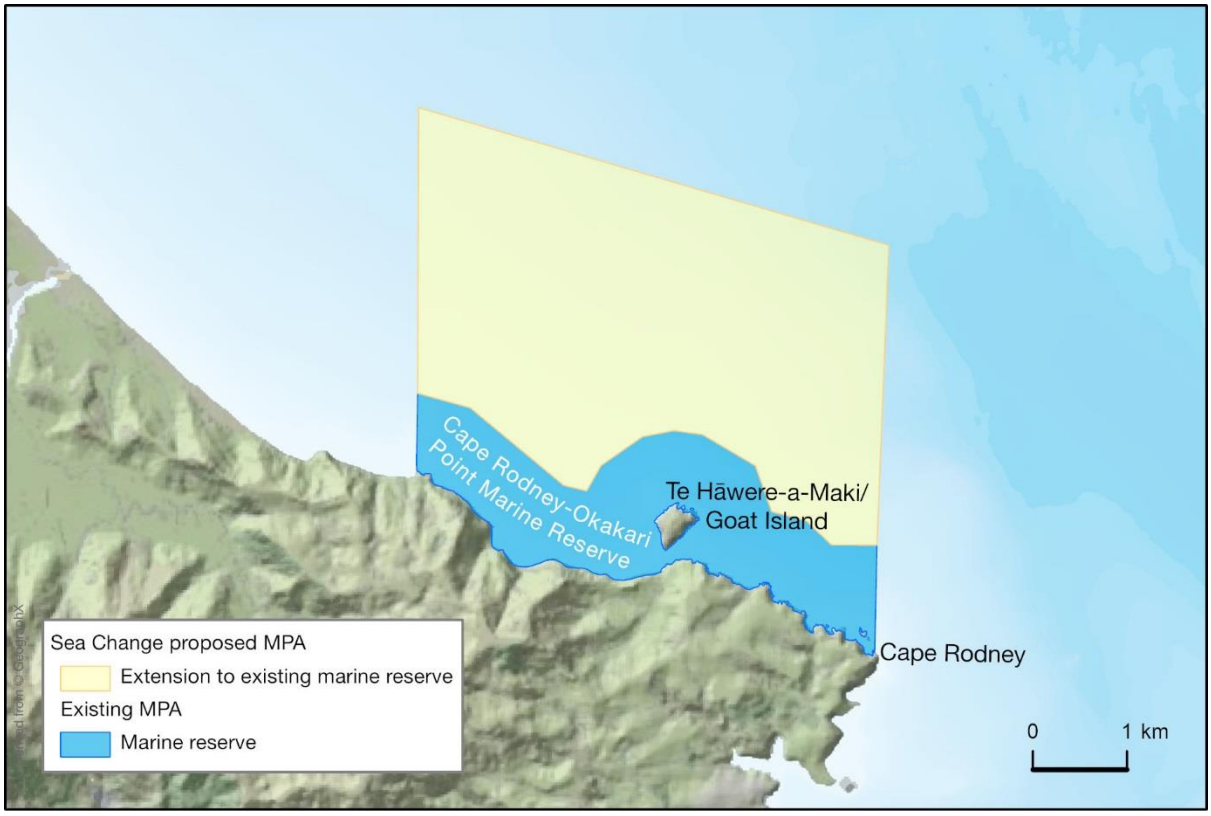

Figure 36. Sea Change Plan proposal for extension of Cape Rodney-Okakari Point Marine Reserve.

Agency assessment of habitats and ecologically significant features that would be protected

The proposed marine reserve extension would provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, the extension would increase the area of protection for three soft sediment habitats. One of the main benefits from the proposal is to mitigate the effects associated with the current vulnerability to fishing on the boundary.

Agency assessment of proposal against Sea Change Plan objectives

Table 23 provides the Sea Change Plan objectives for marine reserves and whether the proposal contributes to the objectives.

Table 23. Assessment of Cape Rodney-Okakari Point Marine Reserve extension against Sea Change Plan objectives.

MARINE RESERVE OBJECTIVES	CAPE RODNEY-OKAKARI POINT MARINE RESERVE EXTENSION
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Would allow some recovery to meet this objective
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	Would afford additional protection to reef ecosystems that would contribute to this objective

Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Would provide protection for several habitat types, would contribute to this objective
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	Would contribute to this objective
Provide reference areas for marine research, monitoring and education	Would contribute to this objective
Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism	Would contribute to this objective by allowing environmental restoration

Agency response to Sea Change Plan proposal

Agencies support this proposal, noting that it would enhance the existing reserve by extending the protection of some habitats beyond the current extent (sheltered shallow sand and very sheltered shallow sand) and providing a buffer for others such as reef habitats encompassed in the existing marine reserve.

The size of individual habitat patches, and whether they are of suitable size to allow the maintenance of their ecological processes, remains a concern with the reserve as a whole. Small size has been identified as a limitation of the current reserve, and while this proposal mitigates those concerns to some degree, ongoing research looking at the reserve effectiveness in meeting objectives would be required to inform future management.

The Sea Change Plan extension proposal, encompassing three types of sandy soft sediments, has been identified as territorial grounds for rock lobsters.

The proposal offers minimal protection of any mapped biogenic habitats, with only dog cockles present in a small patch on the eastern end (0.04 km^2).

Modifications to proposal

No modifications to this proposal are suggested.

Alignment with existing legislation and policy

As the proposed marine reserve (Fig. 37) would have the same protection status as the current marine reserve, it is likely to be consistent with the Marine Reserves Act 1971 and will be referred to as a **marine reserve** in recognition of this.

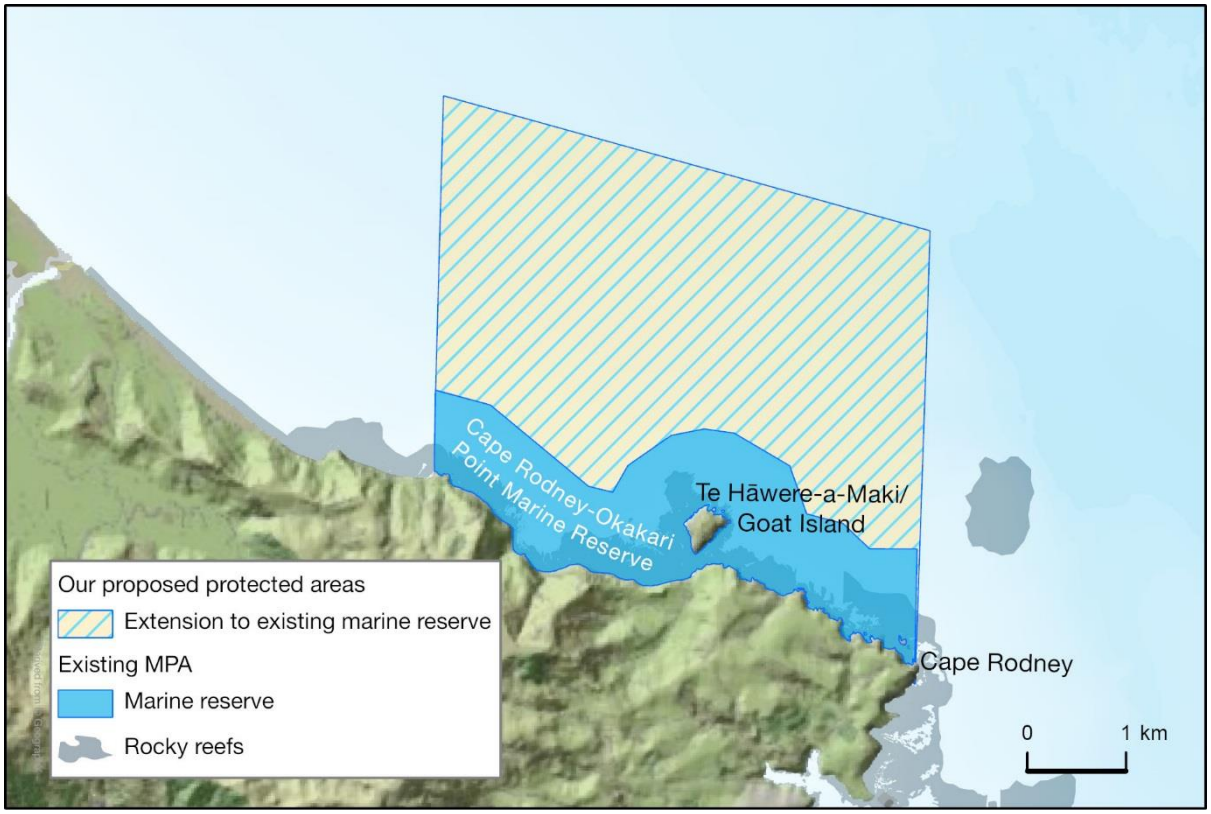

Figure 37. Proposed extension of Cape Rodney Okakari Point marine reserve.

Activities that would be affected by the marine reserve extension

A summary of the existing users that may be affected by the proposal is given in Table 24.

Table 24. Assessment of affected users for the proposed Cape Rodney-Okakari Point Marine Reserve extension.

ACTIVITY	MARINE RESERVE
Commercial fishing	All commercial fishing would be prohibited. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $69,000 based on a total reported average yearly catch of 13.3 tonnes. The biggest displacement would be experienced by the snapper and blue mackerel fisheries, of which 6.6 and 4.0 tonnes per year would be displaced, respectively. In terms of foregone revenue, the snapper fishery would be the most impacted. It should be noted that whilst the assessment determined negligible impact to rock lobster fishing from this extension, limitations of that assessment (described in Part 3) will likely have underestimated the level of catch taken within the proposed extension. Anecdotal information for this site suggests it is a popular area for commercial rock lobster potting and further assessment of the potential economic impact of this site on commercial rock lobster fishing should be undertaken.
Recreational fishing	All recreational fishing would be prohibited. An analysis of the spatial distribution of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park indicates that 0.06% of recreational fishing effort and 0.05% and 0.04% of snapper and kahawai landed catch would be displaced, respectively.

Mining and petroleum exploration	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	All commercial extractive activities would be prohibited. Approximately half of the proposed extension overlaps with a consent for sand extraction.

9. Whangateau Harbour

Site description

Whangateau Harbour is a sandspit-enclosed estuary on the west coast of the Hauraki Gulf, approximately 54 km north of Auckland City. It covers an area of approximately 750 ha and is very shallow, with over 90% of the water being exchanged after each low tide (Townsend et al. 2010). Consequently, it is characterised by extensive intertidal flats (mostly coarse to medium sand with a very low mud content) and fringing salt marsh and mangrove forest. The surrounding catchment has been extensively modified for pastoral farming, horticulture and residential development (particularly Mangatawhiri Spit and Point Wells).

Marine biodiversity values

Whangateau Harbour is considered one of the most important estuaries on Auckland's east coast because of its high water quality, the diverse range of habitats it contains and its use by several nationally threatened coastal birds (Townsend et al. 2010).

The harbour entrance has a unique sequence of benthic communities due to the large changes in species composition that occur over a very short distance (Grace 1966).

Habitats found inside the harbour include a variety of rocky reef types, extensive intertidal sand and mud flats, and shallow subtidal sands, muds and coarse shell in the main channel. Biogenic habitats include saltmarsh, mangrove forest and intertidal seagrass beds (*Zostera muelleri*). A detailed description of habitat distribution can be found in Kelly (2009). The harbour is well known for its dense shellfish beds, particularly cockles, but also horse mussels, pipi (*Paphies australis*) and tuatua (*Paphies subtriangulata*). It also provides habitat for a variety of fishes such as eagle rays, seahorses, parore (*Girella tricuspidata*) (Fig. 38), trevally, snapper, kahawai (*Arripis trutta*) and sand flounder (*Rhombosolea plebeia*) (Kelly 2009).

Mangatawhiri Spit is an important nesting and flocking site for the threatened New Zealand dotterel (*Charadrius obscurus*).

*Figure 38. Parore (*Girella tricuspidata*) on reefs and amongst mangroves adjacent to Horseshoe Island. Source: Kelly (2009).*

Direct pressures

Kelly (2009) undertook a review of threats to the ecological integrity of Whangateau Harbour. They encompass modified catchments, pressure from development around and within the harbour (e.g. coastal reclamation and structures), invasive marine species, introduced predators preying on

wading birds, and recreational fishing and shellfish collection. Despite this, water quality is high with generally low levels of metal and agri-chemical contamination, although there are localised impacts due to point source discharges, and sediments near two historic landfill sites show elevated metal concentrations (Kelly 2009; Townsend et al. 2010). Increasing urbanisation of the catchment is likely to increase contaminant impacts on the estuary.

Increasing summer temperatures and pathogens have been implicated as the causes of natural mass mortalities of cockles in the harbour.

Existing management

Commercial trawling, Danish seining and netting are prohibited within the harbour, and there is a cockle and pipi closure.

The Auckland Coromandel shellfish and finfish daily bag limits and size restrictions apply to recreational fishers.

Whangateau Harbour is classed as a marine Significant Ecological Area in the Auckland Unitary Plan (Auckland Council 2017).

Sea Change Plan proposals for Whangateau Harbour

The Stakeholder Working Group (SWG) agreed that this area would benefit from protection, but a decision was not reached on a single size, location or shape of an MPA. As a result, the SWG proposed two options for MPAs within Whangateau Harbour (Fig. 39).

Scenario 1 (Sea Change Plan, p. 278) includes an Ahu Moana Mana Whenua/Community co-management area around Horseshoe Island, nested within a Type 2 MPA throughout the harbour, including the entrance to the harbour and the southern arm (Waikokopu Creek). Scenario 2 (Sea Change Plan, p. 279) includes an Ahu Moana area throughout the entire harbour, with restrictions on harvesting shellfish.

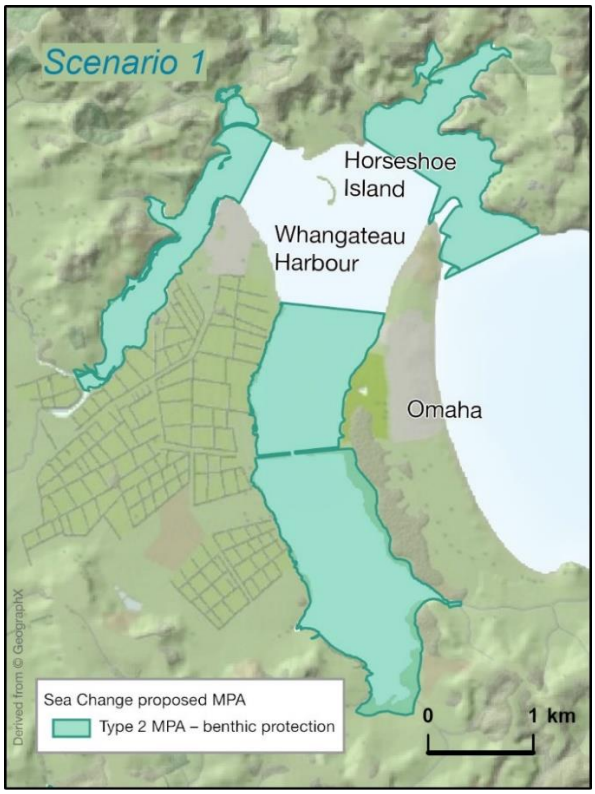

Figure 39. Seachange proposed MPA for Whangateau Harbour.

Agency assessment of habitats and ecologically significant features that would be protected

The proposed restrictions under a Type 2 MPA are unlikely to manage existing pressures on the harbour to a degree that it will benefit ecologically. The overall benefit of protection would be insignificant and questionable as to whether it would meet any of the proposed objectives.

While there are several physical habitats shown to be present in the area, as well as seagrass and salt marsh habitats, none would likely be provided adequate protection to enable recovery and maintenance of the ecological values.

This seafloor protection area is unlikely to significantly contribute to the overarching marine protection objectives.

Agency assessment of proposal against Sea Change Plan objectives

Table 25 provides the stated Sea Change Plan objectives and how the proposal applies.

Table 25. Assessment of Whangateau Harbour proposal against Sea Change Plan objectives.

PLAN TYPE 2 MARINE PROTECTED AREA SPECIFIC OBJECTIVES	BENTHIC PROTECTION
Identify, restore and protect key habitats (e.g. biogenic habitats) in order to maintain the integrity of ecosystems and their functioning by 2020	Unlikely to contribute
Significantly increase the productivity of the Hauraki Gulf Marine Park by 2035	Unlikely
Exclude activities (e.g. dredging, bottom trawling, Danish seining, dumping and sea bed mining) that damage habitats by 2025	Minimal
Potentially serve as a buffer to areas with a higher level of protection (thereby implementing a nested approach)	No
Potentially support restoration projects	Potentially

Agency response to Sea Change Plan proposal

The area has been previously considered for some kind of protection (DOC 1995). In regard to the seafloor protected area in Scenario 1, agencies consider that Whangateau Harbour already has numerous restrictions, and that no additional protection would be afforded through a seafloor protection area-type tool. Agencies will therefore not progress a seafloor protected area as proposed in the Sea Change Plan. Please note that this analysis is not providing an assessment of how this area could be managed within an Ahu Moana initiative.

10. Kawau Bay

Site description

This site extends from Takatu Point, Tāwharanui Peninsula, south to Big Bay near the entrance to Mahurangi Harbour and east to the Hauraki Gulf CPZ. Habitat diversity is high due to the complexity of the coastline, the presence of numerous islands, islets and offshore reefs and the Matakana River estuary. There are numerous sheltered bays and inlets, as well as exposed rocky reefs, and a wide range of sediment types. The entire area has high recreational and aesthetic values.

Kawau Bay itself is located 46 km north of Auckland between Tāwharanui Peninsula and Kawau Island. It is a relatively large, sheltered shallow bay. Most of the area in its centre is less than 10 m deep. A channel orientated northeast-southwest and located east of the Mayne Islands and Eclipse Shoal separates the shallow part of the bay from Kawau Island. This channel deepens to more than 23 m to the north (North Channel) and between 12–16 m to the south (Inner Channel). Tidal currents throughout most of the bay are low except in the channel and the entrance to Matakana River.

Mainland catchments have been extensively modified by pastoral farming, horticulture, and residential, light industrial and roading developments, with only small pockets of indigenous vegetation remaining. Kawau Island remains largely covered by indigenous vegetation, although this has been extensively modified by introduced plant and animal pests and human habitation.

Marine biodiversity values

A comprehensive survey of intertidal and subtidal benthic communities by Chiaroni et al. (2008) identified a high degree of habitat diversity with patchy, highly variable communities. The North and South Channel around Kawau Island had coarse sediments, strong currents and diverse communities. Patches of high density horse mussels and sponges were present, supporting a highly diverse infaunal community. Subtidal, rocky communities were dominated by kelp forests or mixed epifauna, with sponge flats also present on rock and sand mix habitats. Kelly et al. (2018) observed a rhodolith bed on Albert Shoal, approximately halfway between Mullet Point and Beehive Island (Taungamaro Island).

Inside Kawau Bay, Chiaroni et al. (2008) identified a mixture of epifaunal assemblages (scallops, sponges, horse mussels, etc.) on subtidal soft sediments. Hard substrate habitats held a variety of communities, including *Carpophyllum* forests, mixed algae, turfing algae and sponge flats. The sheltered northern and western regions of the bay were dominated by cockles (*Austrovenus stutchburyi*) on intertidal soft sediments, and low density horse mussels and sponges on soft sediments towards the inner bay.

The Inner Channel (between the mainland and Motuketekete and Moturekareka Islands) has a variety of habitats, including intertidal platform reefs, beaches, shallow subtidal reefs and subtidal sediments with varying amounts of shell, sand and mud. The variety of habitats observed is reflected in the ecological diversity of the marine communities present (Kelly et al. 2016). This includes biogenic species such as horse mussels, sponges and seaweeds.

Reef fishes and coastal demersal fish assemblages dominated by snapper are found in the Kawau Bay area. The bay includes nursery habitats and areas for juvenile snapper and other species (Fig. 40). Historically, the area is known to have been a nursery area for sharks, notably rig (spotted dogfish) (*Mustelus lenticulatus*) and school shark (*Galeorhinus galeus*). These species still occur in the area, but in much lower numbers than in the past. Eagle rays, short-tail and longtail (*Hypanus longus*) stingrays, bronze whalers, juvenile smooth hammerheads, juvenile great white sharks and sevengill sharks occur throughout the area. Killer whales and bottlenose dolphins are also regularly

seen foraging or passing through the area. Killer whales have been seen feeding on stingrays and sevengill sharks in Kawau Bay.

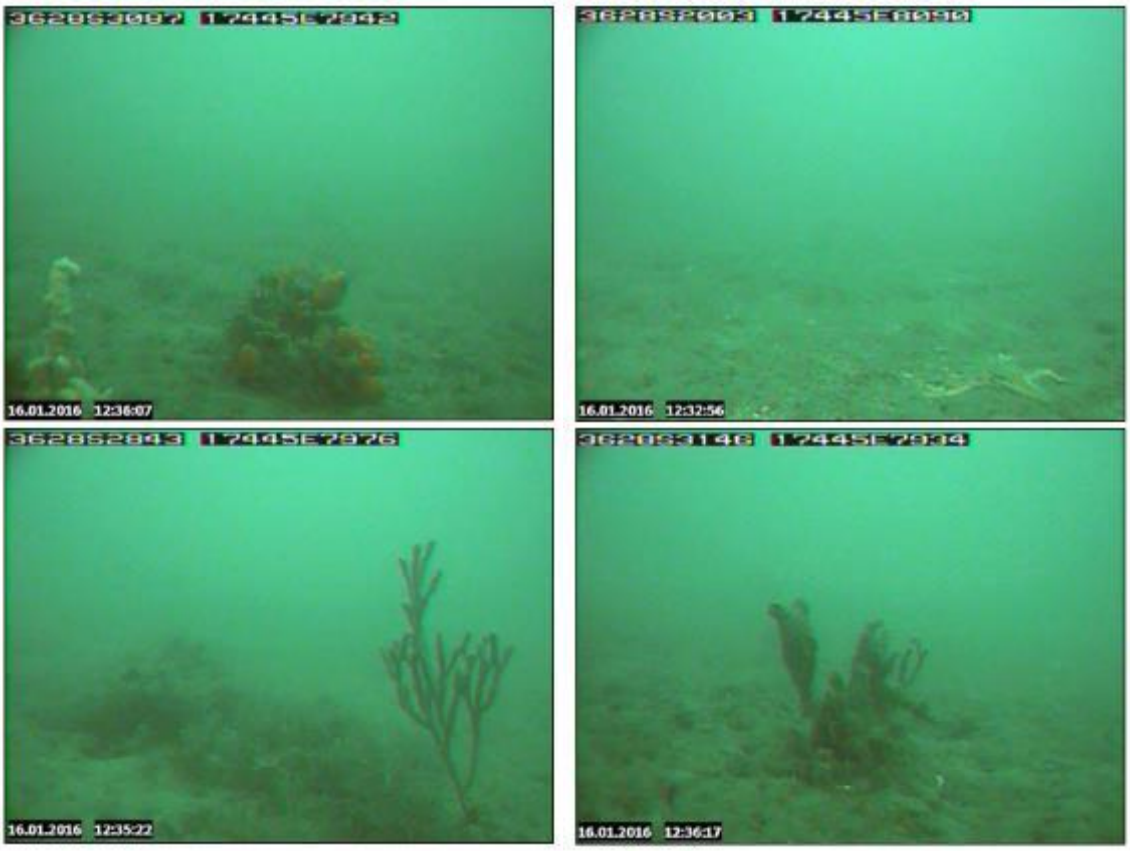

*Figure 40. Images from underwater video tows in Inner Channel showing: top left: sponge encrusted horse mussels, top right: starfish (*Astropecten polyacanthus*), lower left: unidentified finger sponge, lower right: the invasive clubbed tunicate* Styela clava *and finger sponges. Source: Kelly et al. (2016).*

Direct pressures

According to Chiaroni et al. (2008), the major threats to the Kawau Bay marine biodiversity are considered to be:

- Trampling of intertidal rock platform communities.
- Anchor and shellfish dredging damage to diverse epifaunal assemblages, particularly sponge gardens and horse mussel beds.
- Recreational extraction both in the intertidal and subtidal areas potentially disrupting community structure and ecological processes by removing critical specie.s
- Catchment development increasing nutrient and stormwater contaminant runoff. As well as clogging the gills of and smothering benthic organisms, silt and mud permanently change the species composition of benthic assemblages by infilling coarser sediments. This is thought to be a contributing factor in the disappearance of extensive horse mussel beds from parts of Kawau Bay, Martins Bay and throughout Mahurangi Harbour.

A number of non-indigenous marine species also occur in the area. The Japanese seaweed *Undaria pinnatifida* is well established on Iris Shoal in Kawau Bay; the compound ascidian *Eudistoma elongatum* is widespread and abundant in Matakana River, and has spread into Kawau Bay; the Mediterranean fan worm (*Sabella spallanzanii*) occurs throughout the area, as does Burchard's dog

whelk (*Tritia burchardi*), the stalked ascidian *Styela clava* and the Asian paddle crab (*Charybdis japonica*). The ecological effects of these species on the ecology of the area is unknown.

Existing management

Most of this area is within the inner Hauraki Gulf trawl and Danish seine prohibition area. Further, there is a commercial scallop prohibition in place. Auckland Coromandel recreational shellfish daily limits apply.

Kawau Island, Sandspit and the Matakana River mouth, and Beehive Island (Taungamaro Island) are classed as a marine Significant Ecological Area in the Auckland Unitary Plan (Auckland Council 2017).

Sea Change Plan proposals for the Kawau Bay area

The Stakeholder Working Group (SWG) agreed that this area would benefit from protection, but a decision was not reached on a single size, location or shape of MPA. As a result, the SWG proposed two options for MPAs within the Kawau Bay area (Table 26, Fig. 41). Scenario 1 includes a larger marine reserve nested within a benthic protection area, while Scenario 2 included a smaller marine reserve with the same benthic protection area.

Table 26. Description of Sea Change Plan scenarios for Kawau Bay. HGMP = Hauraki Gulf Marine Park.

SCENARIO 1	SCENARIO 2
Marine reserve Scenario 1 includes a marine reserve spanning the CPZ in the north and Motuketekete and Moturekareka Islands in the south. The proposal includes 45 km^2 of marine area (0.3% HGMP), with a minimum width of 8 km and approximately 23 km of island coastline. **Type 2 MPA** The proposed marine reserve is partially nested within a larger Type 2 MPA, aimed at protecting benthic habitats of the Kawau Bay area via the exclusion of all fishing methods that impact benthic habitats, including scallop dredging (Sea Change Plan, p. 280). The proposal includes 166 km^2 of the marine area (1.2% HGMP), with a minimum width of 15 km and 100 km of island coastline.	**Marine reserve** Scenario 2 includes a smaller marine reserve centred around Moturekareka Island. The proposal includes 0.6 km^2 of marine area (0.004% HGMP), with a minimum width of 0.8 km and approximately 3 km of island coastline. **Type 2 MPA** The proposed marine reserve is nested within the same Type 2 MPA in Scenario 1, aimed at protecting benthic habitats of the Kawau Bay area via the exclusion of all fishing methods that impact benthic habitats, including scallop dredging (Sea Change Plan, p. 280). The proposal includes 210 km^2 of the marine area (1.5% HGMP), with a minimum width of 15 km and 120 km of island coastline.

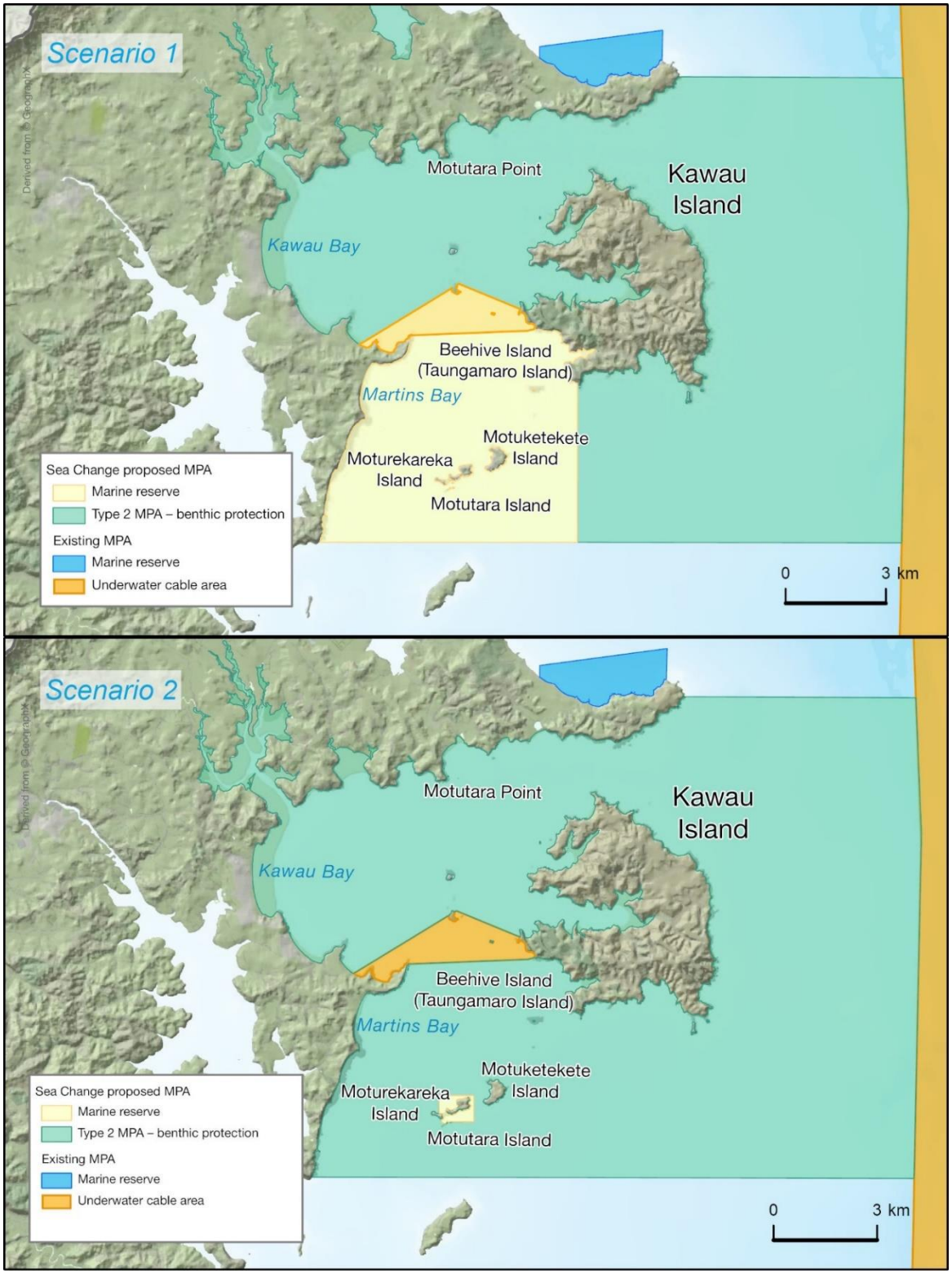

Figure 41. Sea Change Plan proposals for Kawau Bay. Top: Scenario 1. Please note the Kawau Bay cable protection zone is encompassed within the marine reserve proposal. Bottom: Scenario 2. Please note the Kawau Bay cable protection zone is a designated Type 2 MPA and is understood a priori to not be encompassed within the proposed seafloor protection area.

Agency assessment of habitats and ecologically significant features that would be protected in Scenario 1

Marine reserve

The proposed marine reserve in Scenario 1 would provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, eight physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats).

While eight physical habitats are identified as being protected by the site, the estuarine nature of South Cove is questionable, and as there is little freshwater input to South Cove it is likely more consistent with very sheltered embayments.

A relatively large area of rhodolith habitat is present in the proposal that would be protected under this scenario.

Green-lipped mussels are included in a small area within the marine reserve bordering the proposed seafloor protection area. The marine reserve is unlikely to substantially represent this habitat type, and uncertainty around the actual boundary of the mussel bed gives little confidence that it is captured by the proposed reserve.

For the rocky reef habitats, much of the area covered on the mainland and Kawau Island are likely to suffer edge effects and have reduced efficacy of protection. However, those areas that are entirely within the boundary of the proposed reserve are likely to be well protected (e.g. Motuketekete and Moturekareka Islands), even though the actual extent is small.

As noted above, uncertainty remains regarding a few of the physical habitats present in the proposal being of viable size (i.e. to meaningfully afford protection to associated species and ecological processes). Future research and monitoring will allow this uncertainty to be addressed, should this proposal be implemented.

Type 2 MPA – Benthic protection

In order to meet the objectives for the Type 2 MPA proposal at this site, to protect the seafloor features, restrictions would be required on the following:

- Mobile bottom fishing methods (all dredging, bottom trawling and Danish seining).

The proposal would include 17 physical habitat types that would be afforded some degree of protection (see Appendix 3 for full list of habitats). Those features sensitive to disturbance would be protected from physical displacement, but wider ecological benefits are less likely to occur.

Another 10 physical habitats are present but unlikely to be afforded protection from the proposal. The intertidal areas and rocky reefs are unlikely to benefit as the prohibited fishing methods are not used over these habitats and the pressures identified above are not mitigated.

Further assessment based on the levels of extraction from remaining fishing methods, including from recreational extraction, would need to be undertaken to determine if the level of protection could allow for the maintenance and recovery of wider ecosystem values.

Biogenic habitats that are likely to benefit from the Type 2 MPA include rhodoliths and green-lipped mussels. While a patch of dog cockle habitat is identified at the northern boundary of the site, the actual extent included in the proposal is small. The other biogenic habitats present, intertidal seagrass, mangroves and salt marsh, will not benefit from the Type 2 proposal.

Combined

Overall, given the high level of protection afforded by the marine reserve, and the additional protection to seafloor habitats by the Type 2 MPA, it is considered that the Scenario 1 proposals for Kawau Bay contribute to the overarching marine protection objectives of the Sea Change Plan.

Agency assessment of habitats and ecologically significant features that would be protected in Scenario 2

Marine reserve

Based on the habitat classification, four physical habitats would be included within this proposal (see Appendix 3 for full list of habitats). However, due to the small size of the proposal and the extent to which the boundary crosses the reef (that will likely result in significant edge effects), the level of actual protection afforded to the ecosystem is questionable.

Type 2 MPA – Benthic protection

In order to meet the objectives for the Type 2 MPA proposal at this site, to protect the seafloor features, restrictions on the following would be required:

- Mobile bottom fishing methods (all dredging, bottom trawling and Danish seining).

The proposal would include 15 physical habitat types that would be afforded some degree of protection (see Appendix 3 for full list of habitats). Those features sensitive to disturbance would be protected from physical displacement, but wider ecological benefits are less likely to occur.

Another 12 physical habitats are present but unlikely to be afforded protection from the proposal. The intertidal areas and rocky reefs are unlikely to benefit as the prohibited fishing methods are not used over these habitats and the pressures identified above are not mitigated.

Further assessment based on the levels of extraction from remaining fishing methods, including from recreational extraction, would need to be undertaken to determine if the level of protection could allow for the maintenance and recovery of wider ecosystem values.

Biogenic habitats that are likely to benefit from the Type 2 MPA include rhodoliths and green-lipped mussels. While a patch of dog cockle habitat is identified at the northern boundary of the site, the actual extent included in the proposal is small. The other biogenic habitats present, intertidal seagrass, mangroves and salt marsh, will not benefit from the Type 2 proposal.

Combined

The proposed marine reserve around Moturekareka Island is considered ineffective at contributing to overall MPA objectives. The Type 2 MPA would provide protection to seafloor features consistent with Scenario 1.

Agencies assessment of proposals against Sea Change Plan objectives

Tables 27 & 28 provide the objectives for the different management options (marine reserves and Type 2 MPAs).

Table 27. Comparative assessment of Kawau Bay marine reserve proposals against Sea Change Plan objectives.

MARINE RESERVE SPECIFIC OBJECTIVES	SCENARIO 1	SCENARIO 2
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Would allow recovery to meet this objective	No
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	Would contribute to this objective, particularly for biogenic habitats present	No
Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Would provide protection for several habitat types, would contribute to this objective	No
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	Would contribute to this objective	No
Provide reference areas for marine research, monitoring and education	Would contribute to this objective	No
Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism	Would contribute to this objective by allowing environmental restoration (limited as remote)	No

Table 28. Comparative assessment of Kawau Bay seafloor protection area proposals against Sea Change Plan objectives.

PLAN TYPE 2 MARINE PROTECTED AREA SPECIFIC OBJECTIVES	SCENARIO 1 – BENTHIC PROTECTION	SCENARIO 2 – BENTHIC PROTECTION
Identify, restore and protect key habitats (e.g. biogenic habitats) in order to maintain the integrity of ecosystems and their functioning by 2020	Contributes to objective by providing protection to soft sediment biogenic and reef features from physical disturbance	Contributes to objective by providing protection to soft sediment biogenic and reef features from physical disturbance
Significantly increase the productivity of the Hauraki Gulf Marine Park by 2035	Potentially protects key habitats important for fisheries productivity	Potentially protects key habitats important for fisheries productivity
Exclude activities (e.g. dredging, bottom trawling, Danish seining, dumping and sea bed mining) that damage habitats by 2025	Contributes to objective	Contributes to objective
Potentially serve as a buffer to areas with a higher level of protection	Partially. Reduces edge effects on the reserve boundary by	Partially. Reduces edge effects on the reserve boundary by reducing some fishing pressure

(thereby implementing a nested approach)	reducing some fishing pressure	
Potentially support restoration projects	Potentially. But no restoration projects are targeted for the area	Potentially. But no restoration projects are targeted for the area

The main contribution to overall ecosystem protection across the two scenarios is from the marine reserve in Scenario 1, with seafloor features being protected in both Type 2 MPAs proposed. The marine reserve in Scenario 2 is effectively too small to provide adequate protection and is not supported by the agencies.

Agency response to Sea Change Plan proposal

Agencies note the high biodiversity values of the Kawau Bay area and are supportive of the proposal, acknowledging that area-based protection has been considered in the past, including by LINZ (Sewell 1985) and DOC (1995).

The marine reserve in Scenario 1 is of suitable size to likely be effective at providing for the maintenance and recovery of ecological systems, natural species composition and trophic linkages.

Scenario 1 provides better overall biodiversity benefits compared to Scenario 2, primarily due to the higher protection afforded by the marine reserve in Scenario 1, whereas the marine reserve in Scenario 2 is considered ineffective and does not contribute to objectives.

The combined proposals in Scenario 1 would provide protection to a diverse array of species, including sponges, mussels, scallops and a variety of mobile epifaunal invertebrates on soft sediments, and kelp-dominated reefs with sponge flats also present on rock and mixed sand habitats.

As such, the agencies recommend progressing both proposals under Scenario 1.

Modifications to proposal

Agencies consider that a modification to the southern boundary is advantageous to reducing the potential for impact on commercial fishing interests with minimal impact on meeting biodiversity objectives of the Sea Change Plan.

The areas of the proposals to progress are 40.4 km^2 (high protection area) and 159.1 km^2 (seafloor protection area) (Fig. 42).

Alignment with existing legislation and policy

While the proposed marine reserve in Scenario 1 offers a high level of protection, it is unlikely to be consistent with the Marine Reserves Act 1971, as the intention is to make provision for customary practises. As such, the proposal being taken forward to engagement with mana whenua will be defined as a **high protection area** rather than a marine reserve.

Given the restrictions provided under the proposed Type 2 MPA, agencies consider that the proposal would likely afford protection at a suitable level to provide for the maintenance and recovery of physical features and biogenic structures that support biodiversity. However, it does not fully meet the requirements for a Type 2 MPA under the MPA Policy as it is less likely to allow for the maintenance and recovery of wider ecological values due to ongoing extraction from remaining fishing methods, including from recreational fishing.

As such, the agencies consider that the Type 2 MPA proposed in the Sea Change Plan likely does not fully meet the definition of a Type 2 MPA under the MPA Policy, and it will be taken forward as a **seafloor protection area**.

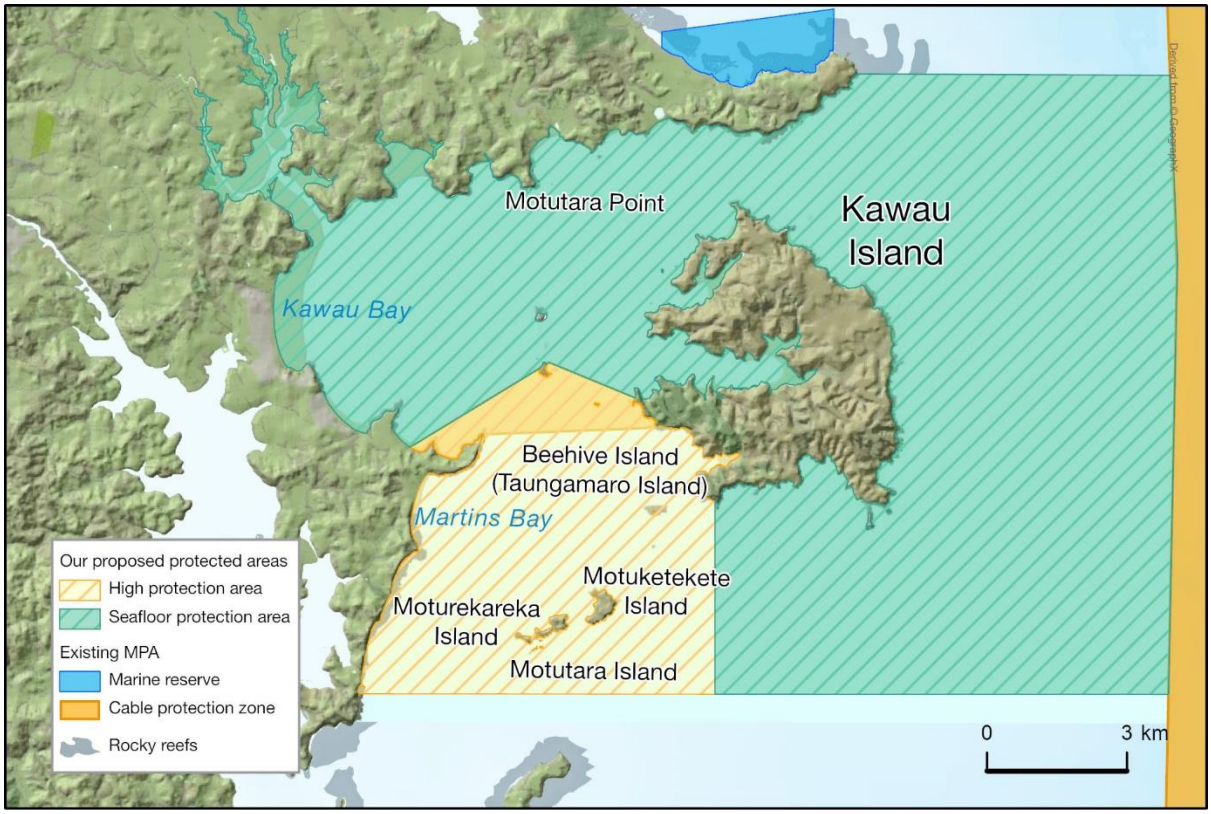

Figure 42. Preferred option for the Kawau Bay area.

Activities that would be affected by the high protection and seafloor protection areas

A summary of the existing users that may be affected by the proposals is given in Table 29.

Table 29. Assessment of affected users for the proposed Kawau Bay high protection and seafloor protection areas.

ACTIVITY	HIGH PROTECTION AREA	SEAFLOOR PROTECTION AREA
Commercial fishing	All commercial fishing would be prohibited. Please note this proposal is within the inner Hauraki Gulf trawl and Danish seine ban. The values below reflect the displacement of other fishing methods. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $203,000 based on a total reported average yearly catch of 20.8 tonnes. The biggest displacement would be experienced by the snapper fishery, of which 14.0 tonnes per year would be displaced. In terms of foregone revenue, the snapper fishery would be the most impacted.	Bottom trawling, dredging and Danish seining would be prohibited. Please note that in this proposal trawling and Danish seining is only allowed to the east of Kawau Island. There are no known commercial scallop beds in the area. The values below therefore reflect catch by trawling and Danish seining east of Kawau Island. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $259,000 based on a total reported average yearly catch of 33.3 tonnes. The biggest displacement would be experienced by the snapper fishery, of which 24.5 tonnes per year would be displaced. In terms of foregone revenue, the snapper fishery would be the most impacted.

Recreational fishing	All recreational fishing would be prohibited. An analysis of the spatial distribution of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park indicates that 1.97% of recreational fishing effort and 1.58% and 1.51% of snapper and kahawai landed catch would be displaced, respectively.	Recreational dredging, set netting and potting would be prohibited. The estimated impact on recreational fishing effort and catch for those methods cannot be quantified.
Mining and petroleum exploration	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	All commercial extractive activities would be prohibited. No current extraction of material is known to occur.	No additional restrictions from above.
Vehicle access over the foreshore	The use of vehicles over the intertidal area of the marine reserve would be an offence, with some exceptions for vessel launching, emergency services or management.	No restrictions would apply.

11. Tiritiri Matangi

Site description

Tiritiri Matangi Island is located 25 km north of Auckland, and 3.5 km east of Whangaparaoa Peninsula. Predator-free since 1991, Tiritiri Matangi Island is one of the most successful community-led conservation projects in the world. It is managed as a scientific reserve by DOC following an 'open sanctuary' model allowing visitors to experience many threatened and endangered species once widespread on the mainland. Shakespear Regional Park, a mainland island, is located at the tip of Whangaparaoa Peninsula.

The seafloor around the island generally shelves evenly from approximately 25 m depth in Whangaparāoa Passage to approximately 40 m depth at the edge of the Hauraki Gulf CPZ. East of Tiritiri Matangi Island, three rock pinnacles rise from the seafloor at 21–25 m depth, Shag and Shearer Rocks reach the surface, the third is marked with a beacon. The wreck of the *Royal Tar*, a 170 ft sailing ship that sank on 26 November 1901, is located on Shearer Rock.

Marine biodiversity values

The shoreline around Tiritiri Matangi Island is predominantly rocky (sandstone) with some small sand and shingle beaches on the western side of the island. Rocky reefs fringe the coastline, giving way to sand and gravel from 2–10 m depth on the western side of the island, and approximately 20 m depth on the eastern side. Sand and gravel substrates predominate down to approximately 30 m depth, giving way to muds below that.

Sheltered shallow rocky reefs have mixed large brown algal assemblages (*Carpophyllum maschalocarpum*, *C. flexuosum*, *C. plumosum*, *E. radiata*), kina barrens, turfing coralline algae (*Corallina officinalis*), Neptune's necklace (*Hormosira banksii*) and large sponges (*Ecionemia alata*). Reefs in deeper areas are dominated by common kelp and sponges. Sessile invertebrate assemblages on the offshore reefs (Shearer Rock, Shag Rock) are dominated by sponges, hydroids, white-striped anemones (*Anthothoe albocincta*) and jewel anemones (*Corynactis australis*). Mobile invertebrates include kina and rock lobster. Shallow patch reefs and low relief 'aggregate' reefs provide nursery habitat for juvenile snapper.

The strong flow in Whangaparāoa Passage is associated with extensive biogenic habitats, particularly rhodolith and horse mussel beds, and large concentrations of jewel anemone (*C. Australis*) (Grace 1983; DOC & MFish 2011; Kelly et al. 2018) (Fig. 43). Kelly et al. (2018) identified horse mussel beds as a major habitat feature in the Passage, providing habitat for a variety of other species, including sponges. Scallops and scallop shell were also observed in deeper waters along the eastern and southern margins of the Passage. The southeastern part of the Passage (i.e. off southwest Tiritiri Matangi Island) is a known scallop bed that attracts many recreational fishers (Williams & Babcock 2004). Historically, green-lipped mussels were dredged in the middle of Whangaparāoa Bay north of the Peninsula (Morrison et al. 2003; Kelly et al. 2018).

Reef fishes are representative of northeast North Island coastal reef fish assemblages. Demersal fishes include snapper, John dory (*Zeus faber*), red gurnard (*Chelidonichthys kumu*), sand flounder, eagle rays and short-tail stingrays (Morrison et al. 2003). Pelagic species include kahawai, kingfish, trevally, jack mackerel (*Trachurus novaezelandiae*), juvenile common thresher sharks (*Alopias vulpinus*), great white sharks, juvenile smooth hammerhead sharks and bronze whaler sharks. Kelly et al. (2018) observed ray feeding pits, particularly along the eastern part of Whangaparāoa Passage. Hāpuku are thought to have been caught in this area up to the mid-1940s.

Overall, the area contains a diverse mix of physical and biogenic habitats.

*Figure 43. Video screen grabs taken in Whangaparāoa Passage showing: Top: sponges growing on live horse mussels (*Atrina zelandica*); middle: Mediterranean fan worm (*Sabella spallanzanii*) among horse mussels (lower left of image); bottom: sponges and* Ecklonia radiata *growing on a reef. Source: Kelly et al. (2018).*

Direct pressures

Land-based impacts (sediments, wastewater discharges and nutrient runoff) and heavy fishing pressure are identified as important pressures acting on the site. The area is a popular recreational fishing destination due to its accessibility from a number of boat ramps and the shelter given by the peninsula and island in a variety of conditions. Consequently, it is heavily fished by boat-based

anglers, spear fishers, scuba divers (rock lobster and scallops) and fishers using dredges to take scallops. Shag and Shearer Rocks are particularly popular with spear fishers targeting kingfish.

Kelly et al. (2018) found the invasive Mediterranean fan worm (*S. spallanzanii*) to be abundant in some places.

Existing management

Most of this area is within the inner Hauraki Gulf trawl and Danish seine prohibition area (with exceptions to Danish seining prohibition in place east of Tiritiri Matangi Island). Likewise, most of the area is within the inner Hauraki Gulf commercial scallop prohibition (except east of Tiritiri Matangi Island where the Auckland Coromandel shellfish fishery applies). Auckland Coromandel shellfish daily bag limits and size restrictions apply to recreational fishers.

Whangaparaoa Peninsula, Whangaparāoa Head cliffs and intertidal platforms are classed as a marine Significant Ecological Area in the Auckland Unitary Plan (Auckland Council 2017).

Sea Change Plan proposals for the Tiritiri Matangi Island area

The Stakeholder Working Group (SWG) agreed that this area would benefit from protection, but a decision was not reached on a single size, location or shape of MPA. As a result, the SWG proposed two options for MPAs within the Tiritiri Matangi Island and Whangaparaoa Peninsula area. Scenario 1 includes a larger marine reserve nested within a Type 2 MPA, while Scenario 2 included a smaller marine reserve with the same Type 2 MPA (Table 30, Fig. 44).

Table 30. Description of Sea Change Plan scenarios for Tiritiri Matangi Island.

SCENARIO 1	SCENARIO 2
Marine reserve Scenario 1 includes a marine reserve centred around Tiritiri Matangi Island. The proposal includes 22 km^2 of marine area (0.2% HGMP), with a minimum width of 5 km and approximately 8 km of island coastline. **Type 2 MPA** The proposed marine reserve is nested within a larger Type 2 MPA, aimed at protecting benthic habitats of the larger area via the exclusion of all fishing methods that impact benthic habitats, including scallop dredging (Sea Change Plan, p. 282). The proposal includes 59 km^2 of the marine area (0.4% HGMP), with a minimum width of 10 km and 7 km of mainland coastline.	**Marine reserve** Scenario 2 includes a smaller marine reserve off Tiritiri Matangi Island extending south from Northwest Point to the southernmost point on the island. The proposal includes 1.7 km^2 of marine area (0.01% HGMP), with a minimum width of 1.4 km and approximately 3 km of island coastline. **Type 2 MPA** The proposed marine reserved is nested within the same Type 2 MPA as in Scenario 1, aimed at protecting benthic habitats of the Tiritiri Matangi Island and Whangaparāoa area via the exclusion of all fishing methods that impact benthic habitats (Sea Change Plan, p. 283). The proposal includes 79 km^2 of the marine area (0.6% HGMP), with a minimum width of 10 km and 12 km of island and mainland coastline.

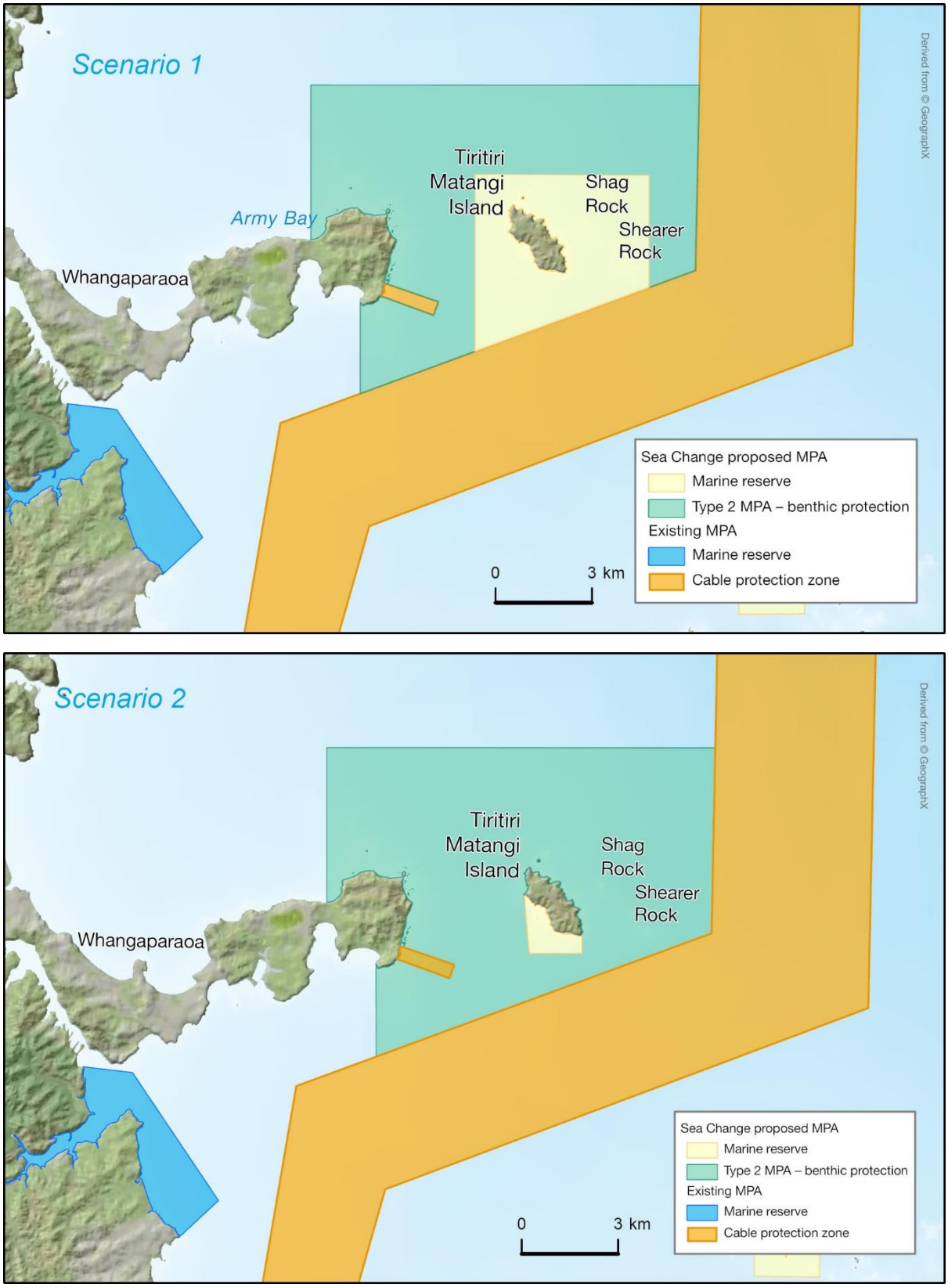

Figure 44. Sea Change Plan proposals for Tiritiri Matangi Island area. Top: Scenario 1, bottom: Scenario 2

Agency assessment of habitats and ecologically significant features that would be protected in Scenario 1

Marine reserve

The proposed marine reserve in Scenario 1 would provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, 10 physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats). In addition, the biogenic rhodolith habitat would also be afforded protection.

Agencies note that uncertainty remains in regard to a few of the physical habitats present in the proposal being of viable size (i.e. to meaningfully afford protection to associated species and ecological processes). Future research and monitoring will allow this uncertainty to be addressed, should this proposal be implemented.

Type 2 MPA

In order to meet the objectives for the Type 2 MPA proposal at this site, to protect the seafloor features, restrictions on the following would be required:

- Mobile bottom fishing methods (all dredging, bottom trawling and Danish seining).

The proposal would include seven physical habitat types that would be afforded some degree of protection. Those features sensitive to disturbance would be protected from physical displacement, but wider ecological benefits are less likely to occur. A further three habitats are present but unlikely to be afforded any protection under the measures proposed (intertidal and reef habitats).

Further assessment based on the levels of extraction from remaining fishing methods, including from recreational extraction, would need to be undertaken to determine if the level of protection could allow for the maintenance and recovery of wider ecosystem values.

Combined

Overall, given the high level of protection afforded by the marine reserve, and the additional protection to seafloor habitats by the Type 2 MPA, it is considered that the proposals for Tiritiri Matangi Island contributes to the overarching marine protection objectives.

Agency assessment of habitats and ecologically significant features that would be protected in Scenario 2

Marine reserve

It is considered that the size of the proposed marine reserve in Scenario 2 would be ineffective in meeting the objectives of the Sea Change Plan. The small size of the habitat patches included within the proposed marine reserve, along with the poor reserve design where reef is bisected by the reserve boundaries, would make the reserve unviable. That is, while the area would include six physical habitat types, this proposal would contribute little to overall objectives.

Type 2 MPA

In order to meet the objectives for the Type 2 MPA proposal at this site, to protect the seafloor features, the following restrictions would be required:

- Mobile bottom fishing methods (all dredging, bottom trawling and Danish seining)

The proposal would include seven physical habitat types that would be afforded some degree of protection. Those features sensitive to disturbance would be protected from physical displacement, but wider ecological benefits are less likely to occur. A further four habitats are present but unlikely to be afforded any protection under the measures proposed (intertidal and reef habitats).

Further assessment based on the levels of extraction from remaining fishing methods, including from recreational extraction, would need to be undertaken to determine if the level of protection could allow for the maintenance and recovery of wider ecosystem values.

Combined

The proposed marine reserve around Tiritiri Matangi Island is considered ineffective at contributing to overall MPA objectives. The seafloor protection area would provide protection to seafloor features consistent with Scenario 1.

Agency assessment of proposals against Sea Change Plan objectives

Assessment against Sea Change Plan objectives

Tables 31 & 32 provide the objectives for the different management options (marine reserves and Type 2 MPAs).

Table 31. Comparative assessment of Tiritiri Matangi Island marine reserve proposals against Sea Change Plan objectives.

MARINE RESERVE SPECIFIC OBJECTIVES	SCENARIO 1	SCENARIO 2
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Would allow recovery to meet this objective	No
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	Would contribute to this objective, particularly for biogenic habitats present	No
Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Would provide protection for several habitat types, would contribute to this objective	No
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	Would contribute to this objective	No
Provide reference areas for marine research, monitoring and education	Would contribute to this objective	No
Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism	Would contribute to this objective by allowing environmental restoration (limited as remote)	No

Table 32. Comparative assessment of Tiritiri Matangi Island seafloor protection area proposals against Sea Change Plan objectives.

PLAN TYPE 2 MARINE PROTECTED AREA SPECIFIC OBJECTIVES	SCENARIO 1 – TYPE 2 MARINE PROTECTED AREA	SCENARIO 2 – TYPE 2 MARINE PROTECTED AREA
Identify, restore and protect key habitats (e.g. biogenic habitats) in order to maintain the integrity of ecosystems and their functioning by 2020	Contributes to objective by providing protection to soft sediment biogenic and reef features from physical disturbance	Contributes to objective by providing protection to soft sediment biogenic and reef features from physical disturbance
Significantly increase the productivity of the Hauraki Gulf Marine Park by 2035	Potentially protects key habitats important for fisheries productivity	Potentially protects key habitats important for fisheries productivity
Exclude activities (e.g. dredging, bottom trawling, Danish seining, dumping and sea bed mining) that damage habitats by 2025	Contributes to objective	Contributes to objective
Potentially serve as a buffer to areas with a higher level of protection (thereby implementing a nested approach)	Partially. Reduces edge effects on the reserve boundary by reducing some fishing pressure	Partially. Reduces edge effects on the reserve boundary by reducing some fishing pressure
Potentially support restoration projects	Potentially. But no restoration projects are targeted for the area	Potentially. But no restoration projects are targeted for the area

Agency response to Sea Change Plan proposal

Agencies consider marine protection of the Whangaparaoa Peninsula and Tiritiri Matangi Island area would be a natural extension of the wildlife and habitat enhancement work being done on adjacent land and would enhance non-extractive recreational use of the area.

The area has been previously considered for some kind of protection, including by MAF (1985), LINZ (Sewell 1985) and DOC (1995).

Scenario 1 provides better overall biodiversity benefits compared to Scenario 2, primarily due to the higher protection afforded by the marine reserve in Scenario 1, whereas the marine reserve in Scenario 2 is considered ineffective and does not contribute to objectives.

As such, the agencies recommend progressing both proposals under Scenario 1 (Fig. 45).

Modifications to proposal

Agencies consider that in order to better deliver on the purpose and outcomes for MPAs in the Sea Change Plan, minimise potential impacts on recreational fishing interests, and follow best-practice MPA design criteria, the following adjustments are recommended:

- In order to reduce impact on fishing activities (in particular recreational) around the area, a marine reserve proposal that is a compromise between both Sea Change Plan scenarios that still provides meaningful protection to the marine biodiversity values is recommended. The area would cover the west and south of Tiritiri Matangi Island but excluding high density recreational fishing spots such as Shag and Shearer Rock.
- Adjust the seafloor protection area boundaries according to the nested marine reserve.

The areas of the proposals to progress are 9.5 km^2 (high protection area) and 53.7 km^2 (seafloor protection area).

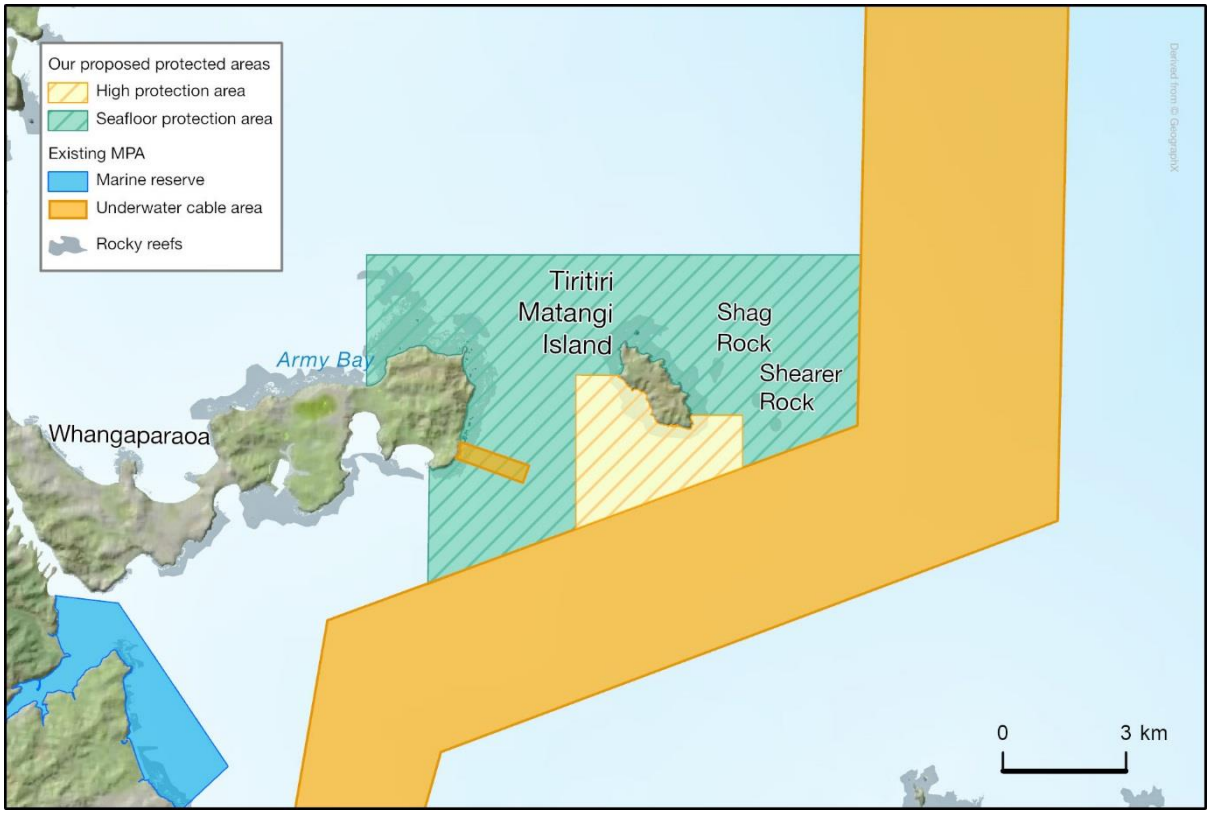

Figure 45. Preferred option for the Tiritiri Matangi Island area.

Alignment with existing legislation and policy

While the proposed marine reserve in Scenario 1 offers a high level of protection, it is unlikely to be consistent with the Marine Reserves Act 1971, as the intention is to make provision for customary practises. As such, the proposal being taken forward to engagement with mana whenua will be defined as a **high protection area** rather than a marine reserve.

Given the restrictions provided under the proposed Type 2 MPA, agencies consider that the proposal would likely afford protection at a suitable level to provide for the maintenance and recovery of physical features and biogenic structures that support biodiversity. However, it does not fully meet the requirements for a Type 2 MPA under the MPA Policy as it is less likely to allow for the maintenance and recovery of wider ecological values due to ongoing extraction from remaining fishing methods, including from recreational fishing.

As such, the agencies consider that the Type 2 MPA proposed in the Sea Change Plan likely does not fully meet the definition of a Type 2 MPA under the MPA Policy, and it will be taken forward as a **seafloor protection area**.

Activities that would be affected by the high protection and seafloor protection areas

A summary of the existing users that may be affected by the proposals is given in Table 33.

Table 33. Assessment of affected users for the proposed Tiritiri Matangi Island proposals.

ACTIVITY	HIGH PROTECTION AREA	SEAFLOOR PROTECTION AREA
Commercial fishing	An assessment of the potential impacts this proposal may have on commercial fishing has not been completed to date, as the area was amended subsequent to the impact assessment being completed for the other sites. Should this proposal be taken forward, a complete assessment will be undertaken.	Bottom trawling, dredging and Danish seining would be prohibited. Please note that in this proposal trawling and Danish seining is only allowed to the east of Kawau Island. There are no known commercial scallop beds in the area. The values below therefore reflect catch by trawling and Danish seining east of Kawau Island. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $259,000 based on a total reported average yearly catch of 33.3 tonnes. The biggest displacement would be experienced by the snapper fishery, of which 24.5 tonnes per year would be displaced. In terms of foregone revenue, the snapper fishery would be the most impacted.
Recreational fishing	All recreational fishing would be prohibited. An analysis of the spatial distribution of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park indicates that 0.66% of stationary recreational fishing effort and 0.56% of snapper and kahawai landed catch would be displaced.	Dredging and set netting would be prohibited. The estimated catch for those methods cannot be quantified.
Mining and petroleum exploration	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	All commercial extractive activities would be prohibited. No current extraction of material is known to occur.	No additional restrictions from above.

12. The Noises

Site description

Located in the central Hauraki Gulf, The Noises are a group of small rocky islands and outcrops. The larger islands are covered in native vegetation and pest-free, providing habitat for a wide range of native species, including nesting seabirds such as ōi/grey-faced petrels, takahikare/white-faced storm petrels, geckos and a variety of terrestrial invertebrates. Indeed, they provided an early test-case for research on the effects of pests on native species, as well as eradication strategies. Maria Island (also known as Ruapuke Island), the eastern-most island of The Noises group saw the first rodent eradication program in New Zealand, with the Norway rat (*Rattus norvegicus*) successfully eradicated by the mid-1960s. The Noises are privately owned and managed under a trust for the purpose of their long-term protection.

Marine biodiversity values

Due to its geographic location, The Noises marine environment encompasses aspects of both inner and outer Hauraki Gulf regions and is influenced by strong tidal currents. The islands are surrounded by a complex, interconnected system of reefs that drop onto coarse, silty, shelly sand substrates at approximately 25 m depth. Muddy substrates occur in deeper areas to the west and north of the islands.

Haggitt (2017) found the rocky reef habitats support a variety of macroalgae (mixed algae at shallow depths, and *Carpophyllum flexuosum* and *E. radiata* in deeper reef areas) and encrusting invertebrate communities dominated by sponges, anemones, ascidians, cup corals, oysters and green-lipped mussels. Kina barrens habitat was prominent and continuous along the northern coastlines of the islands. At other locations, kina barrens were present but often patchily distributed with mixed macroalgae stands. Despite extensive searches, the survey did not encounter any red rock lobster (*Jasus edwardsii*), despite them being common in the past. Reef fish diversity was low to moderate and similar in assemblage composition to that found elsewhere in the inner Hauraki Gulf.

Dog cockles were common in soft sediments, with the heavy shells providing attachment for encrusting sponges and algae. Other biogenic habitats observed included patchy rhodolith beds and low-density horse mussels. Scallops were also observed in coarse shell hash/sand. A previous study by Dewas & O'Shea (2012) describes how the complex structures formed by dog cockle shells and associated rhodoliths shape benthic species assemblages off southwest Otata Island.

Overall, Haggitt (2017) (Fig. 46) found that The Noises have a diverse array of biogenic habitats within a relatively small geographic area, noting the expansive mussel beds, shallow sponge gardens and rhodolith beds are of particular importance within the context of the wider Hauraki Gulf.

Direct pressures

The owners of The Noises have observed an ongoing decline in habitat-forming species. Significant pressure from fishing (including recreational scallop dredging) could be contributing to this decline. Commercial set netting and bottom longlining also occur around the islands.

Observed changes include loss or reduction in schools of baitfish and associated seabird 'boil ups,' an increase in the extent of kina barrens, a reduction in the abundance of scallops and horse mussels, reduced reef fish diversity, reduced abundance and diversity of intertidal species, and a complete loss of rock lobster (The Noises Project, pers. comm.). Haggitt's (2017) findings corroborate these observations, highlighting the widespread impact of fishing on key species and both soft sediment and reef ecosystems. Important target species are rare and/or small (e.g. rock lobster, scallops and snapper), and kina barrens are extensive on shallow reefs (Fig. 47).

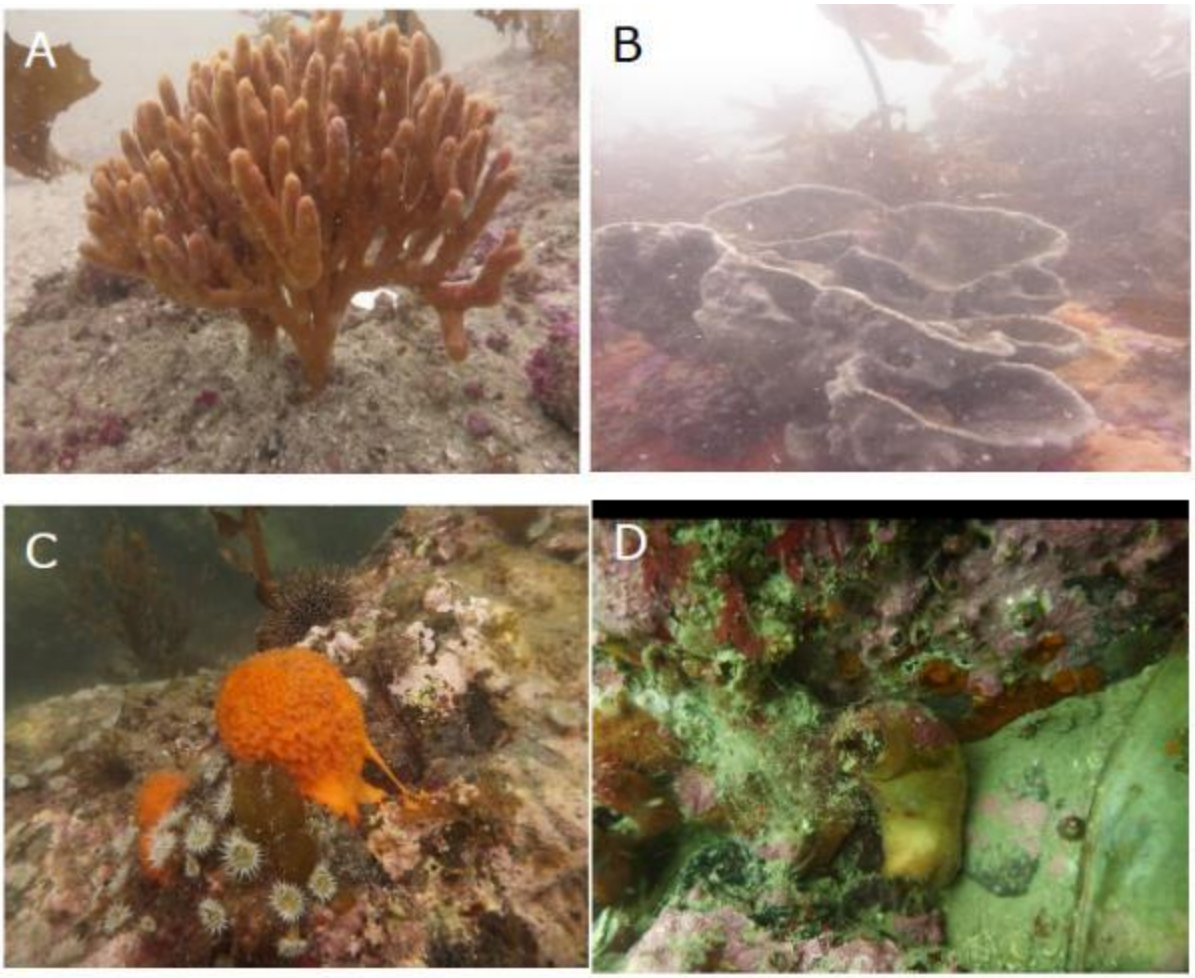

Figure 46. Common sponges and encrusting invertebrates of The Noises islands. A. Raspailia topsenti*, B.* Ecionemia alata*, C.* Tethya burtoni *and the anemone* Anthothoe albocincta*, D.* Cnemidocarpa bicornuta*. Source: Haggitt 2017*.

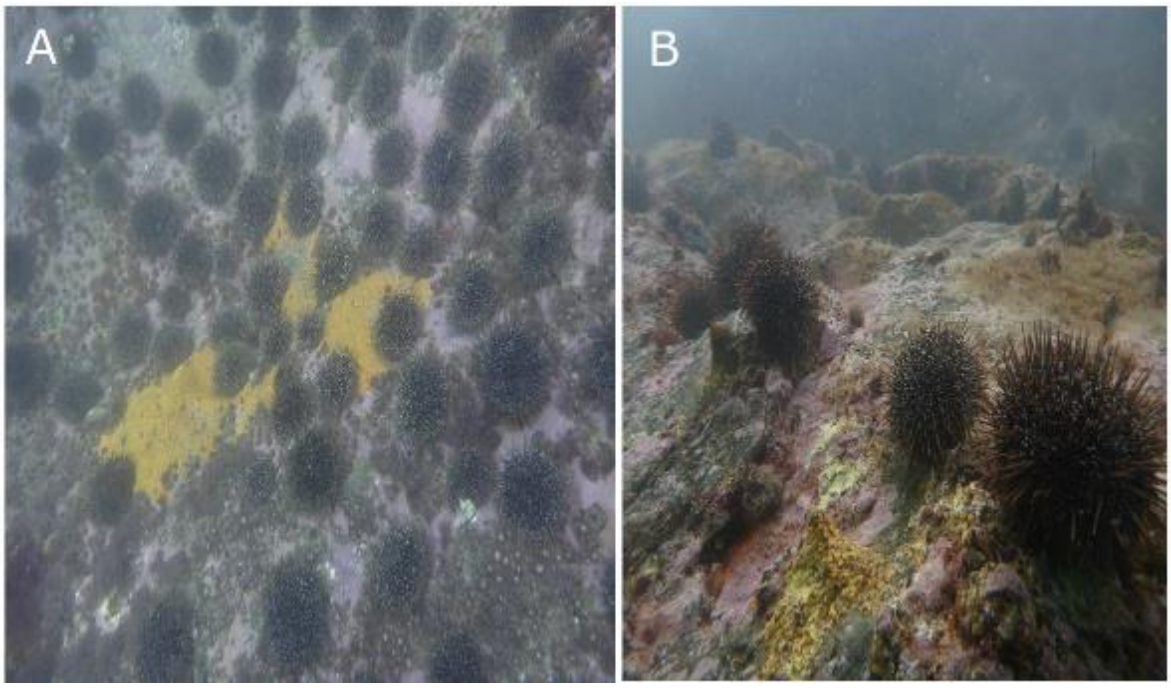

Figure 47. Example of kina/urchin barrens habitat at A. Motuhoropapa Island (north) and B. Otata Island (South). Source: Haggitt 2017

Direct pressures

The owners of The Noises have observed an ongoing decline in habitat-forming species. Significant pressure from fishing (including recreational scallop dredging) could be contributing to this decline. Commercial set netting and bottom longlining also occur around the islands.

Observed changes include loss or reduction in schools of baitfish and associated seabird 'boil ups,' an increase in the extent of kina barrens, a reduction in the abundance of scallops and horse mussels, reduced reef fish diversity, reduced abundance and diversity of intertidal species, and a complete loss of rock lobster (The Noises Project, pers. comm.). Haggitt's (2017) findings corroborate these observations, highlighting the widespread impact of fishing on key species and both soft sediment and reef ecosystems. Important target species are rare and/or small (e.g. rock lobster, scallops and snapper), and kina barrens are extensive on shallow reefs (Fig. 47).

This situation is compounded by declining water quality in the inner Hauraki Gulf (Hadfield et al. 2014).

Existing management

The Noises are situated within the inner Hauraki Gulf commercial trawl and Danish seine prohibition area, and the Coromandel scallop fishery area (Auckland Coromandel shellfish recreational daily limits apply).

The Noises islands are considered an Outstanding Natural Landscape and a marine Significant Ecological Area in the Auckland Unitary Plan (Auckland Council 2017).

Sea Change Plan proposal for The Noises

The Sea Change Plan proposes a no-take marine reserve centred around Motuhoropapa and Otata Islands (Fig. 48). The proposal is nested within a larger Ahu Moana Mana Whenua/Community co-management area for the purpose of protecting benthic habitats from fishing methods that impact them and provide a level of protection around the high-level protection marine reserve (p. 284).

The proposal includes 5 km^2 of marine area (0.03% HGMP), with a minimum width of 2 km and approximately 5 km of coastline.

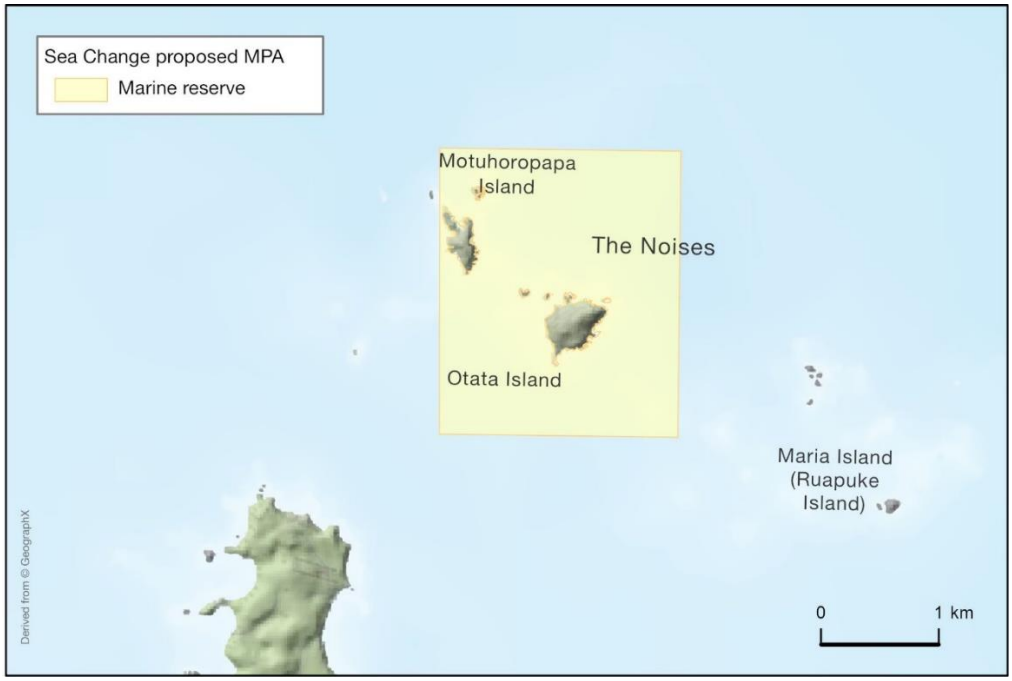

Figure 48. Sea Change proposal for The Noises.

Agency assessment of habitats and ecologically significant features that would be protected

The proposed marine reserve would potentially provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, six physical habitats would be present within the proposal (see Appendix 3 for full list of habitats). However, due to the small size of the proposal and the extent to which the boundary crosses the reef (that will likely result in significant edge effects), the level of actual protection afforded to the ecosystem is questionable.

The ecologically important biogenic dog cockle habitat would be afforded protection by the proposal.

Agency assessment of proposal against Sea Change Plan objectives

Table 34 provides the Sea Change Plan objectives for marine reserves and whether the proposal contributes to the objectives.

Table 34. Assessment of The Noises marine reserve proposals against Sea Change Plan objectives.

MARINE RESERVE OBJECTIVES	THE NOISES – MARINE RESERVE
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Uncertain if recovery would occur
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	Uncertain
Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Uncertain
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	Only if future monitoring shows recovery
Provide reference areas for marine research, monitoring and education	Only if future monitoring shows recovery
Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism	Uncertain

Agency response to Sea Change Plan proposal

As a result of the unique geographic location and diversity of habitats found, The Noises support a regionally significant range of biogenic habitats, including macroalgae forests, shallow sponge gardens, rhodolith beds, extensive intertidal and subtidal mussel beds and large soft sediment dog cockle beds. Agencies consider that the biodiversity values observed around The Noises warrant protection.

However, agencies consider that the marine reserve proposal in the Sea Change Plan does not align with MPA design principles. We consider that the marine reserve proposal displays poor reserve

design, and likely compromises its effectiveness in affording adequate protection to the rocky reef system around the two islands. All boundaries bisect the reef, not providing a buffer of sand habitat around the reefs. Further, agencies consider that given the relatively small size of the proposal and the high intensity of recreational fishing in the area, the edge effect would further impact on the viability of the proposal to adequately protect biodiversity encompassed within. Should a proposal at The Noises go forward, these issues will need to be addressed.

Agencies are aware that a community-led project is currently looking at marine protection options around The Noises (Fig. 49). Given the community-led project, and the limited effectiveness of the Sea Change Plan proposal, the agencies will not take the Sea Change Plan proposal further at this stage. However, the agencies will maintain awareness of the community-led project and may include it in the formal MPA consultation process.

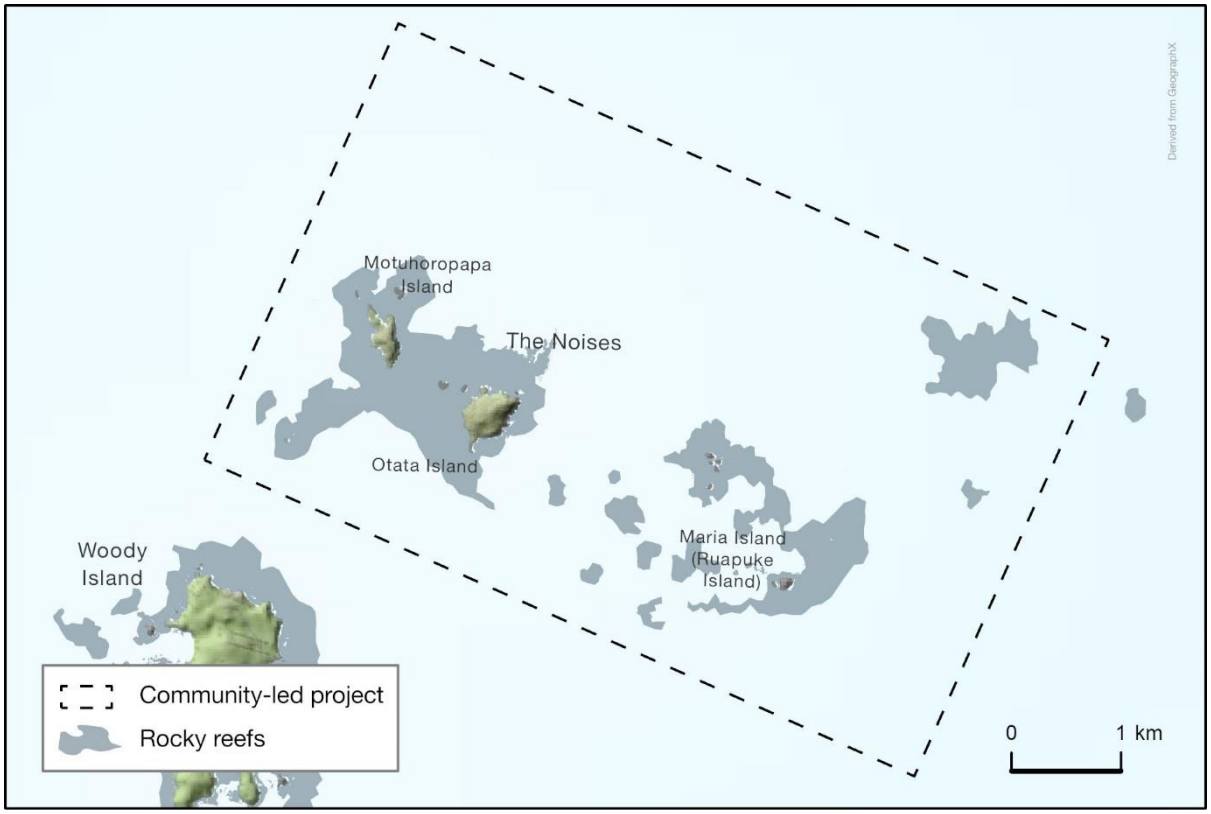

Figure 49. Approximate location of the community initiative for a marine protected area (MPA) at The Noises.

13. Rangitoto/Motutapu

Site description

This site encompasses Sandy Bay, Administration Bay, Gardiner Gap and Boulder Bay on the northern shores of Rangitoto and Motutapu Islands. This coastline consists of three geologically very different blocks that produce three contrasting topographies. The shoreline of Boulder Bay, Rangitoto Island, consists of large boulders produced by a mixture of slab and clinkery ‘a‘ā lava flows. In contrast, the western shoreline of Motutapu Island is formed by a series of sedimentary shelves extending up 100 m from the base of high cliffs composed of layered mudstones and sandstones. To the east of this the geology changes to steeply dipping layers of argillite, and in Administration and Sandy Bays the cliffs are replaced by relatively broad beaches interspersed with reefs of more resistant strata running obliquely offshore. North and east of Sandy Bay the cliffs begin again. Rocky substrata give way to sand and gravel between 0–7 m depth. Muddy sediments predominate in deeper water. A large reef extends offshore for approximately 1.2 km, separating Administration Bay from Gardiner Gap. Maximum depth reached at the end of this reef is approximately 18 m. Throughout most of the area the seafloor is no deeper than 16 m. Tidal currents are generally low in the bays but are relatively strong at Billy Goat Point and Rakino Channel. A sheltered intertidal sand flat occurs in Gardiner Gap, and there is a small, tidal channel connecting it with Islington Bay on the southern side of the islands. Boulder Bay, also known as Wreck Bay, contains the remains of at least 13 ships dumped there between 1887 and 1947.

Marine biodiversity values

The marine biodiversity values of this site are representative of moderately exposed locations in the inner Hauraki Gulf. The intertidal zone is characterised by a littorinid (periwinkle snails) zone around high water, below which is a conspicuous band of barnacles (predominantly *Epopella plicata*), which grades into a band of rock oysters (*Saccostrea glomerata*) and patchy turfing algae (*Hormosira banksii*, *Capreolia implexa* and *Corallina officinalis*). The turfing coralline alga (*C. officinalis*) and Neptune’s necklace (*H. banksii*) are predominant habitat-forming species just above low water. There is a narrow fringe of flapjack (*Carpophyllum maschalocarpum*) and other fucoid algae at the low water mark, with common kelp and turfing algae below that. Aerial imagery indicates the presence of extensive kina barrens on the shallow reefs. The benthic assemblage found in muddy sediments surrounding the islands is characterised by the heart urchin (*Echinocardium cordatum*), the brittle star *Amphiura rosea* and the small bivalve *Dosinia lambata*. This ‘*Echinocardium* community’ is widespread around the North and South Islands. It is dominated by deposit feeding species and is generally less diverse than assemblages found in coarser sediments. A large area of sandy mud located approximately halfway between Motutapu Island and Whangaparaoa Peninsula known locally as ‘the worm beds’ supports a large population of the echiuran *Urechis novaezealandiae* and is a popular recreational fishing destination. The main target species in this area is snapper.

The tidal flats in Gardiner Gap support a typical tidal sand and mud flat fauna and were an important source of shellfish for mana whenua inhabiting the islands. A small area of salt marsh and mangrove vegetation also occurs here. Coastal birds include karoro/black-backed gulls (*Larus dominicanus*), pied shag (*Phalacrocorax varius*), variable oystercatchers (*Haematopus unicolor*), white-faced (*Egretta novaehollandiae*) and matuku moana/reef herons (*Egretta sacra*) and threatened northern New Zealand dotterel.

Direct pressures

This area's proximity to Auckland City and the shelter provided by the islands from southwest winds mean it is a popular recreational fishing destination. Rod and line fishing from boats and the shore are the main fishing methods, with snapper being the most common target species. Commercial netting and longlining also occur in the area.

Waitematā Harbour contains large source populations of non-indigenous marine species and is a major point of entry to New Zealand for them. A number of these, including the Mediterranean fan worm (*S. spallanzanii*), are established in this area. Their effect on the marine ecology of the site is unknown. The proximity to Waitematā Harbour means Rangitoto and Motutapu Islands are located at the end of a contamination gradient extending from the harbour. Contaminant levels are generally low, but the inner Hauraki Gulf islands received much greater levels of plastic pollution than the outer islands.

Existing management

Rangitoto and Motutapu Islands are within the inner Hauraki Gulf commercial trawling, Danish seine and scallop prohibition area. The inner Hauraki Gulf seasonal finfish commercial fishing restrictions apply.

The Auckland Coromandel shellfish recreational daily bag limits and size restrictions apply.

Rangitoto and Motutapu Islands are considered a marine Significant Ecological Area in the Auckland Unitary Plan (Auckland Council 2017).

Sea Change Plan proposals for the Rangitoto and Motutapu Islands area

The Stakeholder Working Group (SWG) agreed that this area would benefit from protection, but a decision was not reached on a single size or shape of MPA. As a result, the SWG proposed two options for an MPA within the Rangitoto and Motutapu Islands area (Fig. 50). Scenario 1 includes a box-shaped marine reserve straddling both islands, while Scenario 2 includes a smaller marine reserve at the same location with a diagonal northern boundary.

The Scenario 1 proposal includes 11 km^2 of marine area (0.1% HGMP), with a minimum width of 3 km and approximately 8 km of island coastline. The Scenario 2 proposal includes 8 km^2 of marine area (0.1% HGMP), with a minimum width of 2.1 km and approximately 9 km of island coastline.

Agency assessment of habitats and ecologically significant features that would be protected in Scenario 1

The proposed marine reserve in Scenario 1 would potentially provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, eight physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats).

Agencies note that uncertainty remains in regard to the proposal being of viable size (i.e. to meaningfully afford protection to associated species and ecological processes). Future research and monitoring will allow this uncertainty to be addressed, should this proposal be implemented.

Agency assessment of habitats and ecologically significant features that would be protected in Scenario 2

The proposed marine reserve in Scenario 2 would potentially provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, eight physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats).

As with Scenario 1, uncertainty remains regarding the proposal being of viable size (i.e. to meaningfully afford protection to associated species and ecological processes). Future research and monitoring will allow this uncertainty to be addressed, should this proposal be implemented.

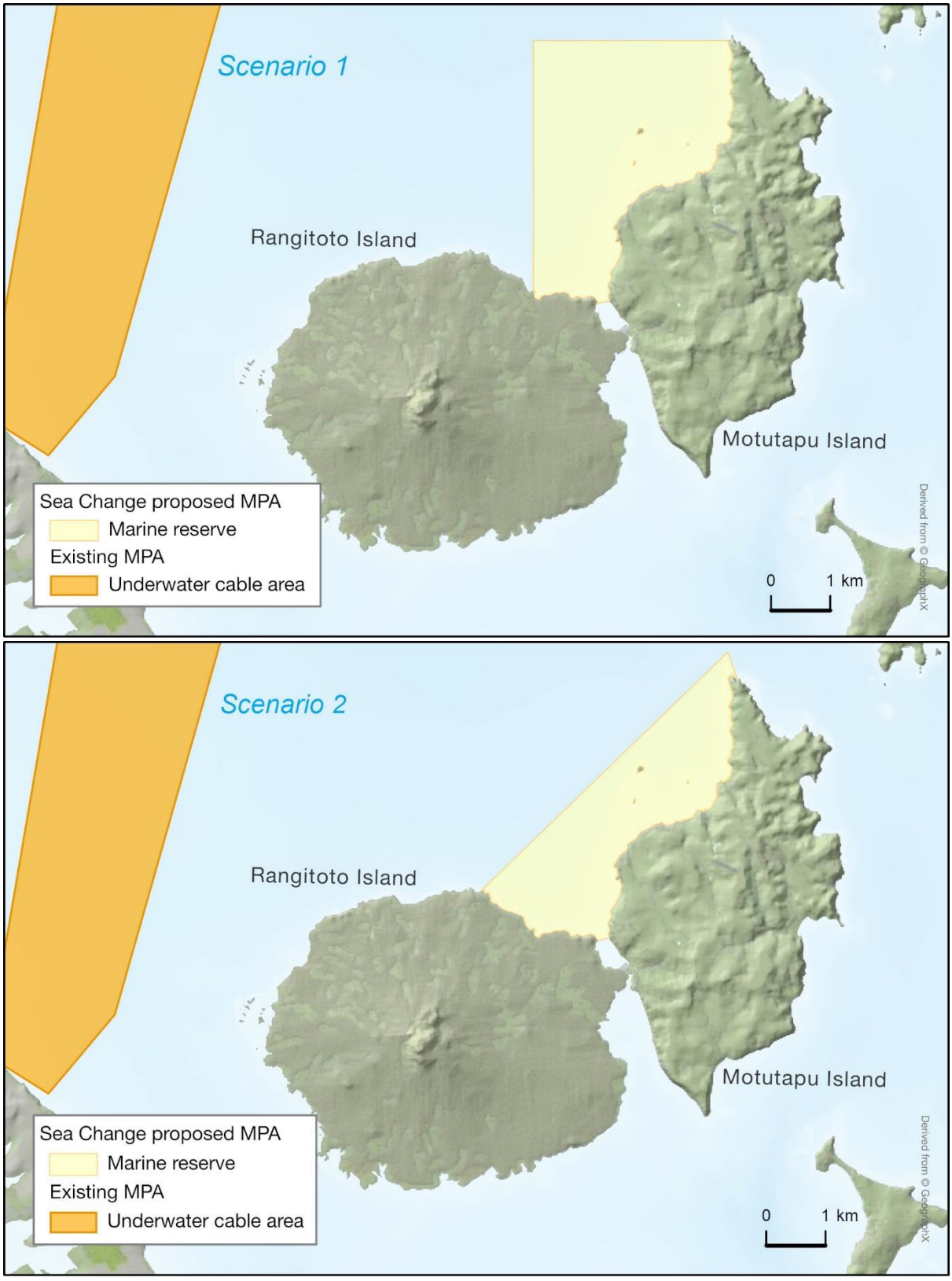

Figure 50. Sea Change Plan proposals for the Rangitoto Motutapu Islands area.

Agency assessment of proposals against Sea Change Plan objectives

Table 35 provides the Sea Change Plan objectives for marine reserves and whether the proposal contributes to the objectives.

Table 35. Comparative assessment of the Rangitoto and Motutapu Islands marine reserve proposals against Sea Change Plan objectives.

MARINE RESERVE SPECIFIC OBJECTIVES	SCENARIO 1	SCENARIO 2
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Uncertain if recovery would occur	Uncertain if recovery would occur
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	Uncertain	Uncertain
Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Potentially contributes	Uncertain
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	Only if future monitoring shows recovery	Only if future monitoring shows recovery
Provide reference areas for marine research, monitoring and education	Only if future monitoring shows recovery	Only if future monitoring shows recovery
Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism	Uncertain	Uncertain

Agency response to Sea Change Plan proposal

Overall, agencies consider that the biodiversity values associated with the islands justify area-based protection at this location. The area has been previously considered for some kind of protection, including by MAF (1985), LINZ (Sewell 1985) and DOC (1995). Rangitoto and Motutapu Islands display coastal marine biodiversity values typical of the inner Hauraki Gulf islands.

While Scenario 2 has slightly more reef within its boundaries (1.3 km^2 compared to 1.1 km^2), the closeness of the boundary to the outer reef (approximately 100 m) makes edge effects more likely. Scenario 1 mitigates the potential for edge effects by extending the protection offshore, making a more viable reserve. Agencies consider that the Scenario 1 reserve design provides a better buffer to the offshore reef and will be taken forward (Fig. 51).

Modifications to proposal

No modifications are required.

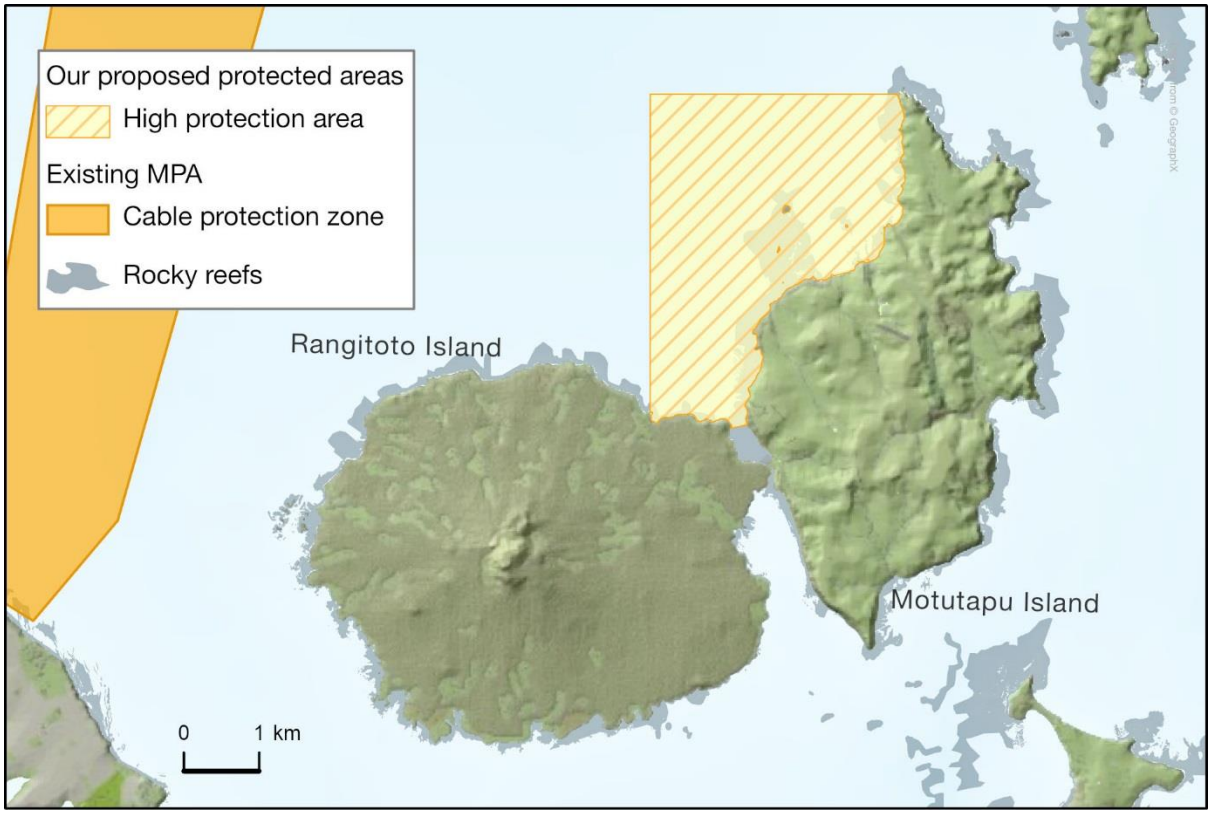

Figure 51. Preferred option for Rangitoto and Motutapu islands.

Alignment with existing legislation and policy

While the proposed marine reserve in Scenario 1 offers a high level of protection, it is unlikely to be consistent with the Marine Reserves Act 1971, as the intention is to make provision for customary practises. As such, the proposal being taken forward to engagement with mana whenua will be defined as a **high protection area** rather than a marine reserve.

Activities that would be affected by the high protection area

A summary of the existing users that may be affected by the proposal is given in Table 36.

Table 36. Assessment of affected users for the proposed Rangitoto and Motutapu Islands proposals.

ACTIVITY	HIGH PROTECTION AREA
Commercial fishing	All commercial fishing would be prohibited. Please note that the Rangitoto and Motutapu Islands proposal is within an area covered by existing trawl and Danish seine restrictions. The values below reflect the displacement of other fishing methods. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $21,000 based on a total reported average yearly catch of 3.0 tonnes. The biggest displacement would be experienced by the kahawai fishery, of which 1.0 tonne per year would be displaced. In terms of foregone revenue, the kahawai fishery would be the most impacted.
Recreational fishing	All recreational fishing would be prohibited. An analysis of the spatial distribution of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park indicates that 0.38% of stationary

	recreational fishing effort and 0.28% and 0.36% of snapper and kahawai landed catch would be displaced, respectively.
Mining and petroleum exploration	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	All commercial extractive activities would be prohibited. No current extraction of material is known to occur.

14. Firth of Thames, including Ponui and Rotoroa Islands

Site description

The Firth of Thames is a large estuarine embayment located between the Hunua Ranges and Coromandel Peninsula. Extensive tidal flats, Miranda chenier plain, saltmarsh and mangrove forest comprise the southern shoreline of the Firth and are recognised as a wetland of international importance under the Ramsar Convention[27]. The Waihou and Piako Rivers discharge into the southern Firth of Thames and drain the Hauraki Plains and Kaimai Range. Their catchments define the large southward land extension of the HGMP. The flood plains of both rivers once supported an extensive lowland swamp forest and complex system of marshes and bogs. Native forest has been largely cleared and the plains converted into agricultural land. The largest surviving remnant of this wetland ecosystem is the Kopuatai Peat Dome. Circulation in the Firth of Thames is driven by tides and local winds. The flow is generally inwards along the western side of the Firth and out along the eastern side, but it can be reversed depending upon the wind direction. The sea floor is largely gently-shelving mud and sandy mud, with deep, very fine, almost fluid mud along the margin of the tidal flats between Miranda and Thames. Rocky substrates are confined to the intertidal zone and shallow fringing reefs around headland and offshore islands. Much of the eastern side of the Firth and a large area off Ōrere Point and Tapapakanga Regional Park have been developed for longline culture of green-lipped mussel.

Marine biodiversity values

The Firth of Thames and Tāmaki Strait once supported extensive green-lipped mussel beds that, in addition to providing habitat for a wide range of benthic invertebrates and juvenile fishes, were capable of filtering all the water in the Firth in a matter of days. They would also have stabilised seafloor sediments and had a strong influence on nutrient cycling. These beds had been virtually eliminated by directed shellfish dredging by the mid-1960s and have not recovered (Morrison et al. 2002; McLeod et al. 2012; Paul 2012).

At least 77 shorebird species have been recorded from the Miranda Ramsar site. Up to 25,000 mostly migratory waders use it at any time, making it one of the three most important wading bird habitats in New Zealand. Birds visiting Miranda also forage elsewhere within the HGMP, in Manukau and Kaipara Harbours, and elsewhere in New Zealand. The mangrove forest at the head of the Firth contains some of the largest mangrove trees in New Zealand.

Morrison et al. (2002) found subtidal epifaunal assemblages were sparse and patchily distributed across the Firth. One area with horse mussel beds and one area with small patches of green-lipped mussels were identified, and beds of sand dollars were found along the western shore. Sponges and anemones were present at a small number of sites in low densities. Fish assemblages recorded by Morrison et al. (2002) consisted of common inshore demersal species such as rig, snapper, jack mackerel, kahawai, gurnard, John dory and flatfishes. Significant numbers of juveniles of these species were also recorded. New-born and juvenile smooth hammerhead sharks are also abundant in the Firth.

The abundance and diversity of marine species generally increases along a gradient of increasing depth, salinity and exposure, and decreasing sedimentation from the inner to outer Firth. Benthic habitat diversity is greatest off Deadmans Point and around Ponui Island (Chamberlins Island), east

[27] The Ramsar Convention on Wetlands is an intergovernmental treaty for the conservation and wise use of wetlands.

of Waiheke Island. Ponui Island (Chamberlins Island) is separated from the mainland to the south by Tāmaki Strait and from Waiheke Island by Waiheke Channel. This channel is deep and swept by strong tidal currents. Tidal flow through Sandspit Passage, the narrow entrance to Tāmaki Strait, is also strong. These areas are characterised by coarser sediments and abundant filter-feeders such as dog cockles, sponges, white-striped anemones (*Anthothoe albocincta*), sponges, hydroids and the small soft coral *Alcyonium* sp. (sometimes referred to as dead man's fingers). Sponges, hydroids, anemones and soft coral grow on rocky reefs and structures, and on shell armouring covering sandy and muddy sediments in the channels. Rhodolith beds occur on some banks southwest of Pakatoa Island, and a complex epifaunal assemblage characterised by hydroids, sponges, small horse mussels and scallops occurs between Pakatoa Island and Tarahiki Island (Shag Island) (Morrison et al. 2002). A recent survey of potential juvenile snapper habitat in the Hauraki Gulf discovered an area of large serpulid tubeworm mounds off the east coast of Waiheke Island (Fig. 51; Anderson et al. 2019). This is the most northerly occurrence of these known in New Zealand waters. Similar tubeworm mounds are found in Marlborough Sounds and Stewart Island/Rakiura. Their highly complex structure provides habitat for highly diverse assemblages of mobile and sessile invertebrates. The area in and around the mounds also provides habitat for a variety of fishes, including reef-associated planktivores such as butterfly perch and demersal predators such as snapper, wrasses and blue cod. Only two species of marine mammals, common dolphins (*Delphinus delphis*) and killer whales are regularly encountered in the Firth of Thames. Little is known about their use of it, or how important it is for either species. Large whale species recorded from the Firth have generally been dead or stranded individuals.

Figure 52. Fragment of a large tubeworm mound formed by Galeolaria hystrix *collected off the east coast of Waiheke Island. Credit: Meredith Lowe, Bottlenecks programme CO1X1618.*

Direct pressures

Excess sedimentation, nutrient enrichment and runoff of contaminants such as heavy metals are the major pressures on the Firth. The major sources of excess sediments and nutrients are pastoral farmland and exotic forestry. Historically, land clearance, beginning with the first Polynesian settlers, and gold mining were major sources of terrestrial sediments. Improvements in land management have reduced sediment and nutrient inputs to the Firth of Thames, but these are still too high and are contributing to the expansion of mangroves into the foraging habitat of shorebirds, and

potentially inhibiting the recovery of sea floor communities following the cessation of dredging and trawling more than 50 years ago. There are indications that excess nutrients are beginning to create a seasonal oxygen-depleted zone below approximately 20 m depth in the outer parts of the Firth.

Aquaculture, particularly mussel farms, can alter species composition and nutrient recycling in sediments below them through the deposition of pseudofaeces and live and dead mussels. In the Firth these impacts appear to be relatively minor and largely limited to the footprints of the farms. Aquaculture structures can also provide settlement substrate for invasive species, and in some cases invasive species can be introduced with spat or spread by farm practices. However, within the HGMP, the Ports of Auckland and Waitematā Harbour remain the main point of entry and largest source of propagules of non-indigenous species. Marine farms can also displace species such as marine mammals from critical habitats. However, the Firth of Thames is not thought to constitute critical habitat for any of the cetacean species recorded from there.

The Firth of Thames has been identified as a potential new location for the Port of Auckland by Auckland Council.

Recreational fishing, including hand gathering of shellfish, and commercial longlining and set netting for snapper, flatfish and mullet occur throughout the Firth. Recreational fishing is particularly intense and encouraged around mussel farms.

Existing management

This area is within the inner Hauraki Gulf commercial trawling and Danish seining prohibition area. The Firth of Thames, along with the area around Waiheke Island, is within the Inner Hauraki commercial scallop prohibition area.

The Auckland Coromandel shellfish recreational daily bag limits and size restrictions apply.

The Firth of Thames Ramsar site encompasses the coastal and intertidal wetland of the southern Firth of Thames and adjoining public conservation land administered by DOC. Key management actions identified in Auckland and Waikato Conservation Management Strategies include integrated catchment management to reduce sedimentation and nutrient inputs; increased legal protection for wetland habitats; and on-site management to restore and protect important habitats and birdlife, and to remove *in situ* or adjacent sources of ecosystem degradation and pollution. Ongoing research to improve understanding of the implications of catchment-wide impacts is identified as a management need.

The Waikato Regional Coastal Plan identifies the Firth of Thames Ramsar site as an Area of Significant Conservation Value and contains rules protecting it from inappropriate development.

Several experimental mussel restoration beds have been established and monitored by Revive Our Gulf and the University of Auckland in Cable Bay, Rotoroa Island, and Revive Our Gulf have a resource consent to deploy shell and live mussels at several locations off the east coast of the island.

Rotoroa Island and nearby islands (Pakatoa Island, Tarahiki Island and Frenchmans Cap) are classified as a marine Significant Ecological Area in the Auckland Unitary Plan (Auckland Council 2017).

Sea Change Plan proposals for the Firth of Thames

The Sea Change Plan proposes a marine reserve centred around Rotoroa Island and a larger Type 2 MPA encompassing the Firth of Thames aimed at supporting regeneration efforts of historic mussel beds in the area via the exclusion of all fishing methods that impact benthic habitats (Fig. 53).

The marine reserve proposal includes 9 km^2 of marine area (0.1% HGMP), with a minimum width of 3 km and approximately 8 km of island coastline. The Type 2 MPA proposal includes 910 km^2 (6.5% HGMP), with a minimum width 26 km and approximately 184 km of coastline.

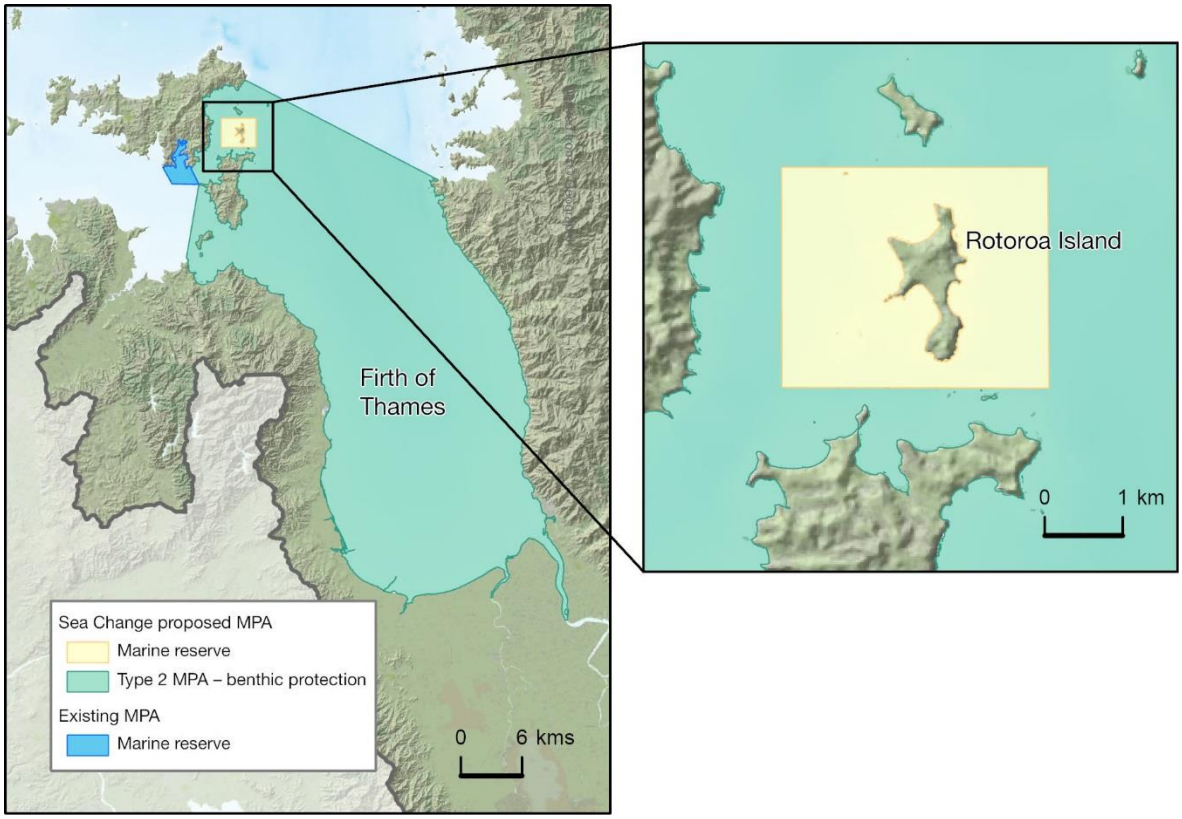

Figure 53. Sea Change Plan proposals for the Firth of Thames and Rotoroa Island area.

Agency assessment of habitats and ecologically significant features that would be protected

Marine reserve

The proposed marine reserve would potentially provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, seven physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats).

Agencies note that uncertainty remains regarding the proposal being of viable size (i.e. to meaningfully afford protection to associated species and ecological processes). In addition, the boundary crosses the reef areas, both north and south, and is likely to incur edge effects that may compromise the site's effectiveness. Future research and monitoring will allow this uncertainty to be addressed, should this proposal be implemented.

The biogenic dog cockle habitat is present within the proposal and a small area of rhodolith habitat is also present at the very north of the site.

Type 2 MPA – Benthic Protection

In order to meet the objectives for the Type 2 MPA proposal at this site, to protect the seafloor features, restrictions of the following would be required:

- Mobile bottom fishing methods (all dredging, bottom trawling and Danish seining).

The proposal would include 12 physical habitat types that would be afforded some degree of protection from direct physical disturbance. Those features sensitive to disturbance would be protected from physical displacement, but wider ecological benefits are less likely to occur.

A further 11 habitats are present but would not be afforded any additional protection by this proposal. The proposed fishing methods to be prohibited generally do not occur over rocky reef and intertidal areas, and these habitats would be unlikely to benefit directly from the proposed protection.

Further assessment based on the levels of extraction from remaining fishing methods, including from recreational extraction, would need to be undertaken to determine if the level of protection could allow for the maintenance and recovery of wider ecosystem values.

The seafloor protection area would also contribute to protecting the biogenic dog cockle habitat (7.2 km^2), and the rhodolith habitat west of Pakatoa Island.

Agency assessment of proposals against Sea Change Plan objectives

Tables 37 & 38 provide the objectives for the different management options (marine reserves and Type 2 MPAs).

Table 37. Assessment of the Rotoroa Island marine reserve proposal against Sea Change Plan objectives.

MARINE RESERVE OBJECTIVES	FIRTH OF THAMES AND ROTOROA ISLAND – MARINE RESERVE
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Uncertain if recovery would occur
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	Possibly contributes
Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Uncertain due to edge effects
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	Only if future monitoring shows recovery
Provide reference areas for marine research, monitoring and education	Only if future monitoring shows recovery
Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism	Only if recovery occurs

Table 38. Assessment of the Firth of Thames Type 2 Marine Protected Area proposal against Sea Change Plan objectives.

PLAN TYPE 2 MARINE PROTECTED AREA SPECIFIC OBJECTIVES	TYPE 2 MARINE PROTECTED AREA
Identify, restore and protect key habitats (e.g. biogenic habitats) in order to maintain the integrity of ecosystems and their functioning by 2020	Would protect some biogenic habitats from physical disturbance

Significantly increase the productivity of the Hauraki Gulf Marine Park by 2035	Possibly, if recovery of seafloor communities occurs
Exclude activities (e.g. dredging, bottom trawling, Danish seining, dumping and sea bed mining) that damage habitats by 2025	Contributes to objective
Potentially serve as a buffer to areas with a higher level of protection (thereby implementing a nested approach)	Partially, for species caught by the prohibited fishing methods
Potentially support restoration projects	Potentially

Agency response to Sea Change Plan proposals

Agencies consider that due to the land-based pressures on the inner Firth of Thames, area-based protection such as an MPA would have limited effectiveness in providing for restoration and maintenance of ecological values. The protection and restoration of the Firth of Thames is dependent largely on managing pressures associated with the catchment. As such, it is not proposed that the Firth of Thames Type 2 MPA proposal be taken forward.

In regard to the Firth of Thames and Rotoroa Island marine reserve proposal, agencies note that while the proposal has value, it is located in a less than optimal location to protect those biodiversity values.

Modifications to proposal

To better align the marine reserve proposal with the objectives and provide better protection to the biodiversity values associated with this area, agencies propose the following modification:

- Shift proposal north to encompass the area around and between Pakatoa and Tarahiki Islands.

The modification would mitigate to some degree the likely edge effects from the reef crossing the reserve boundary. It also affords greater protection for the biogenic dog cockle and rhodolith habitats. The modified proposal would include Pakatoa and Tarahiki Islands, and the area between them, which contain complex epifaunal assemblages characterised by hydroids, sponges, small horse mussels and scallops.

The proposal to progress is 12.4 km^2.

Alignment with existing legislation and policy

While the proposed marine reserve in Scenario 1 offers a high level of protection, it is unlikely to be consistent with the Marine Reserves Act 1971, as the intention is to make provision for customary practises. As such, the proposal being taken forward to engagement with mana whenua will be defined as a **protection area** rather than a marine reserve (Fig.54).

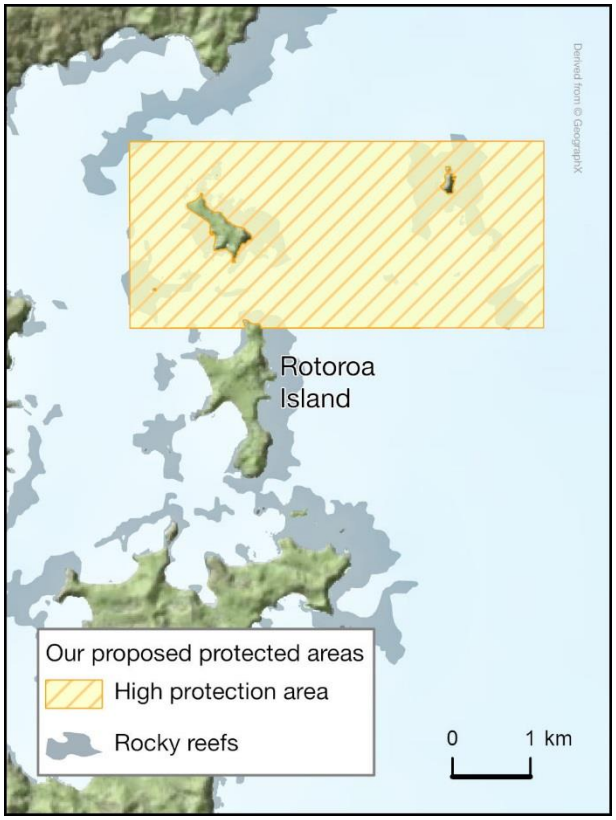

Figure 54. Preferred option for the Firth of Thames and Rotoroa Island area

Agency assessment of habitats that would be protected

The proposed high protection area would provide protection to six physical habitats that it contained, and the biodiversity associated with those habitats (see Appendix 3 for full list of habitats.

Agencies note that uncertainty remains regarding a few of the physical habitats present in the proposal being of viable size (i.e. to meaningfully afford protection to associated species and ecological processes). Future research and monitoring will allow this uncertainty to be addressed, should this proposal be implemented.

Activities that would be affected by the high protection area

A summary of the existing users that may be affected by the proposal is given in Table 39.

Table 39. Assessment of affected users for the proposed Firth of Thames and Rotoroa Island proposal.

ACTIVITY	HIGH PROTECTION AREA
Commercial fishing	All commercial fishing would be prohibited. Please note that the Firth of Thames and Rotoroa Island proposal is within an area covered by existing trawl and Danish seine restrictions. The values below reflect the displacement of other fishing methods. Based on the best available information used for the assessment, Fisheries New Zealand estimates the foregone revenue of displaced commercial catches from the site to be $31,000 based on a total reported average yearly catch of 2.6 tonnes. The biggest displacement would be experienced by the snapper, rig and kahawai fisheries, of which approximately 0.5 stonne per year would be displaced in each fishery. In terms of

	foregone revenue, the snapper, rig and kahawai fisheries would be the most impacted.
Recreational fishing	All recreational fishing would be prohibited. An analysis of the spatial distribution of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park indicates that 1.31% of stationary recreational fishing effort and 1.13% and 1.67% of snapper and kahawai landed catch would be displaced, respectively.
Mining and petroleum exploration	All mining and petroleum exploration would be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area would not likely be significant as the area is not known to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	All commercial extractive activities would be prohibited. There are no known consents for sand extraction in the area.

15. Motukawao Islands

Site description

The Motukawao Group consists of eight islands and islets and numerous rock stacks and awash rocks (Motumakareta Island, Motukahaua Island (Happy Jack Island), Motuwhakakewa Island, Motuwi Island (Double Island), Motukaramarama Island (Bush Island), Motutakapu Island (Gannet Island), Moturua Island (Rabbit Island) and Ngamotukaraka Islands (Three Kings Islands)). It is located off the western Coromandel Peninsula approximately 11 km north of Coromandel Harbour, and 6.5 km southwest of Colville Bay. This proposal covers the marine area surrounding Motukahaua Island (Happy Jack Island) and Motuwhakakewa Island and extends 6 km east to the coastline of Coromandel Peninsula (approximately 1.2 km north and south of Tukituki Bay). Immediately east of the islands, the seafloor drops into a channel with a maximum charted depth of 34 m. The northern end of this channel is located at depth of approximately 17 m just east of Motupotaka (Black Rocks) and it runs south between Motuwhakakewa Island and Motuwi Island (Double Island) and Motukaramarama Island (Bush Island). Maximum width of the channel is approximately 1.4 km. East of the channel the seafloor shelves gently from 20 m depth to the shoreline. The shoreline of the islands and mainland are a mixture of rocky outcrops and gravel beaches. Shallow sediments close to shore consist of coarse, silty, shelly sand, whereas most of the seafloor is composed of soft mud and mud and broken shell (Morrison et al. 2003). A relatively large area of shallow sand occurs in Elephant Cove, Motukahaua Island (Happy Jack Island).

Marine biodiversity values

The marine biology of this site is poorly known but thought to be representative of sheltered inner Hauraki Gulf waters. Kotua-Dickson (1984) recognised two basic habitats in the Motukawao Group: a *Carpophyllum flexuosum* community predominating macroalgal forests at the most sheltered sites, with predominant fauna consisting of echinoderm assemblages, and *E. radiata* dominating at more exposed sites with rich encrusting fauna present on open rocky faces. The presence of small scallops and flounders in sandy bays indicated that those areas provide nursery ground for a variety of species.

Abundance and diversity of benthic invertebrates of muddy substrates tends to be low. Morrison et al. (2003; unpubl. data) recorded 19 species and a total of 326 individuals in six grab samples taken in muds at 11–15.3 m depth between the islands and Colville Bay. Five taxa (*Amphiura rosea*, *Echinocardium cordatum*, unidentified cumacea, *Linucula hartvigiana* and unidentified sigalionidae) constituted 82% of the individuals in the sample, of which the brittle star *A. rosea* was by far the most abundant (37% of individuals). *Amphiura rosea*-dominated communities such as this occur in shallow muddy shelf sediments throughout New Zealand (McKnight 1969). Species composition recorded by Morrison et al. (2003) is consistent with McKnight's (1969) *A. rosea – Dosinia lambata* community, which he described as occurring on sandy mud or mud substrates in depths of 1–50 m from Tasman Bay northwards.

Demersal fishes recorded in research trawls between the islands and the shore are mainly snapper, jack mackerel, red gurnard and sand flounder, with lower numbers of John dory, trevally, kahawai, rig and barracouta (*Thyrsites atun*) (Morrison et al. 2003).

This area historically contained large beds of green-lipped mussels growing on soft sediments. The densest beds occurred along the coast from Colville Bay to Thames and included Motuwi Island (Double Island) and Motukaramarama Island (Bush Island) in the southern Motukawao Group (Morrison et al. 2003). The dredge fishery for these developed in the late 19th century and had

completely extirpated them by the mid-1960s (Paul 2012). The loss of this habitat type will have had major direct and indirect adverse effects on benthic diversity through the direct removal of the mussels, invertebrates and small fishes associated with them, as well as the loss of nursery habits for demersal fishes and the effects on nutrient processing (McLeod et al. 2012; Morrison et al. 2014).

Direct pressures

The Islands are impacted by water quality issues associated with land-based impacts on the wider Firth of Thames. Suspended sediment levels generally reduce from South to North through the archipelago.

Commercial scallop dredging has occurred throughout the area in the past, and all of it is inside the area that was historically dredged for green lipped mussels (Morrison et al. 2002). Commercial longlining for snapper occurs throughout the area.

All of the islands in the group are popular recreational fishing destinations.

Existing management

The Motukawao Group are within the inner Gulf commercial trawling and Danish seining prohibition. The Auckland Coromandel recreational daily bag limits and size restrictions apply.

Motukawao Group is classed as an area of Outstanding Natural Character in the Waikato Regional Coastal Plan.

Sea Change Plan proposal for the Motukawao Group area

The Sea Change Plan proposes a marine reserve spanning from the mainland coast west towards Motukahaua Island (Happy Jack Island) and Motuwhakakewa Island. The proposal includes 18 km^2 of marine area (0.1% HGMP), with a minimum width of 3 km and approximately 7 km of coastline (Fig. 55).

Agency assessment of habitats and ecologically significant features that would be protected

The proposed marine reserve would potentially provide a high level of protection to the habitats that it contained, and the biodiversity associated with those habitats. Based on the habitat classification, 10 physical habitats would be afforded protection by this proposal (see Appendix 3 for full list of habitats).

Agencies note that uncertainty remains regarding a few of the physical habitats present in the proposal being of viable size (i.e. to meaningfully afford protection to associated species and ecological processes). The proposal bisects the Motukahawao Group, meaning that significant edge effects are likely to result across the proposed boundary. Future research and monitoring will allow this uncertainty to be addressed, should this proposal be implemented.

The proposal would also afford protection to biogenic dog cockle habitat that occurs between the islands and the Coromandel Peninsula.

Agency assessment of proposal against Sea Change Plan objectives

The table below provides the Sea Change Plan objectives for marine reserves and whether the proposal contributes to the objectives.

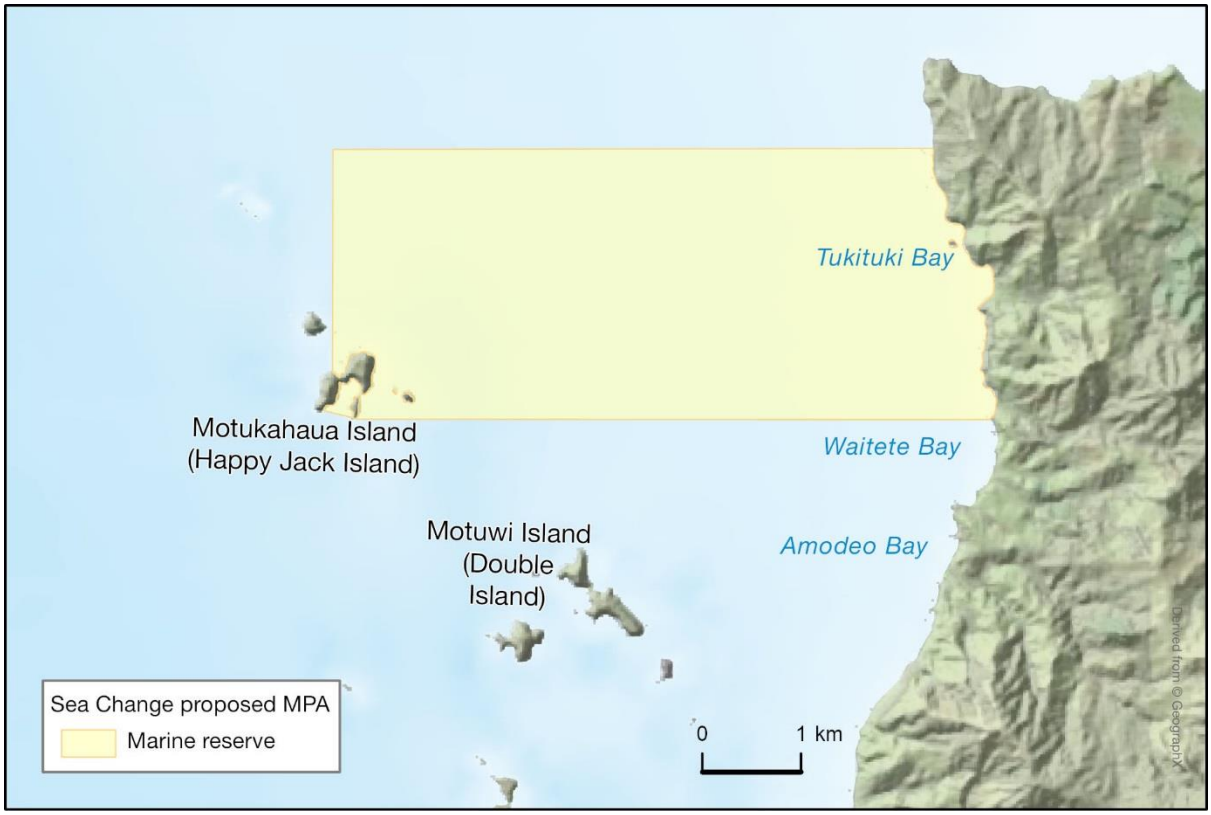

Figure 55. Sea Change proposal for the Motukawao Group area.

Agency assessment of proposal against Sea Change Plan objectives

Table 40 provides the Sea Change Plan objectives for marine reserves and whether the proposal contributes to the objectives.

Table 40. Assessment of Motukawao Group marine reserve proposal against Sea Change Plan objectives.

MARINE RESERVE OBJECTIVES	MOTUKAWAO GROUP – MARINE RESERVE
Set aside places where mana whenua and communities want to experience abundance and diversity of marine and coastal life	Would allow recovery to meet this objective
Conserve and protect cultural and spiritual values and practices associated with nature according to tikanga such as solitude, protection of wāhi tapu and connection to tupuna	To be confirmed with mana whenua
Identify and protect the full range of marine communities and ecosystems with high biodiversity value by 2020	A number of significant features are identified at this site that would contribute to this objective
Identify and protect enough of each habitat type to ensure ecosystem integrity and resilience	Would contribute to this objective
Through these areas, develop a baseline to better understand the ecological integrity of ecosystems within the Hauraki Gulf Marine Park, including progressing the knowledge on impacts of human activities	Would contribute to this objective
Provide reference areas for marine research, monitoring and education	Would contribute to this objective

Provide opportunities for the enjoyment of restored marine environments through education, and sustainable recreation and tourism	Would contribute to this objective by allowing environmental restoration

Agency response to Sea Change Plan proposal

The agency considers this proposal to be beneficial for dog cockle protection, and potentially for reef systems. However, given the concerns around edge effects and poor reserve design, the boundaries should be extended west and south to include the entire outer reef system, especially the patch of 'very sheltered deep rocky reef' habitat. This habitat has a limited extent and is mostly present in the inner Hauraki Gulf, with large patches on the west coast of Coromandel and along the northeast coast of Coromandel.

Modifications to proposal

Agencies consider that in order to better deliver on the purpose and outcomes for MPAs in the Sea Change Plan and follow best-practice MPA design criteria, the following adjustments are recommended:

- Improve the reserve design, modifying the eastern and southern boundary to allow for adequate protection and buffers to reefs around the islands.

The area of the high protection area proposal to progress is 29.1 km^2.

Alignment with existing legislation and policy

While the proposed marine reserve in Scenario 1 offers a high level of protection, it is unlikely to be consistent with the Marine Reserves Act 1971, as the intention is to make provision for customary practises. As such, the proposal being taken forward to engagement with mana whenua will be defined as a **high protection area** rather than a marine reserve (Fig. 56).

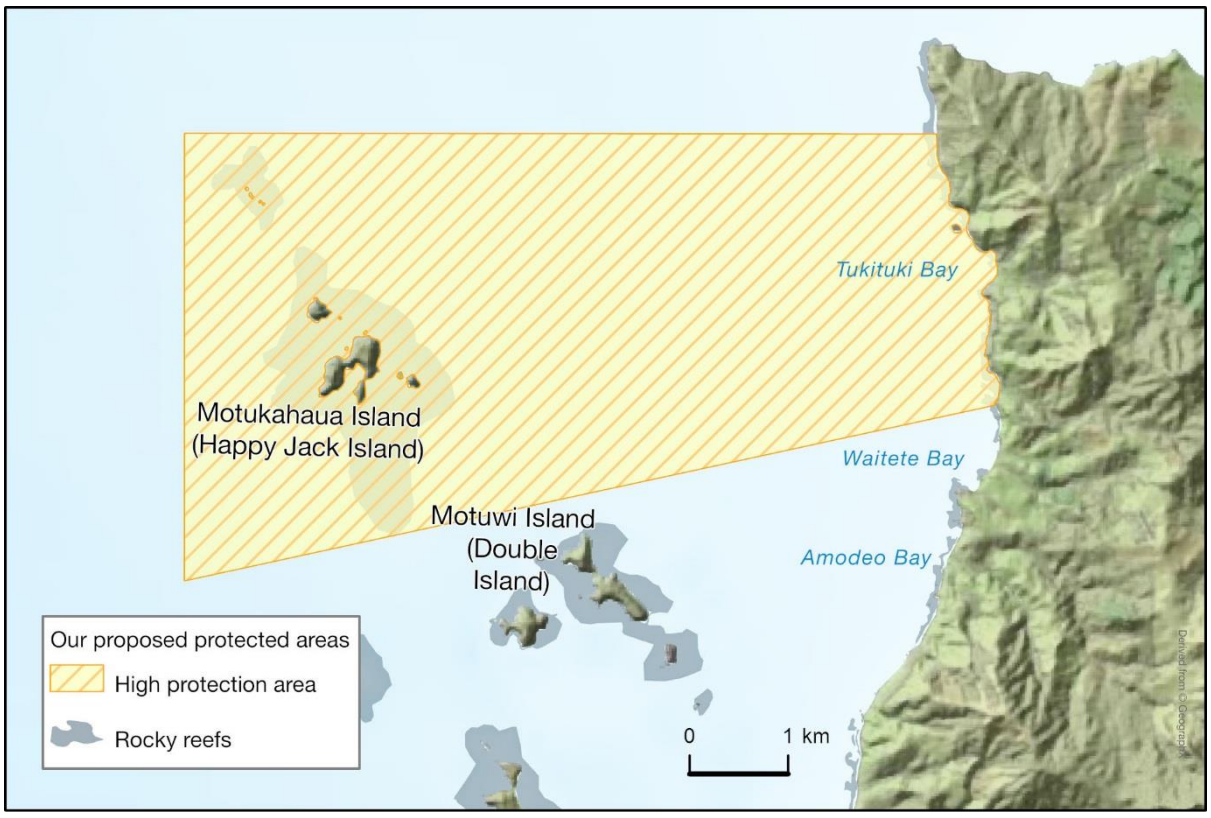

Figure 56. Preferred option for Motukawao Group.

Activities that would be affected by high-protection area

A summary of the existing users that may be affected by the proposals are given in Table 41.

Table 41. Assessment of affected users for the proposed Motukawao Group proposal.

ACTIVITY	HIGH PROTECTION AREA
Commercial fishing	All commercial fishing would be prohibited. Please note that most of this proposal is within an area covered by existing trawl and Danish seine restrictions. There are no known commercial scallop beds in the area. Based on the best available information used for the assessment Fisheries New Zealand estimates the forgone revenue of displaced commercial catches from the site to be $81,000 based on a total reported average yearly catch of 8.0 tonnes. The biggest displacement would be experienced by the snapper fishery, of which 5.1 tonne per year is displaced. In terms of forgone revenue the rock lobster and snapper fisheries are the most impacted.
Recreational fishing	All recreational fishing would be prohibited. An analysis of the spatial distribution of recreational fishing effort (number of stationary boats actively fishing) and landed snapper and kahawai catch within the Hauraki Gulf Marine Park indicates that 0.41% of stationary recreational fishing effort and 0.48% and 0.34% of snapper and kahawai landed catch would be displaced.
Mining and petroleum exploration	All mining and petroleum exploration is intended to be prohibited. Foregone benefits from future potential mining or petroleum extraction in the area not likely to be significant as the area is not known to hold any significant deposits of Crown minerals.
Extraction of any material for commercial use	All commercial extractive activities would be prohibited. No current extraction of material is known to occur.

Summary of preferred network options

The agencies have been through the process of assessing the different options contained within the Sea Change Plan against the Plan's objectives, overall biodiversity benefits and principles of MPA network design.

Agencies' assessment of proposals, and advice underpinning our response, were based on several principles:

- Ensuring the best possible biodiversity benefits are provided for by those Sea Change Plan proposals we want to further engage on.
- Where possible, reduce impacts on existing users/fisheries without compromising biodiversity outcomes.
- Other more pragmatic considerations such as ease of compliance.
- That individually and collectively the proposals progressed by agencies contribute towards an ecologically coherent network of MPAs in the HGMP.
- Alignment between Sea Change Plan objectives for MPAs and outcomes sought (including defining site-specific objectives for each proposal).
- Alignment between the Sea Change Plan proposals and the MPA Policy[28].

As a result of this assessment, the agencies are recommending 11 high protection areas, five seafloor protection areas and extensions to two existing marine reserves (Table 42; Fig. 57).

Table 42. Recommended areas to be progressed.

	SITE	MPA TYPE	AREA (km^2)	PROPORTION OF HAURAKI GULF MARINE PARK
1	Te Hauturu-o-Toi/Little Barrier Island	High protection area	195.4	1.4
2	Slipper Island/Whakahau	High protection area	13.5	0.1
3	Motukawao Group	High protection area	29.1	0.2
4	Firth of Thames and Rotoroa Island	High protection area	12.4	0.1
5	Rangitoto Island and Motutapu Island	High protection area	10.7	0.1
6	Cradock Channel	Seafloor protection area	152.0	1.1
7a	Cape Colville	High protection area	26.7	0.2
7b	Cape Colville	Seafloor protection area	68.3	0.5
8a	Mokohinau Islands	High protection area	118.5	0.8
8b	Mokohinau Islands	Seafloor protection area	326.1	2.3
9a	Aldermen Islands North	High protection area	133.9	1.0
9b	Aldermen Islands South	High protection area	155.0	1.1
10a	Kawau Bay	High protection area	40.4	0.3
10b	Kawau Bay	Seafloor protection area	159.1	1.1
11a	Tiritiri Matangi Island	High protection area	9.5	0.1
11b	Tiritiri Matangi Island	Seafloor protection area	53.7	0.4

[28] DOC & MFISH 2005. Marine protected areas: policy and implementation plan. Department of Conservation and Ministry of Fisheries, Wellington.

12	The Noises	(community-led project)		
13	Whanganui A Hei (Cathedral Cove) Marine Reserve	Extension of existing marine reserve	14.6	0.1
14	Cape Rodney-Okakari Point Marine Reserve	Extension of existing marine reserve	15.2	0.1

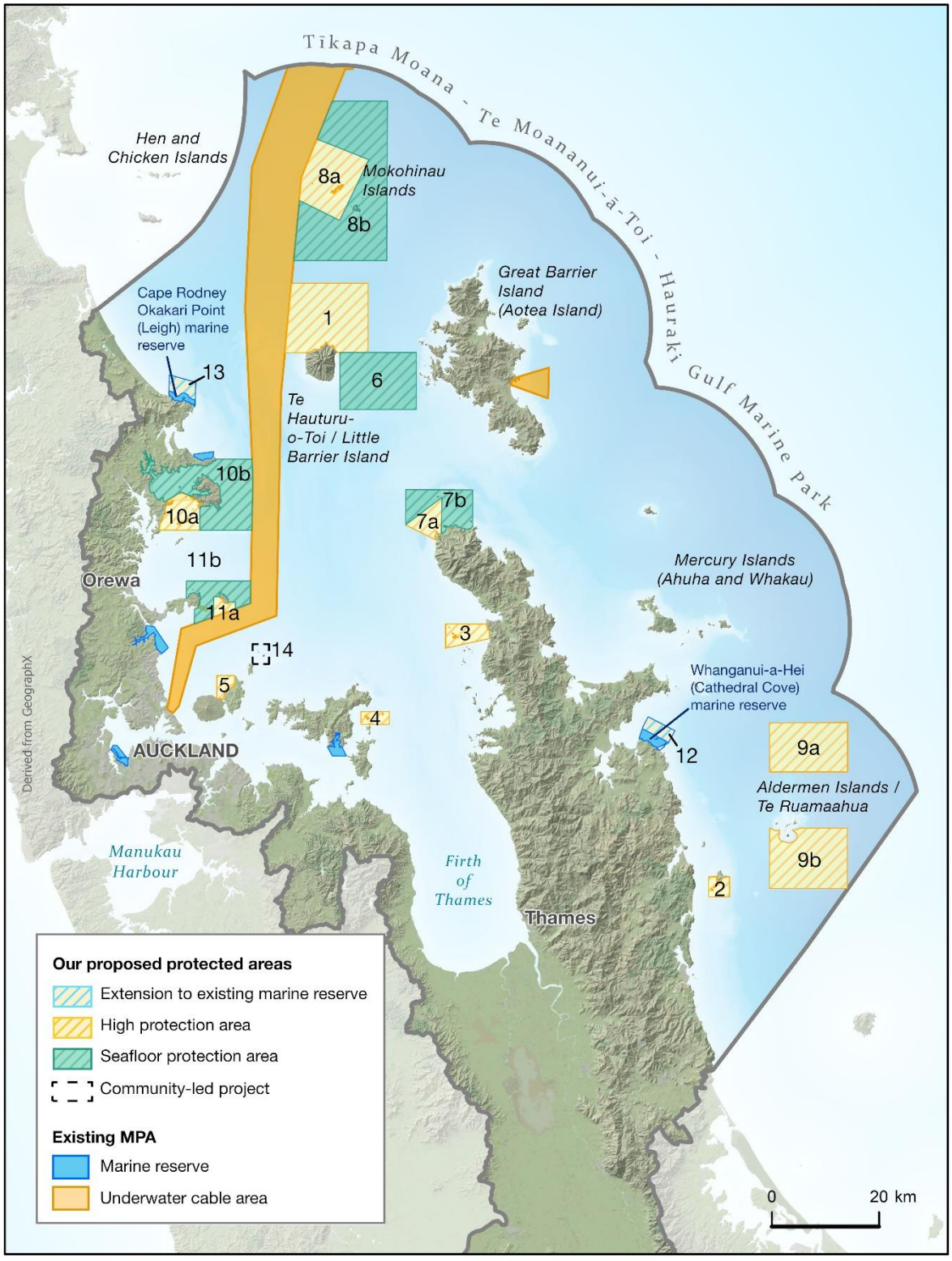

Figure 57. Agency recommended protection areas.

Part 2 – Contribution of our Strategy proposals towards a HGMP MPA network

What makes an MPA?

Not all marine protection measures will meet the requirements for designation as an MPA under the MPA Policy[29].

The Sea Change Plan proposed several different spatial management measures, along with objectives specific to the type of protection. Some of the proposals undoubtedly meet the requirements under existing policy to be considered an MPA for planning and reporting purposes, whereas others likely do not fully meet the requirements. In the cases where the proposals do not meet the requirements for designation as an MPA, it should be noted that this does not mean that they do not contribute anything to conservation at all, but rather that they do not increase representation (or replication) within the MPA network.

An MPA must have '*…adequate protection, [to achieve] the maintenance and/or recovery of biological diversity at the habitat and ecosystem level in a healthy functioning state.*'

In determining if this test is met, the MPA must afford sufficient protection *to enable the maintenance or recovery of the site's biological diversity at the habitat and ecosystem level to a healthy functioning state. In particular, the management regime must provide for the maintenance and recovery at the site of:*

> *a) physical features and biogenic structures that support biodiversity*
>
> *b) ecological systems, natural species composition (including all life-history stages) and trophic linkages*
>
> *c) potential for the biodiversity to adapt and recover in response to perturbation.*

If biological removals or physical disturbance in a proposed site does not allow for the above guidance to be met, it cannot be considered an MPA.

Strategy protection tools

Given the high protection afforded by **marine reserves**, existing marine reserves and the proposed extension to two of those reserves fully meet the protection required to be an MPA.

The **high protection areas** (referred to as Type 1 MPAs in the Sea Change Plan) can meet the protection level required to be designated as an MPA, depending on how mana whenua choose to undertake their customary practises.

The existing submarine **cable protection zones** are already formally designated as Type 2 MPAs within the current MPA Policy framework and are presumed to meet the requirements outlined above.

The **seafloor protection areas** (referred to as Type 2 MPAs in the Sea Change Plan) generally protect the seafloor from physical disturbance due to bottom-impacting fishing methods[30]. Given the high level of fishing pressure in the Hauraki Gulf, it is considered that the level of extraction from remaining recreational and commercial extractive use does not fully meet part (b) above. Therefore,

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[29] DOC & MFISH 2005. Marine protected areas: policy and implementation plan. Department of Conservation and Ministry of Fisheries, Wellington.

[30] Bottom impacting fishing methods are bottom trawling, dredging and Danish seining generally, but also including potting, bottom long lining and set netting on more sensitive habitats (e.g. coral habitats).

seafloor protection areas are not MPAs and hence are not included as representing those habitats in the following analysis. Should the level of protection be amended from what is currently proposed, or additional information indicates otherwise, this may need to be reassessed.

Proposed protection areas

The Government Response Strategy is recommending progressing two marine reserve extensions, 11 high protection areas and six seafloor protection areas (Tables 43 & 44).

Table 43. Sites that contribute to the marine protected area (MPA) network representation. Those shaded in blue are areas that are currently designated as MPAs, those in yellow are areas that are proposed under the Sea Change Plan. CPZ = cable protection zone.

SITE	PROTECTION TYPE
Cape Rodney-Okakari Point	Existing marine reserve
Tāwharanui	Existing marine reserve
Long Bay-Okura	Existing marine reserve
Motu Manawa-Pollen Island	Existing marine reserve
Te Matuku	Existing marine reserve
Whanganui A-Hei (Cathedral Cove)	Existing marine reserve
Kawau Island CPZ	Existing Type 2 MPA
Whangaparaoa Peninsula CPZ	Existing Type 2 MPA
Hauraki Gulf CPZ	Existing Type 2 MPA
Great Barrier Island CPZ	Existing Type 2 MPA
Whanganui A Hei (Cathedral Cove)	Proposed extension of existing marine reserve
Cape Rodney-Okakari Point	Proposed extension of existing marine reserve
Te Hauturu-o-Toi/Little Barrier Island	Proposed high protection area
Slipper Island/Whakahau	Proposed high protection area
Motukawao Group	Proposed high protection area
Firth of Thames and Rotoroa Island	Proposed high protection area
Rangitoto Island and Motutapu Island	Proposed high protection area
Cape Colville	Proposed high protection area
Mokohinau Islands	Proposed high protection area
Aldermen Islands north	Proposed high protection area
Aldermen Islands south	Proposed high protection area
Kawau Bay	Proposed high protection area
Tiritiri Matangi Island	Proposed high protection area

Table 44. Sites that are proposed to protect seafloor features but do not fully meet the requirements to be considered a marine protected area.

SITE	PROTECTION TYPE
Cradock Channel	Seafloor protection area
Cape Colville	Seafloor protection area
Mokohinau Islands	Seafloor protection area
Kawau Bay	Seafloor protection area
Tiritiri Matangi Island	Seafloor protection area

MPA network assessment

The following analysis looks at how well the proposed protection measures contribute to a representative MPA network for the HGMP. It follows the principles of MPA network design, including representation, replication, adequacy and connectivity.

Representation and replication

A representative network of MPAs would protect the full range of marine biodiversity found in the marine environment. This includes protecting features of conservation importance that are known to be rare, threatened or declining, and also habitats that are representative of broad-scale patterns of biodiversity. Under the MPA Policy it is considered that to ensure adequate representation of biodiversity, at least one example of each habitat type should be included in a marine reserve.

Physical habitat types

Overall, the measures would afford protection to 40 out of 47 physical habitat types in high protection areas (including existing marine reserves) and a further three habitats in Type 2 MPAs (the existing CPZs), leaving five without representation in the network (Table 45). While not MPAs, the seafloor protection areas would contribute additional protection to 43 habitats from physical disturbance.

In terms of replication, 22 habitats would be protected in MPAs (marine reserves, high protection areas and CPZs) in at least three locations.

Table 45. Network representation and replication by protection type. Colour scales show well represented habitats as green, and habitats with no or low representation as red. HPA = high protection areas (including marine reserves); CPZ = cable protection zones; SPA = seafloor protection areas. As SPAs do not contribute to representation within an MPA network the column is not coloured, but rather the numbers demonstrate what the representation would be if the protection was increased to be effective at protecting wider ecosystem values.

		HPAs only			HPAs + CPZs			HPAs + CPZs + SPAs		
Habitats	**Total area in HGMP (km2)**	**Total Area in network (km2)**	**Replication (# MPA)**	**Adequacy of representation (%)**	**Total Area in network (km2)**	**Replication (# MPA)**	**Adequacy of representation (%)**	**Total area in network (km2)**	**Potential replication (# MPA)**	**Potential adequacy of representation (%)**
Moderate Shallow Gravel	0.68	0.41	1	60.3	0.41	1	60.3	0.41	1	60.3
Moderate Deep Gravel	62.22	23.72	2	38.1	23.72	2	38.1	23.72	2	38.1
Very Sheltered Shallow Gravel	16.82	5.06	2	30.1	6.70	3	39.8	9.06	5	53.9
Sheltered Deep Mud	355.28	97.33	1	27.4	123.09	2	34.6	137.20	6	38.6
High Current Deep Gravel	60.26	11.53	1	19.1	11.53	1	19.1	40.38	2	67.0
Moderate Deep Rocky Reef	184.40	34.80	5	18.9	35.15	7	19.1	46.76	8	25.4
High Current Deep Rocky Reef	9.62	1.63	1	16.9	1.63	1	16.9	6.07	3	63.0
Very Sheltered Deep Gravel	15.81	2.46	1	15.6	10.00	2	63.3	13.19	4	83.4
Very Sheltered Shallow Rocky Reef	124.79	19.01	12	15.2	20.11	15	16.1	42.37	18	34.0
Very Sheltered Intertidal Rocky Reef	22.81	2.61	12	11.4	2.78	15	12.2	5.35	18	23.4
Sheltered Shallow Rocky Reef	76.14	8.45	7	11.1	9.20	8	12.1	12.56	12	16.5
Moderate Shallow Rocky Reef	20.01	2.00	3	10.0	2.00	3	10.0	2.78	4	13.9
Sheltered Deep Rocky Reef	35.53	3.11	4	8.8	3.17	6	8.9	9.66	10	27.2
Sheltered Intertidal Rocky Reef	7.65	0.59	6	7.7	0.61	7	8.0	0.89	9	11.6
Moderate Deep Mud	3644.43	247.97	4	6.8	608.83	5	16.7	700.40	6	19.2
High Current Deep Sand	166.61	10.57	1	6.3	10.57	1	6.3	34.53	3	20.7
Moderate Intertidal Rocky Reef	0.11	0.01	2	6.2	0.01	2	6.2	0.01	3	10.9
Moderate Deep Sand	2340.89	136.40	3	5.8	213.89	5	9.1	434.93	6	18.6
Very Sheltered Shallow Mud	1202.48	69.38	5	5.8	129.94	7	10.8	175.23	9	14.6
Very Sheltered Shallow Sand	412.30	20.94	8	5.1	21.62	10	5.2	41.66	13	10.1
Sheltered Shallow Sand	311.90	15.70	6	5.0	18.49	7	5.9	20.21	11	6.5
High Current Shallow Gravel	18.11	0.87	1	4.8	0.87	1	4.8	1.73	2	9.5
Very Sheltered Deep Rocky Reef	8.33	0.34	3	4.1	0.34	3	4.1	1.69	4	20.3
High Current Shallow Rocky Reef	13.66	0.56	1	4.1	0.56	1	4.1	5.51	3	40.4
Estuarine Intertidal Soft Sediment	136.45	5.27	4	3.9	5.27	4	3.9	10.19	5	7.5
Estuarine Intertidal Rocky Reef	3.09	0.11	3	3.5	0.11	3	3.5	0.28	4	9.2
Estuarine Shallow Mud	24.55	0.72	5	2.9	0.72	5	2.9	2.63	6	10.7
Estuarine Shallow Sand	101.08	2.84	2	2.8	2.84	2	2.8	3.50	3	3.5
Moderate Shallow Sand	43.85	1.13	3	2.6	1.13	3	2.6	1.16	4	2.6
Sheltered Deep Sand	2817.19	67.50	4	2.4	366.39	6	13.0	562.24	10	20.0
Sheltered Intertidal Soft Sediment	7.02	0.13	3	1.8	0.20	4	2.8	0.35	5	5.0
Estuarine Shallow Rocky Reef	6.60	0.12	4	1.8	0.12	4	1.8	1.10	5	16.7
Very Sheltered Intertidal Soft Sediment	100.50	1.51	8	1.5	1.64	11	1.6	2.43	14	2.4
Moderate Upper Slope Mud	458.65	6.75	1	1.5	6.75	1	1.5	6.75	1	1.5
Very Sheltered Deep Mud	367.06	4.77	1	1.3	31.94	2	8.7	57.63	4	15.7
High Current Shallow Sand	37.53	0.39	1	1.0	0.39	1	1.0	1.62	2	4.3
Sheltered Shallow Gravel	4.15	0.04	2	1.0	0.04	2	1.0	1.83	3	44.0
Very Sheltered Deep Sand	446.76	3.03	3	0.7	3.19	4	0.7	13.37	6	3.0
High Current Intertidal Rocky Reef	0.70	0.00	1	0.1	0.00	1	0.1	0.02	3	3.3
Sheltered Shallow Mud	3.66	0.00	1	0.0	0.00	1	0.0	0.00	1	0.0
Sheltered Deep Gravel	91.24	0.00	0	0.0	1.17	1	1.3	1.28	3	1.4
Moderate Upper Slope Sand	1.09	0.00	0	0.0	0.00	0	0.0	0.00	0	0.0
Moderate Shallow Mud	1.63	0.00	0	0.0	0.00	0	0.0	0.00	0	0.0
Moderate Mid-slope Mud	19.70	0.00	0	0.0	0.00	0	0.0	0.00	0	0.0
High Current Shallow Mud	254.52	0.00	0	0.0	4.89	1	1.9	7.63	2	3.0
High Current Intertidal Soft Sediment	0.51	0.00	0	0.0	0.00	0	0.0	0.01	1	1.5
High Current Deep Mud	23.93	0.00	0	0.0	0.00	0	0.0	0.74	2	3.1

Biogenic habitat types

There are nine mapped biogenic habitats in the Hauraki Gulf (Table 46). Of those, seven are represented in high protection (marine reserves and high protection areas), with another in the existing CPZs (green-lipped mussels). The seafloor protection areas provide additional protection from physical disturbance for eight of the biogenic habitat types.

In terms of replication, three habitat types would be protected in MPAs (marine reserves, high protection areas and CPZs) in at least three locations.

Table 46. Network representation and replication by protection type for biogenic habitats. Colour scales show well represented habitats as green, and habitats with no or low representation as red. HPA = high protection areas (including marine reserves); CPZ = cable protection zone; SPA = seafloor protection area. As SPAs do not contribute to representation within an MPA network the column is not coloured, but rather the numbers demonstrate what the representation would be if the protection was increased to be effective at protecting wider ecosystem values.

		HPAs only			HPAs + CPZs			HPAs + CPZs + SPAs		
Habitat	**Total area in HGMP (km2)**	**Total Area in network (km2)**	**Replication (# MPA)**	**Adequacy of representation (%)**	**Total Area in network (km2)**	**Replication (# MPA)**	**Adequacy of representation (%)**	**Total area in network (km2)**	**Potential replication (# MPA)**	**Potential adequacy of representation (%)**
Biogenic Rhodoliths	48.77138	13.99	3	28.7	18.04	5	37.0	43.40	7	89.0
Biogenic Dog cockles	239.52	48.038	5	20.1	55.83	6	23.3	58.80	8	24.5
Biogenic Mangrove	41.97002	2.3319	3	5.6	2.33	3	5.6	3.16	4	7.5
Biogenic Seagrass Above MHW	0.054075	0.0012	1	2.3	0.00	1	2.3	0.00	2	6.8
Biogenic Saltmarsh	5.420401	0.0532	2	1.0	0.05	2	1.0	0.08	3	1.5
Biogenic Seagrass	9.139152	0.0657	1	0.7	0.07	1	0.7	0.73	2	8.0
Biogenic Saltmarsh Above MHW	9.963927	0.029	2	0.3	0.03	2	0.3	0.03	3	0.3
Biogenic Green-lipped mussel	2.255161	0	0	0.0	0.01	1	0.3	0.46	2	20.6
Biogenic Mangrove Above MHW	0.203917	0	0	0.0	0.00	0	0.0	0.00	0	0.0

Adequacy of representation

Adequacy refers to the concept of ensuring that the proportion of features protected (broad-scale habitats and significant features), are of sufficient size, spatial distribution and management regime to effectively represent the biodiversity of the ecosystems for which they were selected. Minimum viable sizes for different habitats were not incorporated in this analysis, meaning some aspects of the analysis may overestimate how well habitats are represented (in particular levels of replication). Whether the proposed management regime was sufficient to protect particular habitats is based on expert opinion using knowledge around existing pressures and likelihood of recovery.

Physical habitat types

The adequacy of protection can be seen in Table 46, where yellow to green cells show moderate to high adequacy of representation, and yellow to red showing decreasing levels of adequacy. The first coloured column shows representation within high protection areas, whereas the second coloured column shows high protection areas and Type 2 MPAs (as defined under the MPA Policy) combined. As the seafloor protection areas do not contribute fully to representation as currently proposed, the column is not coloured but is retained to show the level of representation that could be reached should the protection level be increased to ensure it meets the definition of an MPA.

Figure 58 shows the physical habitats that are represented at less than 5% of their extent in the Hauraki Gulf, in marine reserves and high protection areas. The map shows there is limited representation for physical habitats throughout the central Hauraki Gulf, the eastern coast of Coromandel Peninsula, estuarine environments, and the deep offshore areas greater than 200 m depth. When including Type 2 MPAs (Fig. 59), some of the larger soft sediment habitats have increased representation by greater than 5%.

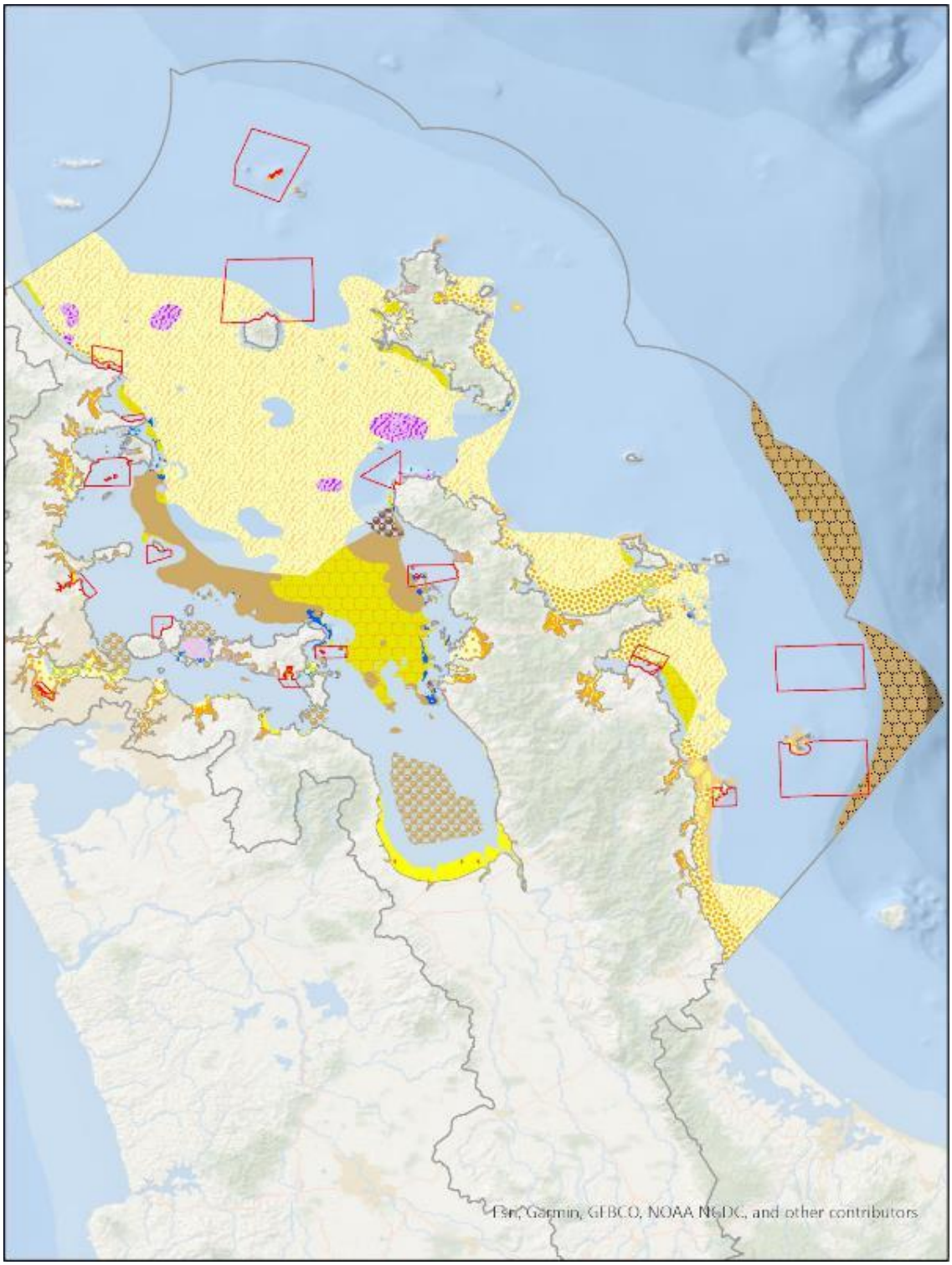

Figure 58. Physical habitats that are not represented by at least 5% of overall extent in high protection areas are shown (see Appendix 3 for full habitat map and key to habitat types). Marine reserves and high protection areas are shown in red outlines.

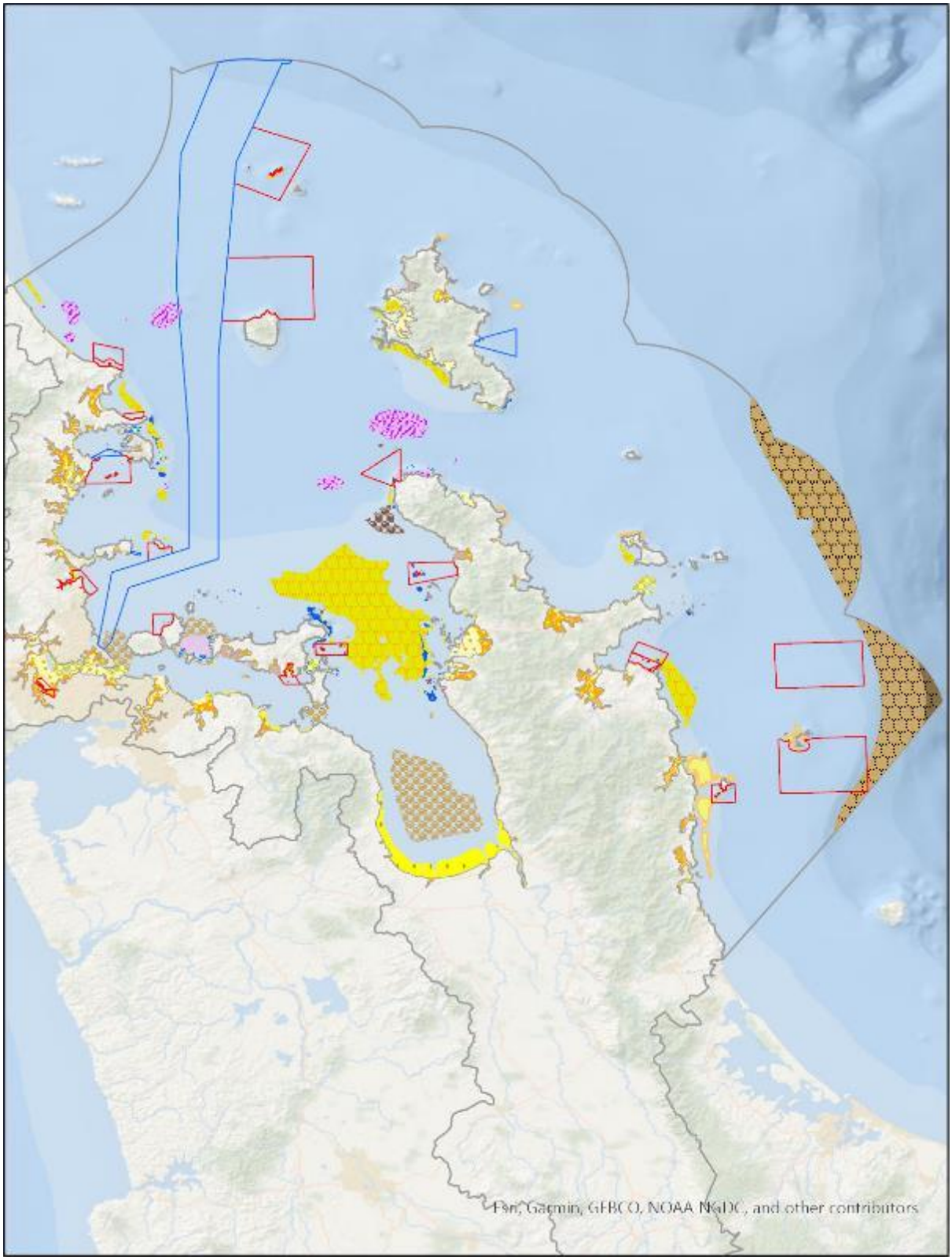

Figure 59. Physical habitats that are not represented by at least 5% of overall extent (all protection types) are shown (see Appendix 3 for full habitat map and key to habitat types). Marine reserves and high protection areas are shown in red outlines, cable protection zones are in blue outlines.

Biogenic habitat types

For the biogenic habitats, only three are represented at greater than 5%, although seagrass and green-lipped mussels are provided additional protection from physical disturbance within the seafloor protection areas (Table 46).

Connectivity

Connectivity in the design of a network provides benefits across protected sites from larval and/or species exchanges, and functional linkages from other network sites. In a connected network individual MPAs benefit one another. Connectivity is a difficult principle to assess as it incorporates complex ecological information that is often unavailable (e.g. species larval dispersal, migration), as well as detailed understanding of hydrodynamic conditions (such as exposure and currents). As a general indication of connectivity potential, Fig. 60 shows the distances between protected rocky reef areas at the scale of 25, 50 and 100 km.

In the absence of high protection areas proposed offshore between the Aldermen and Mokohinau Islands, a gap across both the 25 and 50 km scales for rocky reef habitats exists.

Likewise, the absence of a proposal on the northern outer coromandel coast creates a gap between protected areas in the nearshore area. The ecological consequences of these gaps are difficult to determine, but species that normally disperse less than 50 km will have limited connectivity directly between MPAs.

Summary

The proposals create a foundation for an MPA network in the HGMP. They build upon existing protection by representing 41 of the 47 physical habitats compared to the current 20 physical habitats under existing protection. However, while the level of protection is substantially improved under these proposals, there are some obvious gaps in comprehensive protection across the Hauraki Gulf. Notably, there is an under-representation of central Hauraki Gulf, eastern Coromandel and deeper slope habitats in high protection (Fig. 58). Substantial gaps occur between proposals, particularly for offshore outer reef habitat and the northeastern Coromandel (Fig. 60).

A number of limitations are acknowledged in this analysis. Firstly, it should be recognised that the Hauraki Gulf forms only part of the overall northern North Island biogeographic region, which has relevance as to how well the Hauraki Gulf ‘network’ relates to national MPA policy. Secondly, minimum viable patch sizes for different habitats are difficult to determine and have not been incorporated within the analysis. While this is unlikely to alter the comparative analysis within this report, it may impact on analysis of adequacy across the full bioregion. Thirdly, the intended level of protection for each protected area is not confirmed. Any alteration to the level of protection may potentially increase or decrease the level of representation for specific habitat types.

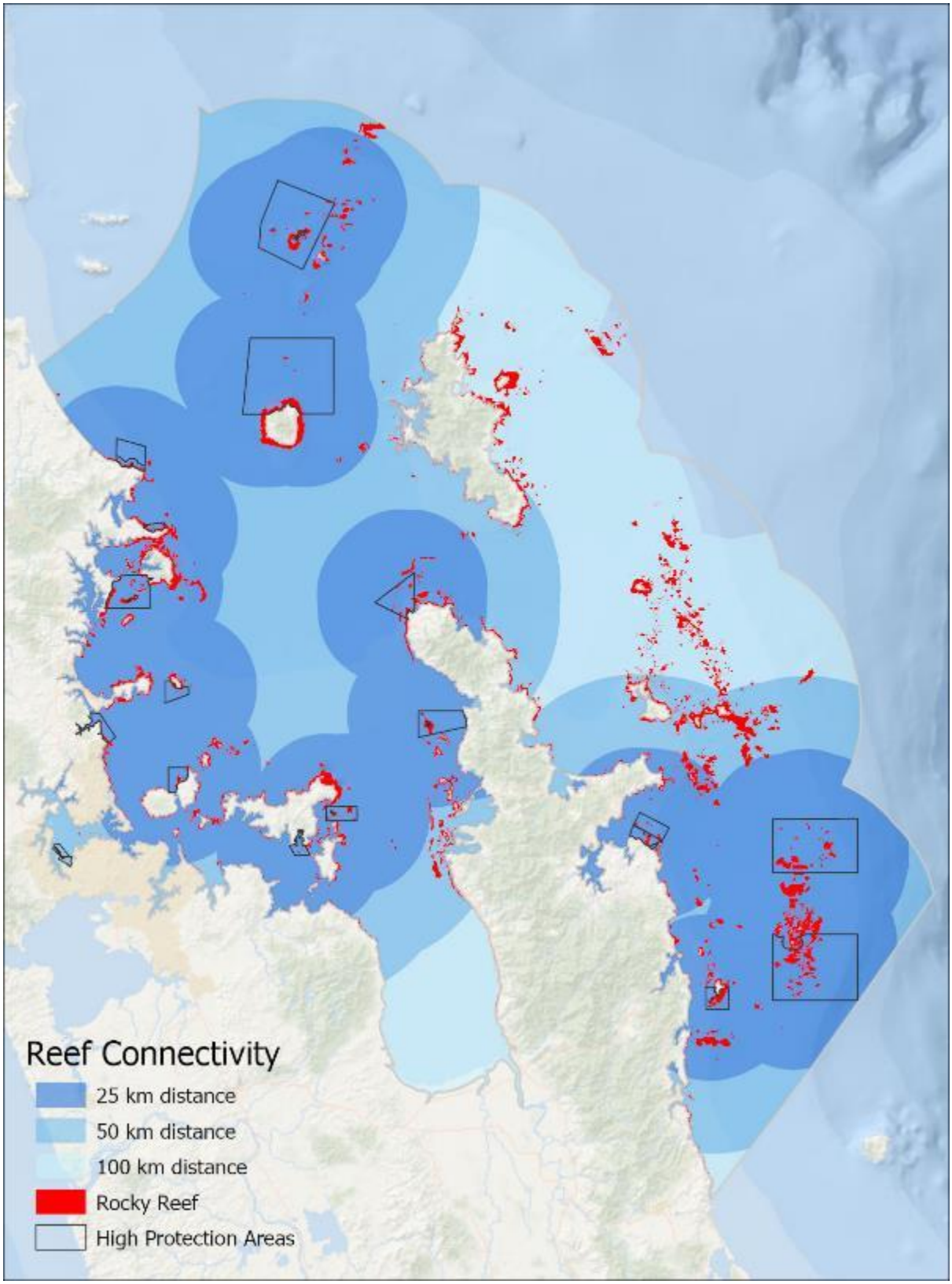

Figure 60. Connectivity between reef habitats. Dark blue shows where protected reefs are within 25 km of each other, mid-blue where protected reefs are with 50 km of each other and light blue within 100 km of each other. Gaps in connectivity at the 25 and 50 km scale occur at the northern east Coromandel and along the outer Hauraki Gulf offshore of the Mercury Islands and Great Barrier Island (Aotea Island).

Part 3 – Summary of impact analysis on commercial and recreational fisheries

Commercial fisheries

Method

FNZ has undertaken analysis of the potential annual economic impact on commercial fisheries for the protected area proposals put forward as agency preferred options in the Marine Protection chapter of the Government Response Strategy.

This assessment estimates potential economic impacts on commercial fishing based on foregone annual revenue. The foregone revenue was estimated by multiplying landed catch estimates for the proposed protected areas by the price for each species.

Landed catch estimates for each of the protected areas were generated using CatchMapper[31] and were based on the average annual catch reported for the most recent three fishing years that are available on CatchMapper (2015/16, 2016/17, and 2017/18). There will be some uncertainty associated with the allocation of catch to the protected area proposals because not all data is reported at a scale fine enough to differentiate into the proposed protected areas (such as those fishing methods that are reported by statistical area - dredging, potting and set netting).

To address this for rock lobster potting, rock lobster catch reported within each of the two statistical areas (905 and 906) in the HGMP was constrained to fishable rocky reef extent. However, this still applied a uniform value across all fishable rocky reef extent within each statistical area. The estimates of rock lobster catch and associated annual revenue, described in Tables 47 and 48, potentially impacted within each of the proposed protected areas therefore do not account for the likely true distribution of rock lobster catch and effort throughout the HGMP. For example, for the Cape Rodney-Okakari Point Marine Reserve extension the assessment indicates no rock lobster catch is taken within the proposed extension. However, anecdotal information suggests this is a popular area for commercial rock lobster potting. Further evaluation of the potential annual economic impact of the protected area proposals on the commercial rock lobster fishery in the HGMP should be undertaken using finer scale information available through new electronic reporting requirements and supported by expert knowledge of the distribution of rock lobster catch and effort.

The price for each species was determined using the price per kilogram of landed fish provided by Business and Economic Research Ltd (BERL)[32]. This is based on port price but is adjusted to reflect, among other considerations, the influence of export price. Where prices from BERL are missing, for some of the less significant species in the 'other' category, we have used port price reported from the 2019/20 port price survey by FNZ.

The estimates of foregone annual revenue presented do not represent Total Economic Value, which would include direct impacts on harvesting and processing and indirect impacts on the wider economy discounted into the future.

[31] CatchMapper is a mapping application that can produce maps and reports in answer to queries about how much and what types of fishing (except eel fishing) occur anywhere within New Zealand's Exclusive Economic Zone and the Territorial Sea.

[32] See Appendix A in Dixon, H.; Williams, J.; Schulze, H. 2018: Ministry for Primary Industries: tarakihi total allowable catch reduction scenarios August 2018. Business and Economic Research Ltd. https://www.mpi.govt.nz/dmsdocument/30801-decision-document-appendix-1-business-and-economic-research-limited-report (accessed 22 October 2020).

Overall, notwithstanding the constraints associated with using coarse scale information for some methods, we recognise that this approach has limitations and will likely represent an upper bound of the annual financial impact. As part of the formal process to consider implementation of any protected areas, we would look at what further options and approaches are available to better estimate economic impacts in a more dynamic way. This would likely need to be a contracted service, targeted to the specific nature of the Hauraki Gulf environment and its stakeholders and would also need to involve discussion with impacted stakeholders to understand the wider implications of closed areas.

Results

Table 47 and Table 48 below summarise the annual landed catch taken from each protected area proposal and associated annual revenue, respectively. A broad indicator is the catch within protected area proposals as a percentage of the catch in the wider Quota Management Area (QMA) for each stock. This indicates the importance of fishing grounds within protected area proposals to those distributed elsewhere in the wider QMA. Most fisheries are fully developed (fished throughout all available fishing areas and the Total Allowable Commercial Catch (TACC) is generally fully caught), which means there are no alternative utilisation opportunities in other undeveloped areas.

For example, all rock lobster fishing grounds in CRA2 (Hauraki Gulf/Bay of Plenty rock lobster fishery) are fully fished at their current productive capacity. There are no rock lobster fishing grounds within CRA2 that are not already being exploited by the incumbent commercial operators and by other sectors of the fishery. Any attempt to relocate fishing effort will have a negative impact on the CRA2 fishery in terms of increased pressure on already fully utilised areas, resulting in increased competition and conflicts, and a decline in catches. This may slow down the current process for rebuilding the CRA2 fishery and/or result in a need for a concomitant 6% TACC reduction. Fisheries other than rock lobster will likewise be impacted, but to a more variable extent..

Table 47. Estimated average annual catch[33] in tonnes by fish stock taken from each of the protected area proposals. MR = marine reserve, SP = seafloor protection area. 'Other' = other fish stocks caught within protected area proposals combined.

FISH STOCK		AVERAGE ANNUAL LANDED CATCH (TONNES GREEN WEIGHT) PER PROTECTED AREA PROPOSAL																	TOTAL ANNUAL LANDED CATCH (TONNES)	PROPORTION OF QUOTA MANAGEMENT AREA CATCH (%)
		MOKOHINAU ISLANDS	MOKOHINAU ISLANDS	TE HAUTURU-O-TOI / LITTLE BARRIER ISLAND	CRADDOCK CHANNEL	CAPE COLVILLE	CAPE COLVILLE	ALDERMEN ISLANDS NORTH	ALDERMEN ISLANDS SOUTH	WHANGANUI-A-HEI EXTENSION	SLIPPER ISLAND	CAPE RODNEY OKAKARI POINT (LEIGH) EXTENSION	KAWAU BAY	KAWAU BAY	TIRITIRI MATANGI	RANGITOTO/ MOTUTAPU	ROTOROA ISLAND	MOTUKAWAO		
		MR	SP	MR	SP	SP	MR	MR	MR	MR	MR	MR	MR	SP	SP	MR	MR	MR		
Snapper	SNA1	7.4 6	27.23	38.05	12.32	5.50	3.38	8.28	9.91	1.51	2.88	6.58	13.97	24.47	12.68	0.30	0.51	5.18	180.24	4.0
Rock lobster	CRA2	0.70	1.30	0.80	0.00	0.00	0.25	1.79	2.46	0.14	0.65	0.00	0.56	0.00	0.00	0.11	0.21	0.28	9.25	6.0
Blue mackerel	EMA1	6.74	0.06	283.45	0.00	0.00	2.55	0.29	11.55	0.03	5.26	3.95	0.03	0.01	0.00	0.00	0.01	0.02	313.93	4.4
John dory	JDO1	0.49	4.27	4.57	0.94	0.17	0.14	0.19	0.46	0.00	0.08	0.06	0.03	1.89	1.21	0.00	0.00	0.06	14.56	4.3
Trevally	TRE1	0.48	7.09	26.07	0.45	0.56	0.05	0.58	6.57	0.02	1.17	0.30	0.13	0.76	0.02	0.04	0.03	0.00	44.34	2.8
Packhorse rock lobster	PHC1	0.20	0.37	0.23	0.00	0.00	0.07	0.17	0.23	0.01	0.06	0.00	0.16	0.00	0.00	0.03	0.06	0.08	1.68	4.2
Tarakihi	TAR1	0.33	1.19	0.76	0.15	0.06	0.02	5.05	10.39	0.01	0.07	0.01	0.00	0.10	0.03	0.00	0.00	0.00	18.14	1.4
Jack mackerel	JMA1	2.10	0.31	12.26	0.06	0.02	0.07	6.00	122.06	0.88	11.46	0.07	0.30	0.05	0.00	0.09	0.11	0.19	156.02	2.3
Gemfish	SKI1	0.00	0.03	0.02	0.00	0.00	0.00	6.10	11.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.29	–
Skipjack tuna	SKJ1	2.25	0.00	0.00	0.00	0.00	0.00	7.21	37.95	0.14	0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48.32	1.2
Coromandel scallops	SCACS	0.00	0.00	0.00	0.09	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	1.5
'Other'		5.40	13.81	22.79	3.78	1.20	2.03	13.54	23.98	1.04	5.74	2.34	5.65	5.98	0.44	2.48	1.69	2.19	114.09	
TOTAL		26.14	54.70	389.00	17.78	7.51	8.58	49.21	236.71	3.77	28.12	13.31	20.81	33.26	14.37	3.04	2.62	8.01	916.95	

[33] Average annual landed catch was calculated using the most recent three fishing years that are available on CatchMapper (2015/16, 2016/17 and 2017/18). Cells with zero indicate no catch for that species was taken from the site.

Table 48. Estimated annual revenue[34] generated from each of the protected area proposals. MR = marine reserve, SP = seafloor protection area, "Other" = other fish stocks caught within the protected area proposals combined.

FISH STOCK		ANNUAL REVENUE ($) GENERATED PER PROTECTED AREA PROPOSAL																	TOTAL ANNUAL REVENUE ($)
		MOKOHINAU ISLAND	MOKOHINAU ISLAND	TE-HAUTURU-O-TOI / LITTLE BARRIER ISLAND	CRADDOCK CHANNEL	CAPE COLVILLE	CAPE COLEVILLE	ALDERMEN ISLANDS NORTH	ALDERMEN ISLANDS SOUTH	WHANGANUI-A-HEI EXTENSION	SLIPPER ISLAND	CAPE RODNEY OKAKARI POINT (LEIGH) EXTENSION	KAWAU BAY	KAWAU BAY	TIRITIRI MATANGI	RANGITOTO/ MOTUTAPU	ROTOROA ISLAND	MOTUKAWAO	
		MR	SP	MR	SP	SP	MR	MR	MR	MR	MR	MR	MR	SP	SP	MR	MR	MR	
Snapper	SNA1	70,456	257,355	359,551	116,469	51,961	31,971	78,291	93,638	14,223	27,247	62,154	131,993	231,249	119,787	2,853	4,776	48,987	1,702,961
Rock lobster	CRA2	56,830	106,169	65,516	0	0	20,769	145,986	201,157	11,251	52,707	0	45,562	0	0	8,623	17,370	22,846	754,786
Blue mackerel	EMA1	3,843	35	161,566	0	0	1,451	164	6,583	15	2,996	2,250	17	4	0	0	7	11	178,942
John dory	JDO1	4,288	37,522	40,173	8,220	1,489	1,231	1,699	4,007	0	729	507	260	16,635	10,628	0	0	558	127,947
Trevally	TRE1	1,093	16,081	59,177	1,031	1,279	114	1,326	14,922	51	2,656	689	284	1,730	49	93	71	0	100,645
Packhorse rock lobster	PHC1	9,553	17,914	11,053	0	0	3,480	8,094	11,091	627	2,868	0	7,616	0	0	1,444	2,904	3,828	80,472
Tarakihi	TAR1	1,297	4,707	3,003	579	230	75	20,063	41,236	38	260	56	0	383	105	0	0	0	72,032
Jack mackerel	JMA1	839	122	4,904	23	10	30	2,400	48,825	352	4,584	26	118	19	0	36	44	77	62,410
Gemfish	SKI1	0	73	45	0	0	0	16,470	30,091	0	0	0	0	0	0	0	0	0	46,680
Skipjack tuna	SKJ1	1,622	0	0	0	0	0	5,190	27,327	99	546	0	0	0	0	0	0	0	34,786
Coromandel scallops	SCACS	0	0	0	5,282	0	660	0	0	0	0	0	0	0	0	0	0	0	5,942
'Other'		39,232	40,866	39,334	5,148	1,756	3,819	31,754	36,761	3,955	15,612	3,772	17,147	8,780	793	8,207	6,065	5,413	268,412
TOTAL		189,052	480,844	744,322	136,751	56,725	63,601	311,436	515,639	30,610	110,203	69,455	202,998	258,800	131,362	21,256	31,238	81,721	3,436,014

[34] Annual revenue for each marine protection area proposal was estimated using average annual landed catch (calculated using the most recent three fishing years that are available on CatchMapper (2015/16, 2016/17 and 2017/18)) multiplied by the Business and Economic Research Ltd (BERL) port price. Where BERL price is unavailable, port price reported from the Fisheries New Zealand 2019/20 port price survey is used. Cells with zero indicate no catch for that species was taken from the site.

Recreational fisheries

Method and results

The distribution of recreational fishing effort and the associated landed snapper and kahawai catch in the HGMP and within each of the proposed marine protection areas was estimated using aerial survey data collected during 47 scheduled flight days in 2017/18 and the associated boat ramp creel survey (interview) data (Hartill et al. 2019) (Table 49). The former provides information on the number of boats and their fishing location (latitude and longitude) and the latter provides data on the catch per trip, which is used to estimate the average catch associated with each boat observed during the aerial overflight surveys.

Data from these two sources was scaled to account for fishing that would have occurred from boat types with different occupancy rates, and at times when the survey flight was not taking place. The scaled boat counts were then used to calculate the estimated snapper and kahawai landed catch that would have been taken at each location where the aerial survey observed a recreational boat actively fishing.

It should be noted that the aerial overflight surveys only record fishing activity from stationary boats actively fishing. Boats underway or obviously not involved in fishing activity, evidenced by the detection of other activities such as swimming or picnicking ashore nearby, were ignored. Similarly, other less common forms of boat-based fishing that are not readily enumerated from the air, such as trolling, netting, longlining as well as diving were not included.

Table 49. Estimated snapper and kahawai catch and recreational effort that would be displaced from each of the protected area proposals as a proportion of the total Hauraki Gulf Marine Park catch and effort[35].

SITE	MPA TYPE	PROPORTION OF HAURAKI GULF MARINE PARK		
		SNAPPER CATCH (%)	KAHAWAI CATCH (%)	STATIONARY BOATS ACTIVELY FISHING (%)
Mokohinau Islands	High protection area	0.14	0.53	0.50
Mokohinau Islands	Seafloor protection area	0.11	0.43	0.39
Te Hauturu-o-Toi / Little Barrier Island	High protection area	0.48	0.22	0.48
Cradock Channel	Seafloor protection area	0.19	0.13	0.16
Cape Colville	Seafloor protection area	0.98	0.77	0.54
Cape Colville	High protection area	0.52	0.41	0.29
Aldermen Islands	High protection area	0.01	0.02	0.03
Aldermen Islands	High protection area	Outside survey	Outside survey	Outside survey
Whanganui A Hei (Cathedral Cove) Marine Reserve extension	Marine Reserve	0.16	0.50	0.34

[35] Hartill B. Unpublished. Estimating snapper and kahawai landed catch in the Hauraki Gulf Marine Park using 2017/18 aerial-access survey data.

Slipper Island/Whakahau	High protection area	0.26	0.52	0.56
Cape Rodney-Okakari Point Marine Reserve extension	Marine Reserve	0.05	0.04	0.06
Kawau Bay	High protection area	1.58	1.51	1.97
Kawau Bay	Seafloor protection area	4.43	3.99	5.46
Tiritiri Matangi Island	High protection area	0.56	0.56	0.66
Tiritiri Matangi Island	Seafloor protection area	3.22	3.61	3.95
Rangitoto Island and Motutapu Island	High protection area	0.28	0.36	0.38
Firth of Thames and Rotoroa Island	High protection area	1.13	1.67	1.31
Motukawao Group	High protection area	0.48	0.34	0.41
Total		14.59	15.61	17.48

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Appendix I – Data sources

List of spatial data layers on HGMP biodiversity and uses collated for use during Sea Change – Tai Timu Tai Pari process.

	DATA LAYER NAME AS SHOWN IN SEASKETCH	DATATREEHEADING*	DATATREEFOLDER LEVEL 1*	SOURCE	COMMENT
1	Place names	Administrative boundaries		LINZ	
2	Hauraki Gulf Marine Park boundary	Administrative boundaries		DOC	As defined in HGMP Act 2000
3	Regional council boundaries	Administrative boundaries		Stats NZ	
4	Territorial boundaries	Administrative boundaries		Stats NZ	
5	Commercial fishing restrictions – shellfish	Existing management	Area based fishing restrictions (MPI)	MPI	Status 2014
6	Commercial fishing restrictions – netting	Existing management	Area based fishing restrictions (MPI)	MPI	Status 2014
7	Commercial fishing restrictions – seasonal	Existing management	Area-based fishing restrictions (MPI)	MPI	Status 2014
8	Commercial fishing restrictions – vessel size	Existing management	Area-based fishing restrictions (MPI)	MPI	Status 2014
9	Amateur fishing restrictions	Existing management	Area-based fishing restrictions (MPI)	MPI	Status 2014
10	Natural Character and Landscape Areas (Outstanding Natural Features and Landscapes)	Existing management	Management areas (councils)	Auckland Council, Waikato Regional Council	Status 2014
11	Outstanding Coastal Natural Character (Waikato)	Existing management	Management areas (councils)	Waikato Regional Council	Status 2014
12	High and Very High Coastal Natural Character	Existing management	Management areas (councils)	Waikato Regional Council	Status 2014
13	Significant Ecological Areas	Existing management	Management areas (councils)	Auckland Council, Waikato Regional Council	Status 2014
14	Mooring management zones	Existing management	Management areas (councils)	Auckland Council, Waikato Regional Council	Status 2014
15	Areas of Significant Conservation Value	Existing management	Management areas (councils)	Waikato Regional Council	Status 2014

* Hierarchical structure of maps as organized in thematical headings and folders in SeaSketch.

16	Marina management areas	Existing management	Management areas (councils)	Auckland Council, Waikato Regional Council	Status 2014
17	Type 1 – marine reserves	Existing management	Marine Protected Areas (MPAs) (DOC/MPI)	DOC	Status 2014
18	Type 2 – Cable and pipelines	Existing management	MPAs (DOC/MPI)	DOC	Status 2014
19	Public conservation land (DOC)	Existing management		DOC	Status 2014
20	Ramsar sites	Existing management		DOC	Status 2014
21	Demersal fishes	Marine environment	Biodiversity	NIWA, DOC	
22	Reef fish species richness (predicted)	Marine environment	Biodiversity	NIWA, DOC	Smith, A.N.H.; Duffy, C. A.J.; Leathwick, J.R. 2013: Predicting the distribution and relative abundance of fishes on shallow subtidal reefs around New Zealand. *Science for Conservation 323*. 25 p. plus supplements. https://www.doc.govt.nz/Documents/science-and-technical/sfc323entire.pdf (accessed 23 October 2020).
23	Estuarine vegetation	Marine environment	Biodiversity	Auckland Council, Waikato Regional Council	Status 2014
24	Horse mussels	Marine environment	Biodiversity	DOC	Status 2014
25	Historic mussel beds and dredged areas	Marine environment	Biodiversity	Auckland Council	Paul, L.J. 2012: A history of the Firth of Thames dredge fishery for mussels: use and abuse of a coastal resource. *New Zealand Aquatic Environment and Biodiversity Report No. 94.* Ministry of Agriculture and Forestry, Wellington. 27p. https://sff-futures.mpi.govt.nz/dmsdocument/4016/direct (accessed 23 October 2020).
26	Bryde's whales sightings modelled by vessel effort	Marine environment	Biodiversity	Leena Riekkola, Rochelle Constantine, Auckland Whale & Dolphin Safari and Auckland University	Riekkola, L. 2013: Mitigating collisions between large vessels and Bryde's whales in the Hauraki Gulf, New Zealand. Unpublished BSc thesis. University of Auckland, Auckland.
27	Whale sightings	Marine environment	Biodiversity	DOC	Extract from DOC's marine mammal sightings database. Status 2014

28	Dolphin sightings	Marine environment	Biodiversity	DOC	Extract from DOC's marine mammal sightings database. Status 2014
29	Pest-free islands	Marine environment	Biodiversity	DOC	Status 2014
30	Commercial scallop grounds (2006)	Marine environment	Biodiversity	NIWA, MPI	Tuck, I.D.; Parkinson, D.; Dey, K.; Oldman, J.; Wadhwa, S. 2006: Information on benthic impacts in support of the Coromandel Scallop Fishery Plan. *Final Research Report for Ministry of Fisheries Research Project ZBD2005-15*. Unpublished report.
31	New scallop beds (2011)	Marine environment	Biodiversity	MPI	Williams, J.R. 2012: Abundance of scallops (*Pecten novaezelandiae*) in Coromandel recreational fishing areas, 2009 and 2010. *New Zealand Fisheries Assessment Report 2012/24.* Ministry for Primary Industries, Wellington. 32 p. https://fs.fish.govt.nz/Doc/23022/12_24_FAR.pdf.ashx (accessed 23 October 2020).
32	Scallop fishing intensity	Marine environment	Biodiversity	MPI	Scallop Fishing Intensity within the Hauraki Gulf between October 2007 and September 2013
33	Seabird species richness at breeding sites	Marine environment	Biodiversity	Stephanie Borrelle, Chris Gaskin	Borrelle, S.B. 2013: Recovery and re-colonisation of seabirds on islands in the Hauraki Gulf after pest eradication. Unpublished BSc thesis. Auckland University of Technology, Auckland.
34	Total species richness (predicted)	Marine environment	Biodiversity	Waikato Regional Council	Miller, M.G.R.; Gaskin, C.P. 2013: Hauraki Gulf seabird modelling report. Prepared for Hauraki Gulf Spatial Planning. Waikato Regional Council. Unpublished report.
35	Inshore species richness (predicted)	Marine environment	Biodiversity		
36	Shearwaters – species richness (predicted)	Marine environment	Biodiversity		
37	Petrels – species richness (predicted)	Marine environment	Biodiversity		
38	Petrel, shearwater and prion species richness (predicted)	Marine environment	Biodiversity		
39	Shorebird Sites of Importance	Marine environment	Biodiversity	Auckland Council, Waikato Regional Council, Birds New Zealand	Status 2014

40	Snapper egg distribution	Marine environment	Biodiversity	NIWA	Zeldis, J.R.; Francis, R.I.C.C. 1998: A daily egg production method estimate of snapper biomass in Hauraki Gulf, New Zealand. *ICES Journal of Marine Science 55*(3): 522–534.
41	Hāpuku modelled distribution	Marine environment	Biodiversity	NIWA	Leathwick, J.R.; Elith, J.; Francis, M.P.; Hastie, T.; Taylor, P. 2006: Variation in demersal fish species richness in the oceans surrounding New Zealand: an analysis using boosted regression trees. *Marine Ecology Progress Series 321*: 267–281.
42	Ecosystem productivity – ecosystem service (predicted)	Marine environment	Goods and services	NIWA	Townsend, M.; Thrush, S.F.; Lohrer, A.M.; Hewitt, J.E.; Lundquist, C.J.; Carbines, M.; Felsing, M. 2014: Overcoming the challenges of data scarcity in mapping marine ecosystem service potential. *Ecosystem Services 8*: 44–55.
43	Biogenic habitat formation – ecosystem service (predicted)	Marine environment	Goods and services		
44	Nutrient recycling – ecosystem service (predicted)	Marine environment	Goods and services		
45	MPA Policy habitat classification (2014)	Marine environment	Marine habitats	DOC	Jackson, E.S. 2014: Prioritisation of Areas in the Hauraki Gulf Marine Park for Biodiversity Conservation. Unpublished MSc thesis, University of Auckland, Auckland.
46	Biogenic habitats			DOC	Data extract of MPA Policy habitat classification. DOC & MFish 2011: Coastal marine habitats and marine protected areas in the New Zealand Territorial Sea: a broad scale gap analysis. Department of Conservation and Ministry of Fisheries, Wellington. 50 p. https://www.doc.govt.nz/about-us/science-publications/conservation-publications/marine-and-coastal/marine-protected-areas/coastal-marine-habitats-and-marine-protected-areas-in-the-new-zealand-territorial-sea-a-broad-scale-gap-analysis/

					(accessed 23 October 2020).
47	Bathymetry contours	Marine environment	Physical properties	Auckland Council, Waikato Regional Council, DOC.	
48	Multibeam survey	Marine environment	Physical properties	Mark Morrison/ NIWA	Multibeam for vicinity of Great Barrier Island (Aotea Island).
49	Substrate	Marine environment	Physical properties	Waikato Regional Council, DOC, Auckland Council, MetOcean Solutions Ltd.	
50	Rocky reefs (subset of 'substrate' layer)	Marine environment	Physical properties	DOC	
51	Tidal current	Marine environment	Physical properties	NIWA	Mean tidal current (m/s)
52	Wave height	Marine environment	Physical properties	NIWA	Mean significant wave height (m)
53	Water quality index grades (Auckland region only)	Marine environment	Contaminants and water quality	Auckland Council	Status 2014
54	Safe swim grades (Auckland region only)	Marine environment	Contaminants and water quality	Auckland Council	Status 2014
55	Muddiness (%mud) (Auckland region only)	Marine environment	Contaminants and water quality	Auckland Council	Status 2014
56	Benthic health grades (Auckland region only)	Marine environment	Contaminants and water quality	Auckland Council	Status 2014
57	Nitrate and nitrogen in rivers	Marine environment	Contaminants and water quality	Stats NZ dynamic web map service	Ministry for the Environment and Statistics New Zealand 2015: Environment Aotearoa 2015: data to 2013. *New Zealand's Environmental Reporting Series.* https://www.mfe.govt.nz/sites/default/files/media/Environmental%20reporting/Environment-Aotearoa-2015.pdf (accessed 23 October 2020).
58	Streambed sedimentation	Marine environment	Contaminants and water quality		
59	Agricultural nitrate-nitrogen leaching estimate	Marine environment	Contaminants and water quality		
60	Sediment contamination – combined metals values	Marine environment	Contaminants and water quality	Auckland Council	Status 2014
61	Swimming water quality	Marine environment	Contaminants and water quality	Auckland Council, Waikato Regional Council	Status 2014
62	Approved marine farm areas	Uses and activities	Aquaculture	Auckland Council, Waikato Regional Council	Status 2014
63	Marine farm application areas	Uses and activities	Aquaculture	Auckland Council, Waikato Regional Council	Status 2014
64	Disturbances	Uses and activities	Existing consented activities	Auckland Council, Waikato Regional Council	Status 2014

65	Beach replenishment and disturbance	Uses and activities	Existing consented activities	Auckland Council, Waikato Regional Council	Status 2014
66	Sand extraction	Uses and activities	Existing consented activities	Auckland Council	Status 2014
67	Snapper catch intensity	Uses and activities	Fishing	MPI	Status 2014
68	Average annual intensity of set line fishing	Uses and activities	Fishing	MPI	Status 2014
69	Average annual intensity of trawl fishing	Uses and activities	Fishing	MPI	Status 2014
70	Recreational fishing effort (2004/05)	Uses and activities	Fishing	MPI	Status 2014
71	Recreational fishing effort (2011/12)	Uses and activities	Fishing	MPI	Status 2014
72	Archaeological sites (NZAA)	Uses and activities	Heritage	New Zealand Archaeological Association (NZAA)	Status 2014
73	Historic sites (Historic Places Trust)	Uses and activities	Heritage	Heritage New Zealand Pouhere Taonga	Status 2014
74	Shipwrecks	Uses and activities	Heritage	New Zealand Archaeological Association (NZAA), LINZ, Dive NZ magazine, Moran et al. 2004	Status 2014
75	Boat ramps	Uses and activities	Recreation and tourism	Auckland Council, LINZ	Status 2014
76	Dive sites (known commercial sites)	Uses and activities	Recreation and tourism	Waikato Regional Council, DOC	Status 2014
77	Significant surfbreaks	Uses and activities	Recreation and tourism	Auckland Council, Waikato Regional Council	Status 2014
78	Cruise routes (AYBA)	Uses and activities	Recreation and tourism	Auckland Council, Auckland Yacht and Boating Association (AYBA)	Status 2014
79	Recreational high use coastline areas	Uses and activities	Recreation and tourism	Auckland Council, Waikato Regional Council	Status 2014
80	Anchorage areas	Uses and activities	Recreation and tourism	Auckland Council, Auckland Yacht and Boating Association	Status 2014
81	Anchorage areas (indicative)	Uses and activities	Recreation and tourism	Auckland Council, Auckland Yacht and Boating Association	Status 2014
82	Private moorings	Uses and activities	Recreation and tourism	Auckland Council, Waikato Regional Council	Status 2014
83	Yacht race courses (AYBA)	Uses and activities	Recreation and tourism	Auckland Council	Status 2014
84	Managed campsites	Uses and activities	Recreation and tourism	DOC	Status 2014
85	Huts	Uses and activities	Recreation and tourism	DOC	Status 2014
86	Tracks	Uses and Activities	Recreation and tourism	DOC	Status 2014

87	DOC visitor centres	Uses and activities	Recreation and tourism	DOC	Status 2014
88	Shipping traffic – density	Uses and activities	Shipping and navigation	Marico Marine Ltd.	Status 2014
89	Shipping traffic – vessel tracks by speed (knots)	Uses and activities	Shipping and navigation		
90	Shipping traffic – passenger vessel tracks	Uses and activities	Shipping and navigation		
91	Shipping traffic – tracks by vessel type	Uses and activities	Shipping and navigation		
92	Dedicated shipping zones	Uses and activities	Shipping and navigation	Auckland Regional Council Navigation and Safety Bylaws, LINZ National Hydrographic Office	Status 2014
93	Underwater cable areas (cable protection zones)	Uses and activities	Shipping and navigation	LINZ, Auckland Council	Status 2014
94	Underwater cables	Uses and activities	Shipping and navigation	LINZ, Auckland Council	Status 2014
95	Navigational safety bylaws	Uses and activities	Shipping and navigation	Auckland Council, Waikato Regional Council	Status 2014
96	Catchment boundaries	Land use and catchment		DOC	
97	Erosion	Land use and catchment		Stats NZ Geographic Data Service (https://datafinder.stats.govt.nz/data/)	Ministry for the Environment and Statistics New Zealand 2015: Environment Aotearoa 2015: data to 2013. *New Zealand's Environmental Reporting Series.* https://www.mfe.govt.nz/sites/default/files/media/Environmental%20reporting/Environment-Aotearoa-2015.pdf (accessed 23 October 2020).
98	Land use classification (LCDB3)	Land use and catchment		Manaaki Whenua Landcare Research	
99	Rivers (LINZ Topo50)	Land use and catchment		LINZ	
100	Threatened environment classification	Land use and catchment		Manaaki Whenua Landcare Research	
101	Wetland extent (historic and current)	Land use and catchment		Stats NZ dynamic web map service	Ministry for the Environment and Statistics New Zealand 2015: Environment Aotearoa 2015: data to 2013. *New Zealand's Environmental Reporting Series.* https://www.mfe.govt.nz/sites/default/files/med

					ia/Environmental%20reporting/Environment-Aotearoa-2015.pdf (accessed 23 October 2020).

AYBA = Auckland Yacht and Boating Association, DOC = Department of Conservation, LINZ = Land Information New Zealand, MPI = Ministry for Primary Industries, NIWA = National Institute of Water and Atmospheric Research.

Appendix 2 – Habitats of the Hauraki Gulf Marine Park

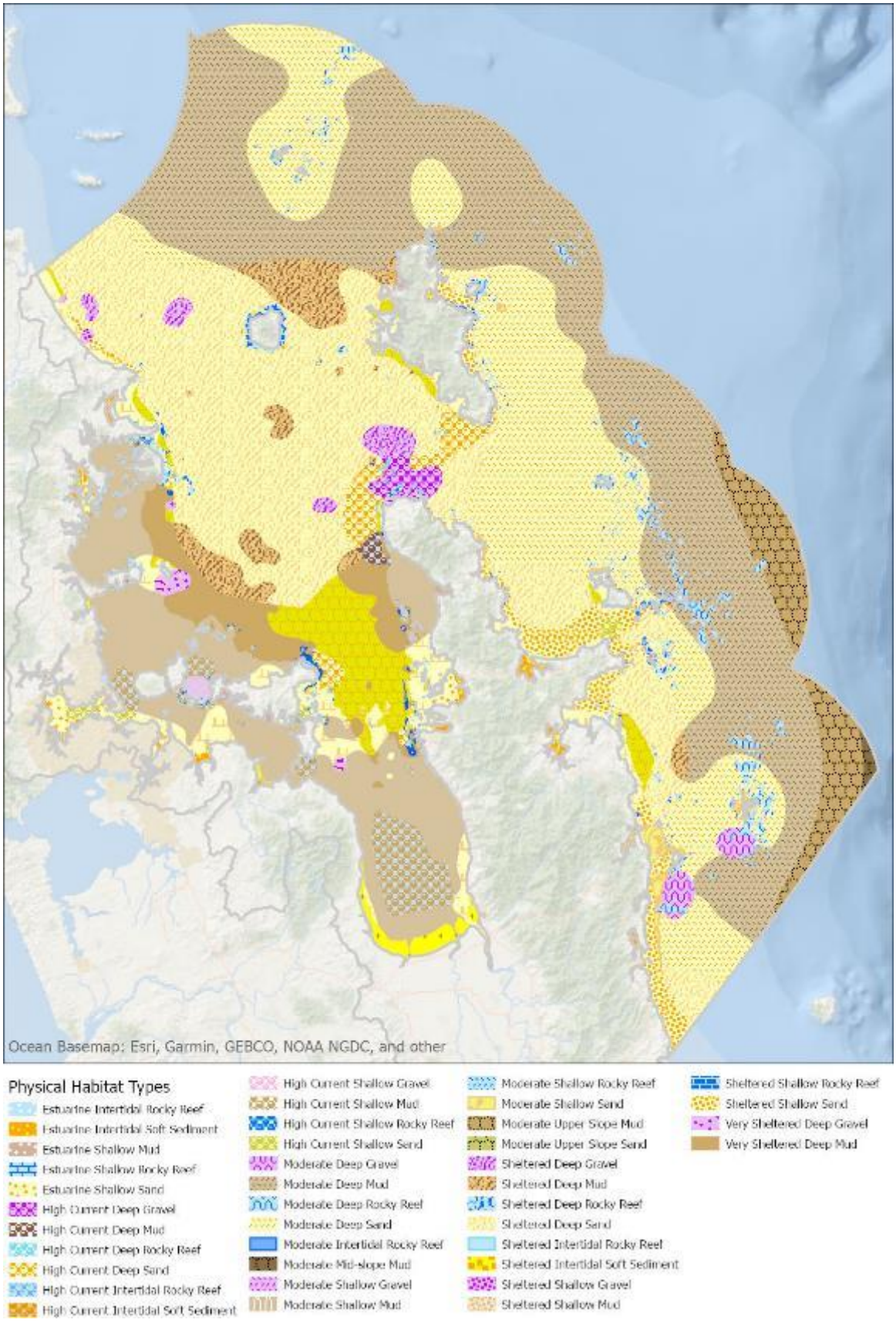

Figure 61. Physical habitats of the HGMP.

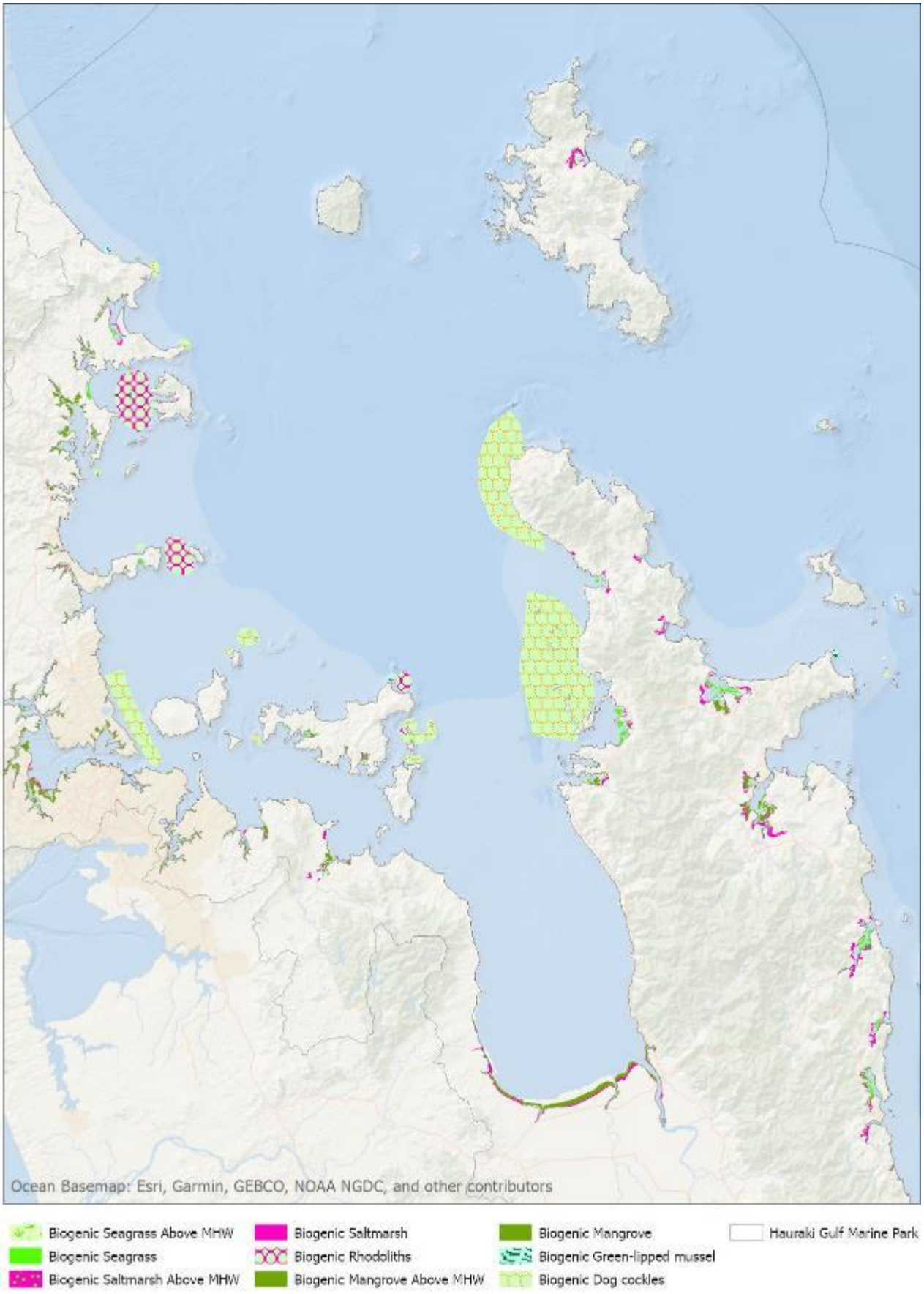

Figure 62. Biogenic habitats of the HGMP

Appendix 3 – Habitat tables

Existing Marine Protected Areas

Habitats	Total in HGMP (KM2)	Cape Rodney-Okakari Point	Long Bay-Okura	Motu Manawa-Pollen Island	Tāwharanui	Te Matuku	Whanganui A Hei (Cathedral Cove)	Great Barrier Island CPZ	Hauraki Gulf CPZ	Kawau Island CPZ	Whangaparaoa Peninsula CPZ
Biogenic Dog cockles	239.6	0.51			0.15				7.79		
Biogenic Green-lipped mussel	2.3									0.01	
Biogenic Mangrove	42.0		0.17	1.72		0.45					
Biogenic Mangrove Above MHW	0.2										
Biogenic Rhodoliths	48.8									3.96	0.09
Biogenic Saltmarsh	5.4			0.03		0.02					
Biogenic Saltmarsh Above MHW	10.0			0.01		0.02					
Biogenic Seagrass	9.1										
Biogenic Seagrass Above MHW	0.1										
Estuarine Intertidal Rocky Reef	3.1			0.00		0.01					
Estuarine Intertidal Soft Sediment	136.4		1.17	3.00		1.32					
Estuarine Shallow Mud	24.5		0.38	0.01		0.15					
Estuarine Shallow Rocky Reef	6.6			0.00		0.01					
Estuarine Shallow Sand	101.1			1.95		0.90					
High Current Deep Gravel	60.3										
High Current Deep Mud	23.9										
High Current Deep Rocky Reef	9.6										
High Current Deep Sand	166.6										
High Current Intertidal Rocky Reef	0.7										
High Current Intertidal Soft Sediment	0.5										
High Current Shallow Gravel	18.1										
High Current Shallow Mud	254.5								4.89		
High Current Shallow Rocky Reef	13.7										
High Current Shallow Sand	37.5										
Moderate Deep Gravel	62.2										
Moderate Deep Mud	3644.4								364.86		
Moderate Deep Rocky Reef	184.4							0.32	0.03		
Moderate Deep Sand	2340.9							17.62	59.87		
Moderate Intertidal Rocky Reef	0.1										
Moderate Mid-slope Mud	19.7										
Moderate Shallow Gravel	0.7										
Moderate Shallow Mud	1.6										
Moderate Shallow Rocky Reef	20.0										
Moderate Shallow Sand	43.9										
Moderate Upper Slope Mud	458.7										
Moderate Upper Slope Sand	1.1										
Sheltered Deep Gravel	91.2								1.17		
Sheltered Deep Mud	355.3								28.65		
Sheltered Deep Rocky Reef	35.5							0.06	0.00		
Sheltered Deep Sand	2817.2	0.13					0.02	2.04	296.85		
Sheltered Intertidal Rocky Reef	7.7						0.00				
Sheltered Intertidal Soft Sediment	7.0										
Sheltered Shallow Gravel	4.2										
Sheltered Shallow Mud	3.7										
Sheltered Shallow Rocky Reef	76.1	0.09					0.06	0.75			
Sheltered Shallow Sand	311.9	1.29					1.30	2.79			
Very Sheltered Deep Gravel	15.8								7.54		
Very Sheltered Deep Mud	367.1								27.17		
Very Sheltered Deep Rocky Reef	8.3						0.01				
Very Sheltered Deep Sand	446.8				0.06		0.02		0.17		
Very Sheltered Intertidal Rocky Reef	22.8	0.36	0.27		0.17	0.04	0.16				
Very Sheltered Intertidal Soft Sediment	100.5	0.00	1.18		0.18	0.02	0.03				
Very Sheltered Shallow Gravel	16.8								1.63		
Very Sheltered Shallow Mud	1202.5		5.81			3.94			57.24	3.32	
Very Sheltered Shallow Rocky Reef	124.8	1.41	0.71		1.23	0.37	2.04		0.16	0.87	0.07
Very Sheltered Shallow Sand	412.3	2.16			2.33	0.10	4.72		0.03		0.64

Scenario 1 Marine reserve habitats

Habitats	Total in HGMP (KM2)	Alderman Islands	Cape Colville	Cape Rodney-Okakari Point marine reserve extension	Kawau Bay	Te Hauturu-o-Toi/Little Barrier Island	Mokohinau Islands	Motukawao Group	Rangitoto Island and Motutapu Island	Rotoroa Island	Slipper Island/Whakahau	The Noises	Tiritiri Matangi Island	Whanganui A Hei (Cathedral Cove) Marine Reserve extension
Biogenic Dog cockles	239.6		18.57	0.04				8.24		2.74		2.84		
Biogenic Green-lipped mussel	2.3				0.01									
Biogenic Mangrove	42.0													
Biogenic Mangrove Above MHW	0.2													
Biogenic Rhodoliths	48.8				13.47					0.01			4.56	
Biogenic Saltmarsh	5.4													
Biogenic Saltmarsh Above MHW	10.0													
Biogenic Seagrass	9.1										0.07			
Biogenic Seagrass Above MHW	0.1										0.00			
Estuarine Intertidal Rocky Reef	3.1				0.01				0.09					
Estuarine Intertidal Soft Sediment	136.4				0.08				0.00					
Estuarine Shallow Mud	24.5				0.11				0.08					
Estuarine Shallow Rocky Reef	6.6				0.08				0.03					
Estuarine Shallow Sand	101.1													
High Current Deep Gravel	60.3		10.18											
High Current Deep Mud	23.9													
High Current Deep Rocky Reef	9.6		1.14											
High Current Deep Sand	166.6		8.43											
High Current Intertidal Rocky Reef	0.7		0.00							0.00				
High Current Intertidal Soft Sediment	0.5													
High Current Shallow Gravel	18.1		0.77											
High Current Shallow Mud	254.5													
High Current Shallow Rocky Reef	13.7		0.40							0.30				
High Current Shallow Sand	37.5		0.31							1.52				
Moderate Deep Gravel	62.2	20.63												
Moderate Deep Mud	3644.4	82.36				40.26	9.50							
Moderate Deep Rocky Reef	184.4	16.72					5.92				0.62			
Moderate Deep Sand	2340.9	34.74				7.88	100.17				0.19			
Moderate Intertidal Rocky Reef	0.1						0.00				0.00			
Moderate Mid-slope Mud	19.7													
Moderate Shallow Gravel	0.7													
Moderate Shallow Mud	1.6													
Moderate Shallow Rocky Reef	20.0	0.01					0.81				0.50			
Moderate Shallow Sand	43.9	0.04					0.72							
Moderate Upper Slope Mud	458.7	9.78												
Moderate Upper Slope Sand	1.1													
Sheltered Deep Gravel	91.2					1.17								
Sheltered Deep Mud	355.3					20.66								
Sheltered Deep Rocky Reef	35.5					1.58	0.23				0.04			0.01
Sheltered Deep Sand	2817.2			12.33		116.80	0.05							1.77
Sheltered Intertidal Rocky Reef	7.7		0.07			0.10	0.09	0.06			0.14			0.00
Sheltered Intertidal Soft Sediment	7.0		0.02			0.00	0.00	0.03			0.08			
Sheltered Shallow Gravel	4.2		0.03											
Sheltered Shallow Mud	3.7							0.00						
Sheltered Shallow Rocky Reef	76.1		0.23			2.76	0.34	0.14			1.22			0.56
Sheltered Shallow Sand	311.9		0.08	2.66		0.81	0.62				1.27			4.08
Very Sheltered Deep Gravel	15.8												4.64	
Very Sheltered Deep Mud	367.1							0.76				0.32	3.91	
Very Sheltered Deep Rocky Reef	8.3							0.01				0.00	0.00	0.10
Very Sheltered Deep Sand	446.8					0.17							1.01	1.90
Very Sheltered Intertidal Rocky Reef	22.8		0.00		1.06			0.06	0.50	0.18	0.00	0.15	0.28	0.04
Very Sheltered Intertidal Soft Sediment	100.5				0.09			0.01	0.01	0.04	0.03	0.00	0.00	0.03
Very Sheltered Shallow Gravel	16.8		0.11										6.37	
Very Sheltered Shallow Mud	1202.5				37.24			15.70	8.87			2.61	0.02	
Very Sheltered Shallow Rocky Reef	124.8		0.14		7.09			0.80	1.09	1.39	0.00	1.61	2.99	0.79
Very Sheltered Shallow Sand	412.3		0.13	0.22						5.39	0.33		3.23	1.17

Scenario 1 Type 2 Marine reserve habitats

		Proposed type 2 MPAs								
Habitats	**Total in HGMP (KM2)**	**Alderman Islands**	**Cape Colville**	**Cradock Channel**	**Firth of Thames**	**Kawau Bay**	**Mercury Islands – Great Mercury Island (Ahuahu) and Red Mercury Island (Whakau)**	**Mokohinau Islands**	**Tiritiri Matangi Island**	**Whangateau Harbour**
Biogenic Dog cockles	239.6		6.53		7.21	0.03				
Biogenic Green-lipped mussel	2.3					0.46				
Biogenic Mangrove	42.0				*9.47*	*0.91*				*0.49*
Biogenic Mangrove Above MHW	0.2									
Biogenic Rhodoliths	48.8				0.65	15.28			9.39	
Biogenic Saltmarsh	5.4				*0.69*	*0.03*				*0.01*
Biogenic Saltmarsh Above MHW	10.0				*0.01*	*0.00*				0.00
Biogenic Seagrass	9.1					0.66				0.35
Biogenic Seagrass Above MHW	0.1					*0.00*				0.00
Estuarine Intertidal Rocky Reef	3.1				*0.03*	*0.18*	*0.00*			*0.01*
Estuarine Intertidal Soft Sediment	136.4				*0.69*	*4.89*	*0.00*			*5.27*
Estuarine Shallow Mud	24.5				*0.31*	*1.91*				
Estuarine Shallow Rocky Reef	6.6				*0.02*	*0.98*	*0.04*			*0.00*
Estuarine Shallow Sand	101.1				*0.02*	*0.65*	*0.15*			*0.33*
High Current Deep Gravel	60.3		30.19							
High Current Deep Mud	23.9		0.62		1.43	0.12				
High Current Deep Rocky Reef	9.6		*4.36*		*1.58*	*0.56*				
High Current Deep Sand	166.6		23.35		4.94	2.74				
High Current Intertidal Rocky Reef	0.7		*0.02*		*0.09*	*0.00*				
High Current Intertidal Soft Sediment	0.5		*0.01*		*0.01*					
High Current Shallow Gravel	18.1		0.96							
High Current Shallow Mud	254.5				200.28	2.74				
High Current Shallow Rocky Reef	13.7		*1.72*		*2.06*	*3.39*				
High Current Shallow Sand	37.5		0.08		4.72	1.24				
Moderate Deep Gravel	62.2									
Moderate Deep Mud	3644.4	221.03						91.48		
Moderate Deep Rocky Reef	184.4	*33.27*					*0.00*	*11.61*		
Moderate Deep Sand	2340.9	53.70					0.68	221.05		
Moderate Intertidal Rocky Reef	0.1	*0.01*					*0.00*	*0.01*		
Moderate Mid-slope Mud	19.7									
Moderate Shallow Gravel	0.7									
Moderate Shallow Mud	1.6									
Moderate Shallow Rocky Reef	20.0	*3.28*					*0.05*	*0.78*		
Moderate Shallow Sand	43.9	1.79					0.11	0.03		
Moderate Upper Slope Mud	458.7	1.29								
Moderate Upper Slope Sand	1.1									
Sheltered Deep Gravel	91.2		0.10			0.30				
Sheltered Deep Mud	355.3		0.49	12.11		0.37			4.14	
Sheltered Deep Rocky Reef	35.5	*0.17*	*0.08*	*1.57*		*3.98*	*0.01*	*0.35*		
Sheltered Deep Sand	2817.2	0.01	5.74	127.44		55.92	0.72	0.18		
Sheltered Intertidal Rocky Reef	7.7	*0.09*	*0.26*				*0.17*	*0.05*		
Sheltered Intertidal Soft Sediment	7.0	*0.00*	*0.16*				*0.04*	*0.00*		
Sheltered Shallow Gravel	4.2		1.79							
Sheltered Shallow Mud	3.7									
Sheltered Shallow Rocky Reef	76.1	*1.50*	*1.81*	*0.44*		*0.83*	*1.90*	*0.34*		
Sheltered Shallow Sand	311.9	0.10	0.04	1.15		0.44	1.02	0.09		
Very Sheltered Deep Gravel	15.8				0.34	0.84			0.93	
Very Sheltered Deep Mud	367.1				20.87	14.05			19.03	
Very Sheltered Deep Rocky Reef	8.3				*1.60*	*1.34*				
Very Sheltered Deep Sand	446.8		0.00		47.45	6.79			2.38	
Very Sheltered Intertidal Rocky Reef	22.8	*0.00*	*0.06*		*2.94*	*1.46*			*0.72*	*0.03*
Very Sheltered Intertidal Soft Sediment	100.5		*0.02*		*79.39*	*0.74*			*0.03*	*0.03*
Very Sheltered Shallow Gravel	16.8		0.61		4.95				0.33	
Very Sheltered Shallow Mud	1202.5				447.67	38.62			14.50	
Very Sheltered Shallow Rocky Reef	124.8	*0.01*	*0.32*		*13.46*	*16.46*			*3.61*	*0.01*
Very Sheltered Shallow Sand	412.3		0.08		118.42	3.57			14.27	0.27

Scenario 2 Marine reserve habitats

		Proposed marine reserves												
Habitats	**Total in HGMP (KM2)**	**Alderman Islands**	**Cape Colville**	**Cape Rodney-Okakari Point Marine Reserve extension**	**Kawau Bay**	**Te Hauturu-o-Toi/Little Barrier Island**	**Mokohinau Islands**	**Motukawao grolup**	**Rangitoto Island and Motutapu Island**	**Rotoroa Island**	**Slipper Island/Whakahau**	**The Noises**	**Tiritiri Matangi**	**Whanganui A Hei (Cathedral Cove) Marine Reserve extension**
Biogenic Dog cockles	239.6		18.57	0.04				8.24		2.74		2.84		
Biogenic Green-lipped mussel	2.3													
Biogenic Mangrove	42.0													
Biogenic Mangrove Above MHW	0.2													
Biogenic Rhodoliths	48.8									0.01			0.44	
Biogenic Saltmarsh	5.4													
Biogenic Saltmarsh Above MHW	10.0													
Biogenic Seagrass	9.1										0.07			
Biogenic Seagrass Above MHW	0.1										0.00			
Estuarine Intertidal Rocky Reef	3.1								0.08					
Estuarine Intertidal Soft Sediment	136.4								0.00					
Estuarine Shallow Mud	24.5								0.08					
Estuarine Shallow Rocky Reef	6.6								0.03					
Estuarine Shallow Sand	101.1													
High Current Deep Gravel	60.3		10.18											
High Current Deep Mud	23.9													
High Current Deep Rocky Reef	9.6		1.14											
High Current Deep Sand	166.6		8.43											
High Current Intertidal Rocky Reef	0.7		0.00							0.00				
High Current Intertidal Soft Sediment	0.5													
High Current Shallow Gravel	18.1		0.77											
High Current Shallow Mud	254.5													
High Current Shallow Rocky Reef	13.7		0.40							0.30				
High Current Shallow Sand	37.5		0.31							1.52				
Moderate Deep Gravel	62.2	20.63												
Moderate Deep Mud	3644.4	82.36				40.26								
Moderate Deep Rocky Reef	184.4	16.72					0.14				0.62			
Moderate Deep Sand	2340.9	34.74				7.88	0.03				0.19			
Moderate Intertidal Rocky Reef	0.1						0.00				0.00			
Moderate Mid-slope Mud	19.7													
Moderate Shallow Gravel	0.7													
Moderate Shallow Mud	1.6													
Moderate Shallow Rocky Reef	20.0	0.01					0.09				0.50			
Moderate Shallow Sand	43.9	0.04					0.39							
Moderate Upper Slope Mud	458.7	9.78												
Moderate Upper Slope Sand	1.1													
Sheltered Deep Gravel	91.2					1.17								
Sheltered Deep Mud	355.3					20.66								
Sheltered Deep Rocky Reef	35.5					1.58	0.07				0.04			0.01
Sheltered Deep Sand	2817.2			12.33		116.80	0.02							1.77
Sheltered Intertidal Rocky Reef	7.7		0.07			0.10	0.03	0.06			0.14			0.00
Sheltered Intertidal Soft Sediment	7.0		0.02			0.00	0.00	0.03			0.08			
Sheltered Shallow Gravel	4.2		0.03											
Sheltered Shallow Mud	3.7							0.00						
Sheltered Shallow Rocky Reef	76.1		0.23			2.76	0.21	0.14			1.22			0.56
Sheltered Shallow Sand	311.9		0.08	2.66		0.81	0.36				1.27			4.08
Very Sheltered Deep Gravel	15.8												0.12	
Very Sheltered Deep Mud	367.1							0.76				0.32		
Very Sheltered Deep Rocky Reef	8.3							0.01				0.00		0.10
Very Sheltered Deep Sand	446.8					0.17								1.90
Very Sheltered Intertidal Rocky Reef	22.8		0.00		0.03			0.06	0.53	0.18	0.00	0.15	0.08	0.04
Very Sheltered Intertidal Soft Sediment	100.5				0.01			0.01	0.01	0.04	0.03	0.00	0.00	0.03
Very Sheltered Shallow Gravel	16.8		0.11										0.71	
Very Sheltered Shallow Mud	1202.5				0.11			15.70	5.62			2.61		
Very Sheltered Shallow Rocky Reef	124.8		0.14		0.44			0.80	1.26	1.39	0.00	1.61	0.78	0.79
Very Sheltered Shallow Sand	412.3		0.13	0.22						5.39	0.33		0.00	1.17

MHW = mean high water.

Scenario 2 Type 2 Marine Protected Area/Special Management Area habitats

		Proposed type 2 MPAs						Proposed SMAs	
Habitats	**Total in HGMP (KM2)**	**Cape Colville**	**Cradock Channel**	**Firth of Thames**	**Kawau Bay**	**Mercury Islands – Great Mercury Island (Ahuahu) and Red Mercury Island (Whakau**	**Tiritiri Matangi Island**	**Alderman Islands**	**Mokohinau Islands**
Biogenic Dog cockles	239.6	6.53		7.21	0.03				
Biogenic Green-lipped mussel	2.3				0.46				
Biogenic Mangrove	42.0			9.47	0.91				
Biogenic Mangrove Above MHW	0.2								
Biogenic Rhodoliths	48.8			0.65	28.71		13.51		
Biogenic Saltmarsh	5.4			0.69	0.03				
Biogenic Saltmarsh Above MHW	10.0			0.01	0.00				
Biogenic Seagrass	9.1				0.66				
Biogenic Seagrass Above MHW	0.1				0.00				
Estuarine Intertidal Rocky Reef	3.1			0.03	0.19	0.00			
Estuarine Intertidal Soft Sediment	136.4			0.69	5.00	0.00			
Estuarine Shallow Mud	24.5			0.31	2.01				
Estuarine Shallow Rocky Reef	6.6			0.02	1.06	0.04			
Estuarine Shallow Sand	101.1			0.02	0.65	0.15			
High Current Deep Gravel	60.3	30.19							
High Current Deep Mud	23.9	0.62		1.43	0.12				
High Current Deep Rocky Reef	9.6	*4.36*		*1.58*	*0.56*				
High Current Deep Sand	166.6	23.35		4.94	2.74				
High Current Intertidal Rocky Reef	0.7	*0.02*		*0.09*	*0.00*				
High Current Intertidal Soft Sediment	0.5	*0.01*		*0.01*					
High Current Shallow Gravel	18.1	0.96							
High Current Shallow Mud	254.5			200.28	2.74				
High Current Shallow Rocky Reef	13.7	*1.72*		*2.06*	*3.39*				
High Current Shallow Sand	37.5	0.08		4.72	1.24				
Moderate Deep Gravel	62.2								
Moderate Deep Mud	3644.4							221.02	28.68
Moderate Deep Rocky Reef	184.4					*0.00*		33.25	12.95
Moderate Deep Sand	2340.9					0.68		53.67	189.96
Moderate Intertidal Rocky Reef	0.1					*0.00*		0.01	0.01
Moderate Mid-slope Mud	19.7								
Moderate Shallow Gravel	0.7								
Moderate Shallow Mud	1.6								
Moderate Shallow Rocky Reef	20.0					*0.05*		3.29	1.50
Moderate Shallow Sand	43.9					0.11		1.78	0.37
Moderate Upper Slope Mud	458.7							1.29	
Moderate Upper Slope Sand	1.1								
Sheltered Deep Gravel	91.2	0.10			0.29				
Sheltered Deep Mud	355.3	0.49	12.11		0.37		4.15		
Sheltered Deep Rocky Reef	35.5	*0.08*	*1.57*		*3.98*	*0.01*		0.17	0.51
Sheltered Deep Sand	2817.2	5.74	127.44		55.85	0.72		0.01	0.21
Sheltered Intertidal Rocky Reef	7.7	*0.26*				*0.17*		0.18	0.10
Sheltered Intertidal Soft Sediment	7.0	*0.16*				*0.04*		0.00	0.00
Sheltered Shallow Gravel	4.2	1.79							
Sheltered Shallow Mud	3.7								
Sheltered Shallow Rocky Reef	76.1	*1.81*	*0.44*		*0.83*	*1.90*		1.55	0.47
Sheltered Shallow Sand	311.9	0.04	1.15		0.44	1.02		0.10	0.34
Very Sheltered Deep Gravel	15.8			0.34	0.82		5.45		
Very Sheltered Deep Mud	367.1			20.87	14.00		22.96		
Very Sheltered Deep Rocky Reef	8.3			*1.60*	*1.34*		*0.00*		
Very Sheltered Deep Sand	446.8	0.00		47.45	6.79		3.39		
Very Sheltered Intertidal Rocky Reef	22.8	*0.06*		*2.94*	*2.52*		*1.06*	0.01	
Very Sheltered Intertidal Soft Sediment	100.5	*0.02*		*79.39*	*0.83*		*0.03*		
Very Sheltered Shallow Gravel	16.8	0.61		4.95			5.99		
Very Sheltered Shallow Mud	1202.5			447.67	75.68		14.52		
Very Sheltered Shallow Rocky Reef	124.8	*0.32*		*13.46*	*23.55*		*5.82*	0.01	
Very Sheltered Shallow Sand	412.3	0.08		118.42	3.57		17.50		

MHW = mean high water, SMA = Special Management Area.

Strategy-recommended high protection areas (and marine reserve extensions)

Habitats	Total area in HGMP (KM^2)	Alderman Islands South	Alderman Islands North	Cape Rodney-Okakari Point Marine Reserve extension	Cape Colville	Kawau Bay	Te Hauturu-o-Toi/Little Barrier Island	Mokohinau Islands	Motukawao Group	Rangitoto Island and Motutapu Island	Rotoroa Island	Slipper Island/Whakahau	Tiritiri Matangi Island	Whanganui A Hei (Cathedral Cove) Marine Reserve extension
Very Sheltered Shallow Sand	412.30			0.22	0.20						8.61	0.52	1.03	1.03
Very Sheltered Shallow Rocky Reef	134.79			0.01	0.26	5.99			2.59	1.09	1.94	0.01	0.99	0.43
Very Sheltered Shallow Mud	1202.48					29.41			21.34	8.87				
Very Sheltered Shallow Gravel	16.82				0.14								4.92	
Very Sheltered Intertidal Soft Sediment	100.50			0.00		0.07			0.00	0.01	0.00	0.03	0.00	0.03
Very Sheltered Intertidal Rocky Reef	22.81			0.00	0.00	0.83			0.06	0.50	0.17	0.00	0.09	0.01
Very Sheltered Deep Sand	446.76										1.56			1.41
Very Sheltered Deep Rocky Reef	8.33								0.13		0.15			0.06
Very Sheltered Deep Mud	367.06								4.77					
Very Sheltered Deep Gravel	15.81												2.46	
Sheltered Shallow Sand	311.90			2.65	0.08		0.85	0.62				2.80		5.72
Sheltered Shallow Rocky Reef	76.14				0.29		5.02	0.34	0.14			1.88		0.58
Sheltered Shallow Mud	3.66								0.00					
Sheltered Shallow Gravel	4.15				0.03							0.01		
Sheltered Intertidal Soft Sediment	7.02				0.02		0.00	0.00	0.02			0.09		
Sheltered Intertidal Rocky Reef	7.65				0.10		0.14	0.09	0.06			0.19		0.00
Sheltered Deep Sand	2817.19			12.31			48.66	0.05						5.34
Sheltered Deep Rocky Reef	35.53						2.82	0.23				0.04		0.03
Sheltered Deep Mud	355.28						97.34							
Sheltered Deep Gravel	91.24													
Moderate Upper Slope Sand	1.09													
Moderate Upper Slope Mud	458.65	6.75												
Moderate Shallow Sand	43.85	0.05						0.72				0.35		
Moderate Shallow Rocky Reef	20.01	0.01						0.81				1.18		
Moderate Shallow Mud	1.63													
Moderate Shallow Gravel	0.68											0.41		
Moderate Mid slope Mud	19.70													
Moderate Intertidal Rocky Reef	0.11							0.00				0.00		
Moderate Deep Sand	2340.89	34.52						100.17				1.71		
Moderate Deep Rocky Reef	184.40	16.66	11.05				0.02	5.92				1.15		
Moderate Deep Mud	3644.43	76.23	122.71				39.52	9.50						
Moderate Deep Gravel	62.22	20.64										3.08		
High Current Shallow Sand	37.53				0.39									
High Current Shallow Rocky Reef	13.66				0.56									
High Current Shallow Mud	254.52													
High Current Shallow Gravel	18.11				0.87									
High Current Intertidal Soft Sediment	0.51													
High Current Intertidal Rocky Reef	0.70				0.00									
High Current Deep Sand	166.61				10.57									
High Current Deep Rocky Reef	9.62				1.63									
High Current Deep Mud	23.93													
High Current Deep Gravel	60.26				11.53									
Estuarine Shallow Sand	101.08													
Estuarine Shallow Rocky Reef	6.60					0.08				0.03				
Estuarine Shallow Mud	24.55					0.11				0.08				
Estuarine Intertidal Soft Sediment	136.45					0.08				0.00				
Estuarine Intertidal Rocky Reef	3.09					0.01				0.09				

Strategy-recommended seafloor protection areas

Habitats	Total area in HGMP (KM^2)	Cape Colville	Cradock Channel	Kawau Bay	Mokohinau Islands	Tiritiri Island
Very Sheltered Shallow Sand	412.30	0.01		3.57		16.47
Very Sheltered Shallow Rocky Reef	124.79	0.19		16.46		5.60
Very Sheltered Shallow Mud	1202.48			38.29		7.00
Very Sheltered Shallow Gravel	16.82	0.58				1.78
Very Sheltered Intertidal Soft Sediment	100.50	0.02		0.74		0.03
Very Sheltered Intertidal Rocky Reef	22.81	0.06		1.46		1.05
Very Sheltered Deep Sand	446.76			6.79		3.39
Very Sheltered Deep Rocky Reef	8.33			1.34		0.00
Very Sheltered Deep Mud	367.06			11.57		14.12
Very Sheltered Deep Gravel	15.81			0.07		3.11
Sheltered Shallow Sand	311.90	0.04	1.15	0.44	0.09	
Sheltered Shallow Rocky Reef	76.14	1.75	0.45	0.83	0.34	
Sheltered Shallow Mud	3.66					
Sheltered Shallow Gravel	4.15	1.79				
Sheltered Intertidal Soft Sediment	7.02	0.16			0.00	
Sheltered Intertidal Rocky Reef	7.65	0.23			0.05	
Sheltered Deep Sand	2817.19	5.74	136.21	53.72	0.18	
Sheltered Deep Rocky Reef	35.53	0.08	2.07	3.98	0.35	
Sheltered Deep Mud	355.28	0.49	12.10	0.37		1.15
Sheltered Deep Gravel	91.24	0.10		0.01		
Moderate Upper Slope Sand	1.09					
Moderate Upper Slope Mud	458.65					
Moderate Shallow Sand	43.85				0.03	
Moderate Shallow Rocky Reef	20.01				0.78	
Moderate Shallow Mud	1.63					
Moderate Shallow Gravel	0.68					
Moderate Mid-slope Mud	19.70					
Moderate Intertidal Rocky Reef	0.11				0.01	
Moderate Deep Sand	2340.89				221.05	
Moderate Deep Rocky Reef	184.40				11.61	
Moderate Deep Mud	3644.43				91.57	
Moderate Deep Gravel	62.22					
High Current Shallow Sand	37.53			1.24		
High Current Shallow Rocky Reef	13.66	1.56		3.39		
High Current Shallow Mud	254.52			2.74		
High Current Shallow Gravel	18.11	0.86				
High Current Intertidal Soft Sediment	0.51	0.01				
High Current Intertidal Rocky Reef	0.70	0.02		0.00		
High Current Deep Sand	166.61	21.22		2.74		
High Current Deep Rocky Reef	9.62	3.87		0.56		
High Current Deep Mud	23.93	0.62		0.12		
High Current Deep Gravel	60.26	28.85				
Estuarine Shallow Sand	101.08			0.65		
Estuarine Shallow Rocky Reef	6.60			0.98		
Estuarine Shallow Mud	24.55			1.91		
Estuarine Intertidal Soft Sediment	136.45			4.92		
Estuarine Intertidal Rocky Reef	3.09			0.18		