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Options for no-take marine protected areas in the eastern Bay of Islands: A discussion document

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Introduction

Fish Forever is a local group campaigning for up to 10% of the waters of the Bay of Islands to be set aside as no-take marine protected areas (MPAs) for a generation (25 years). Their implicit aim is to secure no-take areas that are representative of the marine ecosystems of the Bay of Islands, as well as to capture the outstanding and distinctive ecosystems – all firmly in line with the objectives of the New Zealand Marine Protected Areas policy.[1]

Fish Forever identified several spots in the eastern Bay of Islands (Tapeka Point to Cape Brett) as possible candidate areas, these being narrowed down to two – Maunganui Bay and the waters around Okahu, Waewaetorea, and NW Urupukapuka islands (abbreviated here to *Waewaetorea*). MPAs will not go ahead here (or anywhere else) without local Hapu sanction and participation. Accordingly, Fish Forever are now working under an MOU with Patukeha and Ngati Kuta to find out whether Hapu could find no-take MPAs acceptable in their rohe, and if so where they might be placed. (Also being considered are customary management options to surround the MPAs.) At the consultation hui at Te Rawhiti Marae on 3 January 2013, other possible areas for protection within the rohe were suggested – including Motukokako and Whangamumu. The purpose of this paper is to consider this wider range of possible places for no-take protection in eastern Bay of Islands.

Selecting sites for no-take MPAs could be a never-ending process. However, the New Zealand Biodiversity Strategy (NZBS) provides guidance, and is the primary platform for this paper. One of the objectives of the NZBS is "to protect marine biodiversity by establishing a network of marine protected areas that is comprehensive and representative of New Zealand's habitats and ecosystems".[1] The outstanding, the rare, and the distinctive also have special place. The Bay of Islands lies within NZBS's NE Biogeographic Region. It contains a rich variety of marine habitats, examples of many (but not all) of which are to be found in the eastern Bay of Islands (Figure 1). (Noticeably absent are such features as the Black Rocks.)

Some definitions

Benthic Associated with the seafloor
Biogenic Made from the hard parts of living things
Biological diversity (biodiversity) The variability among living organisms from all sources
Community an assemblage of populations of two or more different species occupying the same area
Ecosystem An interacting system of living and non-living components, as small and short-lived as a water-filled tree hole or as large and permanent as an ocean
Estuary A partly enclosed coastal body of brackish water with one or more rivers or streams flowing into it, and with free connection to the open sea.
Exposure Susceptibility to waves and swell, and to a less extent, wind
Habitat The place or type of area an organism naturally occurs
Rhodolith Unattached, crustose benthic marine red seaweed resembling coral (and dog turds)
Substrate The seafloor
Terrigenous Derived from the land

This discussion paper starts off by summarising what we know about ecosystem diversity in the Bay of Islands (Section 1), considering first the results from general overviews and then those from more detailed, focussed studies. It goes on to present a platform for capturing representative (Section 2) and rare and special ecosystems (Section 3) for the eastern Bay of Islands in particular. Section 4 deals with the all-important land-sea connection; Section 5 is about minimising conflicts when it comes to siting potential no-take MPAs; and Section 6 is about defining and policing them. Section 7 considers the gifts and gains (or costs and benefits) associated with no-take MPAs. The pros and cons of various candidate sites in the eastern Bay of Islands are summarised in a final section.

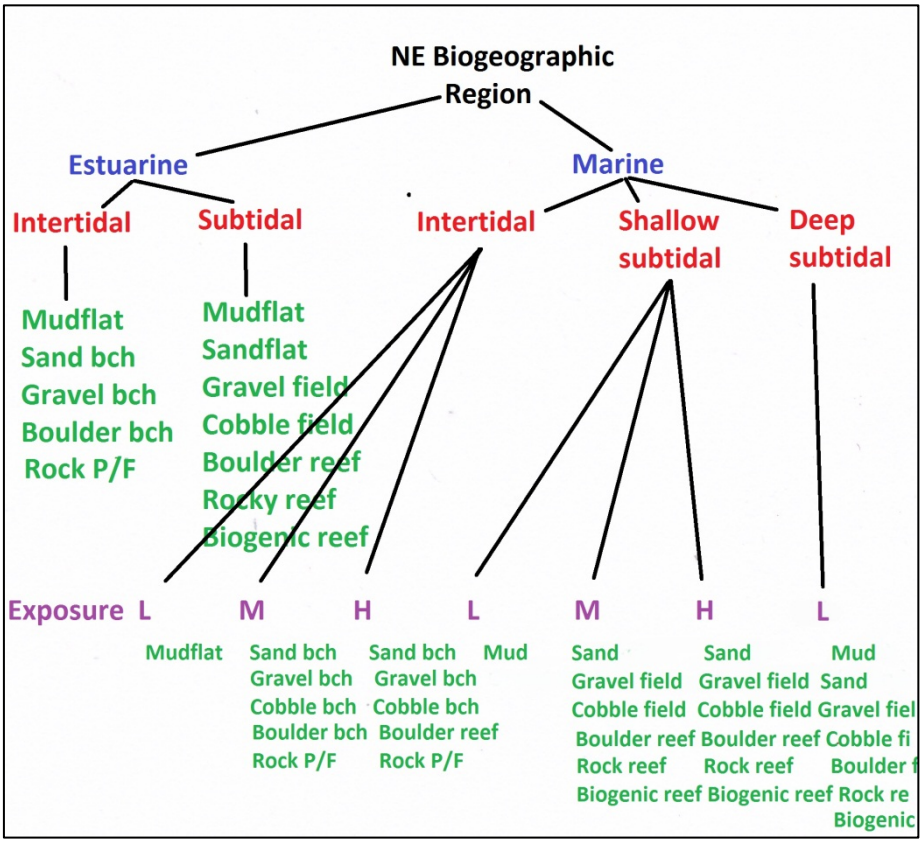


Figure 1. New Zealand Biodiversity Strategy coastal classification and mapping scheme (high water to 200 m depth).[1]

1. What we know of Bay of Islands' ecosystem diversity

1.1 Broad-brush overviews

The NIWA Oceans 20/20 survey with its Deep Towed Imaging System (a video towed just above the seafloor) provided indices of biodiversity. In inner areas, species diversity tended to increase with increased exposure (and possibly depth) (Figure 2); diversity was at least as great – and usually greater – in the eastern Bay of Islands than anywhere else.[2]

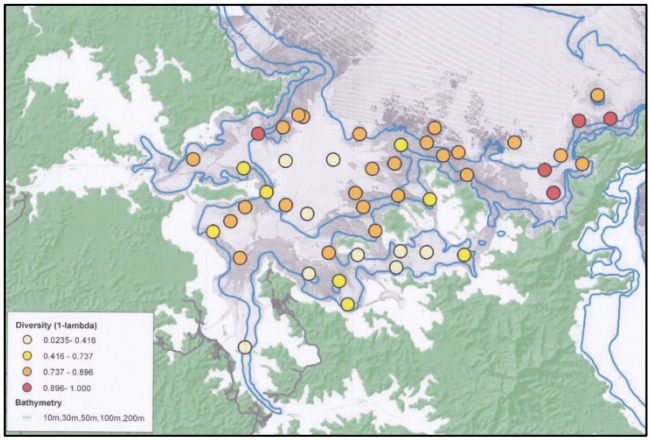


Figure 2. Index of biological diversity on and near the seafloor, based on NIWA's 2009 Deep Towed Imaging System survey.[2] The redder the colour, the greater the species diversity.

For the shallow (<50 m-deep) rocky reefs (using a dropped underwater camera, a dropped underwater video [DUV], and diver transects) in the NIWA Oceans 20/20 survey, the most powerful driver of fish-community representation and diversity was the location of sites along the gradient from inner to outer Bay, inner sites having low species diversity (Figure 3).[3] Depth was also an important determinant of fish community structure, and the level of shelter at a site also interacted with this gradient (so that, for example, the sheltered Deep Water Cove in the outer Bay had a fish fauna that closely resembled inner Bay sites). For the benthic invertebrates, although there were obvious trends from inner to outer Bay sites, depth appeared to be the most important determinant of community structure. When the fish and benthic community data were looked at together, the gradient from inner to outer Bay stood out as a common and important factor. The greater diversity in the outer Bay is probably because of higher water clarity/lower sediment loads, higher wave exposure, and closer proximity to larval sources.[3]

For the deeper (50-200 m) fish communities (from trawl, DTIS, DUV, and stationary baited underwater video) in the NIWA Oceans 20/20 survey, while depth and habitat type were influential, location along the gradient from inner to outer Bay was the most important factor influencing community structure and species diversity (Figure 4).[4]

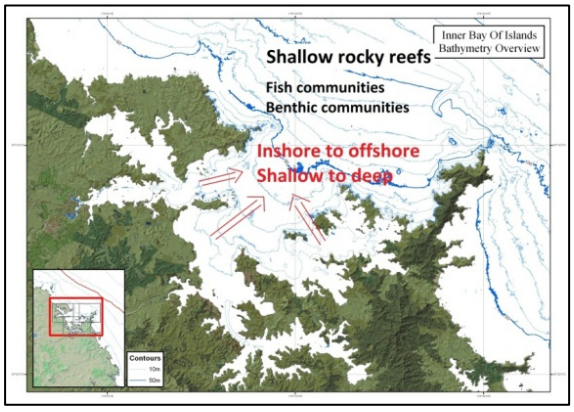


Figure 3. In shallow waters (down to 50 m), the main drivers of fish and seafloor community structure on rocky reefs were the gradient inshore to offshore, and to a less extent, shallow to deep.[3]

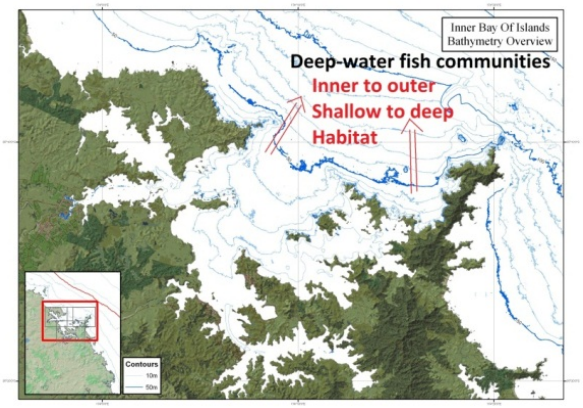
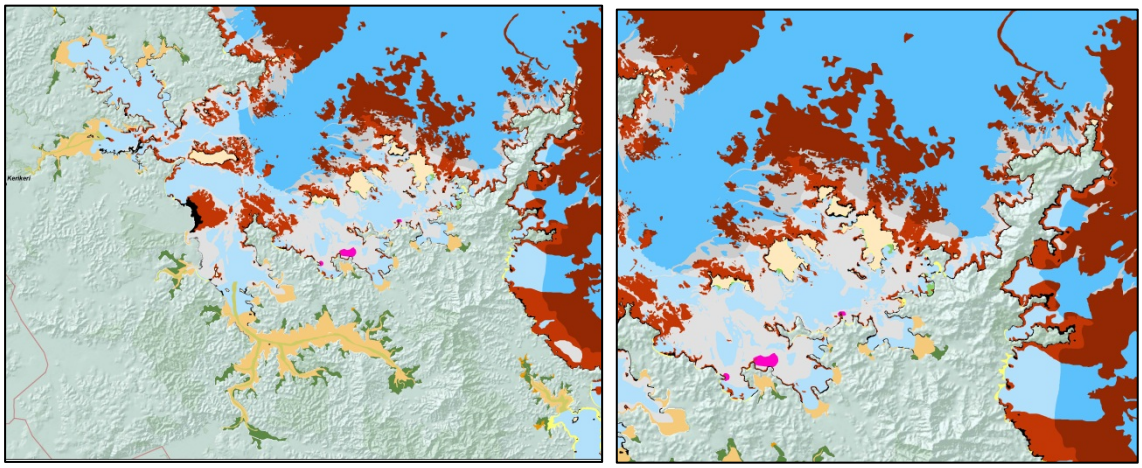


Figure 4. In deeper waters (50-100 m), the main drivers of fish community structure were not only the gradient inshore to offshore and shallow to deep, but also the seafloor type.[4]

1.2 Focussing in

Different types of seafloor (fine silt, rock, etc.) mean different plant and animal communities, and Figure 5 shows how richly diverse the Bay of Islands is in this regard – particularly the eastern parts.[5] A rich tapestry like this implores you to drill down!

Even though soft sediments in the shallow, inshore waters tend to be less diverse in terms of species present than those in deeper offshore waters, notable and significant inshore habitats have been identified. For the eastern Bay of Islands, there are the mangrove/saltmarsh habitats, the shellfish (mainly cockle and pipi) beaches, and the seagrass beds (Figure 6). In deeper waters are the scallop/rhodolith/dog cockle/horse mussel/*Caulerpa* flats (Figure 7). (Although of course, this is all a gross simplification. See, for example, the mosaic of diversity for the southeast part of Urupukapuka Island – Figure 7 [right].)



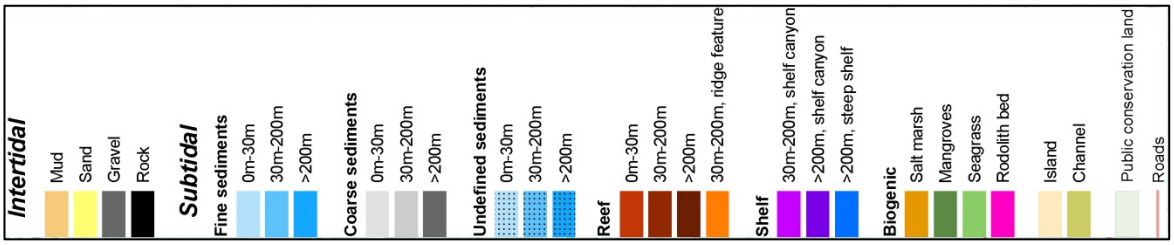


Figure 5. Seafloor type is surrogate for the various habitat types, from the intertidal mud of inner bays and estuaries (brown) to rocky reefs (red) for the Bay of Islands as a whole (left) and the eastern Bay of Islands in particular (right).[5] Certain biological features of shallow waters are shown, too (Biogenic).

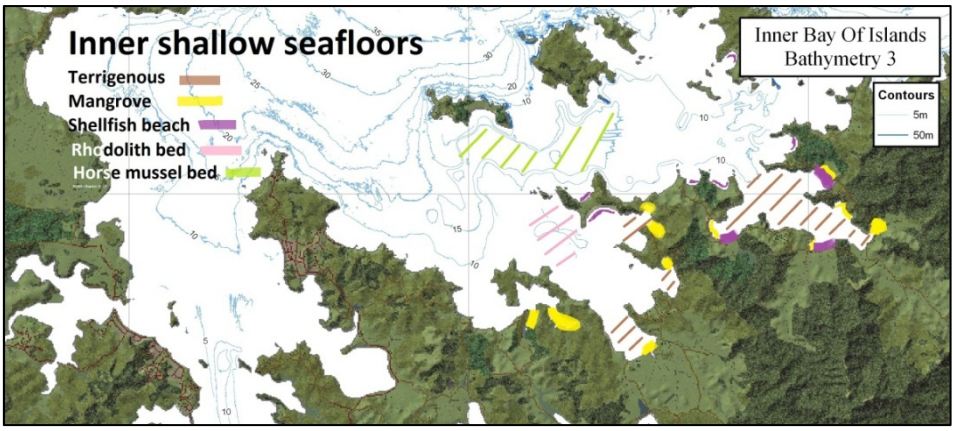


Figure 6. Inshore shallow soft-bottom seafloor communities/types in eastern Bay of Islands.[2, 5, 6]

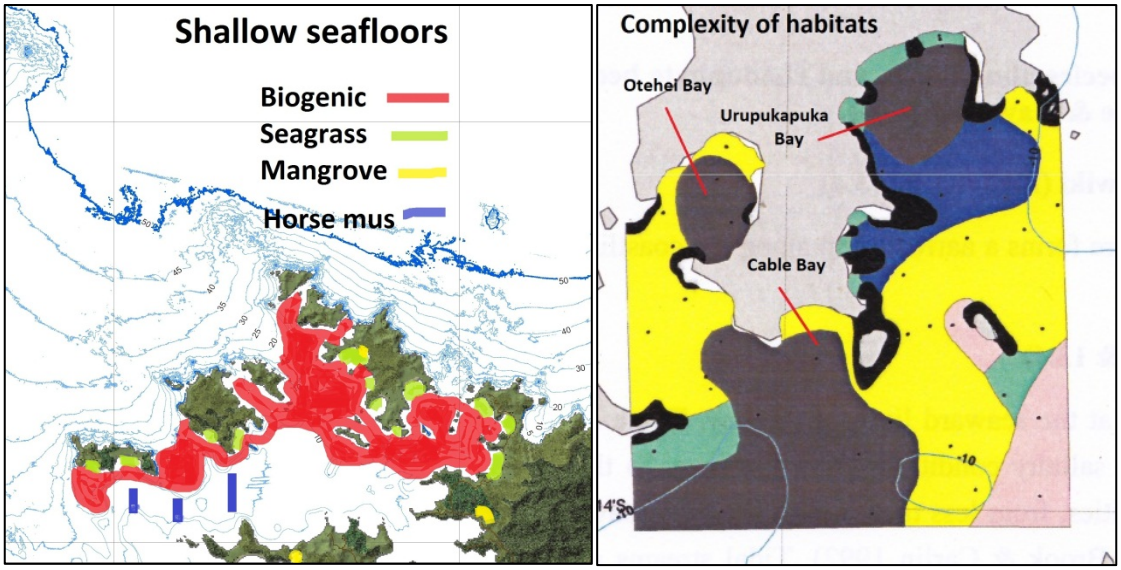


Figure 7. Inshore shallow soft-bottom seafloor communities in eastern Bay of Islands (left),[2, 5, 6] although things are far more complicated than this, as for southeast Urupukapuka Island (right)[7] where each colour denotes a different habitat.

For the diveable nearshore rocky reefs, the main drivers of community structure are thought to be exposure and water clarity. Particular combinations of these two variables, together with the reef topography, led to the typing of the shorelines shown in Figure 8.

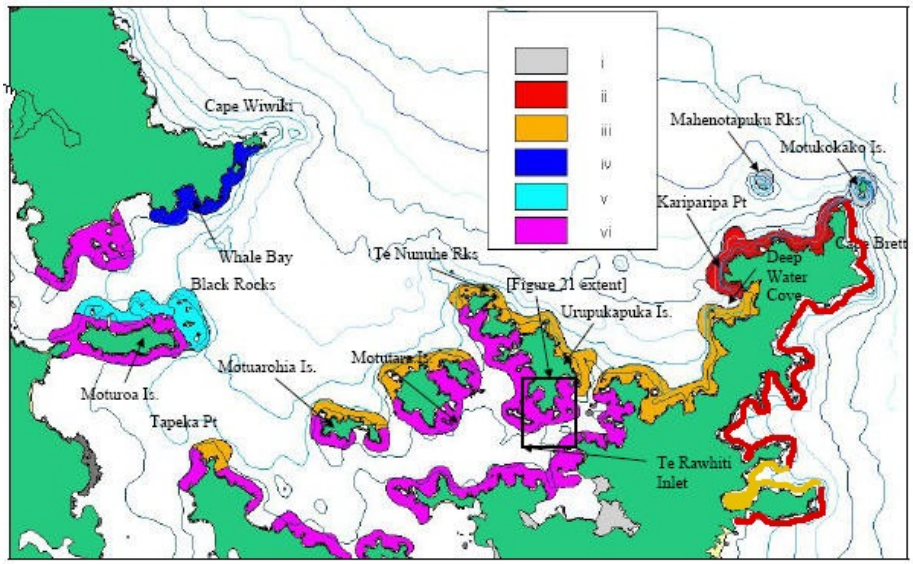


Figure 8. Seabed life and associated fishes of nearshore rocky reef.[8 modified]

Type I (Exposed, low turbidity)
- Unique zonation sequence, shallow to deep
- High fish diversity
- Many subtropical species

Type ii (Exposed, low turbidity)
- Rich shallow to deep, open-water benthic flora and fauna
- High fish diversity
- Many subtropical species

Type iii (Exposed, moderate turbidity)
- Rich shallow to mid-depth, open-water benthic flora and fauna
- Moderate fish diversity
- Some subtropical species

Type vi (Sheltered, moderate to high turbidity)
- Shallow reefs
- Low fish diversity
- Subtropical species absent

Discussion has, so far, centred on the seafloor and immediately adjacent parts of the water column – ignoring the whole world of plankton, pelagic fishes, cetaceans (whales and dolphins), and seabirds above. The Department of Primary Industries aerial sightings database for pelagic fishes is spatially too coarse to be useful. However, it is well known that schooling pelagic fishes are frequently associated with upwelling around islets and near-surface seamounts such as Motukokako and Whale Rock respectively. These same areas are important for cetaceans – whether they be fish- or plankton-feeders (Figure 9), and for such seabirds as gannets and petrels.

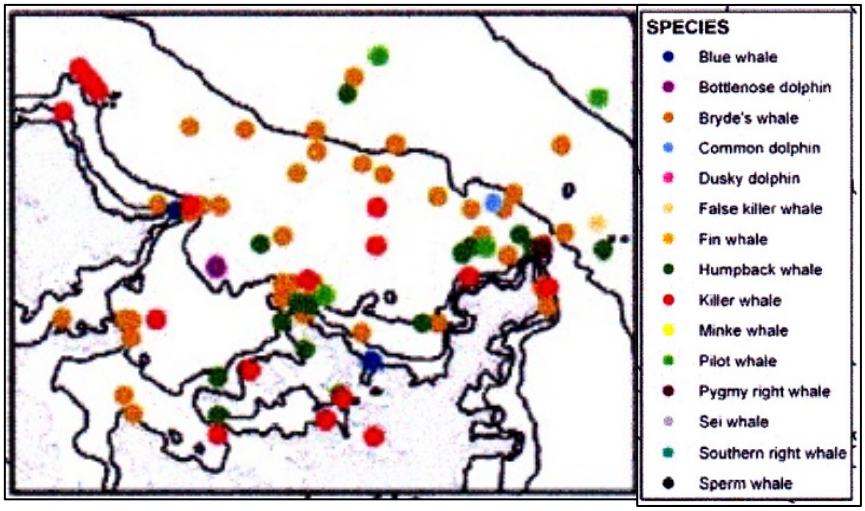


Figure 9. Sighting locations from the DOC and Cawthorn datasets for all whales and dolphins.[7]

2. Capturing representative ecosystems

Discussion of representative ecosystems follows the flow of Figure 1, with focus on the eastern Bay of Islands.

2a. Estuarine and marine

Estuaries aren't all that common in the eastern Bay of Islands, but a significant one is the Tangatapu Estuary at the head of Parekura Bay (Figures 6, 7 and 10).

2b. Depth

The eastern Bay of Islands has the full range of shallow to very deep (>100 m) habitats (Figure 10).

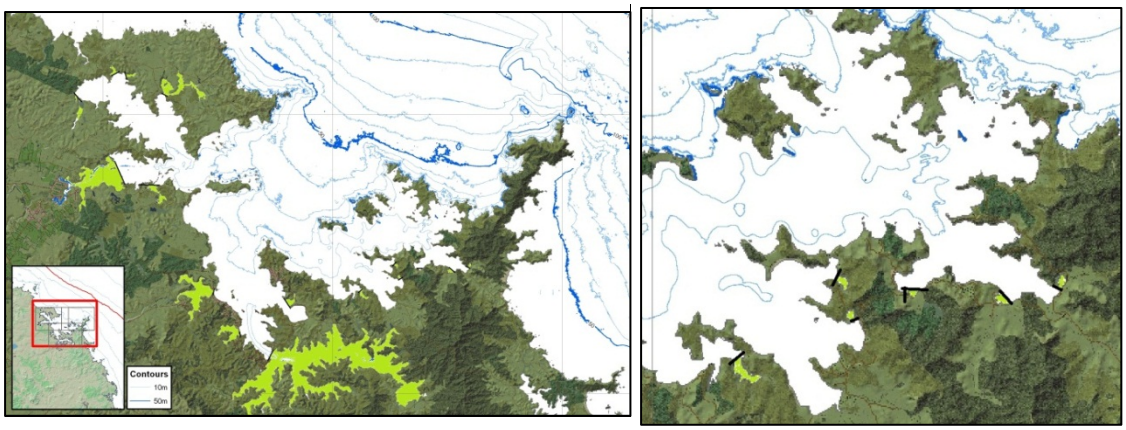


Figure 10. Light green indicates estuarine areas for the Bay of Islands as a whole (left) and the eastern Bay of Islands (right). Depth contours are at 10-m intervals.

2c. Exposure

Exposure is difficult to define objectively. For the Bay of Islands, it can be expressed in terms of susceptibility to ocean waves and swell (from a generally northerly quarter, even though the prevailing winds are from the southwest). Although expressed crudely in Figure 11, it is probably sufficient for now.

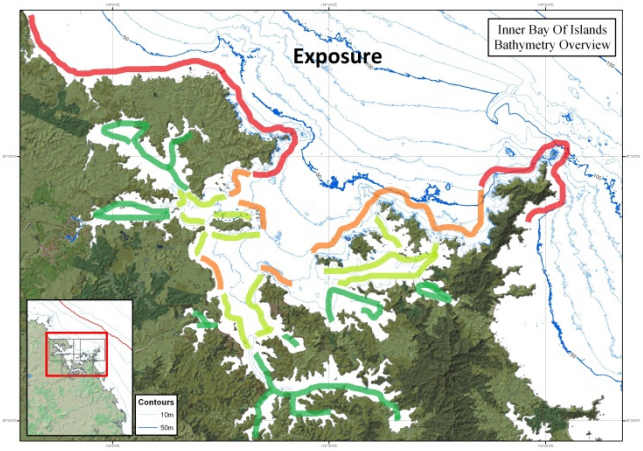


Figure 11. Crude representation of the exposure of Bay of Islands shores to ocean waves and swell.

2d. Habitat type

The final level concerns the type of seafloor – a proxy for habitat type. As for the other parameters, this can be really complicated, but we are fortunate to have the DOC/NIWA habitat mapping as a guide (Figure 5).

3. Capturing rare/special/outstanding ecosystems

The eastern Bay of Islands contains many rare, special or outstanding ecosystems, some of which are shown in Figure 12. Dr James Williams of NIWA and Professors Andrew Jeffs and Mark Costello of the University of Auckland (among others) have expressed keen interest in some of these because of the high-level research opportunities they bring.

3.1 Mangrove/saltmarsh estuary and associated sand/mud flats

Tangatapu Estuary, at the head of Parekura Bay, has extensive mangrove stands along almost a kilometre of tidal channel, with a lot of associated saltmarsh and rushland above. It is among the top-five mangrove estuaries for the Northland Regional Council. It backs onto a wetland under restoration at the start of the Whangamumu Walking Track, and opens out to expansive sand and mud flats with cockles and horse mussels. If this was to become a no-take MPA, it may be the only one of its type in the country.

3.2 Subtidal seagrass beds

Seagrass is (for unclear reasons) predominantly intertidal or subtidal – both threatened ecosystems. In the Bay of Islands, significant seagrass beds are subtidal; at least since the 1950s, they have been confined largely to the eastern Bay of Islands, where they have waxed and waned in density and extent without particular pattern. Those in Kaimarama, Hauai, and Kaingahoa bays are among the very few subtidal beds associated with the mainland. A subtidal seagrass bed within a no-take MPA in the eastern Bay of Islands would be one of very few in the country.

3.3 Strongly biogenic/weakly terrigenous seafloors

The extensive Urupukapuka and Te Rawhiti scallop beds contain a mix of scallop-, dog cockle-, *Caulerpa* (a green seaweed), and rhodolith-dominated seafloors, free from commercial extraction (but nevertheless subject to recreational diving and dredging) and with very little terrigenous influence. Te Rawhiti Inlet contains not only significant beds of rhodoliths,[6] but also extensive, intact horse mussel beds.[2] The opportunity for scallop/rhodolith beds to be divided, one side fished (including amateur-dredged) and the other unfished, is of immense research interest to NIWA scientists.

3.4 Regions of upwelling

Upwelling is particularly strong around Motukokako, but all shores and emergent (as well as near-surface, non-emergent) pinnacles have associated upwelling. Upwelling draws nutrients towards the surface, where plankton productivity is enhanced, in turn feeding pelagic fishes, dolphins and certain whales, and seabirds.

3.5 Caves and fissures

Dark recesses – both below water and intertidal – have associated fish and invertebrate life not found elsewhere. Best-known examples are those at Motukokako, but Maunganui Bay, other parts of the Cape Brett Peninsula, and the open coasts of Okahu to Urupukapuka also feature them.

3.6 Overall complexity richness

Both Waewaetorea and Maunganui Bay present an exceptionally rich diversity of exposure, depth, and substrate – and therefore biodiversity (Figure 12). Whangamumu is likely to be similarly endowed – but much less is known about the ecology of this harbour and its surrounds.

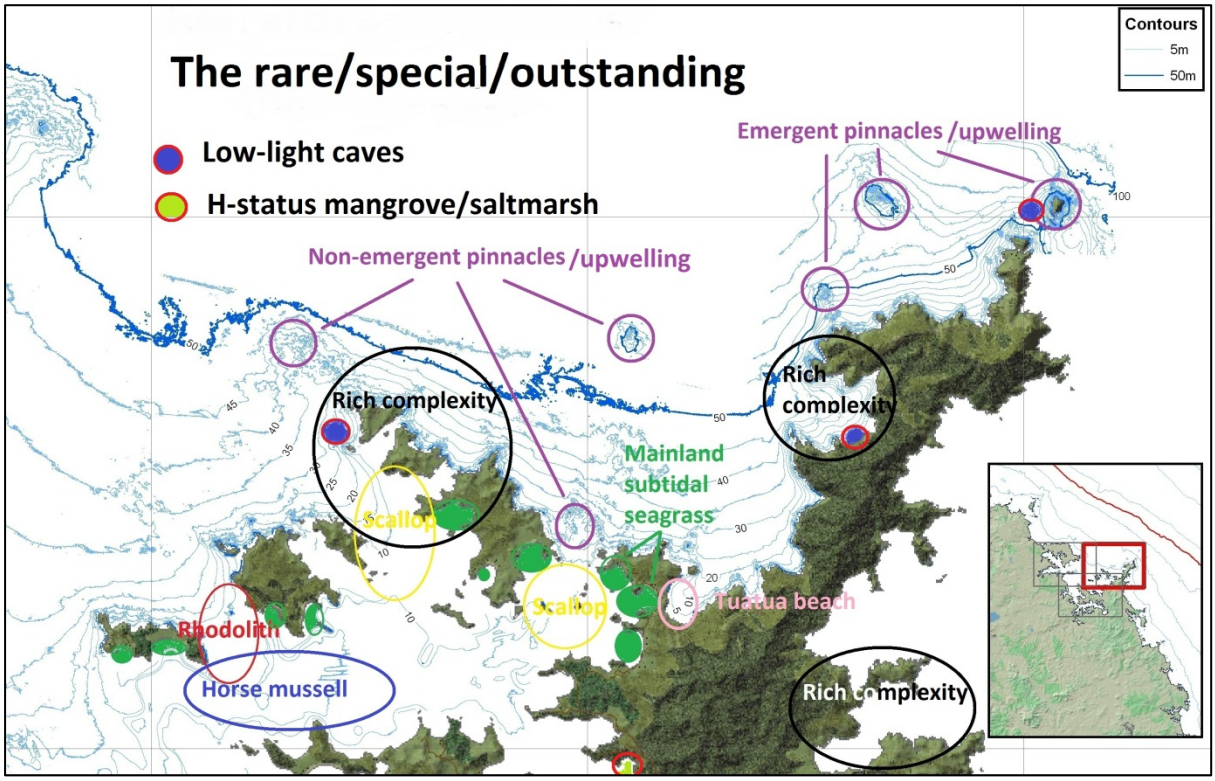


Figure 12. Some of the rare/special/outstanding features of the eastern Bay of Islands. Features such as these offer great opportunities to researchers, including examination of high-level ecological issues.

4. Land-sea connections

The sea is inseparable from the land it laps, nor can it be divorced from the local human history. Emphasising key places in this narrative from the beginning of first settlement is up to Tangatawhenua. The map offered here accounts for some notable interactions (sea-land-people) from first European contact (Figure 13).

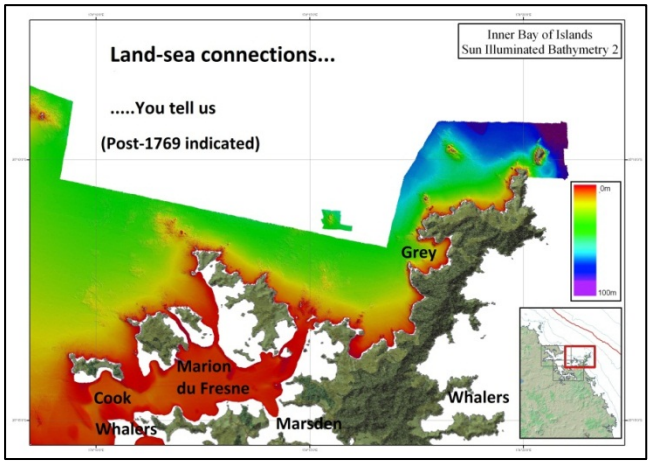


Figure 13. The land and the sea, the people and their history, are inextricably intertwined. Examples post-European contact are indicated. Hapu need to fill out the narrative from their perspective.

5. Minimising conflict with other users

5.1 Commercial fishing

Commercial fishers holding quota in Fishery Management Area (FMA) 1 (or its various species-specific FMAs) are entitled to fish their quota anywhere in the Bay of Islands, except for areas from which they are specifically excluded. Most FMA 1 quota holders will not have fished the Bay of Islands yet are entitled to do so. Figure 14 summarises the commercial fishing activities permitted within and near the Bay of Islands.

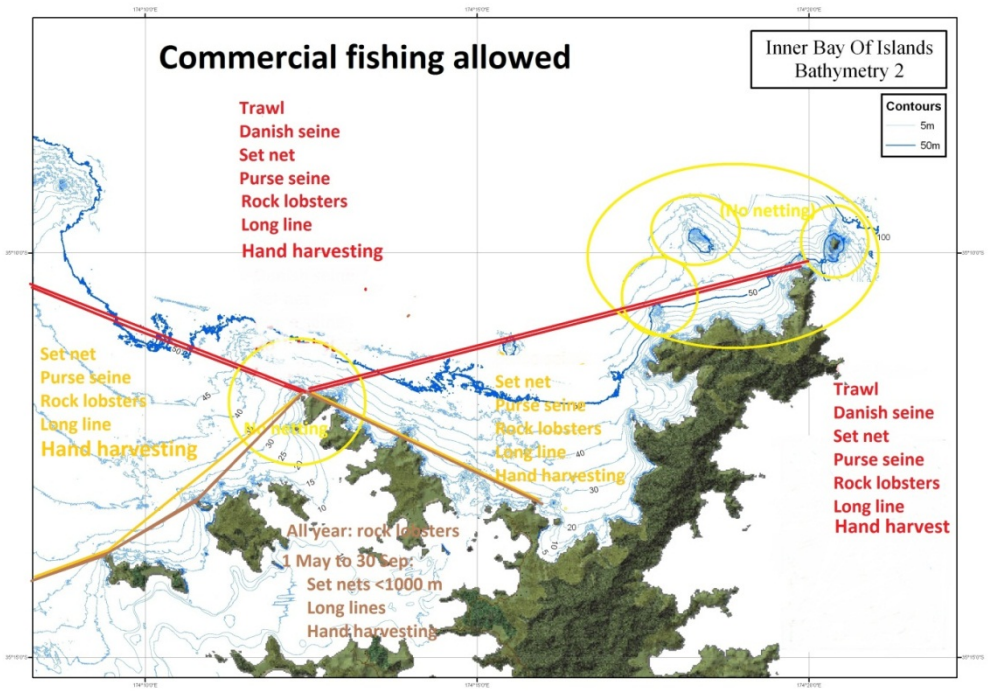


Figure 14. Commercial fishing permitted by those holding FMA 1 quota. (Also shown are specific no-netting areas that apply to both commercial and recreational fishers.)[9]

5.2 Recreational fishing

Recreational fishing interest – based on boat numbers from aerial surveys - for 2004-05 is shown in Figure 15. Highest boating (≡ fishing?) activity was north of Moturoa Island and near the Nine Pin for northern parts of the Bay; Whale Rock and north of Motuarohia were the hotspots for the southern part. Figure 16 shows similar data for 2011-12, with the same hotspots indicated but also with others suggested for southeast of Moturoa Island (these data require more detailed treatment).

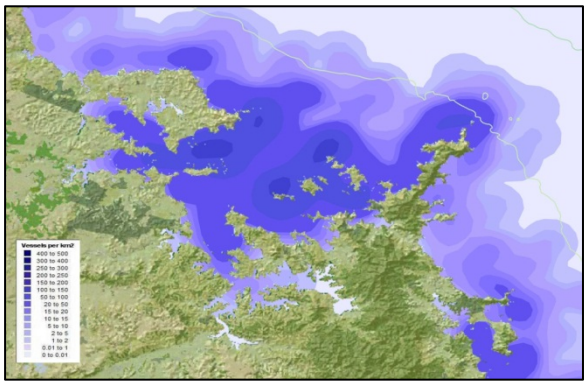
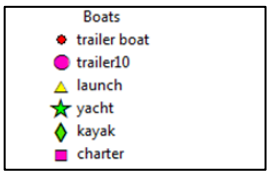
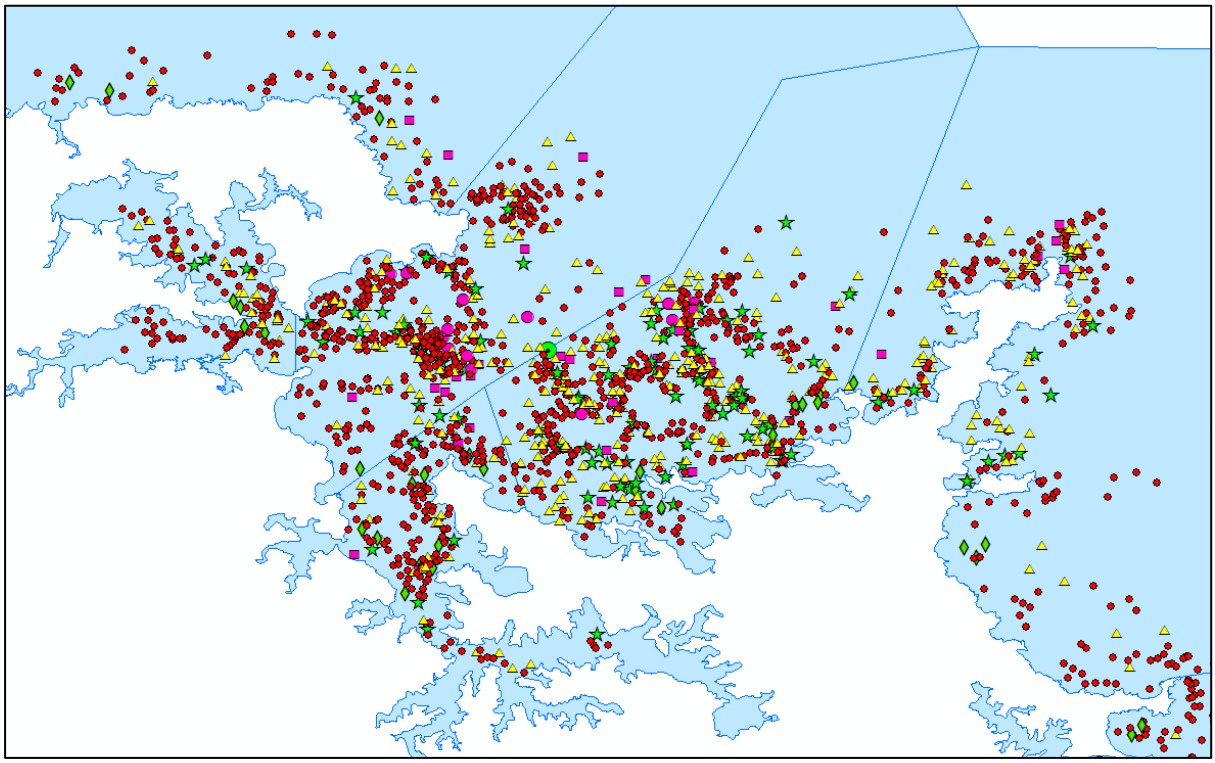


Figure 15 (left). Areas of recreational fishing interest (vessels per square kilometre) in the Bay of Islands, December 2004 to November 2005.[10]

Figure 16 (below). Similar data for December 2011 to November 2012.





5.3 Tourist operators and visitors/boaties

Although not necessarily exploiting sealife themselves, many tourist operators delight in their customers observing fishing activity – no more than at Cape Brett, where skippers will search to show their passengers someone playing a decent fish. Other places such as popular overnight anchorages – particularly at places like Oke Bay – are where visitors and boaties fish (Figures 17 and 18).

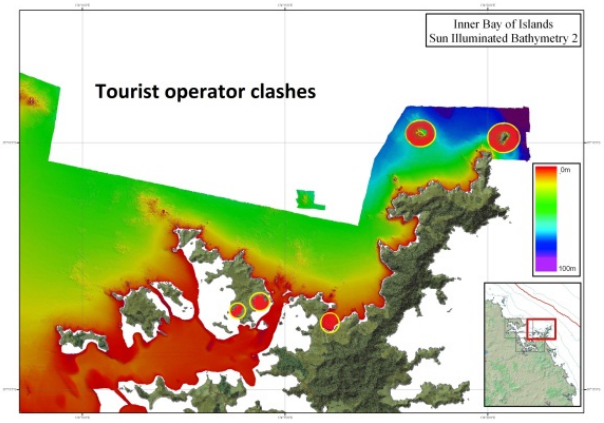


Figure 17. Anecdotally, where tourist operators and visitors/boaties might clash most with no-take MPAs in the eastern Bay of Islands.

6. Delineation, policing, ease-of-access

No-take MPAs that are easily defined, reasonably easily policed, and readily accessed score more highly than the opposite.[11] These are summarised in Figure 18 – but demand further discussion.

7. Gifts and gains

Establishing no-take MPAs in the Bay of Islands will not be without consequence – both biological and social. There will be gifts necessary from the community, but there will also be gains – both for society, and for the children of Tangaroa.

The main gifts (if you like, losses) are the forfeiture of one or more food cupboards for 25 years, and the fishing pressure being transferred to other (usually nearby) areas.

The most tangible gain is that we will have protected from exploitation for a generation representative ecosystems under the sea – in precisely the same way as we do on land. Steadily, the no-take areas will return to a more or less natural state, mauri restored. Our mokos will take their mokos to embrace the taonga of the realm of Tangaroa, thankful that their tupuna didn't let the opportunity to protect slip from them. At the same time there is likely to be enhanced fishing opportunity for species such as crayfish and snapper that move into surrounding areas through the process of spill-over. Any such benefit to fishers is welcome - but entirely coincidental according to leading no-take-MPA advocate Roger Grace – and other benefits to fisheries may be more significant. These include increased larval production, and the maintenance of genetic diversity because both large and small individuals – not just the small ones - contribute to reproduction.

A network of no-take MPAs in the eastern Bay of Islands will bring unprecedented economic opportunity - opportunities which must be captured by the immediate community: interpretation, guiding, diving, transport, accommodation, surveillance, and so on. They will also provide platforms for education and research (check Figure 12).

8. Summary: hitting the mark

The nature and complexity of the ecosystems contained within the Bay of Islands have been summarised, and an NZBS-type MPA hierarchy applied in a general way. Ease of definition, policing, and access have been (very briefly) considered, and minimising conflict with other users discussed. On all scores, Tangatapu Estuary, Waewaetorea (Okahu and Waewaetorea islands, and the northwest portion of Urupukapuka Island), and Maunganui Bay most hit the mark (Figure 18). Waewaetorea and Maunganui Bay (and probably Whangamumu) are all richly diverse in terms of depth, seafloor type,

special features, and so on. All three are also likely to bring significant spill-over benefits for such species as crayfish, snapper, and various reef fishes. A no-take MPA at Cape Brett is likely to generate a lot of opposition, and any spill-over is likely to be small because of the topography. Whangamumu is a bit of an unknown quantity: it is likely to have rich habitat diversity, but is hampered to some extent through difficulty of access – for both the public and the policeman. All areas fill the bill when linking the sea to the land and the people.

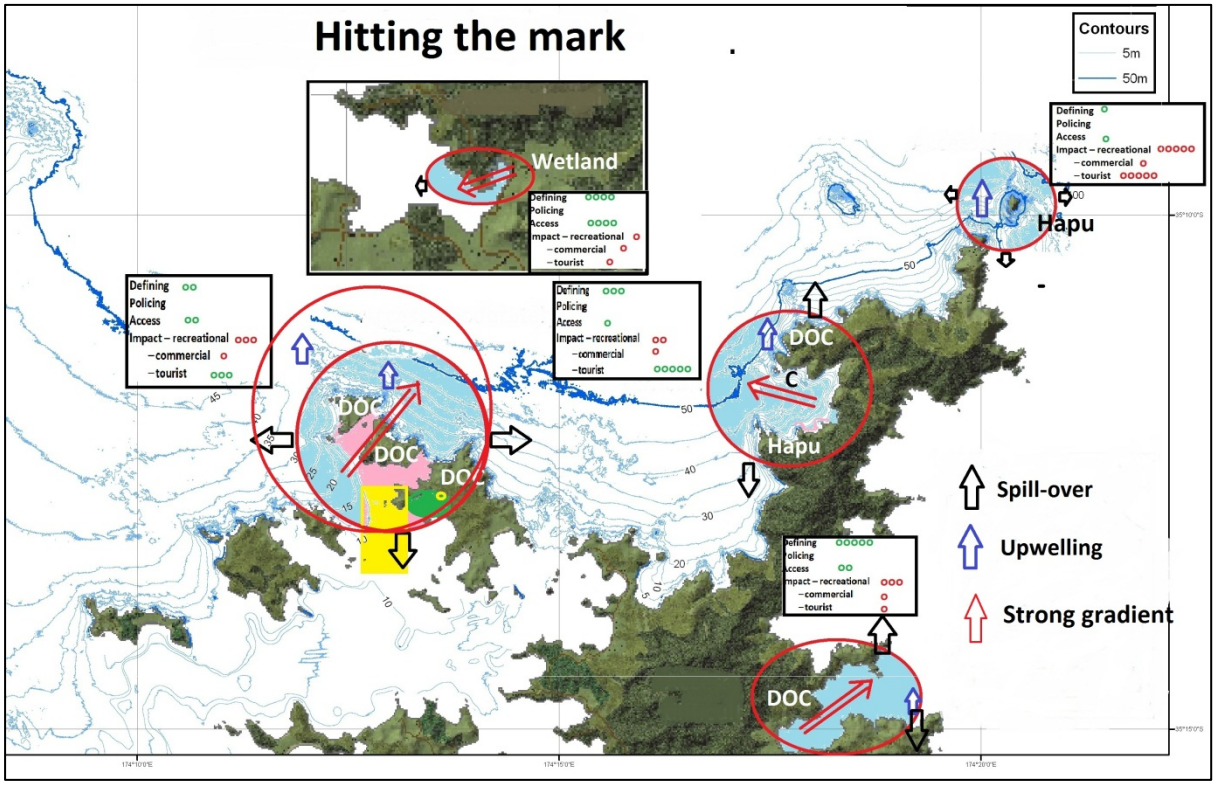


Figure 18. Summarising the pros and cons of various no-take MPAs (with generational review) in the eastern Bay of Islands. The box associated with each candidate areas gives estimates (out of 5) concerning how easy the site is to define, to police and to access. Also assessed is the level of conflict likely with existing users (5 circles being highest level of conflict). DOC/Hapu indicate surrounding land tenure. The larger circle around Waewaetorea takes in Whale Rock.

Should it be decided to go forward with Tangatapu, Waewaetorea and Maunganui Bay as candidate sites for no-take MPAs, quite a swag of NZBS habitat types are captured (Figure 19).

1. References

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[2]Bowden, D. & 4 others (2010). Bay of Islands OS20/20 survey report. Chapter 9: Seafloor assemblage and habitat assessment using DTIS. http://www.os2020.org.nz/bay-of-islands-coastal-survey-project/

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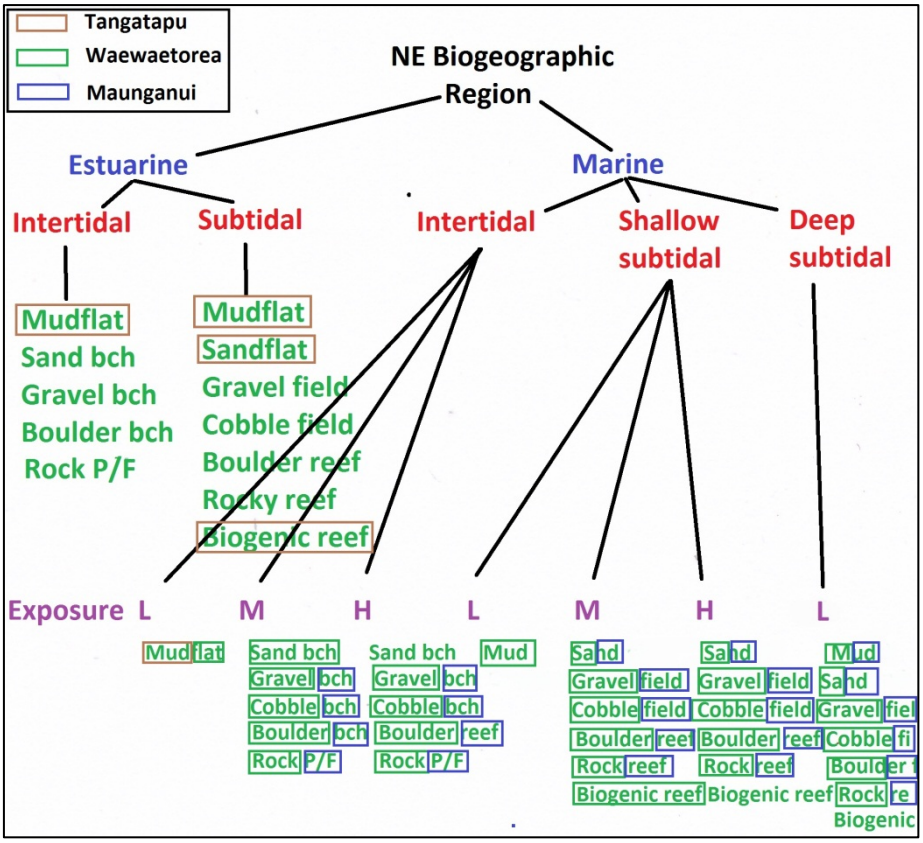

Figure 19. Just how well do our three candidate sites capture representative habitats under the New Zealand Biodiversity Strategy coastal classification scheme?[1] The boxed classes represent habitats present in Tangatapu, Waewaetorea and Maunganui Bay.

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