CARING FOR TE PĒWHAIRANGI – BAY OF ISLANDS

An Oceans Reform Case Study

Raewyn Peart

Environmental Defence Society

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Front cover image: Overlooking camping ground at Urupukapuka Bay, Urupukapuka Island

Back cover Image: Looking across from Waiwhapuku Bay on Moturua Island towards Motukiekie Island and beyond *(Dean Wright)*

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1 Introduction

Russell waterfront

In 2021, the Environmental Defence Society (EDS) embarked on a project to explore options for reform of Aotearoa New Zealand's oceans management system. Phase 1 was completed in May 2022 and examined the current system, identified problems with it, and developed options for reform. The options included new models for spatial protection, integrated management, legislative design and institutional arrangements.[1]

EDS is currently undertaking Phase 2 of the project which is focused on developing concrete recommendations for oceans reform. As part of that work, the Society is undertaking a series of case studies to obtain a better understanding of marine management challenges, how they are being responded to in practice, and the utility of options developed during Phase 1 of the project. This report sets out the findings of the Bay of Islands (Te Pēwhairangi) case study.

1.1 Methodology

The case study draws on a review of relevant literature, with much being written about the natural environment of the Bay of Islands, including by marine scientists who live locally and have undertaken a lot of research on a voluntary basis.

We also held discussions with 22 people with knowledge of and involvement in, the area. They included councillors and staff from Northland Regional Council and Biosecurity NZ, hapū members, scientists, tourism operators and members of environmental and community groups. In addition, we undertook a boat visit to the eastern Bay of Islands hosted by members of the Eastern Bay of Island Preservation Society.

Our discussions were held in confidence to encourage frankness. We would like to thank all those who generously gave their time to meet with us and show us around.

1.2 Structure of report

In Part One of this report we review the special biogeographic features of the Bay of Islands. In Part Two we briefly describe its discovery, settlement and marine activities undertaken in the area. In Part Three we set out the environmental challenges that the area is facing, including loss of kelp forests, depletion of some key fish stocks, sedimentation, decline in bottlenose dolphins, the Caulerpa invasion and climate change. We conclude in Part Four by identifying potential approaches to strengthening the response to these challenges.

Endnotes

1 See Severinsen G, R Peart, B Rollinson, T Turner and P Parson, 2022, *The breaking wave: Oceans reform in Aotearoa New Zealand*, Environmental Defence Society, Auckland

Ōkahu Passage between Waewaetōrea Island (right) and Ōkahu Island (left)

2 Biogeographic features

Purerua Peninsula

Te Pēwhairangi – the Bay of Islands is a large embayment, of around 290 km^2, on the east coast of Northland. It is book-ended by the rugged Cape Brett Peninsula to the north-east (with Rākaumangamanga being the highest mountain) and the Purerua Peninsula to the north-west (see Figure 2.1).

It formed when a series of deep river valleys were submerged by rising seas after the last ice age. The former hill tops and ridges form over 140 islands and undersea reef systems. The undulating coastline and islands form numerous estuaries, bays, sandy beaches, soft shores and rocky outcrops which provide "a wide variety and high diversity of biological habitats".[1]

> "Rākaumangamanga is the gathering of the canoes... It was to Rākaumangamanga that our ancestors were directed ... This was the place where we stepped ashore ... It was part of the Polynesian triangle with Rangiātea and Rapanui (Easter Island) ... [Our ancestors'] intrepid journeys have been captured for all time in the stories of Rākaumangamanga where the names of 7 of those waka are etched in each of the 7 hillocks that make up the Rākaumangamanga range."[2] (Clendon et al, 2021)

Clustered to the east of the Bay of Islands, on what is known as the Ipipiri Platform, is a group of islands including (from east to west) Urupukapuka, Waewaetōrea, Ōkahu, Motukiekie, Moturua and Motuarohia. These provide shallow, sheltered soft sediment habitats on their eastern coasts.[3]

Much of the rock in the Bay of Islands is ancient (Waipapa Terrane) greywacke, the oldest known rocks in the North Island. These are interspersed with small areas of more recent volcanic basalt.[4] The greywacke has been folded, deeply weathered and eroded over time. It forms steep hill country and deep clays which are prone to erosion.[5]

The Northland coast was multi-beam sonar mapped in 2008 and 2009, as part of the Oceans Survey 20/20, so more is known about this part the country's coastline than most other areas.

2.1 Subtropical East Auckland Current

The oceanic water in the Bay of Islands has subtropical origins. It emerges from the Coral Sea in northern Australia, flows south to Brisbane and across the Tasman Sea above North Cape, and then forms the East Auckland Current which flows down Northland's east coast along the edge of the continental shelf.[6]

Rākaumangamanga (Cape Brett)

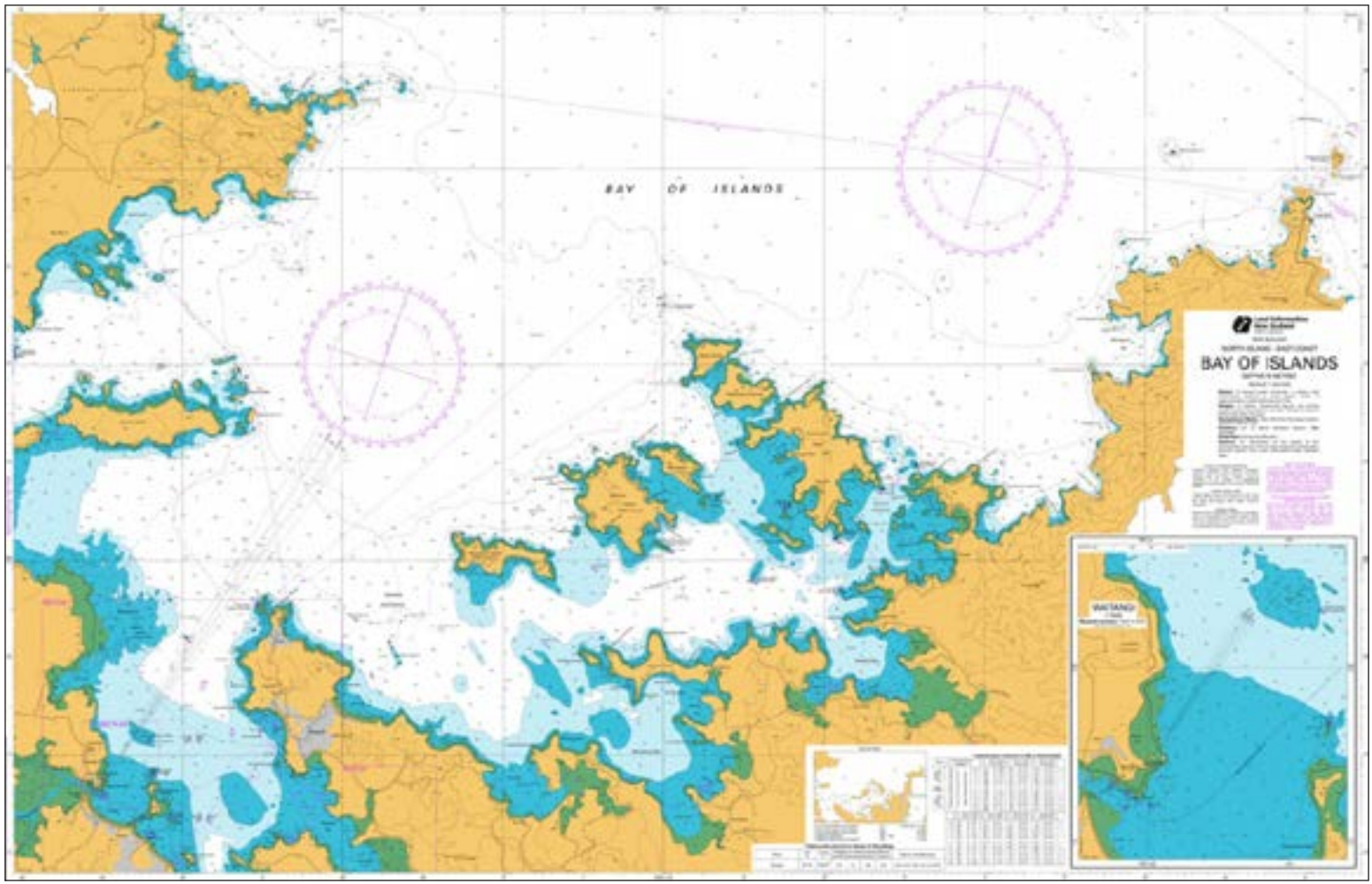

Figure 2.1: Nautical chart of the Bay of Islands *(Source: Land Information NZ)*

During spring and summer months, strong south-easterly winds can drive this clear, warm, dark-blue water close to the coast, bringing with it planktonic life-stages of subtropical species.[7] However, this appears to be occurring less frequently in recent years.[8] The East Auckland Current brings "a unique subtropical component" to marine life in the Northland Area.[9]

Cape Brett protrudes out into this warm, deep-blue water flow, and was thought to generate an eddy to the north-west, and a consequent anti-clockwise flow of clear, fresh, oceanic water around the inner Bay of Islands and back out to the open sea near Cape Brett.[10] This may not be happening now, with generally poor water quality in the inner Bay.[11] There is a localised upwelling of deep nutrient-rich seawater at the Cape itself,[12] the area being characterised by "enormous schools of surface feeding fish, which attract larger fish and marine mammals close to shore".[13]

> "The area around Motukōkako [Piercy Island] and Cape Brett is a significant national and regional upwelling area … Productivity levels … are among the highest in NZ fuelling the shelf and coastal ecosystems."[14] (Stirnemann, 2021)

> "Even up to the 1960s the ranga ika ('work-ups') of kahawai, warehunga, maomao, trevally, tuna/albacore and marlin were acres in size. That is why the marlin come in, you could just about walk on the fish when they were boiling up."[15] (Clendon et al, 2021)

Boil up in the outer Bay of Islands, with Rākaumangamanga (Cape Brett) in the distance

2.2 Extensive rocky reefs

The Northland coast is characterised by unusually expansive rocky reef systems, which extend right out to the edge of the continental shelf (see Figure 2.2). These include a very large reef system to the south-east of Cape Brett (extending out more than 17 km) and another large reef system to the north-east of Cape Wiwiki on the Purerua Peninsula. There are also large reef systems extending north-east from Urupukapuka, Waewaetōrea and Ōkahu islands into the Bay of Islands proper.

Most of these reefs are exposed to open oceanic water and wave conditions. The hard rocky areas are interspersed with large soft sediment plains. They support diverse fauna including a wide variety of sponges, corals, bryozoans and hydroids.[16]

> "Eastern Bay of Islands and Cape Brett is exceptionally diverse and has some of the best examples of coastal rocky reef communities in Northland".[17] (Northland Regional Council)

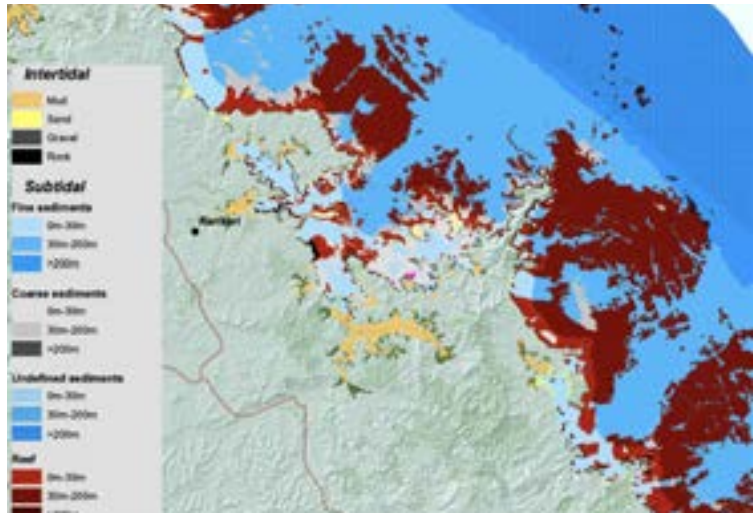

Figure 2.2: Marine habitats in the Bay of Islands and surrounding coast *(Source: Department of Conservation)*[18]

2.3 Seagrass and turfing algal beds

The Ipipiri Platform (where the cluster of islands is located) has clear, well-mixed seawater due to its close proximity to deep water, the high current speeds in the area, and its distance from sediment generating sources (especially the Taumārere catchment).[19] This provides a rare environment which is dominated by coralline red-algae turf interspersed with subtidal seagrass beds.[20]

Ipipiri Platform (Dean Wright)

These extensive beds of coral-like algae are unique in New Zealand and possibly the world.[21] There are also nine subtidal seagrass beds around the islands.[22] These provide important juvenile habitat for snapper, parore, trevally, piper, leatherjacket and pipefish[23] and the sandy substrate (until recently) supported important scallop beds.[24]

> "The number of fish species you could see was incredible. There were kahawai chasing the takeke (piper), warehunga (kingfish) chasing the kahawai; you could watch them all around Ipipiri."[25] (Clendon et al, 2021)

2.4 Rhodolith beds

Rhodoliths are red algae which form hard stony coral-like structures due to the calcium carbonate in their cell walls. Although sitting on the seafloor, they are not attached to it. They thrive in areas where there is sufficient water movement to avoid being smothered by sediment but not so much as to lift them off the seafloor.

Rhodoliths form branching structures that support a high diversity and abundance of marine life.[26] The Oceans Survey 20/20 found that these beds hosted the highest number of species of all soft sediment habitats in the Bay of Islands.[27] They provide nursery areas for juvenile fish (including commercially harvested species), settlement habitat for shellfish larvae, and hard surfaces for other seaweeds to grow on. They are important primary producers, stabilise sediment, and sequester carbon into their structures.[28]

There are two large rhodolith beds in the Bay of Islands, one on the point at Kahuwhera Bay (on the south-west side of Manawaora Bay), and the other south of Te Miko Reef between Moturua and Motuarohia Islands. A 2012 study of the beds found 280 different marine species within them, including several which were rare and previously undescribed. In total, there were 187 invertebrate, 88 marine plant and 5 fish species.[29]

The Kahuwhera Reef bed is the one most at risk due to high sediment flows entering Te Rāwhiti Inlet from the Taumārere (Kawakawa) River. If the rhodoliths are buried in sediment, they are unable to photosynthesize. They can also be damaged by dredging and anchoring, and take a long time to recover, given their extremely slow growth rates.[30]

2.5 Diversity of marine life

The diversity of marine life in the Bay of Islands is extraordinary. For a start, it likely has the most diverse array of molluscs (shellfish, snails and octopuses) of any similar sized area in the country, with 551 species recorded in the 1990s.[31]

But there is also a wide variety of fish. The relatively steep sloping reefs along the sheltered west coast of the long finger of land leading out to Cape Brett, have clear, deep waters which are a hotspot for subtropical species. They support "some of the highest diversity of reef fish in Northland, second only to Poor Knights Islands".[32] A total of 93 fish species has been recorded there, of which over a third are subtropical or tropical.[33]

Within the large, deep underwater cave at Motukōkako can be found snapper, butterfly perch, demoiselles, blue maomao, golden snapper, resident stingrays, Lord Howe coralfish, mado and yellow-banded perch. Just outside the cave are sweep, silver drummer, butterfish, kahawai, kingfish, half-banded perch and butterfly perch.[34]

Spotlight on Motukōkako Island

Motukōkako is the "sentinel and guardian of Rākaumangamanga and the inner reaches of Ipipiri … It was the lookout for waka taua (enemy canoes) on their forays. Ngāpuhi left from Kororipo Pā, via Motukōkako, the site of karakia before forays of utu. They went to Manawahuna, a cave where drips of water baptised them, and then through the hole in the rock, to get the blessing for the venture."[35] (Clendon et al, 2021)

The island is an important seabird breeding location. During the 19th and early 20th centuries birders took up to 500 ōī (grey-faced petrels) from there each season.[36] But they subsequently declined with a 1987 survey estimating a breeding population of only 200-300 pairs.[37] Hapū put this down to a massive increase in trawling, during the 1970s, and later purse seiners. "After that there was a serious decline in ōī (muttonbirds), to the extent that we were no longer able to harvest them … Without the large and frequent ranga ika ('work ups') our seabirds cannot feed well. Without abundant seabirds the cycling of the nutrients to the whenua is interrupted and our ngahere (forests), its inhabitants and wairua are diminished."[38]

Strong tidal currents stream through the narrow passages, that lie between the numerous islands and rocky stacks in the Bay, creating favourable conditions for a wide variety of marine life that feed on plankton. Carved out of the rock are many caves, arches and narrow slots that support a high diversity of marine life. For example, the

Motukōkako (Piercy Island)

sheltered rock walls between Cape Brett and Ōtuwhanga Island are covered in orange golf ball sponges, yellow, orange and green encrusting sponges, a variety of jewel anemones, branching bryozoans, common anemones and coralline turfs.[39]

A wide variety of marine mammals visit the Bay of Islands. A vessel undertaking research between 2012 and 2015 observed bottlenose dolphin, common dolphin, orca, Bryde's whale, humpback whale, false killer whale, pilot whale, blue whale, fin whale and fur seal. Bottlenose dolphins were by far the most common marine mammal species observed, followed by fur seals.[40] Orca hunt eagle rays which feed on cockles in the shallows.

The area is also important for seabirds, which roost on the many rocky islets and stacks. Key seabird sites include Tāpeka Point, Urupukapuka Island, Mahenotapuku (Bird Rock), Black Rocks, Tikitiki Island (Ninepin island), Motukōkako Island, Moturua Island and Cape Brett.[41] Both grey faced and black-winged petrels breed on Motukōkako. Cape Brett supports a breeding colony of hundreds of red-billed gulls. They also breed at Tāpeka Point where there are around 119 nests. There is a gannet colony on Tikitiki Island with some 75 breeding pairs.[42] Black Rocks is probably the most important seabird area in the Bay, with 10 species known to breed there in recent times including red-billed and black-back gulls.[43]

Spotlight on Significant Ecological Marine Areas

The Northland Regional Plan identifies a number of Significant Ecological Marine Areas in the Bay of Islands (see Figure 2.3). They include extensive reef areas, the Waitangi and Te Haumi estuaries, Waikino Inlet, Parekura Bay and a shellfish bed in the Pickmere Channel in the Kerikeri Inlet.

The work to identify the significant areas was led by marine ecologist Vince Kerr, who had earlier completed marine habitat maps for Northland based on the Oceans 20/20 survey data. He worked with an expert group of ecologists to develop criteria to evaluate the habitat information. The Significant Ecological Marine Areas are relevant to resource consents, with rules in the Plan designed to prevent a range of destructive activities impacting on them. However, the rules do not restrict fishing activity, including trawling and dredging. Trawling is currently prohibited within the Bay of Islands itself, but not on the outer reefs. Dredging is not currently taking place, due to the scallop closure, but could re-commence should that fishery re-open.

Figure 2.3: Significant Ecological Marine Areas in the Bay of Islands *(shown by cross-hatched area)* ***(Source: Northland Regional Council)***

2.6 Extensive catchments

Four main river systems flow into the Bay of Islands draining a total catchment area of some 1,294 km^2.[44] They are:

- The Kerikeri River which flows into the Kerikeri Inlet to the north-west of the Bay of Islands
- The Waitangi River which flows into the Veronica Channel near Waitangi in the south-west

- The Taumārere River which flows into the Waikare Inlet, near Ōpua, in the south

- The Waikare River which also flows into the Waikare Inlet but further to the south-east.

Kerikeri Inlet (Dean Wright)

Of all these, the Taumārere catchment is the largest, comprising over 500km^2 and extending south-eastwards all the way to the Hikurangi wetland just north of Whangārei (see Figure 2.4).[45]

Figure 2.4: Bay of Islands freshwater management unit ***(Source: Northland Regional Council)***

Eastern Bay of Islands

Rocky reefs off Urupukapuka Island

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3 Discovery and settlement

Paihia

3.1 Early settlement sites

The Bay of Islands was one of the early areas settled by the Polynesian voyagers who discovered Aotearoa. The earliest discovered human-related item, a rock oyster valve located at Mangahāwea Bay on Moturua Island, has been radio-carbon dated to between 1268 and 1356 AD (see spotlight).[1]

Spotlight on early settlement at Mangahāwea Bay[2]

Mangahāwea Bay, located on the northwest corner of Moturua Island, is one of the earliest known settlement sites in the Bay of Islands. Mangahāwea has a small sandy beach, fringed with rocky reefs to the north-west, which connect to the small island of Motu Rangiātea. The name of the Bay references a 're-adzed' waka hourua (double-hulled ocean-going canoe)[3] highlighting its close relationship with the Pacific voyaging tradition. Archaeological excavations undertaken under the leadership of Ngāti Kuta, along with oral histories passed down by descendants of Te Kemara who lived on the island, tell of a fascinating history of centuries of continuous occupation.

The earliest settlement layer contains remains of moa, seal and the Cook Strait limpet, all species which soon became extinct from the area after first human settlement. There is also early evidence of taro gardens. The find of a pā kahawai (fishing lure) of Polynesian design in this layer provides evidence of the presence on the island of early settlers from Polynesia.

Mangahāwea Bay, Moturua Island

The middle layer highlights extensive trading links with other regions of the country, with obsidian from Mayor Island, chert from the Whangārei area, and argillite from the Marlborough region all present. The upper layer dates to the 19th Century and includes European artifacts as well as evidence of potato cultivation.

In 1968, Moturua Island was purchased from its Māori owners (through the Māori Trustee), and it subsequently became part of the Bay of Islands Maritime and Historic Park. Prior to the land sale,

the Clendon family (associated with Ngāti Kuta) lived on the island, farming it and commercially harvesting rock lobster. The family was forced off the island, when a 1967 revaluation increased its value from 3,500 to 30,000 pounds, making the rates unaffordable. It was subsequently re-zoned to 'public open space'.[4]

Prior to the revaluation, Matu Clendon had hoped to purchase the land from the other shareholders. But that did not prove possible once the land value increased. His father had lived on the island for almost 30 years, and became homeless, aged 73. He died the following year. Clendon has lodged a Waitangi claim for the island's return but at age 86 is not hopeful of this happening during his lifetime. He has moved back onto the island illegally, living in a tiny off-grid house, in order to highlight the claim.[5]

It seems likely that the outer islands in the Bay of Islands were settled first, with the population subsequently moving westwards and inland.[6] Fur seals and New Zealand sea lions were once prolific on the coast and provided an accessible source of protein for the early settlers. But these quickly declined under harvesting pressure and disappeared entirely by 1500.[7]

The Waitangi area became a major population centre for early Māori, focused on an inland "food bowl" centred between Waimate North, Ōhaeawai and Puketona, due to the fertile volcanic soils suited to kumara and taro cultivation. Large garden areas were established interspersed amongst native forest and scrub.[8] The Kerikeri and Te Puna areas were also heavily settled. It has been estimated that, by 1750, the Bay of Islands had a Māori population of around 10,000.[9]

Waka at Waitangi

Kororāreka – Russell waterfront

Despite this large population, for which seafood was a major part of the diet, harvesting appears to have had little long-term impact on fish and shellfish resources.[10] Access to fisheries was strictly controlled and carefully managed by hapū. Fish were taken from different locations, over time, and smaller fish were harvested to retain the larger breeding stock.[11] This is in stark contrast to the current approach, under the quota management system, where bigger fish are intentionally fished down to release food supplies for the faster growing (but less productive) smaller fish.

"It is important to understand that as a hapū that is surrounded by the moana, the moana is part of everything we do and is often a part of the reasons why we do things. Our day-to-day life was governed by the tides, by the ability to gather kaimoana and by the tohu that we would receive from the wai."[12] (Rameka, 2021)

3.2 Rise of Ngāpuhi

By the late 1700s to early 1800s, the numerous hapū established in the area had coalesced into three broad alliances, with conflicts erupting between them from time to time. The northern alliance comprised hapū of Kaikohe, Waimate, Kerikeri and areas to the north. The southern alliance comprised hapū from Taiamai, Kororāreka (Russell), Paihia, Kawakawa and Waikare. The third arm of the 'political triangle' was the Ngāre Raumati confederation which had major settlements on the eastern side of Pāroa Bay (to the south-east of Russell) and on Moturua Island.[13]

Site of the first European mission station at Rangihoua Bay

The first European missionary station was established at Hohi in Rangihoua Bay, in 1814, with a second mission built at Kerikeri in 1819. Both were under the protectorate of the northern alliance (which was at that time referred to as Ngāpuhi). This gave these hapū greater access to European trading goods and enabled them to overpower Ngāre Raumati (in 1826) and to take Kororāreka (in 1830). This then gave the northern alliance control of all the main trading ports in the Bay of Islands. About the same time, the name Ngāpuhi was extended to hapū in the southern alliance.[14] The founding ancestor of Ngāpuhi is Rāhiri, who was born in the Hokianga area, and was descended from the captains of the *Matawhaorua, Ngātokimatawhaorua* and *Mataatua* canoes.[15]

Ngāpuhi were at the centre of major political developments leading up to the early formation of the nation. In 1835, 35 northern rangatira signed the Declaration of Independence which asserted Māori sovereignty over Aotearoa. Ngāpuhi rangatira were at the forefront of dealings with the British Crown over Te Tiriti o Waitangi/Treaty of Waitangi (Te Tiriti), with 43 rangatira signing Te Tiriti on 6 February 1840 at Waitangi and a further 100 signing over the following months.[16]

War broke out between Ngāpuhi and the British colonists in 1845 (the 'northern war'). Although winning many battles through innovative tactics, the Ngāpuhi warriors were unable to sustain their effort against the British fighters, who were more numerous and had superior arms. In the wake of defeat, Ngāpuhi lost much of their land. This was initially through pre-Treaty purchases claimed by Europeans, then the taking of 'surplus land' by the Crown and then dubious Crown purchases. It was followed by the individualisation of title through the Native Land Court which led to further sales. By 1908, just 61,000 ha remained in Māori hands".[17]

Today, Ngāpuhi and its constituent hapū dominate the Bay of Islands area, with Ngātiwai also having interests in the southern coastal area. Ngāpuhi is the largest tribe in the country with (in 2023) 184,470 people affiliated with it. Less than a quarter (22 per cent) still live in Northland with an additional 38 per cent located in Auckland.[18]

Ngāpuhi has identified eight takiwā (areas) within its overall rohe. Two surround the Bay of Islands area: in the north-western takiwā there are 26 hapū and in the south-eastern a further eight (totalling 34) (see Appendix). Each hapū has its own unique history and relationship with the Bay of Islands area. Two hapū groupings have gazetted rohe moana over the Bay of Islands; Ngā Hapū o Taiamai ki te Marangi in the north-west and Ngāti Kuta/Patukeha (Te Rāwhiti marae) to the south-west (see Figure 3.1).

Figure 3.1: Gazetted rohe moana in the Bay of Islands area ***(Source: NABIS)***

Ngāpuhi have yet to reach a settlement with the Crown over Te Tiriti grievances, but the tribal grouping is a recipient of fisheries settlement quota. Te Rūnanga-Ā-Iwi-Ō-Ngāpuhi is the government-mandated iwi organisation for Ngāpuhi under the Māori Fisheries Act 2004. It is the largest shareholder in Moana New Zealand (holding 12.6% of the income shares valued at $25 million).[19] In addition, its income derived from quota holdings totals more than $2 million annually.[20]

Spotlight on Ngāti Kuta

The whānau of Ngāti Kuta lived and farmed at Te Rāwhiti, and on many of the islands in the Bay, including Urupukapuka, Moturua, Motukiekie, Ōkahu and Waewaetōrea. They undertook extensive trading with early European settlers, supplying vegetables from vast gardens and dried fish from the abundant fishery, harvesting flax for rope-making, participating in whaling, and supplying fresh water to visiting ships.[21]

Ngāti Kuta have lost much of their customary land but have retained Motukōkako (Piercy Island) and 1500 ha of land on Rākaumangamanga (Cape Brett). The Cape Brett land is managed by a Māori Land Trust and is protected under a 25-year Ngā Whenua Rāhui kawenata. The Trust has been undertaking extensive pest control on the land and in 2020 won the Te Tira Whakamātaki Māori Award for its work.[22]

Moturua Island (Dean Wright)

During the 1940s, Ngāti Kuta whānau lived on Moturua Island and farmed other islands (Motukiekie, Ōkahu and Waewaetōrea). Until the 1970s, they operated as commercial fishers, with six or seven small clinker boats powered by seagull motors unloading catches at Russell and Ōpua daily. They were hand-lining for snapper, kahawai and tarakihi, netting for mullet and flounder, and setting crayfish pots around Cape Brett. At that time the fisheries were plentiful.[23]

3.3 European settlement

During the 1830s, after the establishment of the early missions, the Bay of Islands became a favoured place for American and other whaling ships to provision during their multi-year whaling expeditions to the South Pacific. For example, in 1838 the Bay hosted 54 American, 14 British, 18 French and 10 Australian ships. Kororāreka developed into a bustling town servicing the whalers' needs along with those of a mix of seafarers, merchants and adventurers. This created valuable trade opportunities for hapū, with locally grown and harvested food being exchanged for a range of European goods.[24]

Once Te Tiriti was signed, in 1840, the capital for the new colony was established at Ōkiato Point (near where the car ferry for Ōpua disembarks) and named Russell. However, the capital was moved to Auckland in 1841 (before moving again to Wellington in 1865) and the settlement was razed to the ground. The name Russell was moved to nearby Kororāreka where it remains.[25]

Today, the Bay of Islands is characterised by a series of small settlements along the Bay's edge. Historic Russell (and nearby Tāpeka Point) has retained a small static resident population of around 800 over the past 30 years, but this swells in summer to more than 3,000. Growth has been impeded by poor vehicle access (which is either by car ferry from Ōpua or a long windy road) and the limited capacity of the town's infrastructure. There is little land in Russell for further development but new houses have been built in surrounding areas including Tāpeka Point.

Russell looking out towards Cape Brett (Dean Wright)

Paihia, which has become the centre of the local tourism industry, has double the number of residents (at around 1,600). Nearby Ōpua has developed more recently and has an additional 1,200. There is a notable Māori presence at Rāwhiti where the population of just over 700 is 66 per cent Māori.[26] These settlements are all outstripped by Kerikeri to the north, which has doubled in size over the past 30 years, and now has over 8,000 residents.

One side effect of urbanisation in the Bay of Islands has been the generation of plastic waste. It is estimated that more than 1.8 million items of litter from Kerikeri's urban stormwater network enters the marine area each year, of which two-thirds are plastics.[27]

Settlement on Tāpeka Point (Craig Potton)

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4 Marine activities

Awaawaroa Bay, Moturua Island

4.1 Tourism

"The strength of the tourist economy in the Bay of Islands is built on its natural character… People expect to see the natural character in all its glory, including a living sea. The biodiversity has got to be maintained at a level that can sustain that sort of interaction with the public … A drop in fish abundance and other marine life limits our economic development."[1] (Clendon et al, 2021)

"The best way to protect our nature is tourism." (Interviewee, 2025)

The Bay of Islands has been a popular destination for tourists for over a century. Paihia first developed as a holiday destination when the Whangārei-Russell Road opened during the 1930s, with cars punted across the Veronica Channel to Paihia. As road access improved, the number of visitors increased, but tourism infrastructure remained rudimentary. For example, in 1959, although Paihia had camping grounds there were no motels and only four shops.[2]

"Paihia is the tourist heart of the Bay of Islands."[3] (Northland Regional Council, 2014)

From the mid-1960s, tourism took off, supported by the provision of a reticulated water supply from the Waitangi River. Paihia became the busiest tourist town in Northland, being particularly popular with Auckland visitors. The number of visitor beds in the town tripled, from 260 in 1914, to 910 in 1975. But then growth stalled due to the lack of a sewerage system.[4] A wastewater treatment plant was eventually built in the 1980s, in the Waitangi Forest, with drainage into the Waitangi wetland system and eventually into the Kerikeri Inlet.

The Bay of Islands Maritime and Historic Park was established in 1978 "to promote the area's recreational attractions and protect its special character".[5] The Park included a variety of scenic, recreational and historic reserves along with several islands in the Bay of Islands and along the broader Northland coast from Whangaruru Harbour to Whangaroa Harbour. When the Department of Conservation (DOC) was formed in 1987 it took over management of the reserve land. In 1989, when all park boards were replaced with conservation boards, the Maritime and Historic Park Board was disbanded.

Visitor numbers in the Bay of Islands increased again during the early 1990s, which was when 'swim with dolphin' tourism first started (in 1991). But then visitation declined after a peak in 1995. A 2000 report noted that, at this time, visitors were still overwhelmingly domestic and mainly from the Auckland area. The international visitors that did visit were most interested in heritage aspects, whereas domestic tourists were seeking "sun, sea and sand".[6] Tourism was highly seasonal, with one large tourism operator indicating that 75 per cent of its total turnover was earned between November and March.[7] This made it difficult to maintain a regular

workforce, and the spikes in visitor numbers put pressure on water and sewage reticulation systems.

One result of this was ongoing sewage spills into the marine area. One (of many incidents) occurred in February 2006 when the town was crowded with tourists. A broken line dumped 700,000 litres of raw effluent into the Waitangi Estuary, and through a communications failure, it appears that swimmers and tourist operators were initially unaware of the spill. The Council had to truck Paihia's sewage to the treatment plant until the pipe could be repaired.[8] With beach closures and sewage trucks on the road, it was not a good look for visitors.

International tourism to the area was buoyed up, for a time, by significant growth in the backpacker market which commenced in the early 2000s.[9] But a 2015 study noted that tourism in Paihia and Waitangi was still facing issues and stagnating. Problems included the short summer tourism season, the need to upgrade tourism facilities, and the lack of promotion strategies.[10]

Tourists visiting the Waitangi Treaty Grounds

Other problems noted were pollution in the Waitangi area (presumably from ongoing problems with the poorly performing sewerage plant, but also likely from sediment turning the water brown after heavy rain, which we observed during our visit to the area). In addition, poor maintenance of tourism facilities limited coastal tourism opportunities associated with Waitangi Beach and cultural heritage sites near the Waitangi grounds. On top of this was the "short-term coastal defence strategies" in the area, which detracted from the tourist experience and meant some beaches could not be used for recreational activities.[11]

Paihia sea-frontage with rock walls and sediment-laden seawater

The authors of the 2015 report were not sure what the future would hold. The local tourism industry might rejuvenate if the much-discussed upgrade of the Paihia waterfront went ahead. But there was a lack of funding from regional and local councils to upgrade the area's tourism facilities and infrastructure.[12]

Another particular issue noted by the 2015 report was a lack of promotion of the Bay of Islands to international tourists and the fact that it was rare for tourism businesses to come together to promote the area.[13] We were told that Northland Inc, the Northland Regional Tourism Organisation jointly owned by Northland Regional Council, Far North District Council and Kaipara District Council, does not use the Bay of Islands brand. For a time, local operators collectively put in $250,000 a year to promote the Bay of Islands to the domestic market. But this initiative was put into hibernation during the Covid years and has yet to be resurrected.[14]

A further constraint on industry growth has been the limited amount of tourism accommodation available in the area which has been static over recent years. We were told there has been a reduction in hotel accommodation but more AirBnBs are being established as "people retire up here and want an AirBnB flat under their house".[15]

> "The Bay of Islands has not seen the tourism growth that has occurred in other areas of New Zealand. Until we have more accommodation there will not be mass tourism here". (Interviewee, 2025)

In recent years, the tourism industry has been buoyed up by cruise ship visits which have helped overcome the lack of onshore accommodation. The largest ship visiting, *Ovation of the Seas*, can hold over 4,000 passengers.[16] The number of cruise ships visiting pre-Covid peaked at 65 during the 2018-19 season. A total of 74 were booked in for the following year but 19 were unable to visit due to the Covid lockdown.[17]

These figures have been outstripped more recently, with 92 visits booked for the 2023/24 season, and 87 ships arriving (with non-arrivals usually due to bad weather). These visits, along with three to Whangārei, were calculated to have brought almost $70 million into the Northland regional economy.[18] However, the country has now become less popular for cruise ship visits (due to higher costs and possibly biofouling regulations) with only 47 visits to the Bay of Islands booked for the 2025/26 season or around half the number two years previously.[19] It is not clear whether visits will further decline. This is likely to have a significant impact on the local tourism industry that has become increasingly reliant on cruise ships.

A significant segment of the Bay of Islands tourism industry consists of boat tours. We were told this mainly attracts overseas tourists "as most kiwis have their own boat or know someone who owns a boat".[20] It is also seasonal, and dependent on weather conditions, with boats largely out of operation from April to September. In addition, one of the key attractions for tourists has been the ability to view and swim with dolphins, but tourism activity (in turn) has led to a significant decline in the number of dolphins using the Bay (see Chapter 8).

Cruise ship anchored off Waitangi

Bay of Islands boat tour

There has also been a recent downturn in the number of gamefish charter fishing operators, attributed to stricter maritime safety regulations (and therefore costs), and a change in rules around the ability to claim running costs against tax.[21]

In the mid 2010s, the backpacker market took a dive, due to a decline in the international economy.[22] This was followed by the Covid-19 border closures and lockdowns. This meant "there was basically no tourism market in the Bay of Islands" during this period.[23] Then there was Cyclone Gabrielle in February 2023, which closed the main route between Auckland and Northland over the Brynderwyns.

> "Bay businesses have been doing it tough for the past four years ... the Covid pandemic, cyclones and extreme weather events, road closures such as State Highway 1 over the Brynderwyns, and the cost of living crisis had all hit hard."[24] (Parker, 2024)

Post-Covid, more retirees have been visiting the Bay of Islands, and they have a stronger interest in learning about marine life and sustainability than the former backpackers.[25] This creates an excellent opportunity to expand marine ecotourism activities in the area and to build on the aspiration to regenerate the marine environment set out in the Northland Destination Management Plan (see spotlight).

"After Covid we started to get more of the retiree "bucket list" person in the 65-75 age bracket. That is where the growth is currently. They are very keen on sustainability and learning and also super excited to see the dolphins." (Interviewee, 2025)

Spotlight on the Northland Destination Management Plan

Recognising the link between environmental stewardship and a thriving tourism industry, the Northland Destination Management Plan highlights as an action to "Regenerate Taitokerau Northland's coastal and marine environment" with the objective "To preserve and replenish the marine environment through significantly increased use of rāhui, mātaitai, taiāpure and marine reserves, leading to a healthy ecosystem."[26]

An upgrade of the Paihia waterfront has been on the cards for at least two decades. A $20 million upgrade was first announced in May 2006, with Far North Holdings (the commercial arm of Far North District Council) lodging consent applications, stating they had been preceded by 10 years of research and five years of consultation.[27]

It was an ambitious plan including artificial reefs, a new beach, reclamation for a new helipad, new berths for tourism vessels and visiting boats, new board walks, viewing decks, a visitor information centre and a tour bus terminus amongst other things.[28] It was intended to help Paihia compete with Queenstown as a tourist destination and was to be the "most extensive waterfront redevelopment programme ever initiated in the Far North". In terms of paying for it, the Council was planning to ask other agencies to help foot the bill.[29]

Consent was granted for the project in 2010, for a slightly altered design,[30] but then the project was scrapped in the wake of the 2008 Financial Crisis. A scaled back version (costed at around $14 million) was revived in 2020 to seek Provincial Growth Fund money for 'shovel ready' projects following the Covid pandemic. This was more strongly focused on addressing coastal erosion and storm impacts rather than promoting the tourism industry.

Government agreed to provide $8 million to build three solid breakwater structures to protect Pahia from storms and to dredge the navigational channel. One breakwater connected the reefs between Motumaire and Taylor Islands, a second ran from the south-west point of Motumaire Island and a third extended towards the Island from Nihinui Point at the western end of the beach. Far North District Council committed $5.84 million to build an additional breakwater on the eastern end of the beach, replenish the beach and create new waterfront recreation areas.[31]

However, in January 2022 this project was also canned by Council, due to escalating construction costs and environmental impacts. There had been significant opposition from the community, along with Ngāti Rahiri and Ngāti Kawa, with more than 4,000 signing a petition to stop the construction.[32] It has now been replaced by a much more modest $2 million waterfront upgrade which is focused on refreshing lighting, seating and deck areas.[33]

This still leaves the issue of coastal erosion, along with the need for a significant upgrade of tourist facilities. Far North District Council spent more than $700,000 between 1997 and 2021 on cleaning up the waterfront after storm events which typically now occur annually.[34] The waterfront is increasingly exposed to climate change impacts (storm surges, sea level rise and extreme weather events) and there is currently no credible plan to deal with these into the future.

Paihia's retail centre

4.2 Oyster farming

Only oysters are farmed in the waters of the Bay of Islands. The bulk of the farms are dotted along the Waikare Inlet and clustered in Ōrongo Bay. There is also a scattering in Kerikeri Inlet, Te Puna Inlet and Poukoura Inlet to the north (see Figure 4.1).

The first European commercial fishery in the Bay of Islands was based on the harvest of wild rock oysters, which began in the mid-1800s, and boomed once a regular steamer service was established to the Auckland market in 1872.[35] Once depletion became quickly evident, the fishery was

overseen by the Marine Department, which marketed close to 2,000 sacks of Bay of Islands oysters each year, between 1912 and 1973. At its peak in 1914, the harvest was close to 6000 sacks. Oysters were also the subject of concerted enhancement efforts, with kilometres of rock wall being established along soft shores to create additional oyster habitat.[36]

With the decline of wild stocks, which were under heavy harvesting pressure, attention turned to farming the shellfish. The first trial oyster farm nationwide was established in Ōrongo Bay in 1966. It produced 431 bags in the first year, and so a second farm was soon established at Te Tii in Te Puna inlet. By 1973, Pacific oysters had overtaken the native rock oyster as the farmed species (being accidentally introduced in spat brought in from Mahurangi Harbour and then favoured as it grew faster), and there was a surge in applications for new farms.[37] Waikare Inlet proved to be a particularly productive area for oysters, and prior to the closures in 2001 (see below), the farms there produced around 30 per cent of the country's commercial oyster harvest.[38]

Figure 4.1: Location of oyster farms in the Bay of Islands ***(Source: NABIS)***

The Waikare Inlet oyster farms have had a patchy history. Three outbreaks of gastro-enteritis were linked to consumption of oysters from the farms in 1994, 1999 and 2001.[39] The oysters were believed to have been contaminated with norovirus, something that is only caught through exposure to faeces or vomit.[40] After the 2001 outbreak, 18 oyster farms were subject to an emergency closure by Northland Health.[41] This resulted in the loss of some eight million oysters valued at more than $1.75 million.[42]

In 2007, the farmers took the Far North District Council to court seeking $12 million compensation for their losses.[43] They alleged that the contamination had come from the Kawakawa sewerage works, which under moderate or heavy rainfall, discharged raw sewage into the Taumārere River (which circles into the lower reaches of the Waikare Inlet before continuing out through the Veronica Channel).[44]

Ultimately the action failed, as it was not possible to definitively prove that the sewerage works were the source of the contamination. However, it was a likely contributor, along with poorly maintained septic tanks at Ōpua and Ōkiato Point, and discharges from yachts when people were living aboard.[45] Twenty-four farms were abandoned and an enormous amount of debris and sediment built up around them. It was only in 2009 that the seawater was deemed clean enough for oyster farming to recommence.

Cleanup of accumulated debris from the abandoned farms did not start until 12 years after the farms were closed, in 2013, after Government provided $2.1 million from its Waste Minimisation Fund and stakeholders provided an additional $1.7 million. But it soon ran into problems because of the method used. A digger, operating from a barge, dug up the excess mud and shell from the seafloor. The excavated shell was then pressure washed on the barge, using 6,000 litres of sediment laden water hourly, with the silt washed directly back into the Inlet. This clouded up water as far afield as Waitangi and Tāpeka Point.[46]

> "The process that was used was that the digger on the barge would dig out all the shells and silt and put it onto the barge where it was washed with high pressure jets. The silt and mud washed out down the Inlet to Waikino, Ōpua and Te Haumi and went straight back into the tide. So they really just stirred it up, dispersed it, and then put it back into the Inlet."[47] (Cook, 2016)

Spotlight on the Waikare Inlet Taiāpure

Peter Clark was raised at Ōhinerira and has seen extensive degradation of the Waikare Inlet over his lifetime. As he explained in his evidence to support Te Kapotai's Marine and Coastal Area (Takutai Moana) Act 2011 Waitangi Tribunal claim, "the Inlet is not what it once was. It has been very sad to witness its lifeforce, its mauri, ebb away with every activity, development and project that has interfered with its natural order. I feel almost like a powerless observer watching the health of the Inlet deteriorate."[48]

Clark highlights a number of activities which have caused pollution of the Inlet; the sewerage plant at Kawakawa, the marina at Ōpua, and the extensive farms and land developments. He has observed changed tidal flows, after the marina was built, with currents now depositing silt directly into the Waikare and Waikino Inlets. There is also pollution from the hundreds of boats and refuse from the oyster farms.[49]

"What used to be beautiful sandy beaches, are now dumping grounds for oyster shells, silt and rocks that are too dangerous for children to walk on. On top of that, there is also rubbish from the oyster farms scattered about and derelict oyster beds with rotting poles under and above the water."[50]

This degradation has profoundly impacted fish stocks. "When I was a boy you would see snapper tails waving in the air as they crunched cockles on the pipi banks. You would not see that anymore".[51]

The Waikare Inlet Taiāpure (18 km^2 in size) was established in December 1997.[52] It lies to the east of Russell (and the confluence of the Taumārere River) and extends up into the head of the Waikare Inlet adjacent to the Waikare Marae (see Figure 4.2). It is the only Taiāpure in the Bay of Islands. For Te Kapotai, it is "a statutory recognition of our rights to the Waikare Inlet … [however] it is not really effective because we are still not able to exercise our rangatiratanga to the extent that we would like".[53]

No specific regulations attach to the Taiāpure which means it does not constrain recreational or commercial fishing. In addition (as outlined above), the main issues for hapū are the impacts of oyster farms, land development, sewage disposal and the Ōpua marina[54] and these are not things that can be controlled by the Taiāpure.

Resourcing to manage the Taiāpure has also been a significant issue. "[N]o regulations have been made to date and we struggle to hold regular meetings with no proper resourcing for good quality partnerships with councils and the Government."[55]

Figure 4.2: Waikare Inlet Taiāpure

Oyster farms have also been closed in the Kerikeri Inlet due to sanitary concerns, with monitoring data identifying an increase in unacceptably high *E coli* levels at oyster farms on the southern side of the Inlet. An investigation concluded it was likely from human faecal contamination as a result of increasing settlement of the coastline and Kerikeri township. Likely sources included effluent discharged from the Kerikeri and Paihia sewerage works as well as failing septic tanks and boat discharges over the summer months.[56]

Such issues have no doubt considerably hindered the growth of the aquaculture industry in the Bay of Islands. In addition, the activity is excluded from most of the places where it is not currently operating under the Northland Regional Plan (see Figure 4.3). However, this does not exclude *all* aquaculture. The Northland Regional Council recently granted a resource consent to the Kaingahoa Marae (associated with Patukeha hapū) for a marine farm in Whapukapirau Bay which is both within the aquaculture exclusion zone and the Rākaumangamanga Rāhui Tapu area.[57]

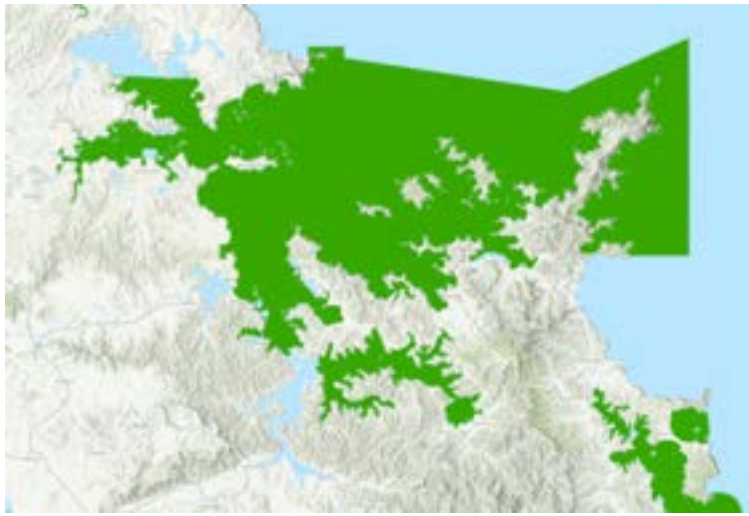

Figure 4.3: Aquaculture exclusion areas in the Bay of Islands *(shown in green)* ***(Source: Northland Regional Council)***

4.3 Recreational boating and fishing

Recreational fishing in the Bay of Islands, centred on gamefish, first developed in the early 1890s, with the main species caught being marlin. By the 1900s, the Department of Tourists and Health Resorts was promoting recreational fishing opportunities in the Bay of Islands to tourists.[58] Game fishing in the area was further popularised by American novelist Zane Grey, who first visited the Bay of Islands in 1926, and established a fishing camp at Ōtehei Bay on Urupukapuka Island. He dubbed the Bay the 'anglers Eldorado'.[59]

Statute of giant marlin on Paihia waterfront

Since the 1920s, an increasing number of marlin catches have been recorded by the Bay of Islands Swordfish Club, with a notable decline during the 1960s when Japanese longliners along with other internationally flagged vessels targeted the marlin fishery. Commercial marlin catches were banned in 1991 (with all commercially caught fish required to be released) to help boost the recreational fishery.[60]

Spotlight on gamefish species caught out of the Bay of Islands

During the 2024-25 fishing year, the Bay of Islands Swordfish Club reported 589 fish caught. They included a wide variety of species with catches of blue marlin, striped marlin, broadbill swordfish, shortbilled spearfish, mako shark, bronze whaler shark, northern bluefin tuna, southern bluefin tuna, yellowfin tuna, yellowtail kingfish, mahimahi, snapper, kahawai, skipjack tuna, trevally, albacore and bass recorded. About half the gamefish caught were released.[61]

The main gamefish species caught off the north-east coast (including the Bay of Islands) is striped marlin. Most of it is caught from charter boats, although (as noted above) the number of such vessels has declined in recent years. At the same time there has been an increase in trailer boats catching one or two fish per year.[62] This indicates a shift away from the tourism charter industry towards purely recreational boating.

"[The] Bay of Islands contains among the most extensive area of intensive recreational boat-fishing in the whole of East Northland, this fishing effort almost certainly far exceeding that of the local commercial fleet for most species."[63] (Booth, 2016)

The most commonly caught recreational species in the Bay of Islands is snapper, followed by kahawai. Other species harvested include john dory, kingfish, red gurnard, tarakihi and trevally. Rock lobster, scallops, green-lipped mussels, cockles and pipi have also been harvested recreationally.[64] With the withdrawal of most commercial fishing from the Bay of Islands (see below) the main fishing pressure in the area now is from recreational harvest.

"There were definitely more boats after Covid. Many people bought boats, all with depth sounders, so they could find a fish again. They were big boats with freezers. The fish had a hard time surviving." (Interviewee, 2025)

Boating is close the heart of Northlanders, with an estimated one in four people owning a vessel (compared to one in seven nation-wide). In addition, just under a quarter of Auckland boat owners (22%) use their vessels in Northland, with Northland camping ground operators reporting that around a quarter of their visitors bring a trailer-boat or jetski with them.[65]

> "In summer we come around the point, and there are so many boats sitting in the middle of the Bay that I stopped counting at 70, mostly little runabouts, you could walk across them." (Interviewee, 2025)

Ōpua is one of New Zealand's busiest ports for recreational vessels. It is also the main entry point for visiting overseas yachts, which sail down to New Zealand from the South Pacific, before the cyclone season. Ōpua hosts more than 1,300 long distance arrivals and departures each year.[66] This creates economic opportunities, through the expenditure of the yacht owners and crews on vessel maintenance, food and tourist activities. In 2014, each international yacht was estimated to bring an additional $40,000 in direct expenditure to the Northland economy.[67] But it also creates environmental risks, particularly the introduction of invasive species through hull biofouling.

Recreational vessels anchored off Motuarohia Island

Opua with marina on the left

The Northland Regional Council's 'Moorings and Marinas Strategy' notes that "demand for mooring space in parts of the Bay of Islands is greater than any other part of Northland", with the pressure expected to only increase.[68] There are currently five mooring/marina areas at Ōpua, Paihia and Waitangi, Russell, the eastern Bay of Islands and Kerikeri.[69] There is no remaining space for new moorings in existing designated mooring locations which has resulted in moorings proliferating in other areas (see Figure 4.4)[70] Moorings sell for an average of $10,000 to $20,000 and marina berths at Ōpua for around $200,000.[71]

Spotlight on impact of boat infrastructure on hapū

The growth in boat infrastructure has negatively impacted local hapū. Edward Cook, from Te Kapotai, noted that no berths at the Ōpua Marina were allocated to hapū. "Before the marina, the old people said we could tie up anywhere we liked. It was our only access in and out of the Waikare Inlet. The Council have continued to build and expand the marina and tried to get us to move from where we park up our boats and even charge us for leaving our boats at the wharf. They have told us to go and use the dinghy dock, but my boat is too big." [72]

Existing marinas and moorings are potentially accelerating sediment accumulation. There are discharges of antifouling and sewage from vessels. Sedimentation in the upper Taumārere River is also resulting in the loss of existing mooring areas as they become too shallow for the vessels.[73]

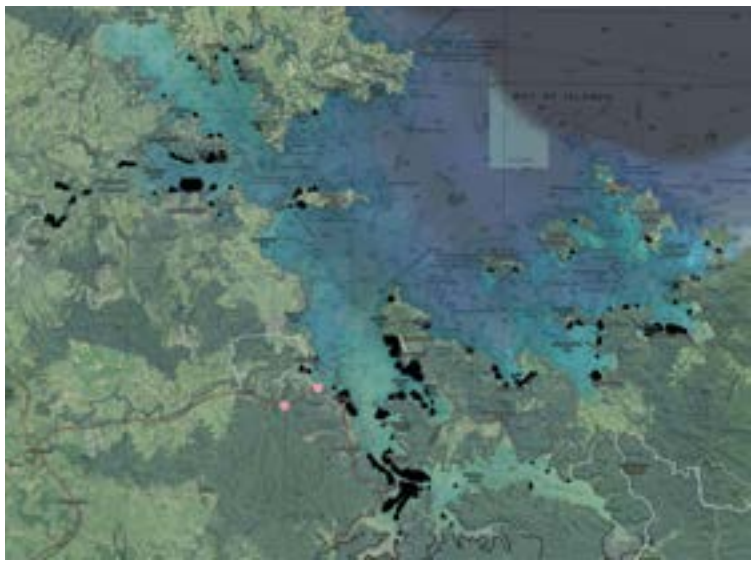

Figure 4.4: Location of moorings in the Bay of Islands *(shown by the black triangles)* ***(Source: Northland Regional Council)***

Boat moorings in Parekura Bay

Spotlight on the Waipiro Bay Marina proposal

In May 2024, an application was submitted to build a 250-berth marina in Waipiro Bay, on the eastern side of the Bay of Islands. This would be the largest marina in the Bay of Islands with Ōpua Marina currently providing 240 berths and the Doves Bay Marina providing 193 berths. As well as vessel berthage the development includes a public boat launching ramp, parking for marina users and boat trailers, fuelling services, and hospitality and retail outlets. Waipiro Bay will be dredged (removing 250,000 to 350,000 m^3 of sediment), mangroves will be removed, and there will be a reclamation of up to 4 ha to house parking and services.[74] The marina would occupy almost all of the Bay with about 40 per cent of its footprint being reclamation.[75] A Controlled Area Notice (CAN) applies to the eastern Bay of Islands including Waipiro Bay and restricts activities in order to stop the spread of invasive Caulerpa (see Chapter 9).

The applicant has claimed significant environmental benefits from the project including a reduction in demand for swing moorings and ad hoc anchorage in the wider Bay, creation of a "new marine environment" and improved ability to manage biosecurity issues. Significant social and public benefits are also claimed including increased employment and business opportunities, and vastly improved access to the coast and wider Bay of Islands for a large number of recreational boaties. In addition, it is envisaged that the marina will provide a base for marine tourism activities thereby creating significant tourism benefits.[76]

At the time of writing the application had been lodged under the Fast-track Approvals Act 2024, and had been referred to the fast-track process by the Minister, but had not yet been considered by the panel.

The marina would occupy an extensive area of mudflats which form the intertidal margin of the Bay. As stated in the desktop preliminary ecological assessment lodged with the application, "Waipiro Bay supports a diverse intertidal ecosystem transitioning from sandy shores to rocky outcrops, providing a variety of habitats that sustain a range of marine life." It has mangrove habitat designated as significant bird habitat, intertidal sand flats likely to contain cockles, and diverse subtidal benthic biota to the north containing a mixture of 30 biota. Marine mammals, including orca, also intermittently use the Bay.[77]

A preliminary EIA report prepared for the Eastern Bay of Islands Preservation Society, based on a site visit, highlights the high natural character of the head of the Bay where there is a continuum of shallow flats with mangroves and salt marsh, adjoining freshwater wetlands, and surrounding native shrubland and low forest.[78] Seagrass is scattered throughout the intertidal area.[79] The Bay supports a wide range of bird species as well as orca and bottlenose dolphin. In particular, the numerous cockles in the area provide a food source for eagle rays which are in turn important food for orcas.[80]

Ngāti Kuta have opposed the development on the basis that the rights and interests of Māori have not been considered, and it does not meet the criteria for fast-track or the Resource Management Act 1991

(RMA). In particular, Waipiro Bay, and connecting Parekura Bay, are a significant customary fisheries area for the hapū, and have the largest remaining cockle and pipi beds in the Bay of Islands.[81]

Waipiro Bay proposed marina site

As a local resident explained to us, "Waipiro Bay cockle beds have uninterrupted links back to ancient times. They haven't been dredged out and reinstated, they have survived over centuries. Yet those people think they can take them over, destroy them, and turn them into a private source of revenue. I don't find that acceptable."

Kohu Atatu Hakaraia of Te Patukeha hapū told the press "The whole area has been a kai basket for generations, not just for our whānau, but from multiple hapū across the area". Our moana carries the mauri – the life force that connects us all. It is the heartbeat of our whenua; it sustains life and nurtures our identity. The mauri is under threat."[82]

There is also the question as to whether this the type of development is appropriate for such a remote and relatively undeveloped part of the Bay of Islands with a majority Māori population. Te Rina Ruka-Triponei argues that this is not the kind of development the area needs. She suggests development based on Māori enterprise is more appropriate which has a foundation in kaupapa Māori. "It doesn't ask 'how do we grow?' but how do we uplift?'. Not 'what can we take?' but 'how can we sustain'?".[83]

Establishing a new tourism hub, in the remote eastern part of the Bay, would also likely serve to undermine the operation of Paihia as the main tourist hub for the area. In addition, there is a question as to whether providing "vastly improved access to the coast and wider Bay of Islands, for a large number of recreational boaties" is a good thing, given how fragile the marine environment currently is, and the growing pressures already on it.

4.4 Commercial fishing

After oysters (mentioned earlier), mullet was a notable early commercial fishery, being plentiful in the tidal reaches of the Bay of Islands, particularly the Kerikeri and Te Puna Inlets. A mullet cannery was first established in Russell in the early 1880s. Later in that decade, there were up to 10 boats fishing into a cannery in Kororāreka Bay. The fishery continued until the mid 1930s, when the canning industry closed due to the scarcity of fish, the depression and high cost of sheet-tin.[84] Other fish species were also targeted during this time, including snapper, blue maomao and parore which, along with mullet, were smoked before being sold.[85]

By the 1920s and '30s, between 30 and 60 vessels were fishing from the Bay of Islands. This sharply increased to 176 vessels, by the early 1980s, mainly due to efforts to establish a catch history before the introduction of the quota management system (in 1986). They collectively landed around 700 tonnes of seafood a year. Set netters and long liners dominated the fleet, with rock lobster vessels increasing significantly during the 1950s. Scallop and mussel dredgers started operating in the Bay of Islands in the late 1960s.[86]

The mainstay species of the fishery, up until the late 1970s, were flounder, grey mullet, hāpuku and snapper, with landings of about 100 tonnes per species. During the 1980s (leading up the implementation of the quota management system) annual landings of snapper were briefly more than 1,000 tonnes. Bait fish such as blue and jack mackerel (along with skipjack tuna) were first fished in the 1980s, with thousands of tonnes taken annually in the open waters just outside the Bay of Islands.[87]

In 2017, Booth reported that there were only a small handful of commercial fishers still operating within the Bay of Islands proper, and they were mainly using small (less than 7m long vessels) deploying set nets and beach seines. The main harvest species were flounder, garfish, grey mullet, pilchard, snapper and trevally with catches of only a few dozen tonnes a year. However, visiting commercial vessels line, net and trawl within the Bay from time-to-time.[88]

Snapper in slurry

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5 Loss of kelp forests

Kelp forest

5.1 The problem

> "Kelp was once widespread on shallow reefs of the Bay of Islands, but is now sparse, at least in the main basin of the Bay."[1] (Booth, 2017)

Kelp forests were once present throughout the Bay of Islands. Examination of time-sequenced aerial photographs demonstrates that loss of kelp first became evident in the 1970s, with widespread kina (sea urchin) barrens established by the mid-1980s. The images showed that, by 2009, barrens covered 97 per cent of the shallow reefs in the main basin, 75 per cent of the reefs around the islands on the Ipipiri Platform, and 50 per cent in the southern bay along the north coast of the Russell Peninsula.[2]

A more recent ground-truthing snorkel survey of the outer Bay of Islands rocky reefs, undertaken in 2016, confirmed this catastrophic loss of kelp forests. The extent of the barrens ranged from 37 per cent of rocky reefs on Urupukapuka Island's outer coast, to 80 per cent at Tāpeka Point on the Russell Peninsula. Kina barrens also covered 65 per cent of rocky reefs at Black Rocks in the western Bay of Islands. Overall, the kina barren extent was on average 48 per cent across the 561 quadrats used in the analysis.[3]

Kelp forests provide the ecological foundations of shallow rocky reef systems, supporting biodiversity, primary production and carbon storage.[4] They are a "vital provider of biogenic habitat for reef fish" and play an important role in "supporting coastal food webs".[5] Kelp forests have been found to host more than 100 different species[6] and their primary production can directly contribute to around half the biomass of coastal fish.[7] Around 40 per cent of coastal fish are at least partially dependent on kelp forests.[8]

> "Shallow kelp forests provide areas for fish spawning and larval settlement, and shelter for juveniles, by reducing exposure to water movement and predation. Red rock lobster postlarvae often settle out of the plankton among shallow-reef kelp, and juvenile snapper are strongly associated with it."[9] (Booth, 2017)

Healthy kelp forests can increase fish growth rates as well as the resilience of stocks to fluctuations in phytoplankton production (which is becoming more acute with a changing climate).[10] The extensive loss of the Bay of Islands kelp forests has huge implications for marine biodiversity, productivity and fish production in the area.

> "...the loss of coastal seaweed productivity would have profound implications for wider fisheries production and surrounding ecosystems."[11] (Doheny et al, 2023)

The relationship between kina, predator species and the health of kelp forests has been well-established in the scientific community since

the early 2000s, with heavy fishing pressure on crayfish and snapper implicated in the explosion of kina (which they prey on), and this in turn causing the loss of kelp forests on which the kina graze.[12] Other factors also play a role in how this trophic cascade plays out at specific sites including land-based pressures, oceanic patterns and climate change.[13]

Kina barren, Bay of Islands

Kina barren expansion coincided with the heaviest fish-down of many commercial species, during the 1970s and '80s, which had been lightly fished in previous years. Although commercial fishing pressure in the Bay of Islands has lessened more recently, it appears to have been largely replaced by increased recreational effort.[14]

> ".. rebuilding populations of key predators at large spatial scales is crucial to increase resilience and can be achieved by increasing the area of MPAs combined with large-scale reductions in fisheries catch."[15] (Balemi and Shears, 2023)

A more recent, and even more alarming threat, is the rapid increase in the extent and density of the long-spined urchin *Centrostephanus rodgersii* which, although native to New South Wales, has wreaked havoc on rocky reefs in Tasmania (see spotlight). Kina typically graze down to 15 to 20 metre depths, but long-spined urchins graze down to greater than 50 metres, thereby potentially taking out entire kelp forests and not just their shallower portions. They are also larger and spikier than kina and so harder for predators to kill. Their only known predator is large lobsters (red and packhorse) highlighting the critical importance of having healthy rock lobster populations on our rocky reefs.[16]

Long-spined urchins are now a significant driver of the loss of kelp forest in the more sheltered, outer parts of the Bay of Islands.[17] Where there is shelter, they occupy shallow parts of the reef, moving deeper in more exposed areas. This is because, due to their larger spines, they are more vulnerable to wave and surge damage than kina.[18] In areas where they have established, culling or harvest, and the introduction of large lobsters may be needed to promote recovery of the kelp forests.[19]

Spotlight on the impact of long-spined urchins in Australia

The native subtropical *Centrostephanus rodgersii* has moved into rocky reef systems in New South Wales and Tasmania, in advance of a similar process happening in Aotearoa New Zealand. This means we can see, ahead of time, the likely trajectory here in the absence of any preventative action.

Long-spined urchins were first spotted in Tasmanian waters in 1978, and have increased in number to some 20 million individuals.[20] Their range has extended some 700km south, due to long-term oceanic warming and the southward extension of the warm East Australian Current. This expansion was also facilitated by overfishing of rock lobster which is the main predator of long-spined urchins in Australia.[21] The urchin is considered to be "the single largest immediate environmental threat to rocky reef communities in eastern Tasmania".[22]

In central and southern New South Wales, the urchin has maintained barrens over more than 50 per cent of all shallow reefs, and a similar pattern is emerging in Tasmania. The overgrazing of kelp forest has been associated with the local loss of over 150 species, including pāua and rock lobster, that live amongst kelp habitat.[23]

What the Tasmanians have learned, is that healthy rock lobster populations within marine reserves can keep long-spined urchins under control, and prevent the formation of barrens. However, creating new marine reserves in areas where extensive barrens have already formed, has not been able to reverse the process and enable kelp forests to re-establish.[24] This highlights the importance of restoring and maintaining healthy rock lobster populations on reefs in advance of barrens forming. Once established, long-spined urchin barrens may be irreversible, without costly and concerted intervention.

5.2 The response

It has been demonstrated at multiple locations (including in the Hauraki Gulf and Marlborough Sounds), that if you remove kina the kelp will return.[25] Recovery of kelp forest can occur within two years. However, without reinstatement of predators, kina start reinvading in around three years.[26] No-take marine areas, which enable kina predators to re-establish, have also been shown to reverse kina barrens and sustain kelp forests over time, but the process can take several decades.[27]

Until recently, the Bay of Islands has lacked spatial protections to support healthy populations of predator species, although there has been a long history of efforts to promote marine protection in the area. We survey these below, acknowledging that their ambit is broader than just addressing kina barrens.

Early marine reserve proposals

During the 1980s, the Department of Lands and Survey, Ministry of Agriculture and Fisheries and Bay of Islands Swordfish Club worked up a series of proposals for marine protection in the Bay of Islands. The proposals were put out for public consultation, in 1988 (by which time DOC had been established), and included six small marine reserves in Waikino Inlet, Hutia Creek in the Waitangi Estuary, a small area on the western side of Black Rocks, the eastern end of Motuarohia Island, the entire coastline of Ōkahu Island, and a small area of reef to the north of Deep Water Cove.[28]

In addition, the Ministry of Agriculture and Fisheries proposed a range of fisheries measures:[29]

- Prohibit trawling and Danish seining within the Bay of Islands
- Close the eastern part of the Bay to commercial fishing (except rock lobster potting) and amateur set netting (except for flounder and mullet) and set lining between 1 October and 1 May every year
- Close one nautical mile around Cape Brett and Bird Rock to commercial fishing (except rock lobster potting) and amateur net fishing and set lining
- Close one nautical mile around Ninepin to all net fishing.

The marine reserves were never progressed, but the fishing controls were put into place prior to 2004. These served to exclude bulk fishing methods from the Bay of Islands itself, reduce commercial fishing pressure on the eastern Bay of Islands during summer months, and protect some reef systems from indiscriminate netting. However, notably, rock lobster harvest was excluded from all measures.

Maunganui Bay rāhui

In 2006, the Bay of Islands Canterbury Charitable Trust, a collaborative partnership between Ngāti Kuta and Patukeha hapū and local dive operators, was formed in a bid to secure the right to sink the decommissioned Navy frigate HMNZS *Canterbury* in Maunganui Bay.[30] The bid was successful and the ship was scuttled (at Deep Water Cove) in November 2007 as an artificial reef to help build fish stocks and provide a diving tourism attraction. The hapū subsequently purchased the ship from the Trust.[31]

Maunganui Bay (Dean Wright)

Although the wreck proved a success in attracting divers, it also attracted recreational fishers who harvested directly above the ship and caused "enough damage to inhibit the growth of the fishery".[32] Hapū had placed a customary rāhui over the area at the time of the sinking, but compliance was poor, so they sought a temporary closure under s186A of the Fisheries Act (which was legally enforceable). This was put in place in 2010 and excluded the harvesting of all marine life except kina.

> "The rāhui at Maunganui Bay is an important place for our rangitahi to experience the moana with its mauri and wairua being restored, and to take their place as kaitiaki."[33] (Clendon et al, 2021)

The section 186A mechanism was chosen, instead of a marine reserve, because hapū considered marine reserves to be "confiscation of their land" as "the Crown will take it and it will be lost forever".[34] However, unlike a marine reserve, the temporary closure only lasts for two years necessitating repeated applications if it is to endure. At Maunganui Bay the closure was renewed seven times before the Rākaumangamanga Rāhui Tapu came into force in 2023 (see below). It has proved successful in supporting marine life recovery.

> "After eight years of no fishing (except for kina) [at Maunganui Bay] there has been a demonstrable recovery of the populations of lobsters, large snapper and other large possible predators of kina."[35] (Froude, 2021)

Fish Forever marine reserve proposals

In 2006, a group of local residents established an entity called the Bay of Islands Maritime Park, which was formally incorporated in 2007. The original concept was to create an umbrella organisation that would represent the interests of the various hapū, community organisations and agencies in the area.[36]

Initially, the group developed two main focus areas, marine protected areas (under the 'Fish Forever' brand), and seeking a single unitary plan for the Bay of Islands catchments. The second area was dropped when it soon became evident "that it would never happen as no-one wanted to cede any authority" and catchment work was refocused onto restoration (under the 'Living Waters–Bay of Islands' brand).[37]

Fish Forever sought to address the urgent need for marine protection in the Bay of Islands. The same year the Maunganui Bay temporary closure came into force (2010), the group launched a consultative process where they asked members of the community to indicate on a nautical chart which areas in the Bay of Islands they would like to see protected. More than 400 charts were submitted. These were combined to identify the protected areas which had the most support. Maunganui Bay was the most popular, followed by the north coast of Waewaetōrea Island, and then the northern coast of Urupukapuka Island.[38]

Alongside this public process, Fish Forever worked with Ngāti Kuta and Patukeha hapū to explore how marine reserves (as nursery areas) might support customary management areas such as mātaitai through spill-over benefits. Marine scientists associated with Fish Forever were also active in undertaking research to support the rāhui at Maunganui Bay.[39]

The results of the consultation process and ongoing discussion with hapū were drawn together into concrete proposals for marine protection. These were released by Fish Forever in a 2014 public discussion document. Two marine reserve areas, designed to include a mixture of habitats in large enough areas to provide protection to resident marine species, were proposed, with a generational (25 year) review:[40]

- *Waewaetōrea Marine Reserve* (1003 ha) which included the entire coastline of Ōkahu and Waewaetōrea Islands and the outside coasts of Urupukapuka and Motukiekie Islands.

- *Maunganui Marine Reserve* (908 ha) which included the coastline north of Maunganui Bay and a marine area bordering on the Maunganui Bay Rāhui.

Cover of Fish Forever consultation document

These were accompanied by a proposal for a scientific reserve at Tangatapu (at the head of Parekura Bay) to protect a mangrove and salt marsh area. Over 1,300 submissions were received, and they demonstrated overwhelming public support for the proposals. Half of the submissions were from the Bay of Island community with a further 15 per cent from other parts of Northland and 14 per cent from Auckland. A total of 134 form letter submissions were received from hapū.[41]

Of the submitters, 90 per cent agreed that marine life and fish populations in the Bay of Islands were declining, and 98 per cent approved of marine reserves in the area. A total of 81 per cent approved the specific proposed sites. The main opposition came from hapū and recreational fishing interests, who did not support marine reserves but instead preferred the use of customary management tools and/or fisheries regulations.[42]

When the proposals went public, hapū withdrew their support for the marine protection work. This was because of an overload of issues and energy needed at that time for the extensive Waitangi Tribunal hearings of Ngāpuhi Te Tiriti claims. We were also told there was little appetite within DOC to receive marine reserve applications at that time, particularly when hapū were not supportive.[43] As a result, the proposals did not proceed.

Proposed Northland Regional Plan

In September 2017, the Northland Regional Council notified its proposed Regional Plan (which included the coastal marine area). Bay of Islands Maritime Park Inc lodged a submission as did Forest & Bird.[44] Although seeking stronger policies and rules to control fishing impacts on marine ecosystems, neither submission deliberately identified any specific areas for protection, or included any maps.

At the Council hearing, environmental scientist Victoria Froude presented evidence in support of the two parties. She proposed that marine protection be achieved through a variation to the Plan, or through rules setting out a process to apply for specific areas to be protected. However, other than a reference to Maunganui Bay, no other specific areas were identified as meriting such protection.[45]

Council notified its decisions on submissions, in May 2019, rejecting the protection proposals. Both the Bay of Islands Maritime Park Inc and Forest & Bird appealed, being inspired by the Bay of Plenty *Motiti* court proceedings which had recently confirmed that regional councils could control fishing activity for marine biodiversity protection purposes.[46]

Local government elections were held later in 2019, and resulted in a change of some councillors on Northland Regional Council. The new Council decided to support the marine protections. In addition, Ngāti Kuta was now willing to re-engage on marine protection proposals and became a section 274 party to the proceedings. Te Uri o Hikihiki also become a party, supporting protection at Mimiwhangata, but as this is outside the Bay of Islands proper we do not delve into this particular area further.

Many other parties joined the appeals including several iwi and hapū, commercial and recreational fishing interests, aquaculture interests, the Ministers of Conservation and Fisheries and Te Ohu Kaimoana. Within the Bay of Islands, three discrete areas became the focus of the Environment Court hearing, which took place in 2021. The proposals were:[47]

- Area A: Rākaumangamanga (Maunganui Bay to Opourua Bay) Rāhui Tapu: to become a closed area – with no removal of aquatic life (except kina) and damage to the seabed prohibited
- Area B: Ipipiri/Inner Bay of Islands: bottom trawling, Danish and purse seining and all dredging to be prohibited but other fishing to be permitted
- Area C: Rākaumangamanga Moana Mara Tipu Rohe/ Te Au o Morunga Protection Area: bottom trawling and Danish and purse seining to be prohibited with dredging and other fishing to be permitted

None of the areas were to exclude customary fishing, and kina management, mussel restoration activities, monitoring and scientific research would also be permitted in all areas.

> "The RMA vehicle we used for Cape Brett fishing protection was about protecting the land and islands, rocks and reefs. A lot of them were just taken by the Crown when some of them were fishing areas and some of them places of significance which had a history to them … So it was really about protecting our traditions and customs." (Interviewee, 2025)

There was broad support for marine protection among many parties, but significant differences in the specifics of what should be protected, and under which legislative framework. The positions ranged from strong support for broad protections, to conditional support for protection of certain areas, to outright opposition to any RMA protection due to concerns about duplication of controls and impacts on existing rights locally and nationally.

> "A positive thing that came out of the hearing process was that there was a lot of passion. Everyone was passionate about the marine environment. They might have disagreed over how best to manage it, but they all valued it." (Interviewee, 2025)

Those with commercial and recreational fishing interests were mostly opposed to protections under the RMA, preferring Fisheries Act tools. Much of the opposition from the fisheries industry was to do with precedent setting rather than the specific proposals on the table.

There was also considerable disagreement amongst Māori groups. Representative bodies such as Te Rūnanga-Ā-Iwi-Ō-Ngāpuhi, Te Ohu Kaimoana and Te Rūnanga o Ngāti Rēhia were largely against RMA protection, claiming it could undermine commercial fishing Treaty rights. However, hapū who had a more direct relationship with the rohe moana in question, were broadly supportive of protection of the identified areas.

> "All the arguments in court were about power and control. There was very little argument about ecology." (Interviewee, 2025)

The Environment Court's final decision, released in May 2023, confirmed one highly protected area in the Bay of Islands, the Rākaumangamanga Rāhui Tapu, which was an enlargement of the Maunganui Bay rāhui. In addition, a larger area around Cape Brett was protected from bulk and destructive fishing methods (see Figure 5.1). This should serve to protect the seabed there from physical damage by fishing gear, and also leave the ranga ika or work ups undisturbed.

The protections sought around the Ipiripiri/eastern Bay of Islands (which were aimed at preventing bottom disturbing fishing methods rather than harvest itself) were not confirmed by the Court under the RMA, as they were already effectively in place through Fisheries Act restrictions at the time of the Court's decision (which included a more recent scallop closure which effectively stopped dredging).

The Environment Court decision was not appealed, and the marine protection rules became fully operative in November 2023. The Northland Regional Council has engaged hapū members to undertake compliance surveillance for the protected areas. Hapū have also led the direction of ecological monitoring work, and have been engaged to assist with ecological monitoring surveys. There are a range of enforcement tools which can be used for breaches of regional marine protection rules under the RMA, including abatement notices, infringement fines, and prosecutions.

After decades of effort, marine protection has increased within the Bay of Islands. However, although there have been hard won steps forward, most of the area is still open to fishing and, consequently the perpetuation of kina barrens.

> "There were 21 lawyers in the room, over 40 witnesses, and documents as long as my arm ... That's a lot of money clicking through every day, a phenomenal amount of money. We spent three weeks in court." (Interviewee, 2025)

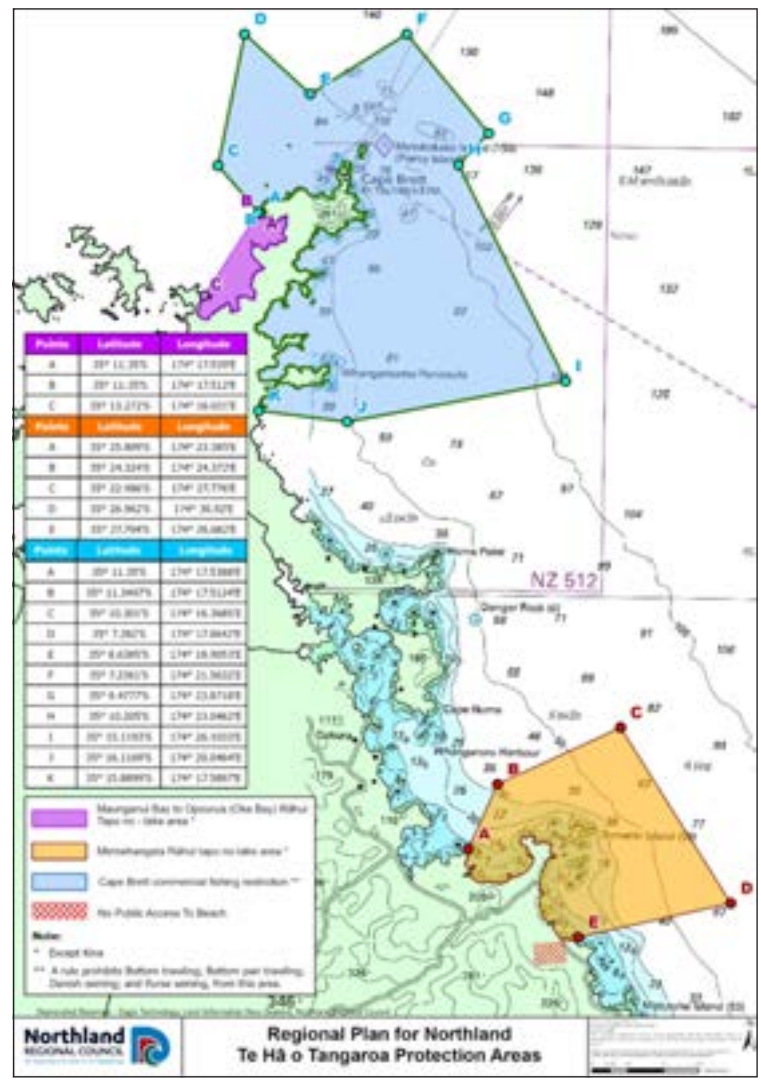

Figure 5.1: Te Hā o Tangaroa Protection Areas *(Source: Northland Regional Council)*

Spotlight on the difficulties facing hapū and community groups pursuing marine protection through the RMA[48]

"From the point of view of a community group or hapū pursuing this, it is an unbelievable amount of work and unbelievably onerous. It is also extremely costly. The only thing that makes it worth pursuing is you know you will come to a point when the judge decides and you have a yes or a no."

"It's very hard to get enough evidence to pursue the process, it's quite a high bar, and you have to have a lot of it. You have to find people prepared to go to court and most don't want to. It's also hard to fit into [the scientist's] work programme as you can't give them a date in advance and it can be changed by the judge any day. I saw many witnesses smashed on the witness stand and I can see why they are reluctant."

"RMA and case law developed on land where there are mostly small areas. If you have a 20 ha forest you can go into it and count all the gecko and you can afford to send someone in there to do an ecological survey. But in the marine area they are much larger areas, they are hard to survey, there is less historical knowledge and surveys may or may not exist."

"You can't use the RMA to restore a degraded area if it has already been trawled for decades. You can't go under the RMA and say there should be lots of sponge gardens. If they are not there now there is nothing to protect. It makes using the RMA for most of the trawled coastal waters virtually impossible."

Cape Brett which is now protected from bulk harvest methods by the Ngā Au o Morunga Mai Rākaumangamanga Protection Area

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6 Depletion of some fish stocks

Red rock lobster

"The circle of life that took food from the Ipipiri seagrass beds through various fish species to the pelagic schooling fish off Motukōkako has been interrupted – the bigger pelagic fish don't come in because there is nothing for them to eat. There are no longer acres of birds there now, because there's not enough feed for them."[1] (Clendon et al, 2021)

Fish stock	Current state
Cockles	Historically highly abundant. Relatively few grow to harvestable size
Green-lipped mussels	Intertidal and subtidal beds completely gone from the eastern Bay of Islands and only a few remnant beds on isolated subtidal reefs in the western Bay. Wild stocks not recruiting
Scallops	Once common around the Bay of Islands. Beds have collapsed
Rock lobster	Rock lobster used to be prolific within the Bay of Islands. The stock now has very low abundance due to extensive fishing pressure.
Finfish	Snapper stocks have rebuilt since the 1990s. Kahawai stocks in a healthy state. John dory near target. Little information about other finfish in the Bay of Islands to know what their status is.

Figure 6.1: Summary of state of fish stocks in the Bay of Islands

6.1 Cockles (Tuangi)

Cockles are filter feeders, drawing water through an 'inhalant' siphon, straining it through gills to remove food particles, and then pumping excess water out an 'exhalent' siphon.[2] Using a large mobile foot, the shellfish burrow into soft sediments. They are ecosystem engineers, increasing sediment stability on sandy substrates,[3] providing shell structure for other marine organisms to attach to, and creating refuges from predation.[4] They also serve to filter seawater, thereby improving water quality, and enrich the sediment with organic matter and oxygen which promotes the growth of microalgae.[5] Cockles provide a valuable food source, can live for up 20 years, and reach a size of 60mm.[6]

The Bay of Islands was once renowned for its abundant cockle beds which supported a historically large Māori population for centuries. This is evidenced by the hundreds of middens around the area, which all feature copious amounts of cockles. Charles Darwin, during his visit to the area in 1835, declared the "great piles of shells" in the Bay of Islands to be too extensive to be middens, and more likely the result of the land rising or sea falling. In the mid-1900s, many tonnes of midden cockle shell were burnt to produce agricultural lime, and the middens were so prominent as to be singled out in a 1922 geological chart.[7]

The density of shoreline middens along the Kerikeri Inlet, is among the highest in the Bay of Islands, and there are written reports (from as early as 1819) of very large cockle beds and extensive harvesting there.

Harvested cockles extracted from the middens reached up to 56mm in size (around 12 years old) and averaged 38mm.[8] Despite heavy harvesting over centuries prior to European settlement, there appears to have been no lasting ecological impacts. This is likely due to strict ownership rights and active management of the beds.[9]

In the Kerikeri Inlet, nearshore areas have now become covered in silt, to depths of 15 cm or more, which is preventing cockles establishing at all. An estimated 50 per cent of cockle habitat has been lost in the mid and upper reaches of the Inlet due to the excess sediment.[10] In the areas where cockles still persist today, they are numerous, but despite no significant harvesting for decades they are so small as to be barely harvestable. In addition, significant numbers of cockles are now lying on the surface (rather than burying into the sediment which is normal behaviour to avoid predation) which suggests the possibility of a parasitic infection inhibiting burrowing ability.[11]

This profound change appears to have been most marked over the past 50 years with reports of harvestable sized cockles being present until the early 1970s.[12] The most likely explanation for the shift is chronic stress, due to increased sedimentation levels, which has rendered the cockles less resistant to parasites and disease. Both these stressors have meant that cockles can now only survive a few years and do not support a harvestable fishery.[13]

6.2 Green-lipped mussels (Kūtai)

Green-lipped mussels have historically been present throughout the main basin of the Bay of Islands, growing on hard surfaces from mid-tide to depths of more than 50 metres. They are planktonic filter feeders, and grow particularly fast, maturing within a year to reach around 30mm long.

Spawning mainly takes place from June to December each year. The larvae spend around three to four weeks in the water column, when they can be carried large distances by seawater currents. They then settle on fine fibrous structures attached to the seafloor (such as provided by hydroids, bryozoans and small algae) with a fine thread excreted from their body. This is known as the primary settlement phase.

One they have metamorphosed into juveniles, and have reached a size of between 0.3 and 6mm, the small mussels sever their thread and migrate to (usually) an adult mussel bed where they reattach for a secondary settlement phase. Most settlement in the Bay of Islands takes place from late winter to early summer.[14]

Green-lipped mussels have been harvested for centuries since very early human settlement in the Bay. In particular, the Black Rocks on the western side "have long been known for their rich source of kūtai".[15] The mussels have more recently been under heavy harvesting pressure exacerbated by the removal of the ban on scuba dive harvesting in 2005. Stocks have declined alarmingly over the past decade or so.

> "... in 2006 green-lipped mussels were relatively widespread in the outer eastern Bay of Islands. They were generally present in the intertidal and shallow subtidal on exposed rock shores in the outer Bay of Islands. From about 2009 I observed the initially-gradual decline and then complete loss of one green-lipped mussel site after another."[16] (Froude, 2019)

Overharvesting of the more easily accessed intertidal beds, and their depletion, led to subtidal mussels being more strongly targeted. Only a few subtidal beds are now known to survive, mainly on the west coast

Black rocks off Moturoa Island (Dean Wright)

of Rākaumangamanga, (Cape Brett Peninsula).[17] At Black Rocks, local knowledge indicates that intertidal and subtidal mussels were common and abundant until the 2010s. It is thought that more recent harvesting with scuba equipment was a key reason for the decline.[18]

> "I watched people turning up with huge buckets and machetes, and scuba with catch bags and large knives. They would use their large knives and cut everything, irrespective of size." (Interviewee, 2025)

There is also evidence of poor recruitment of juvenile mussels and/or low survivorship. This has meant that heavy harvesting pressure has resulted in greater depletion than in the past, because harvested adults are not being replaced. One potential contributor to poor recruitment may be the loss of significant sources of larvae given the broader depletion of the mussels throughout the Bay of Islands area. However, there is significant kūtai settlement occurring on man-made structures in the Bay, suggesting larval supply may not be the issue, but rather larval survival on the reefs.[19]

Spotlight on Te Puna Mātaitai

Ngāti Rēhia and Ngāti Torehina initially lodged a taiāpure application over Te Puna Inlet, but this was put on hold due to community objections. A mātaitai was then pursued around Black Rocks, focused on concern over the rapid reduction of kūtai. A formal application was lodged in 2008 and was finally confirmed in 2014. It covers 20 km^2 between Cape Wiwiki and the south-eastern coast of the Rangihoua Peninsula, and across to the northern coast of Moturoa Island including the Black Rocks (see Figure 7.2). This is the only mātaitai in the Bay of Islands.

On its inception, the Mātaitai excluded all commercial fishing but not customary or recreational. As the harvest of kūtai was all non-commercial, the Mātaitai in itself did little to protect mussel stocks. This changed, when a ban on harvesting blue, black and green-lipped mussels within the Mātaitai was put in place in March 2020, with the aim of allowing kūtai stocks to rehabilitate.[20]

Despite this ban, an extensive dense bed of large mussels (first observed in 2020) had disappeared by mid-2022 almost certainly from illegal harvesting. "This may have been among the Bay of Islands' only remaining significant areas of this very distinctive subtidal biome, characterised by an almost-continuous mat of uniformly large kūtai so dense that few plants or other invertebrates gain footing on the rock faces. Such known sub-tidal communities are now exceedingly rare in New Zealand"[21] Sadly, other remnant kūtai populations are also in decline within the Mātaitai.[22]

Figure 6.2: Te Puna Mātaitai Reserve *(Source: Fisheries NZ)*

6.3 Scallops (Tipa)

The New Zealand scallop is endemic and therefore found nowhere else in the world. The animals feed by opening their shells and filtering out phytoplankton, re-suspended microalgae, and other food particles from the seawater. They live in a range of substrates but prefer coarse sandy areas rather than mud. They are most often located in semi-enclosed areas, where circulating currents retain their larvae, thereby enabling the beds to repopulate. They do not do well when there is suspended sediment in the water column, as this disrupts their ability to feed and grow, and can cause die-off in adults. In addition, juveniles cannot survive in muddy areas.[23]

Scallops are hermaphrodites and most reach maturity within a year. They mainly spawn in spring and summer. The larvae is fertilised in the water column, and therefore requires high concentrations of sperm, which is dependent on high densities of scallops. This means that overfishing can

significantly reduce recruitment. The larvae spend around three to four weeks floating in seawater before settling to the seabed and attaching to algae, seagrasses, bryozoans or other filamentous material with a byssal thread. Once they have grown to around 5mm in size they detach from their thread and become free living on the seafloor. They reach maturity in around a year, and it can take between 18 months and three years for a scallop to reach harvestable size.[24] They can live for up to 10 years, but few reach this age.

Scallops were once common around the Bay of Islands including in Rangihoua Bay (off the Purerua Peninsula) and Onewhero Bay (to the south of Moturoa Island), the western coast of Motuarohia Island, and in Maunganui Bay, as well as to the south and east of the Islands on the Ipipiri platform.[25] Clendon et al (2021) recalled "around the inside of the islands of Ipipiri we would snorkel for tipa (scallops). They were commonly found on quite shallow sand banks and it was easy to collect them in a few feet of water."[26] Others also recalled (in 2007) that up to 30 years ago Te Rāwhiti bays were filled with scallops which attracted rays which fed on the scallops.[27]

The Bay of Islands scallop fishery is managed as part of a much larger fishery (SCA 1) which extends up the entire Northland coast from Leigh, and around North Cape past Ninety Mile Beach and down to Ahipara. This wider fishery has been at a low ebb since the late 1990s. Commercial dredging of scallops within the Bay of Islands has been banned since at least 2004 so the main pressure more recently has been non-commercial.[28]

Diving and dredging are the main scallop harvest methods. We were told that numerous boats used to come into the Bay in summer and "hammer" the scallop beds. At times there would be up to 30 boats, a lot of them using recreational dredges, although these became less popular in more recent years. The number of scallops dropped dramatically through the 2010s and especially after 2016.[29]

> "There were too many people taking too many. On those big boats they would just put them into the freezer. They would come up here and stock their freezers for the year." (Interviewee, 2025)

In the Bay of Islands, there are now only remnant populations on the Ipipiri platform which have low abundance.[30] A 2020 survey of the area found scallops there to be very sparse, with only three live scallops identified, and all undersized.[31] A 2021 Fisheries NZ survey included non-commercially fished beds at Rāwhiti and Urupukapuka, and found densities at below historical lows, showing population collapse across all size levels (see Figure 6.3). The scallop fishery in Northland (including the Bay of Islands) was closed in March 2022.

> "Back 50 years ago there were big areas of scallops in the Bay. The major beds were absolutely hammered right across the Bay to Rāwhiti. They have been completely wiped out in the shallow water." (Interviewee, 2025)

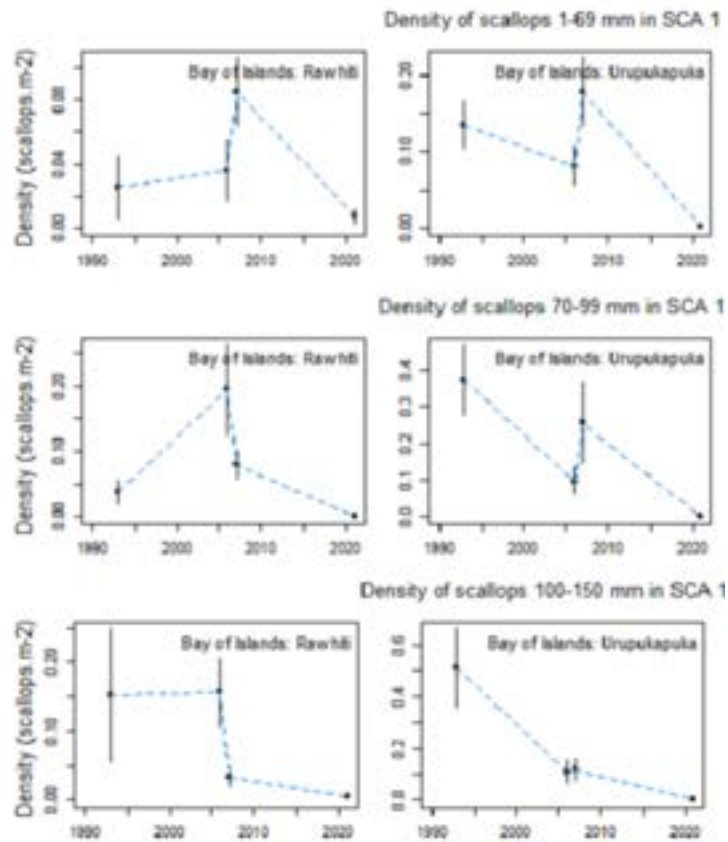

Figure 6.3: Scallop density between 1990 and 2021 in non-commercially fished scallop locations in the Bay of Islands ***(Source: Fisheries NZ)***[32]

6.4 Rock lobster (Kōura)

There are two main types of lobsters in the Bay of Islands, red rock lobsters and packhorse lobsters which grow much larger. In this section we focus on red rock lobsters which is the species more commonly harvested. The female can lay up to one million eggs and the male extrudes a short

lived spermatophore during copulation to fertilise them. The eggs stay attached to the female's tail for up to six months. When the eggs are ready to hatch, the females congregate on the deep seaward edge of the coastal reef, releasing larvae at dawn over a three to five day period.[33]

Once released, the naupliosoma larvae swim vigorously to the surface and moult into stage 1 phyllosoma larvae, forming swarms on the water surface. The larvae then spend 12 to 14 months in the open ocean, some tens to hundreds of kilometres offshore, where they are carried along by oceanic currents. During this time they undergo 11 different developmental stages where each moult cycle marks a transition between larval forms.[34]

Near the edge of the continental shelf they eventually metamorphose into a post-larvae puerulus, when they actively swim towards the coastal reef before settling. They have enough energy reserves to swim up to 20 kilometres.[35] They are likely drawn to the coast by sounds of breaking surf. Settlement takes place on seaweeds, or in holes and crevices in rocks, where the puerulus moult into juvenile rock lobsters. At 5 to 10 years of age, they mature into adults which start breeding, and they may live for up to 30 years.[36]

The lengthy time larvae spend in oceanic currents means that the source of larvae can be a long distance away from the area where they recruit into the adult population. Recruitment into a particular part of the coast can be episodic as weather patterns and ocean currents shift. Some parts of the coast are large larvae sinks due to eddies trapping larvae close to the coast (such as the East Cape and Wairarapa eddies). Other areas, such as the Bay of Islands, have weak recruitment.

The low recruitment in the Bay of Islands is, first, because few locally produced larvae stay in the area due to fast flowing currents heading south. It has been estimated that only one per cent of larvae produced in CRA1 (Northland) recruits into the adult population there, whereas in CRA2 (Hauraki Gulf and Bay of Plenty) around 18 per cent are thought to be retained.[37] Secondly, there is a more complex route for larvae from source stocks on the Taranaki Bight and west coast of the South Island, to reach the east coast of Northland. They have to travel up the west coast, and then around Cape Reinga, before reaching the southward flowing East Auckland current.[38]

Unlike other parts of the New Zealand coast, the oceanic currents along the west coast of the North Island are notably weak and variable. Offshore waters flow in a south-easterly direction (and away from CRA1), with inshore waters flowing in a northwards direction, but only intermittently.[39] This means that only a very small proportion of the larvae produced in the southern stocks (<5%) reaches CRA1, with even fewer making it around North Cape to settle on the east coast of the fishery.[40] Some larvae also likely arrive from east Australia, travelling across the Tasman sea to North Cape, and then moving south down the Northland coast on the East Auckland current.[41]

In addition, the loss of kelp forest has likely contributed to poor rock lobster recruitment. There is evidence that higher puerulus settlement and juvenile survival occurs in healthy kelp forests (such as in protected areas) as opposed to areas which are fished.[42] This may be due to the chemicals released by kelp into the seawater,[43] which puerulus use as a cue for finding the most suitable habitat for survival. Kelp forests help juvenile rock lobsters avoid predation, and also provide more of their preferred invertebrate prey, potentially increasing nutrition and growth.[44]

Overall, this means the stock is particularly vulnerable to variations in settlement levels and overfishing. Compared to other stocks, CRA1 has much reduced capacity to recover from fluctuations in environmental conditions or cumulative stressors. We were told there has been no evidence of large recruitment episodes in recent times.

Red rock lobster were once very abundant in the Bay of Islands. During the 1940s, Ngāti Kuta ki te Rāwhiti whānau resident on Moturua Island were commercially crayfishing in the Bay of Islands from a sixteen foot dinghy. They would take 10 tonnes of rock lobster to the Russell depot each week. They were so abundant, at that time, that they were only paid thruppence a pound.[45]

> Te Aroha Mere Rewha van der Hayden described the abundance of kōura (rock lobster) during her lifetime: "Kōura and fish are just like birds, they migrate at certain times. I was with my grandfather and I saw kōura march-they were plentiful then, hundreds of them from the rocks out to sea in a line behind the leader – he must have been their chief."[46] (Clendon et al, 2021)

After the Second World War commercial rock lobster vessels joined the Bay of Islands fishing fleet. Although numbers fluctuated considerably over time, there were more than 30 rock lobster vessels based in the Bay in the early 1970s.[47] Reported catch peaked at 47 tonnes during the 1986-87 fishing year, for statistical area 904, which includes the Bay of Islands and southern coastline down to Bream Bay.[48]

This high catch did not so much reflect healthy stocks, as peak effort, with fishers lifting pots some 89,000 times during that fishing year. It was lean pickings, as they were on average only harvesting 0.53 kg per potlift.[49] With harvested rock lobster generally weighing 0.6 to 1 kg this was scarcely one lobster per pot. The latest catch per unit effort (CPUE) reported for the area was even less at 0.43 (for 2017-18). This can be compared to the healthy fishery in Fiordland (CRA8) where the CPUE is 18 times greater at 9.37 kg per potlift (for the 2022-23 year).[50]

Red rock lobster only came under the quota management system in 1990, four years after the main stocks (including snapper) had been incorporated. Reported commercial catch peaked again in 1995-96, at over 40 tonnes, before rapidly declining.[51] By the 2020s, commercial harvest from statistical area 904 was less than 1 tonne.[52] This is a strong indicator that (at a minimum) the stock along that part of the coast is not healthy and (more likely) that it has effectively collapsed.

Recreational catch is more difficult to measure. The recent 2022-23 recreational fishers panel survey, which relies on self-reported data, estimated that 8 tonnes of rock lobster were recreationally harvested that year from CRA1.[53] This was a significant reduction from the 24 tonnes estimated for 2011/12 and 16 tonnes in 2017/18. The majority of the catch was taken on the east coast of Northland.[54]

Boat surveys at eight ramps along the east Northland coast were undertaken over the 2022-23 fishing year to obtain a better estimate of the recreational rock lobster catch in CRA1. Only one ramp was in the Bay of Islands (at Waitangi). The surveys found that 60 per cent of the rock lobsters were harvested by fishers using ramps at Tutukaka and Mangawhai, with only 4 per cent being harvested from the Bay of Islands boat ramp (Waitangi).[55] This further indicates that the Bay of Islands rock lobster fishery is in very poor shape.

Rock lobster can be fished most places, and at any time, except commercial harvest in the Te Puna Mātaitai Reserve which has been excluded since 2013, and all harvest in the Rākaumangamanga Rāhui Tapu area which has only been in place since 2023 (see above). A smaller temporary closure had been in place in Maunganui Bay since 2010, with the closure boundary usually marked by an informal row of commercial lobster pot buoys. There is a daily bag limit for recreational fishers which used to be six rock lobster per fisher per day but was halved in April 2023 to three.

"When [our rangitahi) return from the annual Experiencing Marine Reserves (EMR) snorkel day in Maunganui Bay they come back buzzing with astonishment that there are kōura (rock lobster) in the shallows, an experience that has been lost since our grandparents generation that experienced kōura as plentiful in our rohe." (Clendon et al, 2021)[56]

Spotlight on Environmental Law Initiative legal challenges of CRA1 decisions

In 2022, the Environmental Law Initiative and Carmen Hetaraka on behalf of Te Uri o Hikihiki challenged the Minister of Fisheries' decision on setting the total allowable catch for the CRA1 rock lobster stock. This was on the basis that the advice received by the Minister on the development of kina barrens was inaccurate, misleading and unsupported by peer-reviewed and published literature.[57] In addition, the advice paper prepared by Fisheries New Zealand for the Minister stated that "FNZ considers a small TAC decrease would … address concerns regarding rock lobster abundance and the aquatic environment".[58]

In his decision, Justice Churchman confirmed that an ecosystem approach needs to be applied to decisions under the Fisheries Act and that this "requires decision-makers to incorporate wider ecosystem effects into fisheries management, instead of considering sustainability with a single-species focus." Fisheries management decisions are to be "considered in the context of the functioning of the wider marine ecosystems in which they occur to ensure the long-term conservation and sustainable use of those resources and in so doing safeguard those marine systems."[59]

In the context of the interaction between rock lobsters and kina barrens, Justice Churchman found that:[60]

(a) rock lobsters have an important ecological role in coastal ecosystems;

(b) their primary ecological role is as a predator in shallow water areas;

(c) in New Zealand, rock lobsters prey upon sea urchins/kina;

(d) kina are an important herbivore on rocky reefs in north-eastern New Zealand because they can consume entire kelp forests and other seaweeds;

(e) generally, the ecological role of rock lobsters as a predator influences the ecological role of the species they prey on;

(f) where there are fewer rock lobsters, there is an increased population of kina, thereby increasing the grazing activity of kina, and resulting in the loss of strands of seaweed, particularly kelp forests, in coastal areas, described as a "trophic cascade";

(g) trophic cascade has been reported in New Zealand, and areas affected by it are described as 'kina barrens', which take decades to reverse;

(h) loss of kelp forests is ecologically damaging for surrounding coastal systems, in fisheries production, biodiversity, and ocean carbon sequestration;

(i) there is strong evidence that trophic cascade has significantly contributed to the presence of kina barrens in the north-east of New Zealand, within both CRA1 and CRA2;

(j) there are other factors, such as water temperature, water depth, storm damage, sediment and kelp disease that may impact on the prevalence of kina barrens; and

(k) there is a lack of evidence as to this relationship around the remainder of New Zealand.

The proceedings were successful, and the Minister was directed to reconsider his decision. Follow-up proceedings were launched in 2024, when after reconsideration the Minister issued a new decision that only reduced the total allowable catch by around 11 per cent. The Environmental Law Initiative argued that this "still fails to confront the urgent crises which afflicts the marine environment in the eastern part of the fishery" and the Minister's decision would make no material impact on the problem.[61] The Court agreed and directed the Minister to adopt a more effective and nuanced approach in his CRA1 decision in 2025.

In August 2025, Fisheries New Zealand released a discussion document on rock lobster measures to address urchin barrens. This identifies Fisheries New Zealand's preferred option as a year round closure to commercial and recreational fishers on the east coast of CRA1, which includes the entire Bay of islands.[62] This would help address the kina barren issue in the Bay of Islands. However, removal of kina and assistance to re-establish healthy populations of rock lobster may also be required to rebuild healthy kelp forests in a timely manner (particularly in the context of the Caulerpa invasion described in Chapter 9 below).

In contrast to red rock lobster, stocks of packhorse crayfish appear healthy, and have been increasing over recent years. They are usually taken as bycatch in the red rock lobster fishery. It is thought that juveniles migrate up the coast to return to the main spawning grounds in the Far North.[63]

6.5 Finfish

Snapper was the main finfish species harvested by early Māori. But despite heavy harvesting (in the order of 2,000 tonnes a year) the average size of snapper increased over time.[64] Snapper were still abundant during the 1930s and 40s. Peter Clark noted that "when I was a boy you would see snapper tails waving in the air as they crunched cockles on the pipi banks".[65]

Snapper in the Bay of Islands is managed as part of the much larger SNA1 stock which takes in the entire east coast of Northland, the Hauraki Gulf and the Bay of Plenty. The commercial fishery is mainly bottom longline in the outer portions of the Bay of Islands and around Cape Brett. There is also heavy trawling pressure for snapper outside the entrance to the Bay of Islands.[66]

Snapper in the Bay of Islands is part of the East Northland sub-stock, which was fished down heavily during the 1970s and '80s (to about 20 per cent of virgin biomass) prior to the introduction of the quota management system. With subsequent reduced fishing effort, it has since rebuilt, with current Fisheries New Zealand estimates of more than 30 per cent (see Figure 6.3). The recreational bag limit for snapper is seven per fisher per day.

Snapper

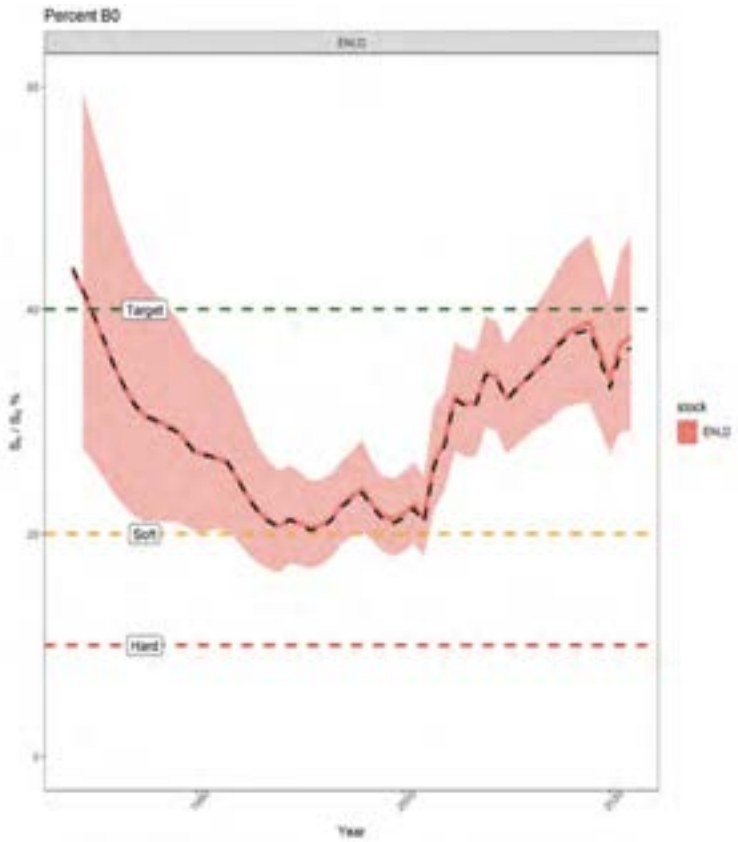

Figure 6.4: Estimated East Northland spawning snapper biomass trajectory relative to virgin biomass *(Source: Fisheries NZ)*

Kahawai is also an important commercial and recreational species, and the stock is in good health with the spawning stock biomass thought to be above the target of 52 per cent of virgin biomass.[67] Other finfish species caught by fishers in the Bay of Islands include John dory (which is thought to be near its abundance target on the east coast), and red gurnard, with the status for the east coast portion of GUR1 unknown although not thought to be below its soft target.[68] There is insufficient information available to ascertain the state of other finfish species that are targeted in the Bay of Islands, due to the lack of information at a sufficiently fine spatial scale.

Spotlight on rāhui over Ōrongo and Pōmare Bay

A seasonal customary rāhui was first declared by the Kororāreka Marae Society (with support of surrounding hāpu) in 2019 for Ōrongo and Pōmare Bays. This closes the area to fishing between 1 September and 31 December every year when fish are potentially spawning.

The rāhui was in response to concerns about the lack of kaimoana which had once been abundant in the area. Local residents had observed large declines in fish life which used to be abundant and easy to catch. "In particular, pātiki (flounder), kanae (grey mullet), kahawai, and tāmure (snapper) were in such low numbers" that it was not worthwhile fishing for them. John Dory had not been caught in the Bay for 20 years.[69]

The rāhui is intended to allow the adult fish to breed and young sprats and juveniles to grow into adulthood and has had some success, showing that the marine system can rebound if given a break. "Large schools of juvenile ika (fish) up to a hectare area in size are now being seen, mullet, kahawai and other estuary fish, all had manu/birds working over them. Some birds and fish have not been seen in these numbers for many years".[70] However, although fish appear to be rebounding, this has not been the case for shellfish.

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7 Sedimentation

Sediment in Kerikeri Inlet (Dean Wright)

7.1 The problem

> "The Bay of Islands is in bad shape. A lot of habitat has been smashed by accelerated erosion. In storm events the amount of sediment entering the Bay of Islands is staggering and it's quietly getting worse." (Interviewee, 2025)

Excess sedimentation is known to have profound negative effects on marine life. It smothers benthic habitats, killing and displacing filter feeders, including shellfish. It changes biogeochemical gradients affecting benthic microalgae (including those which scallops feed on). It clogs the feeding parts of filter feeders and the gills of fish, impedes the ability of fish to find food, and causes chronic effects to their condition and behaviour.[1] Sedimentation also clouds the water, reducing light levels penetrating the seawater and impeding photosynthesis by seagrass and seaweeds.[2] In addition, deposited sediment can provide a favourable habitat for mangrove expansion which out-competes other important habitats such as shellfish beds and shelly shores used as bird roosts.

Much of the land surrounding the Bay of Islands is highly erodible (see Figure 6.1). It was originally cloaked with rimu dominated forest also featuring totara, tanekaha and kauri,[3] but most of this has been cleared. Land use was (as at 2012) dominated by pasture(46 per cent), smaller areas of native forest and scrub (30 per cent), pine forest (11 per cent) and orchards (three per cent).[4]

Figure 7.1: Erosion prone land in Bay of Islands catchments *(water catchment area shown in blue outline)* ***(Source: Northland Regional Council)***

Sedimentation has had, and is continuing to have, profound impacts on the marine ecosystems in the Bay of Islands. Annual sediment deposition averages at around 509,000 tonnes per year which is up to 20 times greater than rates prior to deforestation.[5] It is around double the amount being deposited into the Te Hoiere / Pelorus Sound estuary, and causing havoc to marine life there, despite having a similar catchment size.[6]

".. as a child I remember that the beach at Niaku Pā in Te Tii used to have white sand, but now there is more mud than sand because of the pollution caused by runoff."[7] (Rameka, 2021)

Around 80 per cent of the sediment is coming from the Taumārere catchment although it comprises only a third of the Bay of Island's total catchment area.[8] Analysis of sediment cores has indicated that most sediment comes from dairy and beef farming (60 per cent) and recently clear-felled pine forest.[9] Sediment from production forestry comprises 36 per cent of the sediment flows into Te Puna Inlet and 27 per cent of flows into the Kawakawa Inlet.[10]

Most of the discharged sediment remains in the Bay of Islands itself rather than being dispersed out to sea. Around 30 per cent settles in the eastern Te Rāwhiti Inlet. This is both due to the anti-clockwise eddy flow driving sediment-laden seawater from the Veronica Channel around Tāpeka Point to the east, and the shelter provided by the islands from the large northerly swells that would otherwise resuspend deposited silts. This means that Te Rāwhiti is the largest sediment sink in the Bay of Islands despite not having a major river flowing into it.[11]

Spotlight on sedimentation impacts in Ōrongo-Pōmare Bay

The Kororāreka Marae Society reported in the *Russell Review* that: "the water in Ōrongo Bay was clear back in the 1950s and 60s. The bottom was firm sandy gravel and at low tide, you could walk across the Bay no problem. There were heaps of pīpī (cockles), patches of seagrass for young fish to hide in, and very few mangrove trees".

"Water clarity started to go downhill in the 1970s after they widened and sealed the road. They put a big cutting in the bank with no retention, all the clay ran into the Bay and turned the bottom into mush … the sediment never cleared. The pīpī (cockles) and seagrass haven't come back. You'd struggle to walk across the bay now because of the thickness of the mud."[12] The establishment of oyster farms in the Bay also served to absorb wave energy and prevent resuspension and removal of fine silt accumulations.

Sediment coming out of Kerikeri Inlet (Dean Wright)

Spotlight on sedimentation impacts at Te Rāwhiti

As Harte (2007) described "... sedimentation, chemicals and boats have reduced light levels affecting sea grass meadow. This sedimentation has been exacerbated by the unsealed road, stupidly cut 35 years ago, along the edge of the shoreline, and left in its clay state covered thinly with metal until 2018. After heavy rains, the bays are clay-coloured that extend several metres out into the coastal marine area". The sea grass which once filled the many bays of Ipipiri, particularly around Te Rāwhiti, have disappeared along with shellfish due to the heavy clay deposits in the sand.[13]

A natural response to sedimentation has been the expansion of mangroves, with mangrove habitat in the Bay of Islands doubling between the early 1950s and 2009.[14] In particular, in Parekura Bay, the mangrove cover has more than trebled between 1951 and 2018. This has turned more than 40 per cent of the shelly beaches into mangrove habitat and has resulted in a significant reduction in the cockle beds.[15]

Spotlight on seagrass beds in the Bay of Islands

Early aerial imagery indicates that seagrass was not a feature in the eastern Bay of Islands during the 1930s to early 1950s. This may have been due to sediment-laden waters associated with land clearances undertaken during the late 1800s. In mainland bays, seagrass started establishing in the late 1950s to early 1970s as forest cover on the hills regenerated. However, they declined soon after the unsealed extension of the coastal road during the 1970s, with recovery only evident after the road was sealed in the early 2000s. Changes to seagrass beds off the islands followed different patterns which may be more related to shifts in the oceanic climate.[16]

The amount of sediment reaching the marine area has likely been increased by the extensive loss of wetlands in Northland. Almost a third of the land area in the region was once covered in wetlands, but this has now been reduced to just a few per cent of the original extent (see Figure 7.2),[17] much less than the 10 per cent figure for the whole country.

Mangroves in eastern Bay of Islands

"We have only around 3 per cent of wetlands. They used to hold sediment, slow down the water so that sediment could drop out. Wetlands are now farmer paddocks. They are the ones that grow grass in the summer so farmers don't want to give them up. Yet many of them love fishing and they are not aware of how their farm is having a massive impact on the coastal ecology that supports the fish they catch." (Interviewee, 2025)

Figure 7.2: Original wetlands before human settlement compared to remaining wetlands present today in Northland *(Source: Forest & Bird)*

7.2 The response

> "There seems to be no energy in our society to change sedimentation." (Interviewee, 2025)

The Northland Regional Plan has rules to exclude stock from rivers, lakes and wetlands (where access is a discretionary activity), and the coastal marine area (where access is a non-complying activity).[18] The Council was preparing a plan change, in response to the National Policy Statement for Freshwater Management 2020, which was to include strengthened rules on vegetation clearance and earthworks to better manage sediment producing activities. However that has now been put on hold pending the government's resource management reforms.

The Northland Regional Plan identifies the Waitangi Catchment as having special values. When consent applications are processed in this area, reducing the amount of sediment entering waterways and improving the quality of fresh and coastal water for cultural and recreational uses, are to be had "regard to".[19] After 1 January 2025 all pastoral land use on "high sediment yielding land" within the catchment is a controlled activity if an erosion control plan has not been developed for the land.[20] The rules were

first proposed in the Waitangi Catchment Management Plan developed by a collaborative group of interests within the catchment led by the New Zealand Landcare Trust and subsequently the Northland Regional Council.[21] Similar rules have not been applied to the Taumārere catchment which is the main source of sediment entering the Bay of Islands.

When it comes to sediment generated by forestry activity, the Northland Regional Council has not applied stringency in respect of the Resource Management (National Environmental Standards for Commercial Forestry) Regulations 2017 for forestry in catchments draining into the Bay of Islands. Under the Regulations, forestry is permitted on land which does not have a very high "red zone" category under the erosion susceptibility classification. The bulk of land within the Bay of Islands catchments does not have this classification and so, without stringency, all forestry activities which comply with the standards in the Regulations are permitted. This is likely to lead to a perpetuation of forestry-induced sediment.

There are several catchment restoration projects within the Bay of Islands catchments. Since 2022, Ngāti Hine have been undertaking a wetland restoration in Kawakawa through its three year, DOC-funded Te Papa Pa Orooro project. Willows and other weeds have been removed, and native species replanted, while training eight kaitiaki. In 2023 the project received a Whakamānawa ā Taiao Environmental Award for 'environmental action in water quality improvement'.[22]

Living Waters – Bay of Islands manages over 100ha of land in catchment restoration areas through management agreements or covenants with Far North District Council. These include the Tangatapu floodplain restoration project which restored a retired dairy farm on the main tributary of the river draining into Parekura Bay. The project has re-established the meandering channel and oxbow ponds and has been planting since 2012 a mosaic of kahikatea forest and flax/sedgeland to intercept sediment and nutrients. Another floodplain restoration project has been undertaken since 2015 on an abandoned dairy farm in the Pipiroa catchment.

Living Waters has also made several attempts to establish a watershed management scheme, or at least exemplars of wetland or floodplain restoration, in the Taumārere catchment. These have included joint applications with the Northland Regional Council to the Ministry for the Environment's Essential Freshwater Fund, a joint proposal to DOC to include the Taumārere River in the Ngā Awa River Restoration Programme, and a partnership with the New Zealand Landcare Trust to convene landowner/farmer workshops to develop interest in a catchment-wide restoration programme. None of these have been successful. The only tangible progress has been the establishment and planting of a small wetland on a private farmlet at Taumārere, together with salinity analysis and mapping of all potential whitebait spawning habitat in the same locality.[23]

Northland Regional Council has more recently been working in partnership with Ngāti Hine on a business case for investment within the Taumārere catchment to address sedimentation and faecal contamination. This will help identify areas and remedial activities that will have the most impact on sediment reduction. The initiative is seeking to attract outside investment into remediation work.

> "The problems are known, the remedies are known, it's how we go about delivery." (Interviewee, 2025)

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8 Dolphin decline

Bottlenose dolphins

8.1 The problem

> Papahu (dolphin) are kaitiaki (guardians) of our people. Tohunga (high priests) were known to call the dolphins. To us, they are protectors and represent the closeness of the whānau."[1] (Clendon et al, 2021)

Dolphins are regarded by whanau at Te Rāwhiti as good luck due to their spiritual guardianship or kaitiaki wairua.[2] They also formed the basis of a once thriving dolphin tourism industry which commenced in the Bay of Islands in 1991.[3]

The initial dolphin operation by Dolphin Discoveries, based out of Paihia, consisted of a small vessel which could carry just 13 passengers. The following year the Marine Mammals Protection Regulations came into force requiring a permit for commercial operations "where a purpose is to view or come into contact with any marine mammal".[4] A permit was issued to Dolphin Discoveries to operate its dolphin tourism vessel. The Regulations also mandated practices for all persons interacting with dolphins, including on recreational vessels, prohibiting moving through a pod of dolphins or swimming with juveniles.[5]

The dolphin trips proved hugely popular and Fullers was soon issued a permit to operate a purpose-built 11-metre long catamaran carrying 35 passengers. A further permit was issued to Dolphin Discoveries to operate a second vessel. At this point, little was known about the bottlenose dolphin population in the Bay of Islands or what impact the tourism activities would have on them.[6]

Tourists viewing bottlenose dolphins, Bay of Islands

This situation was partially rectified, in 1994 to 1995, when the first field research on the dolphins and tourism impacts was undertaken. The research identified 265 individual dolphins using the Bay of Islands, which were part of a wider north-east coast population. The research also found that the tourism activities were negatively impacting dolphin behaviour and in particular disrupting their time spent socialising. The researchers recommended a preferred swimmer placement strategy, when attempting to swim with the dolphins, and prohibitions on approaching the dolphins

when they were foraging or resting.[7] In response, DOC appointed a full-time Marine Mammal Ranger, and engaged with operators to improve practices, but did not seek to change conditions on the permits.[8]

The popularity of the dolphin trips, and in particular the ability of tourists to swim with dolphins (which was unusual in an international context), meant that the existing boat trips became booked out days in advance. This encouraged further applications for commercial permits. In addition, recreational boaties started following the dolphin tours and were seen flouting the law by speeding through pods of dolphins and swimming with calves.

Tourism boat operators without dolphin permits were also starting to follow the permitted tour boats, to show their own passengers the dolphins. This exploited a grey area in the law where a permit was only required if a "purpose" of the trip was dolphin interaction. Operaters could claim they were undertaking general wildlife tours and only came across the dolphins inadvertently. This practice came to a head in 1996 when DOC attempted to prosecute Kings Tours and Cruises for interacting with dolphins without a permit. But this action failed due to a technicality.[9] The Regulations have never been amended, to close this loophole, which has made their enforcement problematic. We are not aware of DOC taking enforcement action in the Bay of Islands, under the Regulations, since this time.

By 1997, nine permits to interact with bottlenose dolphins in the Bay of Islands had been issued. These authorised up to 10 boat trips a day, with 18 swimmers per vessel per trip, and up to three swimmer drops (of 18 persons each) per trip.[10] This meant that up to 540 passengers could attempt to swim with the dolphins in the Bay of Islands each day. On top of this, there were multiple recreational boats interacting with dolphins, particularly over the summer months.

Marine mammal scientist Professor Rochelle Constantine recalls Easter 1999 when she observed 25 boats and 50 swimmers surrounding a pod of four dolphins. "It was simply bedlam".[11]

A second research project was undertaken during 1997-1999 to better understand the dolphin population and tourism impacts. This identified 278 individual adult dolphin users of the Bay of Islands (slightly more than in the 1994-95 study).[12] Of these, 59 dolphins were found to be core users of the area. Disturbingly, the study found that many calves were dying, with less than 60 per cent surviving to weaning at around three years of age, and most dying during their first year of life.[13]

The study also observed that dolphins were increasingly avoiding swimmers attempting to interact with them. Boat-based tourism activity was disrupting their resting and other natural behaviours. On average, an individual dolphin was exposed to 31 swim attempts per year.[14] The greatest impacts were from the permitted tour boats.[15] The researchers recommended no further permits for dolphin-based tourism be issued, and that the number of trips, swim attempts and operating times be restricted.

Following this research, in 2004, DOC tightened up conditions on permits which now required swimmers to be placed 'line abreast' and provided the dolphins a 'lunch break' between 11.30am and 1pm when commercial operators were not allowed to interact with them. It also created two exclusion areas to enable the dolphins to rest. However, a moratorium on the issue of more permits was deferred pending further work.[16]

Further research confirmed the ongoing negative impact of human interaction with the dolphins. A study undertaken between 2003 and 2005 found that only 37 dolphins were now regular visitors to the Bay (down from 59 only a few years earlier).[17] This was a very small number, in the context of the up to 540 passengers being permitted to swim with dolphins each day. In addition, more than half the calves were dying during the first two years of life.[18]

"Further analyses suggested a decline in abundance, high calf mortality and a decline in adult survival. Long-term monitoring in the Bay of Islands is needed to examine the causes of decline, which could threaten the persistence of this population and the sustainability of dolphin-related tourism activities."[19] (Tezanos-Pinto, 2009)

The research prompted DOC to put in place a five-year moratorium on the issue of additional dolphin watching and swimming permits, in 2009, but did not result in the revocation of any existing permits. So, while preventing additional permitted dolphin tours, it did little to reduce current pressure on the dolphins.

By 2012, there were very few dolphins using the Bay of Islands, with abundance estimates fluctuating from a high of 94 in December 2009, to just 24 in February 2012.[20] In addition, the two exclusion zones that DOC had inserted as a condition on the permits (in 2004) were no longer being

used by the dolphins.[21]This all strongly indicated that current measures to protect the dolphins were ineffective and that "more substantial protection measures for the dolphins using the Bay of Islands" were required.[22]

"In 2011 we thought something was not right here as we were only seeing the same 30 dolphins every time." (Interviewee, 2025)

Despite the alarming situation, there was no effective management response for many years. Research continued to document dolphin decline, along with widespread non-compliance with permit conditions and the marine mammal regulations more generally.[23]

Between 2017 and 2020 only 26 individual dolphins were spotted in the Bay of which 16 were frequent users. The dolphins were spending on average 86 per cent of their daylight hours in the presence of at least one vessel. Calf mortality had risen to 75 per cent. No new calves were born during the peak calving season in December 2019 to February 2020.[24] (DOC, 2021)

8.2 The response

In 2019, DOC finally acted and removed the ability to swim with dolphins from the permits issued to commercial operators. However, this did little to address activity from private boats or overall vessel disturbance. Then in April 2021, the Minister of Conservation notified her intention to establish a marine mammal sanctuary, with the proposal put out to public submission. Ngāti Kuta ki te Rāwhiti was a key supporter of the proposal.[25]

Te Pēwhairangi (Bay of Islands) Marine Mammal Sanctuary finally came into effect in December 2021 (see Figure 8.1). Rules attached to the sanctuary specify that no one is allowed in the water within 300m of a marine mammal and no vessel is allowed to approach within 300m. In addition, vessels must travel at 5 knots or less within two marine mammal safe zones in Manawaora Bay and along the east coast of the Russell Peninsula, and between Moturua and Motuarohia Islands. It is not clear what the rationale was for identifying these areas as safe zones, given the broad use of the Bay by the dolphins.

"We are not a big fan of safe zones, as we know that habitat use in the Bay of Islands has always been variable. Static protection zones don't seem to work for dolphins as food sources move around so they aren't going to stick to those areas." (Interviewee, 2025)

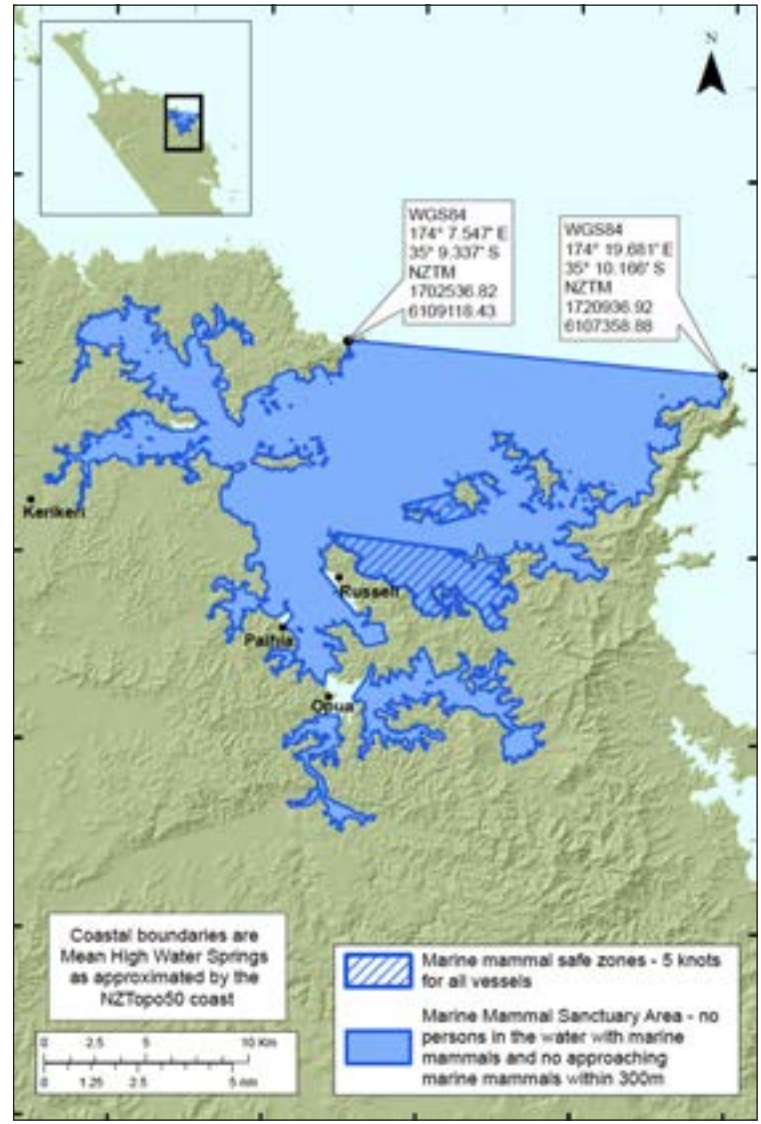

Figure 8.1: Te Pēwhairangi (Bay of Islands) Marine Mammal Sanctuary ***(Source: DOC)***

The 2025 findings of a Sanctuary review found that there has been poor compliance with the rules, and the level of non-compliance is likely increasing. Although all vessels were compliant with the no swimming rule, other rules were frequently infringed. Notably, vessels holding marine mammal permits were 100 per cent compliant with the rules. But non-permitted commercial vessels (ie boat-based tour operators) were non-compliant on multiple occasions and 80 per cent of recreational vessels did not follow the regulations. More than 50 per cent of vessels crossing safe zones did not comply with 5 knot speed limit, with more than 75 per

cent of power-driven vessels non-compliant.[26] In any event, dolphins were rarely present within the safe zones designated as part of the sanctuary, suggesting that the use of such static zones for a mobile species is not an effective strategy. The unclear rationale for the safe zone restrictions may have contributed to poor compliance. Overall, the effectiveness of the Sanctuary has been limited by a lack of compliance and low dolphin occurrence in areas of heightened protection.[27]

> "Compliance with the sanctuary rules was generally poor, with power driven vessels rarely adhering to rules minimising dolphin interactions or the safe zones."[28] (Brough et al, 2025)

DOC recorded 37 offences over the 2021/22 summer (which was artificially low due to poor weather and Auckland just coming out of Covid lockdown), 50 in 2022/23, and 85 in 2023/24. DOC rangers approached 170 vessels that were in breach of the regulations. However, no infringement notices have been issued, and DOC has not attempted any prosecutions.[29]

> "We have a sanctuary which is great but we can't enforce it." (Interviewee, 2025)

A key element of the Sanctuary has been co-governance and co-management in partnership with Ngā Hapu o Pēwhairangi, a collective of coastal hapū who exercise mana moana and kaitiakitanga over the coastal waters of the Bay. This has been operationalised through the jointly established Te Pēwhairangi (Bay of Islands) Marine Mammal Protection Advisory Committee Rōpū which is tasked with making operational management decisions and undertaking a review of the Sanctuary.[30] However, at times the Rōpū has had difficulty achieving a quorum.[31] Hapū members have emphasised the importance of adequate resourcing for compliance and patrols, alongside education and outreach that kaitiaki can help drive.[32]

Marine mammal sanctuary signage

The recommendations of the 2025 review include increasing compliance efforts throughout the year, resetting the Rōpū and re-engaging members in Sanctuary decision-making and management activities.[33] No recommendations relating to the safe zones, which have proved ineffective, were included. Somewhat strangely, less than half the budget allocated to managing the Sanctuary had been spent by DOC, since its establishment,[34] suggesting that money has been available to increase patrol and compliance efforts but has not been used.

> "The BOI offers an example of inadequate management and rapid, dramatic negative consequences of tourism … Despite robust research advice and cultural significance, the welfare of this population has been largely neglected by management authorities."[35] (Fumagalli et al, 2021)

Tourists on a Bay of Islands rental boat viewing dolphins

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9 Invasive Caulerpa

Paradise Bay on Urupukapuka Island where a member of the public reported the spread of exotic Caulerpa in February 2025

9.1 The problem

Two species of exotic invasive caulerpa (*Caulerpa brachypus and Caulerpa parvifolio*) were first discovered at Aotea Great Barrier Island in May 2021, and subsequently in the Bay of Islands at several locations surrounding Te Rāwhiti Inlet, Ōmakiwi Cove and into Albert Channel (in May 2023) when it washed up onshore.[1]

By the time they were found there, the seaweeds had already formed very thick carpets over the seafloor, indicating that they had been established for some time. By November 2024, exotic Caulerpa covered more than 70 per cent of the seabed in Ōmakiwi Cove.[2] Biosecurity New Zealand concluded this was potentially the original site of the country's incursion, with Caulerpa likely present prior to May 2021 when the algae were first discovered in the Hauraki Gulf.[3]

The two species of exotic Caulerpa are closely related and look very similar. They are native to the Indo-Pacific region. They grow fronds shaped like oar blades, that can be up to 10 centimetres long, and are linked to long runners (stolons) that attach to the seafloor. The plants grow on soft shores and hard rock surfaces, and in water depths of more than 30 metres.[4]

These Caulerpa species are fragile plants which are easily broken up by wave action, anchoring or other activities which disturb the seafloor. The fragments (as small as 1-2 mm) that disperse on currents can form new plants that infest additional areas through asexual vegetative reproduction. The plants can also reproduce sexually through mass spawning events.[5]

It is not clear how the seaweeds will behave in the Aotearoa New Zealand marine environment over the long term. Since 2024, there have been reports of 'Caulerpa dieback' on soft sandy sediments at Aotea Great Barrier Island and Waiheke Island in the Hauraki Gulf.[6] However, there has been no reported dieback on rocky reefs.

Concerningly, the invasive Caulerpa kept expanding over the soft sediment seafloor at Ōmakiwi Cove, during the period when dieback was observed in the Hauraki Gulf. This may be due to warmer seawater temperatures in the Bay of Islands which are more favourable to these species. However, after Cyclone Tam hit the area in April 2025, there was an almost 100 per cent decline at depths of 6-7 m. This did not appear to be from storm disturbance itself, as exotic Caulerpa plants observed shortly after the event appeared healthy.[7] Potential triggers of the decline are thought to have been light limitation, sedimentation and reduced salinity as a result of the storm.[8]

Cyclone Tam also washed up many tonnes of Caulerpa onto the beaches of Ōmakiwi Cove. A volunteer army of more than 200 people from iwi and the community worked hard to move the material above the high tide mark so it was not washed back into the marine area.[9]

9.2 The response

As soon as the invasive seaweed was discovered at Te Rāwhiti, Ngāti Kuta rose to the challenge organising three hui and supporting the Northland Regional Council's response, including seeking funding from central government. NIWA and Cawthron also provided scientific resources in support.

In June 2023, Biosecurity New Zealand put a CAN (Controlled Area Notice) on the Te Rāwhiti Inlet, imposing anchoring, diving and fishing restrictions. Hapū also placed a rāhui on the same area. Although these measures many have slowed the spread of exotic Caulerpa they have not been sufficient to keep it contained. In April 2024, Northland Regional Council conducted a dive surveillance survey around Northland and only discovered one further infestation at Poroporo Island in Te Rāwhiti Inlet.[10]

But exotic Caulerpa has since spread to many other locations in the Bay of Islands (as well as in the Hauraki Gulf) including near Urupukapuka, Motukiekie and Moturua Islands (see Figure 9.1). These new infestations were only detected when a member of the public reported seaweed on an anchor in Paradise Bay at Urupukapuka in early February 2025.[11] It is uncertain what the extent of exotic Caulerpa spread in the Bay of Islands will ultiamtely be.

> 'The Bay of Islands is really big, and complicated and unique and virtually all of it's perfect for [exotic] Caulerpa, the whole damn thing!" (Interviewee, 2025)

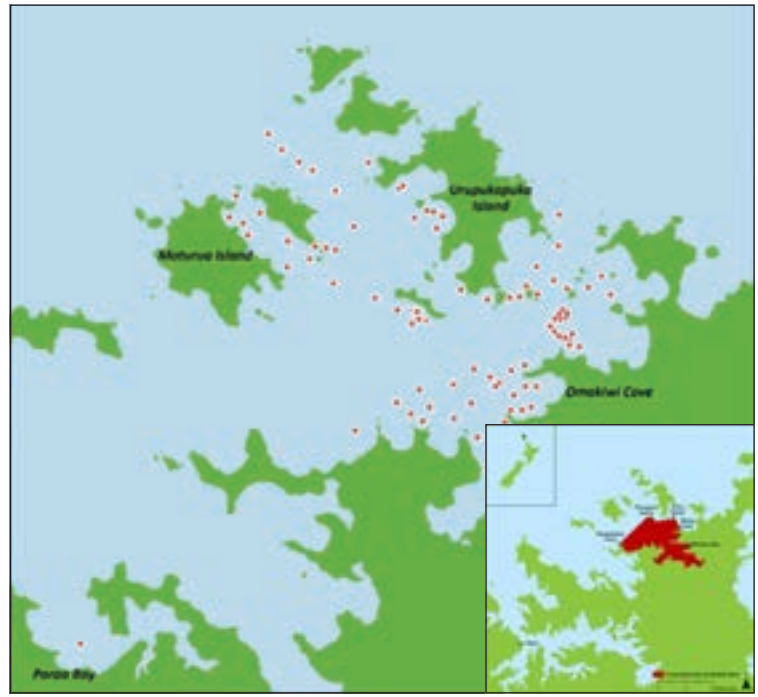

Figure 9.1: Exotic Caulerpa detections in the Bay of Islands as at May 2025 ***(Source: Ministry for Primary Industries)***

Biosecurity NZ's funding has been focused on finding effective methods to remove local infestations of exotic Caulerpa. In May 2023, chlorine mats were placed on areas along the outer extent of the CAN area, and showed some promise, with the treatment killing the invasive seaweed after one week. Mechanical suction dredging was first trialled in October 2023 but

Exotic Caulerpa has been found in Otiao Bay on Urupukapuka Island (Dean Wright)

encountered problems with handling the large quantities of the seaweed extracted. A Phase 2 trial commenced in March 2024 with new equipment and a refined process. However, although reducing the cover of exotic Caulerpa, the method does not entirely eliminate it from the seafloor within the dredged area.[12] A more sophisticated chlorine treatment, with the use of a mix of chlorine and freshwater in an enclosure, has had promising results. UV lights have also been trialled to good effect.[13]

It is not clear what will happen once the removal trials are completed. Neither the Northland Regional Council nor central government have committed money for further removal. By May 2025, the Council had expended $1.25 million on the incursion and indicated there would only be low-level ratepayer funding in the future.[14] Biosecurity New Zealand's exotic Caulerpa funding has been episodic, as it has not been part of a budget line, and relies on reprioritisation of funds from other areas.[15]

There is a philanthropic entity called Conquer Caulerpa which is raising funds for the invasive Caulerpa effort. The group has focused on monitoring, employing a dive team. When the divers find Caulerpa, the group seeks permission from Biosecurity New Zealand to respond. This effort eradicated an infestation between Urupukapuka and Waewaetōrea Islands using benthic mats with chlorine tablets.

Complete elimination is now not thought possible, given the extent of the incursion, and the fast rate of spread. Most people we talked to in the Bay of Islands feared this could result in an ecological calamity. Given the current fragility of the Bay of Islands ecosystems the incursion could potentially drive the extinction of local indigenous species. Invasive species are more likely to take hold where indigenous marine ecosystems are in poor health,[16] highlighting the need for a multi-faceted approach to the response.

We were told that one positive impact of the exotic Caulerpa invasion is that it has brought people from different sectors together, and this could prove a good basis to build on to also address broader pressures on the Bay of Islands.

There are other invasives which also pose a significant threat if they make it into the country. They include *Caulerpa taxifolia*, which is a popular aquarium species, and has become established in New South Wales. It contains a toxin which prevents animals from eating it.[17]

Waiwhapuku (Army) Bay, Moturua Island is also infested with exotic Caulerpa

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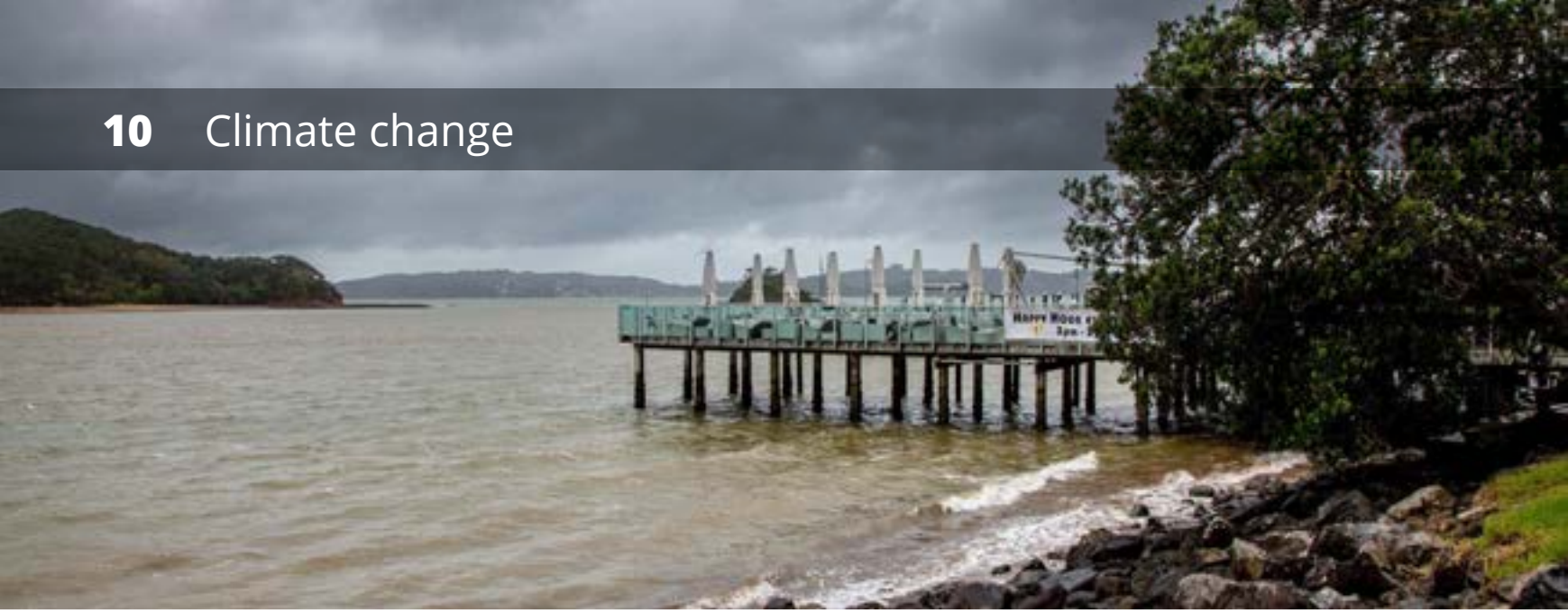
10 Climate change



Sedimentation of seawater, as shown here at Paihia, is likely to become worse under climate change

The average sea surface temperature is increasing in east Northland at close to 0.2 degrees per decade.[1] Although this is less than in other parts of the country, the implications on marine productivity are significant, because of the already warmer water in Northland. Since 1998, the productivity of waters off the north-eastern coast of the North Island has decreased by 5 per cent per decade, whereas most other regions in the country have showed increasing trends with warming seas.[2]

Subtropical water has much lower phytoplankton levels (and therefore lower productivity) than colder waters. For example, between 1998 and 2023, the average phytoplankton concentration in the warm water off the north-east coast of the North Island was 0.19mg/m^3, less than half that at the Chatham Rise (0.46 mg/m^3) which is bathed with cooler subantarctic waters.[3] As the seas continue to warm, the productivity in the Bay of Islands and surrounding coast is likely to further decrease.

On top of this warming is the impact of marine heatwaves. For example, in 2022, the average temperature along the north-eastern coast was 1.1 degrees warmer than normal at 18.7 degrees. This was the warmest year recorded, and the coast spent more than 70 per cent of the year in marine heatwave conditions.[4] With climate change, the average number of coastal marine heatwave days could double by the end of the century.[5]

Under a climate changing world, the East Auckland Current off the east coast of Northland is also expected to strengthen, and this will promote the establishment of tropical or subtropical species that currently occur as vagrants in warm La Niña years, including long-spined urchins (as described above).[6]

Northland Regional Council collects seawater temperature data at a series of sites. At Brampton Reef, north of the Veronica Channel, a maximum temperature of 23.6 degrees was measured between 2018-2020. Temperatures were higher within estuaries and tidal creeks with a high of 27.5 degrees measured in the Kerikeri River, 26.5 degrees in the Te Haumi Inlet, 26 degrees in the Waikare Inlet and 25.5 degrees in the Taumārere River.[7]

Increasing seawater temperatures have implications for temperate species. For example, snapper spawning takes place in temperatures of 15-23 degrees, but mostly within a range of 16-21 degrees.[8] In the past, strong year classes have corresponded with warm years and weak year classes with cold years. But growth and recruitment will likely decrease after reaching an optimum thermal maxima.[9]

It is not known what that maxima is in Aotearoa New Zealand. Studies in Australia have shown a reduction in snapper recruitment after temperatures rose above 25 degrees. In Western Australia, snapper growth has been greatest at mid latitudes (which have more moderate temperatures), and lowest at the northern limit of their range where temperatures are higher. The optimal temperature maximum for snapper growth in South Australia was found to be between 18-20 degrees,

temperatures which are being already exceeded at times in the Bay of Islands.[10] This may affect growth in the future.

There is also evidence of an optimal temperature range for red rock lobster recruitment, with relatively warm years being associated with poorer recruitment in northern quota management areas, and better recruitment in southern quota management areas.[11] Warming waters may have contributed to poor rock lobster recruitment in the Bay of Islands in recent years.

Sediment flows into the marine area are also likely to increase significantly in a climate changing world (without effective mitigation being put in place), with more intense storms and increased frequency of storm events predicted. Soft rock hill country, as in the Taumārere catchment, is particularly susceptible to increased erosion. It will likely generate an increased sediment yield of between 50 and more than 200 per cent by 2090, depending on the emissions reduction track adopted by global emitters.[12]

Te Haumi Inlet, where water temperatures have already exceeded 26 degrees

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11 Potential initiatives

Tourists at Motuarohia Island

There are multiple pressures on the Bay of Islands marine area which, cumulatively, are likely to increase without a strengthened response. It is also clear that ongoing marine pollution and degradation is having significant cultural, social and economic impacts. In this Chapter we identify some potential initiatives that might assist in better responding to the environmental challenges identified in Part Three. This is not to suggest that we have answers to what are complex issues, but we thought it might be helpful to provide some indications to enrich local debate. It will be local hapū, along with the community and management agencies, that will determine the next steps.

> "There needs to be a mechanism to pull all the different entities together towards a shared vision of the future. All would agree to high level objectives but it's lining up the details and then having the funding to be able to do it." (Interviewee, 2025)

11.1 Broadened invasive Caulerpa response

The current focus of the exotic Caulerpa response has been to stop the spread by using a CAN at Te Rāwhiti Inlet, and identifying methods to remove local infestations. But the CAN has not worked as intended, arguably being too late and not being expanded to capture outliers. Exotic Caulerpa is now established on the Ipipiri Platform which has warm, sheltered, clear waters which are likely to be favourable to further growth.

As described in section 2.3, this area has very special and possibly unique benthic habitats which are now at high risk. Given this situation, it would seem prudent to reduce other stressors on the marine ecosystem there (to the extent possible), to increase its resilience to exotic Caulerpa (and removal methods which also impact indigenous species).

For this reason we suggest a fisheries closure be established around the entire Ipipiri Platform, to prevent harvest of marine life, until the exotic Caulerpa invasion in the Bay is under control. This would help address the main activity reducing the resilience of marine ecosystems to the seaweed invasion (fishing). An anchoring ban could also be contemplated, under a CAN, as anchoring is thought to be a significant source of dispersal.

11.2 Kelp forest restoration

The Bay of Islands may be suffering the most profound loss of kelp forests in the country. This is having a significant impact on the abundance and diversity of other marine life including harvested species. Restoration of lost kelp forests would make a very significant contribution to revitalising the marine area. It may also be critical to maintaining healthy reefs in the face of the expanding exotic Caulerpa invasion.

Fortunately, we now know kelp forests can be restored through intervention, with the removal of sea urchins and re-establishment of their predators. The prospective closure of the rock lobster fishery on the North Island's north-east coast (including the Bay of Islands) would provide

a strong platform for a concerted restoration effort. This would, in the first instance, require large scale kina and long-spined urchin removal. Secondly, in addition to a harvest closure, physical re-establishment of red rock lobster populations will likely be required. This could be achieved through relocation of mature adults from other areas where there are healthy populations (such as Fiordland), so that the natural balance in the marine foodweb can be re-established.

Such a project could build on the local collaboration established in response to the exotic Caulerpa crisis which could potentially be expanded to include kelp restoration. As noted above, that response has brought people together to focus on the health of the marine area.

Additional support could be sought from the Minister of Oceans and Fisheries and central government based on the economic revival and job creation opportunities such a project would create (perhaps recycling the $8 million prospective government investment in the area that was recently withdrawn).

It would also support the Bay of Islands becoming an eco-tourism hotspot, should that be a local aspiration, thereby further expanding economic opportunities and creating marine-based jobs (see below). There have been indications that some philanthropic funding might be available to complement that from government for such an ambitious project.

11.3 Taumārere catchment remediation

We described in Chapter 7 the debilitating impacts of high sediment flows into the Bay of Islands. Most of the sediment is sourced from the Taumārere catchment. These sediment flows will likely increase with climate warming and more intense and frequent storm events. It is therefore urgent that a more effective response is put in place.

Inspiration could be taken from the Kaipara Moana Remediation project which is tackling similar issues but on a much larger scale (the Kaiapara Moana catchment is 6,000 km^2 compared to 500km^2 for the Taumārere catchment). This has involved a collaborative effort underpinned by an earlier Te Tiriti Settlement and Memorandum of Understanding between the Ministry for the Environment, iwi and hapū, Northland Regional Council and Auckland Council. A Joint Committee has been established to oversee the initiative. The collaboration has enabled the project to secure $100 million in funding from the Crown.[1]

The project has adopted a strategic approach to focussing on areas with high sediment-generating potential. As well as directly working with landowners, to undertake restoration activities, it supports community-led projects and job creation. It has created significant employment in nature restoration and environmental management.[2]

It is time to establish a second such project in Northland, with the Taumārere catchment a priority given its significant impact on the health of the Bay of Islands. There have been efforts to achieve this in the past and now is the time to bring them fruition. Such a project could be initiated through the establishment of a collaborative group including local hapū, community groups, key stakeholders in the catchment, Northland Regional Council and Far North District Council. This could build on the business case currently being developed by Northland Regional Council and Ngāti Hine.

11.4 Tighter enforcement of dolphin sanctuary

It is clear that bottlenose dolphins in the Bay of Islands have suffered from excessive disruption for decades. Te Pēwhairangi Marine Mammal Sanctuary provides a mechanism through which this pressure can be better managed, and the dolphin population rebuilt over time. However, it is evident that the Sanctuary rules are being flouted much of the time, and that enforcement efforts are insufficient. This is not good enough.

We urge DOC to ramp up its enforcement efforts significantly, including through targeting some high-profile prosecutions, to ensure the rules are respected and the dolphins are left in peace. We also suggest that a further tightening of rules is considered, if monitoring indicates that the dolphins are still being negatively impacted by boating activity.

11.5 Marine Eco-tourism Strategy

The Bay of Islands has some of the most extraordinary marine environments in the country and they are relatively accessible. It also has a very rich cultural and historical context. The establishment of the Rākaumangamanga Rāhui Tapu provides additional opportunities for marine tourism. This is particularly in the context of the proposed Great Walk which would take walkers from Maunganui Bay, over Rākaumangmanga, and through the eco-sanctuary on the Elliot Farm, thereby providing increased opportunities for Ngāti Kuta in cultural and natural tourism.[3]

Better supporting hapū to effectively deploy customary fisheries management tools, and expanding marine protected areas, could help

support similar initiatives in other parts of the Bay of Islands. This could establish the Bay of Islands as a domestic and international dive and snorkelling destination drawing on the rapid expansion of the international market for such tourism activities (see spotlight).

Spotlight on international dive tourism

"In just a few years, the [international] market size for diving tourism has seen rapid expansion. Growth is predicted to continue from $4.06 billion in 2024, reaching $4.52 billion in 2025, with a compound annual growth rate of 11.4%. This ... has been driven by a variety of factors, including enhanced disposable income, the growing appeal of adventure tourism, heightened consciousness about marine conservation efforts, the introduction of dive training schemes, and advancements in travel infrastructure. The market size for diving tourism is projected to ... [reach] $6.87 billion by 2029."[4]

Bay of Islands Maritime Park recently lodged with DOC an expression of interest for the Bay of Islands to be included on Aotearoa New Zealand's World Heritage Tentative list based on its outstanding natural and cultural heritage values. If the listing were to proceed, it could provide a strong focus for an eco-tourism strategy, and also help bring the additional recognition and resources needed to better manage the area.

Kelp forest restoration projects could also provide an attraction for tourists, and could be linked with restoration on land, including the work of Project Island Song and Predator Free Pēwhairangi Whānui which is undertaking collaborative pest control across three peninsulas in the Bay of Islands.[5]

There will be other opportunities and the development of a Marine Eco-tourism Strategy for the Bay of Islands could identify and build on these. Such a strategy could provide more granular detail for the Bay of Islands marine area than provided in the Northland Destination Management Plan, serving to operationalise the action set out in that plan of regenerating the coastal and marine environment "through significantly increased use of rāhui, mātaitai, taiāpure and marine reserves, leading to a healthy ecosystem."[6]

It will be important to make sure sufficient infrastructure and resource is in place to properly provide for and manage additional visitors including managing biosecurity risks, providing reliable wastewater treatment systems and addressing litter in the marine area.

11.6 Charging marine users

We reviewed in Chapter 4 the significant pressures that marine activities are placing on the Bay of Islands' marine environment. However, few of these activities are actually contributing towards the cost of managing these. One notable exception is commercial vessel operators who hold dolphin permits, under the Marine Mammals Protection Regulations, who pay annual fees to fund research undertaken on the bottlenose dolphins.

Quota owners pay towards fisheries management, including undertaking research to ascertain stock status, but as commercial fishing has largely withdrawn from the Bay of Islands and stock assessments are undertaken at much larger spatial scales, we now know little about the state of fisheries there. Charter fishing vessels report their catch but do not pay towards fisheries management or research.

Northland Regional Council does currently charge modest fees for activities in the marine area to cover things such as administration, inspections, navigational safety and marine biosecurity.[7] However, there are currently no coastal occupation charges in place under the RMA. Imposing such charges is a mechanism through which regional councils can raise funds for management of the coastal marine area more broadly.[8]

Arguably, local residents are paying towards current management through their rates. But this excludes the large flotilla of boats that visit the area each summer. We suggest that the Northland Regional Council puts in place an equitable charging regime that helps ensure that marine users are paying their fair share towards management.

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12 Conclusions

Looking across Urupukapuka Island

In this report we have described the very special biogeographic features of the Bay of Islands and the environmental challenges it faces including widespread loss of kelp forests, depletion of some key fish stocks, sedimentation, decline in bottlenose dolphins, the Caulerpa invasion and climate change. Cumulatively these pressures have significantly degraded the health and mauri of the marine area.

There has been much activity to respond to these pressures, by hapū, Northland Regional Council and community members, but it has not been at a sufficient scale to address the issues. We have identified some potential additional approaches to consider in strengthening this response.We consider that the time is right to step up that activity and resource a coherent and practical initiative to restore the special environment of the Bay of Islands.

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Appendix: Ngāpuhi hapū in Bay of Islands area[1]

6 Taiāmai ki te Marangai

Hapū	Marae	Wharenui	Location
Ngāti Hineira	Parawhenua	Parawhenua	20 Te Ahuahu Road, Te Ahuahu
	Rāwhitiroa (Te Ahuahu)	Rawhitiroa	444D SH1, Te Ahuahu
	Tauwhara	Te Rangiawhiowhio	140 Whakataha Road, Waimate North
Ngāti Kawa	Oromāhoe	Ngāti Kawa	41 Porotu Road, Oromāhoe
	Te Tī Waitangi (Lower marae)	Te Tiriti o Waitangi	30 Te Karuwha Parade, Paihia
	Waitangi National (Upper marae)	Te Whare Runanga	Tau Henare Drive, Waitangi
Ngāti Kiriahi	Ngāwhā	E Koro Kia Tutuki	5748 SH12, Ngāwhā
Ngāti Kiripakapaka	Tauwhara	Te Rangiawhiowhio	140 Whakataha Road, Waimate North
Ngāti Korohue	Parawhenua	Parawhenua	20 Te Ahuahu Road, Te Ahuahu
	Tauwhara	Te Rangiawhiowhio	140 Whakataha Road, Waimate North
	Te Aranga Hou	"No wharenui"	Lake Road, Ōkaihau
Ngāti Kura	Mātauri (Te Tāpui)	Ngāpuhi	60 Tāpui Road, Mātauri Bay
Ngāti Mau	Ngāwhā	E Koro Kia Tutuki	5748 SH12, Ngāwhā
	Wharengaere	"No wharenui"	44 Wharengaere Road, Purerua Peninsular
Ngāti Miru	Mātauri (Te Tāpui)	Ngāpuhi	60 Tāpui Road, Mātauri Bay
Ngāti Rāhiri	Oromāhoe	Ngāti Kawa	41 Porotu Road, Oromāhoe
	Te Tī Waitangi (Lower marae)	Te Tiriti o Waitangi	30 Te Karuwha Parade, Paihia
	Waitangi National (Upper marae)	Te Whare Runanga	Tau Henare Drive, Waitangi
Ngāti Rangi	Ngāwhā	E Koro Kia Tutuki	5748 SH12, Ngāwhā
Ngāti Rēhia	Hiruhārama Hou (Te Tī)	Hiruharama Hou	8 Te Tii Road Extension, Te Tii
	Mātoa	"No wharenui"	Kōwhai Point Road, Kerikeri
	Tākou	Te Whetū Marama	Otaha Road, Tākou Bay
	Tauwhara	Te Rangiawhiowhio	140 Whakataha Road, Waimate North
	Whitiora	Te Ranga Tira Tanga	128 Te Tii Road, Te Tii
Ngāti Tautahi	Tākou	Te Whetū Marama	Otaha Road, Tākou Bay
	Tauwhara	Te Rangiawhiowhio	140 Whakataha Road, Waimate North
Ngāti Tawake ki Te Tuawhenua	Tauwhara	Te Rangiawhiowhio	140 Whakataha Road, Waimate North
Ngāti Torehina	Wharengaere	"No wharenui"	44 Wharengaere Road, Purerua Peninsular
Ngāti Tūpango	Tākou	Te Whetū Marama	Otaha Road, Tākou Bay
Ngāti Whakaeke	Mātoa	"No wharenui"	Kōwhai Point Road, Kerikeri
	Tākou	Te Whetū Marama	Otaha Road, Tākou Bay
Te Kapotai	Rāwhitiroa (Te Ahuahu)	Rawhitiroa	444D SH1, Te Ahuahu
Te Mōunga	Tauwhara	Te Rangiawhiowhio	140 Whakataha Road, Waimate North
Te Popoto	Rāwhitiroa (Te Ahuahu)	Rawhitiroa	444D SH1, Te Ahuahu
Te Uri Hoatau	Ngāwhā	E Koro Kia Tutuki	5748 SH12, Ngāwhā
Te Uri o Hua	Te Aranga Hou	"No wharenui"	Lake Road, Ōkaihau
Te Uri Taniwha	Ngāwhā	E Koro Kia Tutuki	5748 SH12, Ngāwhā
	Parawhenua	Parawhenua	20 Te Ahuahu Road, Te Ahuahu
	Rāwhitiroa (Te Ahuahu)	Rawhitiroa	444D SH1, Te Ahuahu
Te Whanauwhero	Parawhenua	Parawhenua	20 Te Ahuahu Road, Te Ahuahu
	Tawhata	Te Hinau	Tawata, Whanganui River
Te Whiu	Mātoa	"No wharenui"	Kōwhai Point Road, Kerikeri
	Tauwhara	Te Rangiawhiowhio	140 Whakataha Road, Waimate North
Whānautanga	Parawhenua	Parawhenua	20 Te Ahuahu Road, Te Ahuahu
Whānautara	Tauwhara	Te Rangiawhiowhio	140 Whakataha Road, Waimate North

7 Taumārere ki Rākaumangamanga

Hapū	Marae	Wharenui	Location
Ngāti Kuta	Te Rāwhiti (Omakiwi)	Te Rāwhiti	221 Rāwhiti Road, Rāwhiti
Ngāti Manu	Kāretu	Ngāti Manu	652 Kāretu Road, Kāretu
	Pākaru-ki te Rangi	*No wharenui*	Pakaru Road, Kāretu
Ngāti Pare	Waikare (Te Tūruki)	Te Huihuinga / Te Aranga o te Pā	1690 Waikare Road, Waikare
Patukeha	Kaingahoa (Rāwhiti)	Tūmanako	243 Rāwhiti Road, Rāwhiti
	Te Rāwhiti (Omakiwi)	Te Rāwhiti	221 Rāwhiti Road, Rāwhiti
	Waihāhā	*No wharenui*	Waikare Road, Waikare
Te Kapotai	Kororāreka	Haratu	5-7 Pitt Street, Russell
	Waihāhā	*No wharenui*	Waikare Road, Waikare
	Waikare (Te Tūruki)	Te Huihuinga / Te Aranga o te Pā	1690 Waikare Road, Waikare
Te Uri Karaka	Kāretu	Ngāti Manu	652 Kāretu Road, Kāretu
Te Uri o Raewera	Kāretu	Ngāti Manu	652 Kāretu Road, Kāretu
Te Uri Ongaonga	Pākaru-ki te Rangi	*No wharenui*	Pakaru Road, Kāretu
	Waimangaro		Lonely Valley, Paihia

Endnotes

1 Te Puni Kōkiri, at https://www.tkm.govt.nz/iwi/ngapuhi/#

In this report we have described the very special biogeographic features of the Bay of Islands and the environmental challenges it faces including widespread loss of kelp forests, depletion of some key fish stocks, sedimentation, decline in bottlenose dolphins, the Caulerpa invasion and climate change. Cumulatively these pressures have significantly degraded the health and mauri of the marine area.

There has been much activity to respond to these pressures, by hapū, Northland Regional Council and community members, but it has not been at a sufficient scale to address the issues. We have identified some potential additional approaches to consider in strengthening this response.

It is time to step up action and resource a coherent and practical initiative to restore the special environment of the Bay of Islands.

Environmental Defence Society

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