# *Te ora o te Taiao ā-Takutai Moana*
# *State of the Environment Coastal*
# *Te Taitokerau*
2024

Northland
REGIONAL COUNCIL
Te Kaunihera ā rohe o Te Taitokerau

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# Ngā Ihirangi
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# 1 Tīmatanga


## Reporting on the state of our environment

Monitoring of the state of the environment is a key function of regional councils and is required by the Resource Management Act 1991 (RMA). Councils must make available a review of results of their monitoring activities at intervals of not more than five years. Northland Regional Council elected to habitually share their results in State of the Environment reports, produced every three years and covering five different areas:

- Biodiversity and Biosecurity
- Land
- Coast
- Freshwater
- Air quality and Climate

Rather than presenting findings for all five areas concurrently, our objective is to adopt a phased approach, disseminating reports on one or two specific areas each year.

**This is our State of the Environment (Coastal) 2024 report.**

## Our Coastal Environment

Northland has approximately 3,000 km of coastline stretching from the Mangawhai Harbour on the east coast, North towards Cape Reinga, and down the west coast to the entrance of the Kaipara Harbour. Along the coast there are numerous offshore islands, stacks, and estuaries supporting a diverse array of marine life. Bounded by the Tasman Sea and the Pacific Ocean, Northland's coastal waters are home to the highest diversity of fish and invertebrates of any region in mainland New Zealand and contain marine ecosystems of regional and national importance. The ocean, beaches and estuaries are integral to our communities, providing kai moana, recreational opportunities, environmental resources, and economic opportunities.

## Managing the coastal environment

Managing the activities that occur in the coastal environment, as well as activities on land, that may impact the diverse range of plants and animals that call the ocean home is a challenge, complicated by our incomplete knowledge of the marine environment and the coastal processes that shape it.

The management of the coastal environment is made more complex by the array of agencies and organisations, with responsibilities to protect and manage our coastal resources. Northland Regional Council (NRC) has responsibilities under the Resource Management Act[1], to manage certain activities in the coastal marine area and some activities on the land that might affect coastal water quality. Council's Maritime team also has responsibilities under the Maritime Transport Act 1994[2] and Marine Management (Marine Pollution) Regulations 1998[3]. Other local and central government organisations, such as the Department of Conservation (DoC), the Ministry of Primary Industries (MPI) and our three district councils also play important roles in managing our coastal environment.

## This report

This report aims to inform Northlanders of the pressures and threats facing our coastal environment, report how these pressures have influenced the health of our marine environment, and highlight actions taken by council, community groups and hapū/iwi to respond to the challenges. It looks at activities on land that impact the coastal environment, activities in the coastal marine area, climate change and coastal hazards, and biosecurity. While this report explores the history of human activities that have impacted our marine environment, this assessment of the state of our marine environment is for the period from 1 January 2019 to 31 December 2023. The report also explores the outlook for the marine environment in relation to each of the threats examined.

The range of threats facing the coastal environment presents a huge challenge, and monitoring and reporting on the health of the environment is vital for making informed decisions to protect and enhance it. This is particularly crucial considering increased pressures, such as development within the coastal environment, population growth and climate change. Through high quality data, solid analytics, productive engagements with our communities, and partnership with iwi and hapū, the right decisions can be made for us, our mokopuna and our marine environment. This report aims to inspire readers to learn more about our incredible marine environment and encourage you to exercise kaitiakitanga over the moana.

# Ngā tirohanga ao Māori

## *Te Ao Māori perspectives*

Iwi and hapū play an active role in the management of Northland's coastal environment. In te ao Māori, tangata whenua have a deep connection with te taiao (the natural world, or environment) and express this through the practice of kaitiakitanga – guardianship, protection and looking after te taiao, while seeing people as being part of it. Local hapū play key roles in biosecurity, environmental monitoring, fisheries management, the development of council plans and policies, and resource consent process.

Council's Te Tiriti strategy and implementation plan, Tāiki ē4, jointly developed and agreed by council and Te Taitokerau Māori and Council Working Party (TTMAC), guides the implementation of all of council's work. It comprises five Whāinga or Goals, encompassing the areas of Capacity and Capability; Climate Crisis; Māori Representation; Economic Development; and Water/Marine. A key component of these whāinga is that tangata whenua and council work in a Te Tiriti o Waitangi partnership to achieve shared goals. Within the water/marine whāinga there are commitments to protect, restore and improve the mauri of wai; better understand and improve the health of water through mātauranga Māori; and to give effect to Te Mana o te Wai. Actions relevant to the coastal environment include:

- environmental monitoring incorporating mātauranga and tikanga Māori, recognising the role of tangata whenua as kaitiaki (guardians);
- supporting tangata whenua-led approaches to marine environmental protection and economic development opportunities such as:
    - marine protected areas;
    - restoration and enhancement programmes within coastal marine areas;
    - reviewing and implementing marine biosecurity policies and measures; and
    - progressing with culturally and ecologically appropriate economic development opportunities in the coastal marine area such as aquaculture activities.

Some examples of partnership in the coastal area highlighted in this report include dune restoration at Mātihetihe; Caulerpa surveillance and removal trials in Te Rāwhiti; and the creation and implementation of rāhui tapu in Mimiwhangata and Rākaumangamanga. These activities have all been jointly developed, planned and implemented by council and tangata whenua.

Council has also entered Mana Whakahono ā Rohe agreements with Patuharakeke, Ngāti Rēhia, Te Parawhau ki Tai, and Ngāti Hine. These agreements are binding statutory arrangements under the Resource Management Act (RMA), which provide for a more structured relationship with iwi/hapū, enhance Māori participation in RMA resource management and decision-making processes, and aim to build capacity and capability for hapū to undertake monitoring and exercise kaitiakitanga.

Some tangata whenua entities in Te Taitokerau have prepared Environmental Management Plans, which if formally lodged with council and recognised by an iwi authority must under the RMA[1] be taken into account by council as planning documents when preparing or changing the regional policy statement or regional plan, or when considering resource consent applications. These plans may describe such things as hapū or iwi aspirations and objectives for looking after the taiao in their rohe; desired outcomes, policies, and planned actions; hapū monitoring indicators and the use of mātauranga Māori for monitoring and protecting/restoring environmental wellbeing; and expectations for partnership with other groups and agencies.

# 2 Activities on Land

## Te Tirohanga whānui

*Overview*

Our coastal environment is under pressure from activities which occur on land, sometimes far away from the ocean. Contaminants like sediment, nutrients and plastics are carried by rivers and our urban stormwater drainage networks out into the moana. This chapter will look at five contaminants, which are of particular concern in Northland's coastal environments: sediment; nutrients, pathogens, metals; and plastic.

# Activities on Land

**Our coastal environment is under pressure from activities which occur on land, sometimes far away from the ocean. Contaminants like sediment, nutrients and plastics are carried by rivers and our urban stormwater drainage networks out into the moana.**

## Sediment

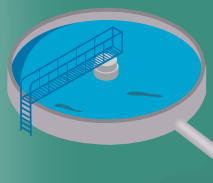
- Soil erosion from forestry and agriculture increases sediment in estuaries.
- Uncontrolled earthworks can lead to sediment entering waterways.
- Stock access to waterways can cause bank erosion.
- Increased sediment has shifted habitats from sand to mud in estuaries.
- Increased sediment can smother marine plants and animals.

## Pathogens

- Pathogens threaten swimmers and kaimoana.
- Human waste pathogens can enter the coast from wastewater discharges, overflows, and faulty septic systems.
- Stock access, dairy effluent discharges, and agricultural runoff can lead to animal waste in waterways.

## Nutrients

- Nutrients from fertiliser runoff and wastewater discharges can impact coastal ecosystems.
- Many wastewater treatment plants discharge into the coast.
- Heavy rainfall can cause wastewater overflows.
- Excess nutrients cause algae blooms and low oxygen levels, harming marine life.
- Some algal blooms are toxic to marine animals and humans.



## Metal

- Metal contaminants from urban and industrial activities can wash into the coast.
- Heavy metals like copper and zinc harm marine organisms.
- Contaminants move up the food chain to animals and humans.
- Industrial discharges, stormwater, and boat maintenance can contribute to metal contamination.

## Plastic

- Plastic is a major ocean pollutant and can harm or kill animals that ingest or get entangled in it.
- Larger plastic items break down into microplastics, which marine organisms mistake for food.

# 2.1 Sediment

In Northland, extensive historical clearance of natural vegetation cover for agriculture, forestry and urban development has increased the amount of sediment that reaches our coastal environments. In addition, significant areas of saltmarsh and mangrove forest, which act as natural filters for sediments and other contaminants, have been cleared and drained. Northland's climate and landscape also makes us vulnerable with approximately 45% of Northland's land area considered to be at a high risk of erosion[1].

## He aha ngā pāpātanga?
## *What are the issues?*

Increased sediment inputs can have several impacts on our coastal biodiversity. High levels of sediment in the water column restrict light transmission, which affects the amount of photosynthesis (primary production) of aquatic plants and consequently other species that are dependent on them, such as fish and shellfish. Reduced water clarity can also affect the feeding efficiency of visual predators like fish and sea birds. Sediment particles can clog the feeding structures and gills of fish and suspension feeding animals like hūwai (cockles) and kōkota (pipi), that filter their food from the water column[2]. Increased sediment loads also leads to an infilling of our estuaries and a shift from sand to mud dominated environments.

*Sediment laden water covering an oyster farm in Whangaroa Harbour.*

*Water clarity is an important attribute for recreation and aesthetic values as poor water clarity makes the water less desirable for swimming and recreational activities for some people.*

# E pēhea ana te ora ināianei?
## *What is the current state?*

Historic deforestation to make way for pasture dominated landscapes has increased soil erosion leading to sediment accumulation in many of Northland's harbours. In many cases this has caused a shift from sand to mud dominated estuarine systems and an order of magnitude increase in sediment accumulation rates, relative to pre-deforestation values[3].

Council has undertaken investigations of sediment accumulation rates in the Bay of Islands, Whangārei Harbour, and the Kaipara Harbour, which have estimated sediment accumulation rates of between 2.4mm and 6.4mm per year, over the last 100 years [3, 4 & 5].

While annual sediment accumulation rates of 2 to 4mm may not sound significant, they represent an order of magnitude increase compared to sediment rates prior to the arrival of Polynesians and Europeans in Te Taitokerau. As part of the Bay of Islands investigation, radiocarbon dating of shell material preserved deep in the sediment cores was used to estimate that the average sediment accumulation rate was just 0.23mm per year during the 10,000 years prior to deforestation by people.

*Analysis of sediment cores has estimated that annual sediment deposition in the Bay of Islands over the last 150 years to be 509,000 tonnes per year, which is 10-20 times higher than the period preceding European settlement[3].*

The same Bay of Islands study estimates that annual sediment deposition in the Bay of Islands has averaged 509,000 tonnes per year – far greater that the average of 20,000-50,000 tonnes per year prior to human settlement[3].

A later study commissioned by council in 2020 to estimate contaminant loads to the Hokianga Harbour found that the sediment load has almost doubled (48%) since prehuman times[6]. The study also found that approximately 76% of the sediment load to the Hokianga Harbour is now derived from agriculture and plantation forestry sources.

Council's coastal water quality monitoring shows that between 2019 and 2023 several sites in the Kaipara Harbour and Hokianga Harbour have poor water clarity, with water clarity in the northern Wairoa River being particularly poor.

### Key Fact

Sediment loads to the Hokianga Harbour have almost doubled since prehuman times.

# He aha ngā mahi hei whakatika?
*What is being done?*

## Response

Council has set out policies and rules in the Proposed Regional Plan for Northland[7], that aim to maintain water quality and manage sediment discharges from land disturbance activities. For example, the Proposed Regional Plan includes rules that require stock be excluded from specified waterbodies and controls on land disturbance activities within and close to waterways, to help reduce sediment entering water.

Over the period from November 2023 to March 2024 council sought feedback on a draft plan change[8] developed in response to the National Policy Statement for Freshwater Management 2020[9] to maintain or improve the state of fresh and coastal waters. The draft plan change included proposed new rules to better manage sediment loss to water given:

- The significant and widespread impacts of sediment in freshwater bodies and coastal receiving environments of Te Taitokerau;
- Current regional rules (and government regulations) are unlikely to lead to significant improvement; and
- Climate change is expected to significantly increase erosion risk in Te Taitokerau.

The draft plan change included tighter rules on vegetation clearance and earthworks and sought feedback on options to manage livestock access to waterways with a particular focus on high value waterbodies and areas of high erosion risk. The plan change process is currently on hold pending revised policy direction on freshwater from Central Government.

Council also provides advice and grants to landowners to fence waterways and reduce soil erosion. NRC's Environment Fund, Waimā Waitai Waiora funding and Whangārei Urban Awa Project have provided grants to landowners, hapū, and community groups to carry out environmental improvement projects. This includes funding for 601 kilometres of fencing to exclude stock from the riparian margins of rivers, streams, drains and wetlands, and the planting of 51,063 native plants in riparian areas to reduce soil erosion and enhance biodiversity values.

*The Whangārei urban awa project has helped fund over 20 km of fencing helping to keep stock out of our waterways and planted 20,890 native plants between 2020 and 2023.*

*Council's nursery supplied 23,929 subsidised popular and willow trees for planting on erosion prone land between 2019 and 2023.*

Northland Regional Council's nursery supplies subsidised poplar and willow trees to protect against soil erosion. This helps maintain agricultural productivity and reduces the amount of sediment reaching our waterways. Between 2019 and 2023 Council supplied 23,929 popular and willow trees for planting on erosion prone land throughout Northland.

In 2020, Northland Regional Council joined the Ministry for the Environment, Ngā Maunga Whakahii o Kaipara, Te Rūnanga o Ngāti Whātua, Te Uri o Hau and Auckland Council, in signing the Kaipara Moana Remediation Memorandum of Understanding, a joint commitment by the Crown, Kaipara Uri and Regional Councils to protect, restore and enhance the mauri of Kaipara Moana.

By December 2023, Kaipara Moana Remediation (KMR) had been fully operational for two years and had developed 539 Sediment Reduction Plans or equivalent for landowners in the Kaipara Moana catchment, covering 102,681 hectares of land. In this time, KMR also provided or committed to grants of over $8.9 million to landowners and community groups to carry out projects to reduce erosion and sedimentation in the catchment. Over 569 kilometres of fencing to exclude stock from the riparian margins of rivers, streams, drains, wetlands, and the coastal environment had been completed or contracted with landowners and community groups and nearly 1.3 million native plants had been planted or contracted for planting in riparian, wetland or coastal margins, or highly erodible hill country.

## Key Fact

Between 2019 and 2023 Councils supplied almost 24,000 popular and willow trees to help stabilise erosion prone land.

# He aha kei tua?
## *What is the outlook?*

Approximately 62% of Northland's land cover is used for agriculture, horticulture, and production forestry, with relatively little change in the total land area used for these activities between 2012 and 2018[10]. Without significant changes in land use and land management practices, increased levels of soil erosion and sedimentation rates in our estuaries are likely to persist for the foreseeable future.

Recent legislative changes at national and regional level, including the Resource Management (stock exclusion) Regulations 2020[11], amendments to the National Environmental Standards for Commercial Forestry (November 2023)[12], and the Proposed Regional Plan for Northland[7], will help to improve land management practices. The government requirement for freshwater farm plans (under the Resource Management Freshwater Farm Plans Regulations[13]) is also expected to improve land management practices once implemented.

However, because of the scale of the issue, current regional rules and government regulations are unlikely to lead to a significant reduction in sediment loads reaching our coastal environment. In addition, any improvement may be limited by the impacts of climate change. Northland is expected to experience an increase in droughts and severe rain events[14]. As a result, Northland's erosion rates and sediment yields are predicted to increase significantly by the end of the century, with the potential for the total suspended sediment load flowing to Northland's coast to more than double by 2090[15].

The outcome of council's draft plan change, developed in response to the National Policy Statement for Freshwater Management 2020, will be critical to reducing soil erosion and reducing sediment loads reaching our coastal environment.

*Sediment laden water in Mangōnui Harbour, following heavy rainfall.*

# 2.2 Nutrients

While nutrients are essential for all forms of life, nutrients that enter the environment from human sources and activities, such as fertiliser runoff, stormwater, treated wastewater, sewage overflows and failing septic systems, may exceed the capacity of an ecosystem.

## Key Fact

Wetlands, that can help filter excess nutrients, used to cover 32% of Northland, but 95% of these wetlands have been lost.

## He aha ngā pāpātanga?
*What are the issues?*

Elevated nutrient levels can cause excessive plant growth leading to algal blooms which, in turn, can cause lowered levels of water clarity, and periodically lowered levels of dissolved oxygen. Toxic algal blooms pose a significant human health risk through contact with water and eating contaminated shellfish. Both toxic algal blooms and excessive plant growth due to nutrient supply (eutrophication) can reduce the life-supporting capacity of the water. Excessive plant growth can also look unattractive and can cause an unpleasant odour when it dies and decays.

*Large quantities of red algae have been washed ashore at Waipū Cove, impacting recreational and amenity value of the beach.*

# E pēhea ana te ora ināianei?
## *What is the current state?*

Council undertakes monthly coastal water quality monitoring at 46 sites around the region. The results from this programme show that between 2019 and 2023 concentrations of nutrients like phosphorous and nitrogen were typically lower at open coast and estuarine sites compared to sites in tidal creeks and the Hātea River, in Whangārei Harbour. However, large differences were also observed between estuarine systems, with higher nutrient concentrations typically found at sites in the Kaipara Harbour, the Hokianga Harbour and in the Hātea River. More information about the coastal water quality programme and water quality in Northland can be found in the latest technical report on NRC's website.

**71%** of sites achieved the coastal water quality standard for **total nitrogen**

**90%** of sites achieved the coastal water quality standard for **ammoniacal nitrogen**

**71%** of sites achieved the coastal water quality standard for **nitrate-nitrite nitrogen**

**83%** of sites achieved the coastal water quality standard for **total phosphorus**

**79%** of sites achieved the coastal water quality standard for **dissolved reactive phosphorus**

Council also keeps records of algal blooms and nuisance algae, reported by members of the public. Between 2019 and 2023, 26 algal blooms were reported with two particularly significant events during the reporting period. In March 2021, large quantities of red algae accumulated in Waipū Estuary. Initially, the warm and relatively shallow conditions in the estuary were favourable for the red algae to continue to grow, but once the algae began to die, the decomposition of the seaweed resulted in widespread death of marine animals, and a significant odour issue for residents[16].

*Decaying macro algae in Waipū Estuary March 2021 resulted in widespread death of marine animals and a significant odour issue for residents.*

In April 2023, a large algal bloom was reported in the Hātea River, Whangārei, which extended for 7.5 km, from the Town Basin to Onerahi. Sampling indicated that the dominant species was *Heterosigma akashiwo*, which is the Japanese name for 'red tide' and is known to be toxic to fish. Water quality monitoring during the bloom found exceptionally high concentrations of chlorophyll-a, total nitrogen and total phosphorus at the Town Basin, in Whangārei.

*Nutrient concentrations in the Hātea River in Whangārei Harbour are very high and several algal blooms have been reported to council.*

# He aha ngā mahi hei whakatika?
## *What is being done?*

### Response

Nutrients can enter the coastal environment from diffuse sources such as runoff from agricultural land and from point source discharges such as wastewater treatment plants and farm dairy effluent. While point source discharges can be readily managed through rules or consent conditions, controlling diffuse sources of nutrients (such as run-off from agricultural land) is far more challenging for regional councils due to multiple sources distributed across the landscape (rather than being discharged from an outlet or treatment system). The government requirements for freshwater farm plans[13] are likely to provide improved nutrient management once implemented and a future regional plan change would also provide an opportunity to better manage nutrient loss.

To help address the issue, council's land management team provides advice to landowners on soil and pasture management, and NRC's environment fund has provided grants to support riparian fencing. Farm nutrient budgeting is critical to achieve optimum soil nutrient availability and production, without over-fertilising, which can result in nutrient run-off and leaching into waterways. Regular testing of soils to ensure that fertiliser is only applied when it's needed and ensuring that fertiliser application is targeted and carefully applied near streams and drains to prevent fertiliser ending up in waterways.

Council regulates point source discharges through policies and rules in the Proposed Regional Plan for Northland[7]. Treated wastewater discharges to water from wastewater treatment plants are discretionary activities while the discharge of treated farm dairy effluent wastewater to water is a non-complying activity, meaning that both activities require a resource consent. These discharges are monitored by council's compliance team to ensure that they are compliant with the conditions of their consent.

In Northland, there are 30 consented municipal wastewater treatment plants: five plants discharge to the coast; 18 plants discharge into waterways that ultimately discharge into the coastal environment and seven discharge to land. Compliance staff conduct regular monitoring of the plants to assess compliance with resource consent conditions and also assess information received from consent holders for compliance. When issues are identified, NRC can and has taken enforcement action. There have been numerous levels of enforcement applied which have ranged from abatement notices, infringement notices and in one case an enforcement order to address non-compliance issues.

In the latest compliance reporting period (2022-23), 719 inspections of farm dairy effluent consents were undertaken with 70% of farms achieving full compliance. 22% of farms had moderate noncompliance and 8% had significant noncompliance with the conditions of their resource consent. To find out more about compliance monitoring and to view the latest compliance statistics please visit the compliance page on NRC's website.

## He aha kei tua?
## *What is the outlook?*

Northland is a rural region with a relatively large amount of agriculture and horticultural activity. The risk of eutrophication of coastal waters from diffuse sources across catchments, is difficult to control through regional rules as the regulatory 'toolbox' for managing these nutrient sources is currently limited – while the Proposed Regional Plan includes rules for activities such as livestock access to waterbodies, farm wastewater discharges to land and fertiliser application, these are unlikely to significantly reduce nutrient concentrations in our coastal environments in the short term. Northland's variable geography, geology and soil types and the range of productive land uses and farm systems means site specific management of nutrients at a property scale is likely to be most effective method to manage diffuse nutrient loss from primary production land. Government requirements to improve freshwater through the implementation of freshwater farm plans is expected to be of real value in reducing nutrient loss, which could be complemented by new rules around stock exclusion and riparian setbacks, educating landowners on the value of riparian planting and wetland creation/restoration, and providing advice on soil conservation and pasture management.

In Whangārei Harbour, where high nutrient concentrations found in the Hātea River are most likely from point source discharges, such as wastewater, a significant reduction in nutrient concentrations is going to be difficult to achieve. The Hātea River catchment is relatively small and has comparatively little agricultural or horticultural land use (<30%) but is home to Whangārei with a population of 56,800. Discharges of treated wastewater effluent from the municipal wastewater treatment plant and any wet weather bypass overflows from the network, therefore, contribute a large proportion of the nutrient load compared to our other estuarine systems[17]. A substantial investment in our water infrastructure is likely to be required for a significant reduction to be observed.

# 2.3 Metals

Heavy metals occur naturally in the environment and are essential to life but can become toxic if concentrations get too high. Metal contaminants from urban and industrial activities can be washed into the coast, where they have lethal and sub-lethal effects on marine organisms.

## He aha ngā pāpātanga?
*What are the issues?*

Although plants and animals can usually regulate metal contaminants within a certain range, metals that cannot be excreted remain within the organisms and accumulate over time. As metals accumulate in an organism they can interfere with biological processes. In contaminated environments the diversity and species richness may decrease as the community becomes dominated by a smaller number of more tolerant species which are able to survive and reproduce in these conditions. The contaminants can also move progressively up the food chain as organisms are consumed by other animals and humans – so this can pose a risk to human health. Metal contaminants are also generally not subject to bacterial attack or broken down by natural processes, so they persist in the marine environment.

*Discharges from industrial sites, can contain high concentrations of metal contaminants.*

Human sources of metal contaminants in the marine environment reflect their different uses and applications by humans, including industrial discharges, roofing materials, drainpipes, plumbing fittings, house paints, vehicle brake pads and tyres, antifouling paint and some agrichemicals.

# E pēhea ana te ora ināianei?
## *What is the current state?*

In Northland, you would expect metal contamination to be relatively low, as it's a rural region, with a relatively small amount of urban and industrial development. However, there are some high-risk industrial sites including a major port, a decommissioned oil refinery - which has operated as a fuel import terminal since 2022, a cement manufacturer, twelve marinas and several boat maintenance facilities.

Council undertakes state of the environment sediment sampling for metal contaminants at 59 sites every two years. Results between 2019 and 2023, indicate that levels of heavy metal contaminants in sediments are generally low, and most sites had concentrations below the coastal sediment standards in the Proposed Regional Plan for Northland[7]. The exception to this were sediment monitoring sites in the Hātea River in Whangārei Harbour and the Kerikeri Inlet, where several sites exceeded the standards. All our sediment results can be viewed on NRC's data hub and more information about sediment quality in Northland can be found in the latest technical report, which is available on our website.

**100%**

of sites were below the relevant standards for lead and **cadmium.**

**99%**

of sites were below the standard for **zinc** with one site in Whangārei harbour (Town Basin) exceeding the standard.

**98%**

of sites were below the standard for **chromium** with two sites in Kerikeri Inlet exceeding the standard

**94%**

of sites were below the standard for **copper** with six sites exceeding the standard (five sites in Kerikeri and one in the Kaipara – Wāhiwaka Creek)

**92%**

of sites were below the standard for **nickel** with eight sites exceeding the standard in Kerikeri Inlet, Wairoa River, and Whangārei Harbour.

Council also undertakes compliance monitoring of industrial discharges, stormwater discharges, marina, and boat maintenance facilities annually. An analysis of all sediment sampled, which included compliance monitoring of resource consents and pollution incidents, demonstrate that elevated concentrations of heavy metals were typically associated with marinas, boats maintenance facilities and stormwater discharges.

*Elevated metal contamination is often associated with point source discharges at boat maintenance facilities.*

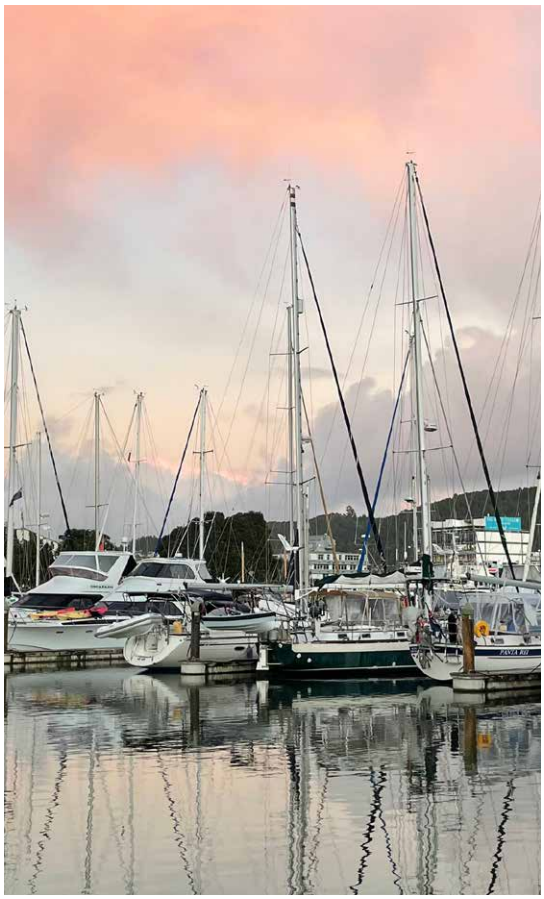
# He aha ngā mahi hei whakatika?
## *What is being done?*
### Response

High risk activities such as marinas, boats maintenance facilities and stormwater discharges usually require resource consents for their discharges, and compliance officers undertake inspections to ensure the activities are compliant with their consents. In addition, a new rule in the Proposed Regional Plan for Northland requires that stormwater discharges from all high-risk industrial premises, such as boat maintenance facilities and concrete manufacturing sites are subject to standards set out in a resource consent.

Managing elevated heavy metal concentrations in sediments within marinas is more complex. Antifouling paints are formulated to reduce the rate of biofouling on the hull of vessels, which helps to reduce the risk of unwanted marine organisms spreading. But antifouling paints can leach into the surrounding waters, and the concentration of boats within marina basins, that often have limited tidal flushing, can contribute to the accumulation of heavy metals in seabed sediments. In granting consents for marinas, council balances the effects of the passive discharge of contaminants from vessels' antifouling paints with the economic and social benefits that the marina brings to the region, and the need to manage space in the coastal environment efficiently.

# He aha kei tua?
## *What is the outlook?*

Metal contamination in Northland is relatively low, with elevated concentrations typically associated with urban areas, and consented activities like marinas, boats maintenance facilities and stormwater discharges. As Northland's population continues to grow, and the number of vessels increases, there is likely to be some increase in metal contamination, but this is likely to continue to be centred around urban areas, point source discharges from trade and industrial sites, boat maintenance facilities and marinas.



# 2.4 Pathogens

Northland is renowned for its warm climate and beautiful beaches, but our ability to enjoy the moana relies on how healthy and clean our harbours, estuaries and swimming spots are. Pathogens from human and animal waste, can enter the coastal environment via livestock effluent, wastewater discharges, sewage overflows, and faulty or poorly maintained septic tank systems.

## He aha ngā pāpātanga?
*What are the issues?*

Pathogens can pose a threat to human health for people swimming or collecting kaimoana (like shellfish). Collecting shellfish is an important cultural tradition in Northland and the coastline is an important source of high-quality kai to our community. Our local aquaculture farms growing mussels and oysters also rely on good water quality.

Discharges from farm dairy effluent treatment ponds and wastewater treatment plants are sources of pathogens to the coastal environment, in addition to diffuse sources from surface runoff, that can contain animal faeces. Farm dairy effluent systems rely on storage of effluent from dairy sheds, which can then be applied to land (as a fertiliser). If the system is not properly maintained or if there is insufficient pond storage during wet weather when land application is not appropriate, discharges containing pathogens may occur.

Wastewater treatment plants are required to treat wastewater before discharge, but discharges can still occur if there is a sewage spill or during bypass events. Bypass events typically occur during heavy rainfall, when inflows to a wastewater plant exceed its capacity, due to surface runoff and stormwater infiltration of the wastewater network through faults and illegal connections.

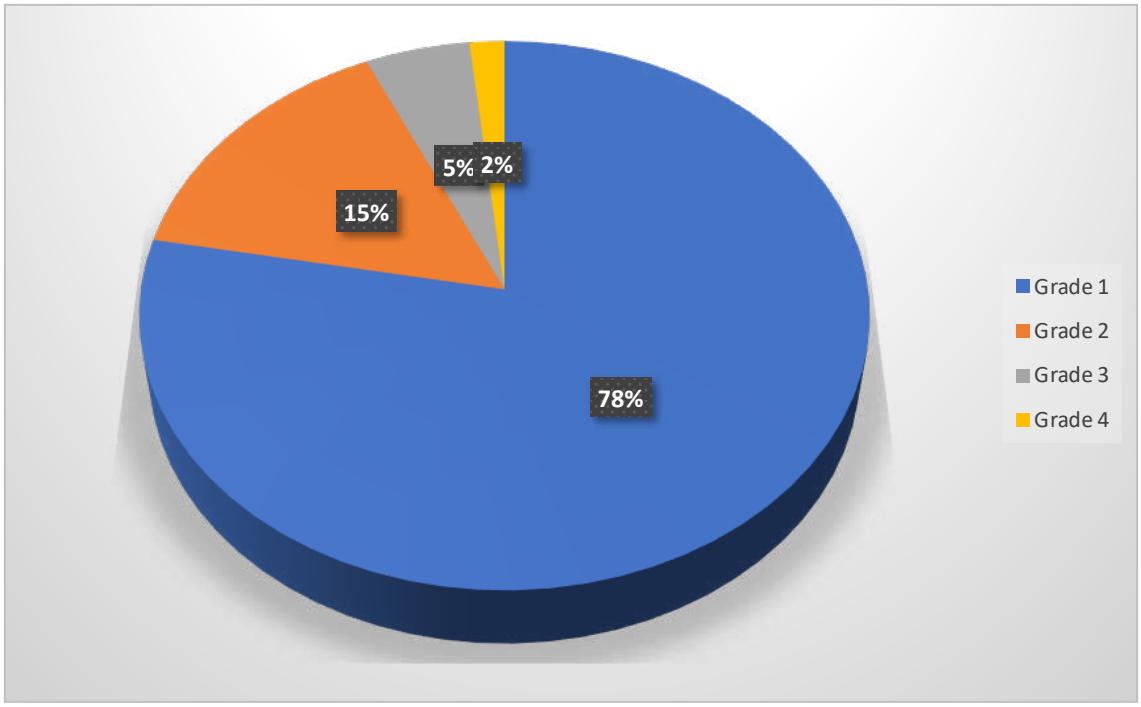
## E pēhea ana te ora ināianei?
*What is the current state?*

Council has maintained a recreational bathing water quality monitoring programme since 2009, traditionally undertaking weekly sampling at popular swimming sites within our coastal, estuarine, and river environments. Over the five-year reporting period, 2599 samples were collected from fifty-nine coastal swimming sites across Northland. Samples are analysed for concentrations of enterococci, which is an indicator of other disease-causing organisms that pose a health hazard to recreational users. These results are used to inform swimmers of health hazards at Northland's monitored coastal swimming sites and to grade the swimability of each site.

### Key Fact

78% of our coastal sites were within Grade 1 indicating that water quality at most of Northland beaches is suitable for swimming

Between 1 January 2019 and 31 December 2023, based on microbial results, 46 coastal sites were within Grade 1, nine sites were classified as Grade 2, three sites were in Grade 3 and one site was Grade 4, using the Ministry for the Environment microbial assessment categories[18]. Overall, the high percentage of Grade 1 (78%) and Grade 2 (15%) coastal swimming sites indicates that the water quality at most of Northland's monitored beaches is very good. With 96% of the samples collected across the reporting period below the 'Action' level, set by the Ministry for the Environment and Ministry of Health, this indicates there are minimal health hazard risks posed to recreational users at most of Northland's monitored beaches.




*Recreational bathing results for 59 coastal sites sampled between 2019 and 2023 (Grade 1 are excellent swimming locations whilst the one Grade 4 location is poor).*

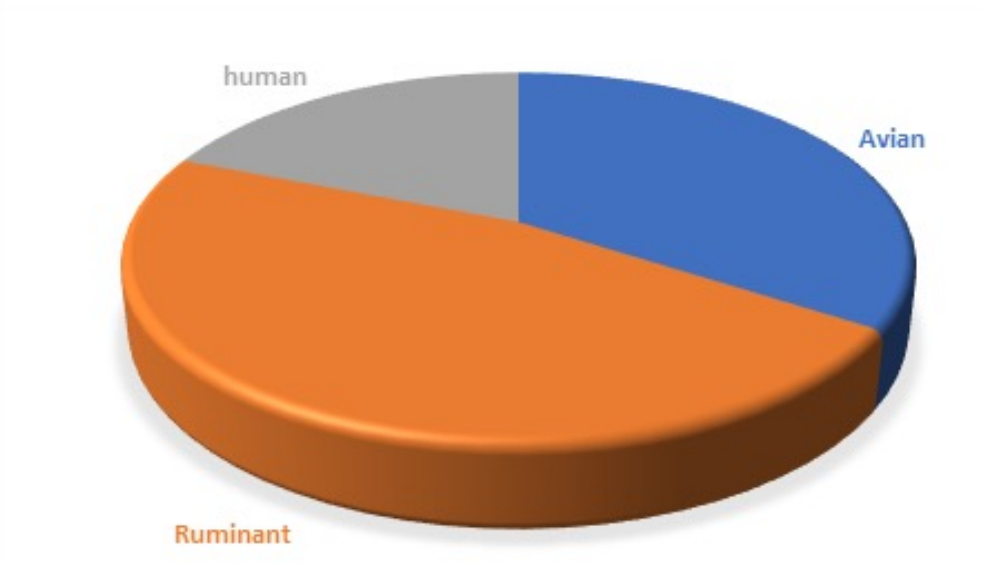
*There are minimal health hazard risks posed to recreational users at most of Northland's monitored open coast beaches.*

However, after heavy or prolonged rain, many of our coastal swimming sites may become unsuitable for swimming, principally because of diffuse inputs from intensive agricultural land use. Council recommends checking Safeswim following rainfall to check current swimming water quality conditions. Safeswim informs swimmers of health hazards at Northland's monitored coastal swimming sites and grades the swimmability of each site: www.safeswim.org. Council also produces annual recreational bathing reports at the end of each summer sampling season, to help Northlanders understand the water quality at their favourite swimming spots. You can access the latest report on our website.

## Finding the problems - Microbial source tracking

When faecal contamination is detected, there are several scientific techniques that can be used to help identify the source of bacterial contamination, collectively known as microbial source tracking. Between 1 January 2019 and 31 December 2023, 96 samples (from 46 different coastal sites) were analysed using microbial source tracking techniques. Ruminant sources (cows and sheep) were the dominant source in 47% of samples, avian (birds) the dominant source in 34% and human the dominant source in 19% of samples. By tracking the sources of contamination, solutions can be identified to contamination events. For example, at Tauranga Bay, where there are consistent water quality issues in the estuary – community concern had focused on domestic onsite wastewater treatment systems as a potential source. However, our source tracking has identified ruminant sources in the catchment as the dominant source.

Human sources of contamination were detected at all five coastal water quality sites in the Hātea River, in Whangārei Harbour, as well as at Rāwene in the Hokianga, Paihia, Ōakura Bay, Houhora heads and Wahiwaka Creek in the Kaipara Harbour. The detection of human sources of faecal contamination in the Hātea River, is not surprising as it is the receiving environment for the Whangārei wastewater treatment plant, and may also represent leaks, spills or bypass events from the town's wastewater network. There are also wastewater treatment plants at Rāwene, and upstream of the Wahiwaka Creek site. The human sources detected at Ōakura, Houhora and Paihia could be due to failing on site domestic wastewater treatment systems or discharges from vessels. The detection of contamination in these catchments is not indicative of consistent faecal discharge at those locations and does not represent faecal loadings across the wider region. It represents a monitoring event where faecal presence was detected and followed up with microbial source tracking to provide insight into the potential source of the contamination event.




*The dominant source of faecal contamination in the coast was ruminants (cows and sheep) between 2019 and 2023.*

### Key Fact

Where water quality issues have been detected microbial source tracking has indicated that ruminant sources (cows and sheep) were the dominant source of faecal contamination in 47% of samples

# He aha ngā mahi hei whakatika?
*What is being done?*

## Response

Council compliance monitoring staff conduct annual inspections of all consented farm dairy effluent discharges and district council wastewater treatment plants to ensure compliance with their resource consent.

Stock access to waterways is another potential source of pathogens if stock defecate directly into the water. Rules in the Resource Management (Stock Exclusion) Regulations 202011 and the Regional Plan for Northland[7] mean that stock must be kept out of specified waterways. The rules are different for beef cattle, dairy cows, dairy support cows, pigs, deer and sheep and there are some differences for hill country and lowland areas. Pigs and dairy cows were required to be excluded from all continually flowing waterways from 1 January 2023 and all stock must be excluded from continually flowing lowland watercourses by 1 January 2030.

Stock access to the coastal marine area, was prohibited by the Regional Coastal Plan for Northland[19] in June 2009 and since this date there has been a decrease in reports of stock in the coastal marine area, with just nine incidents reported to NRC between 2019 and 2023.

*Only nine incidents of stock in the coastal marine area were reported to Council between 2019 and 2023.*

# He rangahau whakapūaho

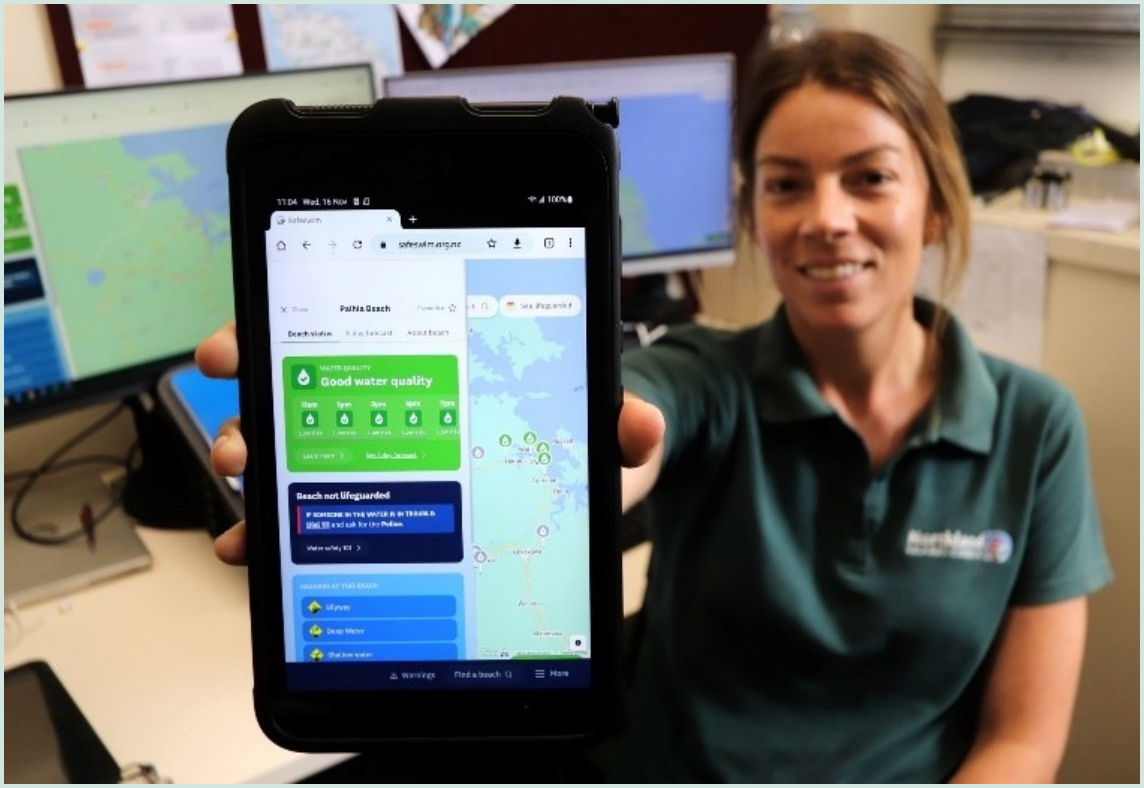
## CASE STUDY 1

## *Safeswim*

A major shortfall of the traditional recreational bathing monitoring programme is that by the time results have been communicated to the public - which can be up to two days after a sample is collected – the conditions may have changed at the swimming site and any information provided may not reflect the current water quality status.

Recognising the limitations of our traditional sampling approach, NRC joined Auckland Council's Safeswim programme in 2022. Safeswim provides real-time microbial water quality predictions, ensuring water users can make informed decisions on where and when to swim based on current information. Safeswim combines current environmental data (e.g., rainfall), with predictive models built from the wealth of water quality data collected over time and is underpinned by ongoing sampling. Safeswim has proven to be a very successful and useful tool for informing the public of recreational swimming health risks, winning numerous international awards, and is recognised by the World Health Organisation as best practice.

The Safeswim website currently provides up to date water quality predictions for 56 coastal sites, as well as 19 river sites across Northland.




*You can check out the water quality at your favourite swimming spot on the Safeswim website https://safeswim.org.nz/.*

# He aha kei tua?
## *What is the outlook?*

The Stock Exclusion Regulations 2020[11] and new livestock exclusion rules in the Proposed Regional Plan for Northland[7], should reduce faecal contamination from stock entering our waterways, so some improvement is likely, in areas where ruminants are the dominant source of contamination.

A lack of investment in aging wastewater infrastructure increases the risk of faecal contamination from human sources. This is an issue that has been made more acute as a result of escalating costs of repairs and upgrades to wastewater networks.

Continued population growth, changing weather patterns and sea level rise are likely to exacerbate the issues.  A lot of our towns and vital water infrastructure are located in areas prone to natural hazards. As sea levels rise, and our climate becomes more unpredictable managing our water infrastructure will become more complex.


*Dargaville wastewater treatment plant is located within both a river hazard zone and a coastal flood hazard zone.*

# 2.5 Plastic

Plastic is lightweight, cheap, and versatile and has become a ubiquitous part of our modern lives. But as plastic production and use has soared, plastic waste has leaked into the environment, polluting our rivers, lakes, and oceans.

## He aha ngā pāpātanga?
*What are the issues?*

Plastic litter is one of the biggest pollutants of our oceans and can have damaging or lethal effects on animals that ingest or get entangled in it. A major concern is the persistence of plastic pollution in the environment and that larger plastic items break down into smaller pieces (called microplastics) overtime, which are mistaken for food items and are consumed by marine organisms. Once plastic is in the marine environment it is difficult and expensive to remove. Some litter items such as nappies and sanitary items also present a health risk at recreational bathing sites and impact the aesthetics and the amenity value of our coast.

*Plastic debris at Baylys Beach*

## E pēhea ana te ora ināianei?
*What is the current state?*

Council undertakes quarterly shoreline surveys for litter including plastic debris at two sites in Whangārei Harbour and survey an additional 16 popular recreational beaches during the summer. Between 2019 and 2023, 109 surveys were undertaken with a total of 21,944 items collected. The average density of items was 265 items per 1000m$^2$ with the highest density found in the Hātea River, with 2,394 items found per 1000m$^2$. 79.5% of all items collected were made from plastic (including foamed plastic).

# He rangahau whakapūaho

## CASE STUDY 2

## *Stormwater plastic project*

To estimate how much plastic and litter is reaching our rivers and estuaries each year, NRC teamed up with NorthTec, Whitebait Connection, Whangārei District Council, Far North District Council, Kaipara District Council and Northland District Health Board to install 51 'LittaTraps' at representative locations across the region.

The LittaTraps are a simple cost-effective net that fits inside stormwater grates to trap plastic and litter pollution that would otherwise be carried by stormwater straight to rivers or the ocean. Traps were installed at a variety of locations across the region including playgrounds, car parks, supermarkets, fast food premises, and industrial sites. Over the 12-month study, the 51 traps captured 21,006 items with over 70% of the litter items collected in the LittaTraps made of plastic. This data was used to estimate that more than 13.2 million litter items are discharged from urban stormwater drains in Northland every year[20].


*Composition (by item) of litter items captured by LittaTraps across Northland in 2021. The total count of litter items determines the cell size of each material category.*

*Councillor McDonald and Manue Martinez, talk to TVNZ about Council's stormwater litter project.*

### Key Fact

We have estimated that more than 13 million litter items are discharged from urban stormwater drains in Northland every year

Interestingly, there were big differences between the amount of litter captured at different sites. One site captured 2,409 items, which was 11% of all litter, while the best performing site (a residential street) captured just 26 items. This information will help us to develop targeted education and mitigation measures to reduce the amount of litter reaching our coast. You can read the full report on council's website[20].


*Councillor McDonald and WDC's Councillor Nic Connop help staff install a littatrap near a playground in Onerahi.*

*Manue Martinez, with some of the 6,868 cigarette butts captured by the littatraps. Cigarette butts and filters which are made from plastic was the most common item captured during the 12-month study period (32.8% of all items).*

## Microplastic surveys

A major concern with plastic pollution, is that once in the environment, plastic breaks down into smaller and smaller pieces over time. Little was known about the distribution and abundance of microplastics in our moana, so council partnered with iwi, hapū, Institute of Environmental Science and Research (ESR) and Scion for a vital research initiative focused on microplastic contamination in Northland. This research contributed to the nationwide 'Aotearoa Impacts and Mitigation of Microplastics Project,' aiming to establish baseline data on microplastic levels across various environments, shedding light on associated risks, including impacts on ecosystems and primary industries.

Results from sampling revealed that microplastics were present in beach sand from all of the ten open coast beaches that were sampled and in shellfish samples collected from Houhora Harbour, Te Haumi in the Bay of islands, Whangārei Harbour, and Mangawhai Harbour[21].

# He aha ngā mahi hei whakatika?
*What is being done?*

## Response

To promote education of this issue, Whangārei District Council, Kaipara District Council, Far North District Council and Northland Regional Council's Enviroschools Programme have launched an education initiative in schools. LittaTraps are installed on the school grounds and students help to audit the contents of the traps and learn about the threat from plastic pollution to the awa and moana. The programme also provides us with valuable information about the quantity and type of litter flowing into the moana and helps the schools track their progress at reducing litter over time.

*Students at Taipā Area School audit litter from one of the LittaTraps installed at the school.*

*Council staff undertake an annual clean-up of litter from the Hātea River in Whangārei Harbour removing between 300 and 500kg of litter each year.*

Council has also made progress on regulatory options to reduce plastic pollution in Northland.

As part of the Draft Freshwater Plan Change for Northland[8] which NRC is required to implement as part of the National Policy Statement for Freshwater Management 2020[9], council developed a draft attribute for plastics and litter (gross pollutants). Council also drafted rules requiring the installation of gross pollution traps from sites with a 'high risk for gross pollutants', such as public car parks and playgrounds.

## He aha kei tua?
## *What is the outlook?*

Globally plastic production has increased dramatically over the last 70 years from just two million tonnes in 1950 to 460 million tonnes in 2019 and is projected to reach 1,231 million tonnes by 2060[22, 23 & 24]. In New Zealand, plastic imports increased from around 400,000 tonnes in 2009 to 575,000 tonnes in 2018[25]. Plastic is cheap and versatile and has become a ubiquitous part of our lives. As plastic production and its use in New Zealand continues to rise, plastic pollution is likely to remain a key issue in Northland for decades to come.

To counter the growing threat from plastic pollution, central government has introduced new rules that have phased out and restricted the use of some single-use plastics products, including plastic straws, plastic bags, plastic tableware and cutlery, plastic drink stirrers, cotton buds and polystyrene takeaway food and beverage packaging[26]. These restrictions and growing public awareness around plastic waste will hopefully help to limit the increase in plastic pollution along our coast.

*Plastics and litter collected during a beach clean by Bream Bay Coastal Care Trust at Ruakākā.*

# 3 Activities in the coastal environment

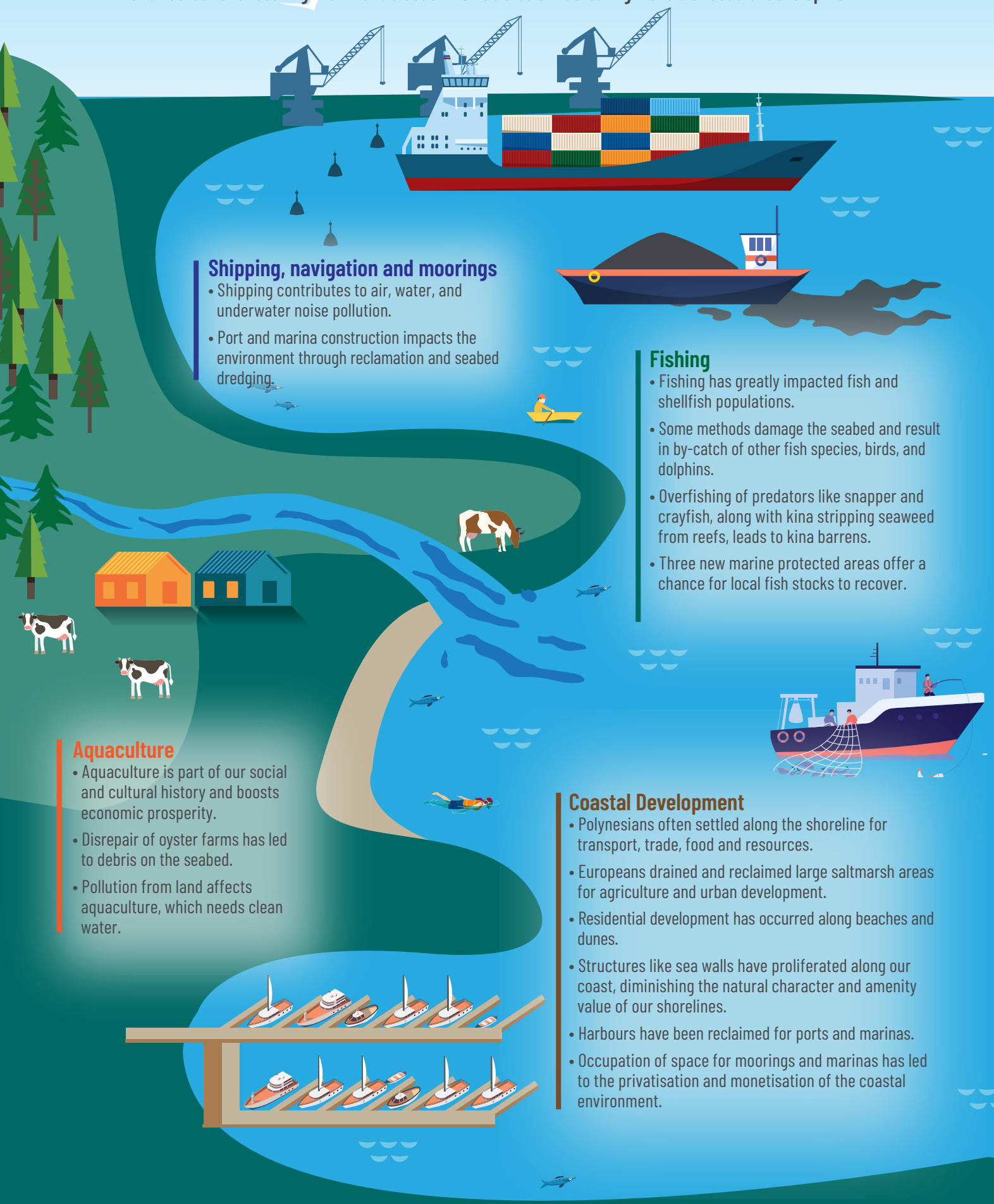
## Te Tirohanga whānui

### *Overview*

Our coastal environment supports a diverse range of activities including aquaculture, fishing, shipping, and recreational boating. Northland's coastline has also attracted high levels of coastal development. These activities have the potential to adversely impact the environment if they're not managed carefully. In this chapter we'll take a closer look at four of these activities: aquaculture; fisheries; shipping and maritime safety; and coastal development.

# Activities in the coastal environment

**Our coastal environment supports a diverse range of activities including aquaculture, fishing, shipping, and recreational boating. Northland's coastline has also attracted high levels of coastal development.**



## Shipping, navigation and moorings

- Shipping contributes to air, water, and underwater noise pollution.
- Port and marina construction impacts the environment through reclamation and seabed dredging.

## Fishing

- Fishing has greatly impacted fish and shellfish populations.
- Some methods damage the seabed and result in by-catch of other fish species, birds, and dolphins.
- Overfishing of predators like snapper and crayfish, along with kina stripping seaweed from reefs, leads to kina barrens.
- Three new marine protected areas offer a chance for local fish stocks to recover.

## Aquaculture

- Aquaculture is part of our social and cultural history and boosts economic prosperity.
- Disrepair of oyster farms has led to debris on the seabed.
- Pollution from land affects aquaculture, which needs clean water.

## Coastal Development

- Polynesians often settled along the shoreline for transport, trade, food and resources.
- Europeans drained and reclaimed large saltmarsh areas for agriculture and urban development.
- Residential development has occurred along beaches and dunes.
- Structures like sea walls have proliferated along our coast, diminishing the natural character and amenity value of our shorelines.
- Harbours have been reclaimed for ports and marinas.
- Occupation of space for moorings and marinas has led to the privatisation and monetisation of the coastal environment.

# 3.1 Aquaculture

Aquaculture contributes to the economic prosperity of Northland and is part of the social and cultural history of our coastal communities. Māori are known to have undertaken aquaculture techniques such as placing suitable rocks on intertidal flats for oyster larvae to settle on and there is evidence of Māori, translocating shellfish species between different areas[1]. Following the arrival of Europeans, further attempts at aquaculture were underway as early as 1916, with 'oyster rocks' being placed on intertidal areas and later the establishment of rock walls in the Bay of Islands, Whangārei and Whangaroa[2]. The first trial rock oyster farm was established on leased shore in Ōrongo Bay, in the mid-1960s, and soon afterwards several farms were established throughout Northland[2].

*Oyster farms in Pōmare Bay, Bay of Islands. Archives New Zealand. Photographer: G. Riethmaier.*

## Key Fact

In 2023, aquaculture in Northland was estimated to have produced over $14m in regional domestic product and directly employed more than 130 people[3].

Today, Northland's aquaculture is still dominated by the cultivation of oysters at the farms first established in the 1960s and 1970s, with some small areas of mussel farming and a land-based marine aquaculture facility in Bream Bay, producing haku (kingfish) and pāua.


*Yellowtail kingfish/haku, is grown at NIWA's Northland Aquaculture Centre in Bream Bay.*

# He aha ngā pāpātanga?
## *What are the issues?*

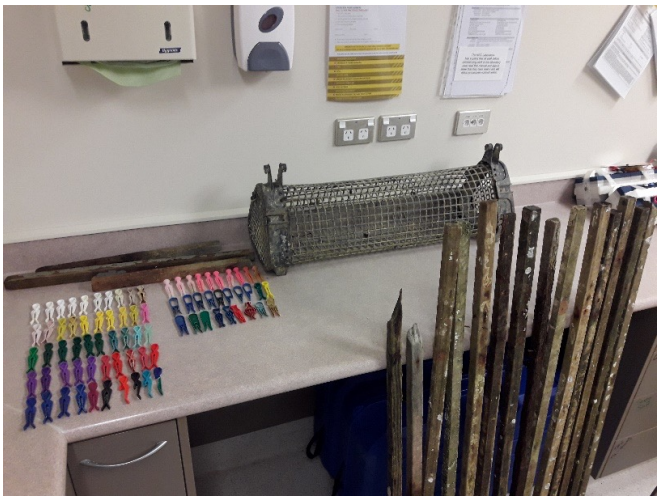
Northland's marine farming is largely rooted in the original oyster farms established in the 1960s and 1970s, in what were then, relatively remote locations. As population growth and coastal development have boomed, these original marine farms now find themselves in popular harbours and bays, where there are competing demands for space, recreation, and amenity values, giving rise to complaints about noise and the use of land-based facilities such as boat ramps. Older farms, that have fallen into disrepair, have been an issue in the past, with accumulations of oyster shells and debris on the seabed, including structures that contained asbestos.

Water pollution from the land and discharges from recreational boating poses a threat to aquaculture, which relies on clean water. In 2001, water quality issues in the Waikare Inlet, caused the closure of this area, resulting in several farms falling into disrepair and requiring $2 million in government funding to clean up derelict and abandoned farms[4].

Land based marine aquaculture, avoids some of the impacts of open coast aquaculture, such as the accumulation of shells and debris, disturbance to the seabed, and visual impacts. However, waste water discharges of nutrients and pharmaceuticals, together with biosecurity risks, still need to be carefully managed to avoid impacts on water quality and coastal ecosystems.

*A derelict farm in the Kaipara Harbour.*

*Pegs, posts, oyster bags and other marine farm debris collected by Council staff from Whangaroa Harbour.*



### Key Fact

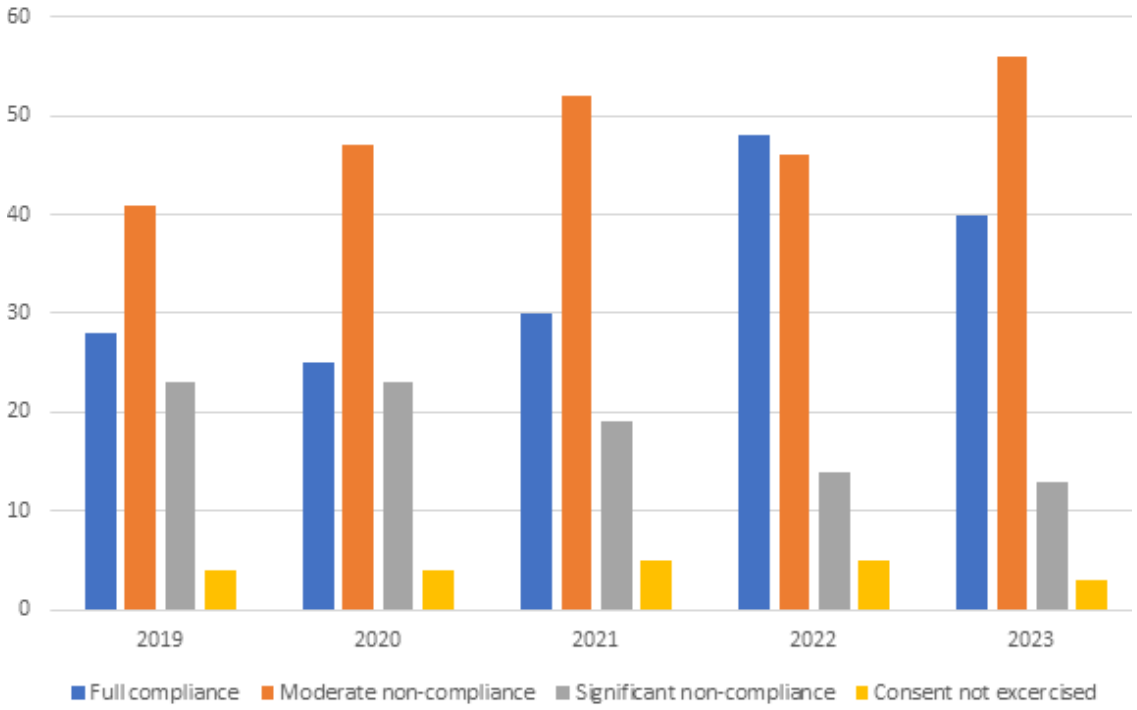
In 2001, harvesting oysters from 18 farms in the Waikare Inlet was stopped after an outbreak of viral gastroenteritis among people who had eaten the oysters. This resulted in the loss of eight million oysters worth more than $1.75million[5]

# E pēhea ana te ora ināianei?
## *What is the current state?*

There are currently 1,046 hectares of consented marine farm area - although approximately only half of this is developed. There were 118 resource consents held by 109 oyster farm operations and nine mussel farm operators in Northland in 2023. Council monitors all marine farms in March or April by helicopter, to ensure that they are compliant with the conditions of their resource consents. Based on this visual assessment, a farm can be found to be significantly non-compliant, moderately non-compliant or fully compliant in relation to the state of the farm

structures, the condition of the seabed under the structures, the presence of debris associated with farming activities and the status of navigational markers.

Between 2019 and 2023, there was a reduction in significantly non-compliant farms. There was an increase in the number of moderately non-compliant farms and a fluctuating trend for fully compliant farms over the same period. The data indicates that there has been an improvement in the compliance status of marine farms, facilitated by annual compliance monitoring and reporting to consent holders.




*Overall compliance status for all marine farms in Northland between 2019 and 2023 as assessed by annual inspections from the air.*

## Key Fact

Approximately 40% of New Zealand's oyster farming area is in Northland with 860,000 dozen oysters harvested from the region each year[6]

In addition to aquaculture activities, the collection of spat (young shellfish) from Northland supports aquaculture activities in other parts of New Zealand. The Kaipara Harbour provides oyster spat and mussel spat collected from seaweed at Te Oneroa a Tōhē (Ninety Mile Beach) supplies at least 65% of seed to mussel farms throughout New Zealand, an industry which had an export value of approximately $320 million in 2023[7].

There's one land based marine aquaculture facility in Bream Bay. The site is home to Northland's aquaculture centre, where NIWA recently commissioned its first Recirculating Aquaculture Systems, where they're able to produce 600 tonnes of haku (kingfish) each year[8]. The site is also home to New Zealand's sole pāua farm, owned by Moana. This farm has the capacity to produce over 2 million pāua (120 tonnes) each year[9].

*In 2023 NIWA commissioned a new RAS facility at the Bream Bay marine aquaculture facility. Credit Photoblique.*

# He aha ngā mahi hei whakatika?
## *What is being done?*

### Response

All marine farms require a resource consent to occupy space in the coastal marine area for the structures that are associated with farming activities. The consents require that the seabed be kept clean and free from shell or debris from farm structures. Each marine farm is also required to lodge a bond with council, based on the area of the farm that has been developed. The purpose of this bond is to provide some financial insurance, for Northlanders, to cover the cost of any clean up should a farm fall into a state of disrepair or be abandoned in the future.

NIWA's land based marine aquaculture facility has a consent to discharge aquaculture wastewater into Bream Bay, with limits on the volume of wastewater discharged and the total load of nitrogen discharged, for the various stages of the facilities development.

# He aha kei tua?
## *What is the outlook?*

In the Proposed Regional Plan for Northland[10], aquaculture is prohibited within Significant Ecological Areas, Aquaculture Exclusion Areas and other areas mapped on account of their natural features, landscapes, historical heritage and significance to Tāngata Whenua, in order to protect these values. This means that there are limited areas available for new marine farms, especially in the many sheltered estuaries and harbours along the East Coast of Northland. However, there is the potential to develop some already consented areas, including authorised mussel farms near Stephenson Island and in Houhora Bay.

Another opportunity for growth in the aquaculture industry is from the collection of mussel spat on new offshore farms. Northland has traditionally been a source of mussel spat, for the New Zealand mussel industry, which is currently harvested from beach cast spat on Te Oneroa a Tōhē (Ninety Mile Beach). In 2023, a new 18 ha experimental mussel spat catching farm was authorised approximately two kilometres off the west coast of Te Oneroa a Tōhē (Ninety Mile Beach). The research area is part of a larger proposed development for a 182ha farm. The farm will culture wild mussel spat, which will be transported to other mussel farms and re-hung for on growing.

Within the footprint of existing farms, farming methods are changing from traditional wooden posts and rail to floating flip farming systems. These new techniques have the advantage that the oysters are always submerged, so the oysters can feed for longer and grow faster. However, some farmers have reported that because the oysters stay at the surface, within the freshwater layer, they are subjected to higher mortality during high rainfall events.

This evolution in aquaculture techniques should reduce issues around shell and debris build up beneath farms and result in less disturbance of the seabed, as more farming activities can be done from vessels, but NRC has received complaints from the public of plastic oyster bags being washed up along the foreshore within the Whangaroa harbour. Some farmers are also looking to cultivate new species. One farm has authorisation to cultivate scallops and another to cultivate geoduck.

NIWA's land-based marine aquaculture facility has a resource consent allowing for a staged increase in production. The current, experimental, commercial-scale operation is located on an eight-hectare site owned by NIWA, with seawater intake and discharge infrastructure to accommodate further expansion[8]. These developments signals confidence in the aquaculture industry in Northland.


*New flip farming systems for growing oysters are replacing traditional wooden post and rail systems.*

# 3.2 Fishing

Fishing is the most widespread human activity in the marine environment. New Zealand's fisheries resources are highly valued economically, recreationally, culturally, and environmentally. Species like kūtai (green lipped mussels), pipi, tāmure (snapper) and kōura (crayfish) are considered taonga (treasure) by Māori and have long been an important food source for local communities. These species also support important commercial fisheries that provide jobs in our communities and support local economies.

*In 2023, fishing in Northland was estimated to have produced over $30m in regional gross domestic product and directly employed more than 280 people[3].*

## He aha ngā pāpātanga?
## *What are the issues?*

When Europeans first visited Aotearoa New Zealand, they reported finding bounteous fish and shellfish resources despite almost 500 years of settlement by Māori[2]. However, over the subsequent 250 years commercial and recreational fishing has had a profound impact on fish populations, bycatch species, and the wider coastal ecosystem.

Fishing has reduced the abundance of some of our most valued recreational and commercial species, and altered the age, size, and gender structure of fish populations. Some fishing methods, such as trawling and dredging have also damaged features on the seabed and some techniques have resulted in the bycatch of other species, like birds and dolphins.

One of the most well documented impact of fishing on coastal ecosystems is the expansion of kina barrens. The decrease in the populations of tāmure (snapper) and kōura (crayfish) because of fishing, has limited the ability of these species to control kina populations.

Native kina are important grazes of our kelp forests but when their population is allowed to grow unchecked due to the absence of large predators, they can completely strip a reef of kelp creating what is referred to as a kina barren.

*Native kina populations have increased in the absence of large predators like tāmure/snapper, stripping our kelp forests and creating kina barren. Credit: Arie Spyksma*

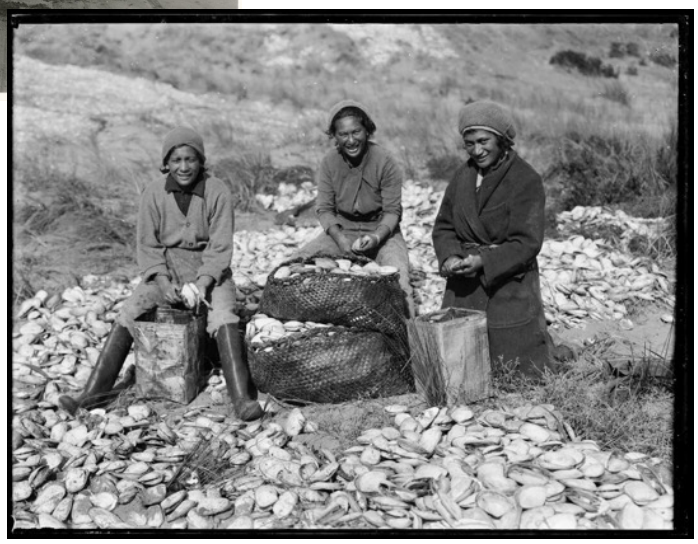
# E pēhea ana te ora ināianei?
## *What is the current state?*

The populations of two of our most important cultural, recreational, and commercial fish species, tāmure and kōura are now a fraction of their pre-fished state. The overall spawning biomass of snapper in east Northland is estimated to be 38% of its unfished levels while the spawning biomass of crayfish is just 37% of unfished levels[11 &12].

The depletion of snapper and crayfish populations will have contributed to the expansion of kina barrens in Northland. Recent research has shown that kina barrens covered 30% of shallow reefs in fished areas, compared to <2% of shallow reefs in marine reserves, and estimated that as much as 30 km$^2$ of kina barrens exist in Northeastern Aotearoa (which includes Northland to the Hauraki Gulf)[13]. This is consistent with earlier analysis in the Bay of Islands, which showed that kelp forests visible in early aerial images (1940-70s) have been depleted, and that kina barrens covered 47% of rocky shores in the Bay of Islands by 2009[2].

Some of our important cultural and recreational shellfish stocks have also been depleted. The toheroa, which was a staple of the Māori diet for centuries and once supported a large commercial canning operation for export, was closed to commercial fishing in 1969 with recreational closures occurring between 1971 and 1980[14]. In 2011, culturally important pipi beds on Mair Bank were temporarily closed, following a dramatic decline in numbers and have remained closed[15]. More recently, in 2022, the Ministry for Primary Industries (MPI), announced the closure of the depleted scallop fishery in Northland, following an alarming decline in the biomass and abundance of scallops in Northland from historic levels[16].

*Toheroa Digging at Muriwai Beach in 1962. Archives New Zealand. Photographer Mr. Riethmaier.*



*Locals shelling Toheroa for the local cannery. Photograph probably taken in the Northland region between 1910-1939 by Arthur James Northwood.*

# He aha ngā mahi hei whakatika?
*What is being done?*

## Response

While the Ministry for Primary Industry (MPI) are responsible for managing fish stocks, councils can make rules for the sustainable management of natural and physical resources under the Resource Management Act 1991[17] and are directed by the New Zealand Coastal Policy Statement 2010[18] to protect the biodiversity of our coastal environment.

Following the notification of the Proposed Regional Plan for Northland in 2017, an appeal to the Environment Court was lodged seeking restrictions on fishing between Maunganui Bay and Ōpourua (Oke) Bay, and around Mimiwhangata Peninsula and Rākaumangamanga (Cape Brett) on the basis that the significant ecological values of these areas had been severely impacted by fishing.

Evidence produced in the Environment Court showed a collapse in tipa (scallop) populations, the disappearance of kūtai beds, significant reductions in hāpuku, tāmure and kōura populations, a decline in the size and number of workups and a growing number of kina barrens, changing the ecosystems in these areas[19]. The urgency of the issue and the need to act quickly to prevent further loss of ecological values was made clear during the Environment Court hearing.

The Environment Court ordered 'no-take' rules be put in place between Maunganui Bay and Ōpourua (Oke) Bay, and around Mimiwhangata Peninsula - although kina take remains permitted. In the third area around Rākaumangamanga (Cape Brett) commercial fishing restrictions preventing bottom trawling, bottom pair trawling, purse seining, and Danish seining were ordered[20].

Council supports the Environment Court's decision on the basis that the evidence presented during the appeal showed significant ecological values in the three areas were negatively impacted by fishing, reflecting the concerns of local hapū Ngāti Kuta ki te Rāwhiti and Te Uri o Hikihiki, who wanted the protections to be put in place.

# He aha kei tua?
*What is the outlook?*

These new Te Hā o Tangaroa Protected Areas add to two existing 'no take' marine reserves administered by the Department of Conservation in Whangārei Harbour and at Poor Knights. Despite the relatively small size of the new protected areas, they will provide safe refuges for local fish populations and coastal ecosystems to recover, with spillover effects to surrounding areas.

These new protected areas should also benefit local communities by providing opportunities for recreational activities like snorkelling and diving and act as tourist attractions for domestic and international visitors. They'll also hopefully support and enhance the social and cultural wellbeing of local communities and hapū. The protected area present local hapū with the opportunity to exercise kaitiaki and to be actively involved in the restoration of taonga species and the mauri of the moana.

Other fishing controls introduced by MPI should also help the recovery of our fish stocks and marine ecosystems. A recent request for a judicial review by the Environmental Law Initiative (ELI), and Te Uri o Hikihiki Hapū of an earlier ministerial decision on the management of Northland crayfish stocks, resulted in a ground-breaking decision by the High Court in November 2022[21]. The judgment exposed weakness in current fisheries management decision making processes and clarified that the Minister must incorporate wider ecosystem effects into decision making and act more cautiously when information is uncertain, unreliable, or inadequate. Subsequently, MPI reduced the commercial catch of spiny lobster by 16 tonnes and the recreational bag limit from six to three lobster per day[22].

*The Poor Knights Islands Marine Reserve is world renowned for its snorkelling and diving experiences, attracting tourists from all over the world, benefitting the local community and economy. Credit: Nick Bamford.*

## Key Fact

The new Mimiwhangata rāhui tapu and Rākaumangamanga rāhui tapu protected areas, cover 11,877 ha or 0.68% of Northland's territorial sea.

# He rangahau whakapūaho

## CASE STUDY 4

## *Te Hā o Tangaroa Protection Areas*

Council is implementing the Te Hā o Tangaroa marine protection rules in partnership with mana moana hapū. An implementation/project plan has been developed with input from hapū, containing three main workstreams: community engagement and education; compliance monitoring; and ecological monitoring. The project plan and each workstream are underpinned by Tāiki ē[23], Northland Regional Council's Te Tiriti Strategy and the implementation plan, with a focus on building hapū capacity and capability to undertake restoration and enhancement programmes within coastal marine areas.

### Community engagement and education

Public education surrounding the new rules and the values they aim to protect, will support NRC's social licence to implement the rules, encourage compliance and engagement in restoration. The target audiences are the general and boating public, the Rāhui Tapu community, tamariki and kura (schools).

Education mediums will include signage at boat ramps at sites near the Rāhui Tapu, pamphlet distribution, information on Council's website and navigational applications, targeted on-water and boat ramp messaging, radio advertising, editorial and newsletter advertisements, social media promotion, posters at community sites, media releases and media liaison, and staff presence at relevant community events. Mana moana hapū have been influential in communications planning, design, and delivery of communications material and key messaging.

### Compliance monitoring

As the Rāhui Tapu rules are new in Northland's regional planning, an education phase was in place for the first 12 months of implementation, with a focus on on-water and targeted messaging to the Rāhui Tapu boating public. Regulatory processes have been developed and Council is now formally enforcing the Rāhui Tapu marine protection rules.

Regular on-water surveillance is currently the most effective way of monitoring and enforcing compliance with the Rāhui Tapu rules, however it requires significant resource. NRC is collaborating with external agencies, Department of Conservation (DoC) and MPI Fisheries, for a combined approach to on-water regulation in the Rāhui Tapu, supported by contracts with local commercial vessel operators and eight recently appointed RMA warranted officers, largely sourced from mana moana hapū, who have been specifically onboarded and trained to regulate the Rāhui Tapu rules. Since on-water surveillance began in October 2023, more than 400 vessels have been approached in the Rāhui Tapu and informed about the rules.

### Ecological monitoring

Monitoring and measuring the ecological changes in the marine protected areas will determine if the protections put in place by the court are achieving the desired ecological outcomes.

Council will draw on the expertise of hapū and marine ecologists to produce ecological monitoring plans for the Rāhui Tapu marine protected areas for the duration of the rules. At a minimum, the following activities will occur with the intention of building hapū capacity and capability to undertake and/or lead future ecological monitoring:

1. Identify monitoring sites and key indicator species;
2. Baseline monitoring programme for both Rāhui Tapu is undertaken to assess the health of the moana as of the commencement of the new rules; and
3. Ongoing ecological monitoring of the Rāhui Tapu is undertaken to assess changes in the environment.

*Council and hapū patrol the new Rākaumangamanga Rāhui Tapu. Credit. Nicola Hartwell.*

# 3.3 Shipping, navigation, and moorings

Whangārei Harbour is home to a bulk cargo port, a fuel terminal at Marsden Point, and a cement terminal at Portland, while the Bay of Islands is a popular cruise ship destination and Northland is an important international shipping route. Since 2000, our marine transport industry has doubled in size. Firms operating in that part of our economy, collectively, generated $20m of GDP and employed 168 people in 2023, up from 104 people two and a half decades ago[3]. Our moana is also a popular location for recreational boating, with Ōpua and Whangārei among New Zealand's busiest ports for recreational vessels.

*A tanker enters Whangārei harbour, home to a bulk cargo port, a fuel terminal, and a cement terminal.*

# He aha ngā pāpātanga?
## *What are the issues?*

Shipping contributes to air, water and underwater noise pollution and is an important vector for marine pests to enter our region. The construction of some facilities like marinas and ports can also impact the coastal environment through the reclamation of parts of the harbour, and the need to dredge the seabed and navigation channels, which can impact the marine environment through habitat disturbance and destruction of seabed communities, noise and the remobilisation of sediment and contaminants into the water column.

*The construction of a new 130 berth marina in Whangārei, required the removal of mature mangrove trees, the reclamation of 4,550 $m^2$ and capital dredging of 150,000 cubic materials of material from the seabed.*

The growth in popularity of recreational boating has put a strain on land-based facilities such as boat ramps and increased the demand for space in the coastal environment for marinas and moorings. Swing moorings can damage plants and animals that live on the seabed as the mooring chain is dragged in a circular motion around the mooring block, by tidal movements. The proliferation of moorings has also impacted the general public's right to navigate and securely anchor in mooring areas and impacted on the visual values of areas with high natural character. The proliferation of moorings and marinas has also led to the privatisation and monetarisation of the coastal environment with mooring holders effectively afforded exclusive use of what was previously public space. Mooring owners can on-sell their moorings, with moorings in high demand locations for sale with asking prices of up to $35,000 and a large marina berth currently for sale for $588,000.

With the high level of maritime activity in our region it is inevitable that some maritime incidents will occur. Oil spills and the abandonment of old and derelict vessels are key areas of concern to our maritime team.

*Damage to subtidal seagrass beds, caused by the anchor chain of an unauthorised mooring near Moturua Island, in the Bay of Islands.*

*Abandoned and derelict vessels pose a risk to the environment from spills and discharges, and can be a navigational risk to other vessels.*

# E pēhea ana te ora ināianei?
## *What is the current state?*

Commercial and recreational vessels arrive into Northland from both domestic and overseas ports. Channel Infrastructure has two jetties for oil tankers at its fuel terminal at Marsden Point. Northport has a three-berth bulk cargo facility and Golden Bay has a jetty that is used regularly by a specialised bulk cement vessel. Northland receives about 400 large (greater than 99 tonnes) commercial vessels annually with the vast majority of these being bulk and cargo vessels that travel to Northport in Whangārei Harbour[24]. The Bay of Islands is also a popular cruise ship destination with 92 cruise ships visiting over the 2023-24 summer[25] and in 2024 Whangārei received its first cruise ship visit.

*Channel Infrastructure's Marsden Point fuel terminal, supplies around 40% of New Zealand's transport fuel demand and all the jet fuel to Auckland International Airport[26].*

Northland also receives more than 2000 vessel movements from visiting recreational vessels and the Region's two customs clearance posts mean it also receives a large proportion of vessels from overseas[24]. Ōpua is among New Zealand's busiest ports for recreational vessels, with more than 1300 long-distance arrivals and departures each year, while Whangārei receives about half that number[24].

To accommodate the large number of recreational vessels, Northland has 12 marinas with 1616 berths, and there are 54 mooring areas designated in the Proposed Regional Plan covering 1051 ha. In 2023, there were a total of 3005 moorings but increasingly moorings are being authorised and installed outside of designated mooring areas. 579 of all moorings (approximately 19%) are now outside of designated mooring areas.

*On 6th February 1950 just one wharf and half a dozen moorings were visible in the Ōpua basin. Credit: Alexander Turnbull Library - Aerial photograph taken by Whites Aviation.*

*Today Ōpua is one of New Zealand's busiest recreational ports, with a 400-berth marina, vessel haul-out and boat maintenance facility, and 492 private moorings. Credit: Photoblique*

Given the level of maritime activity in our region it's inevitable that maritime incidents will occur. A total of 1185 maritime incidents were responded to in the five-year reporting period, including 67 oil spill incidents. These also include aids to navigation, moorings, wrecks and accidents, debris disposal and bylaw infringements such as speeding and failure to comply with lifejacket rules. Most of the reported oil spills were small diesel spills.

The number of abandoned vessels continued to increase and in the five-year reporting period 150 vessels were removed and recovered from Northland's marine environment by council's maritime staff.

Abandoned vessels are a nationwide issue but it's particularly acute in Northland due to the large number of recreational boats in the region. The size of our coastline, the remoteness of some of our harbours and the lack of facilities to haul out and dispose of vessels add to the cost and complexity of operations to remove abandoned vessels. It takes many hours of staff time and a significant amount of money to remove and relocate large vessels for disposal. These vessels have often been inhabited by people living aboard and are usually abandoned in a decrepit and unmaintained condition when they move on. This is becoming a more common occurrence as housing and living costs rise.

*The harbourmaster's office responded to 1185 maritime incidents between 2019 and 2023.*

*Maritime staff towing an abandoned fishing vessel from Whangaroa to the Bay of Islands for disposal. This vessel cost $52,300 to remove and dispose of.*

*This abandoned vessel had an elderly gentleman living aboard until he was taken by his family to an aged care facility, leaving Council with the cost to recover and dispose of the vessel.*

# He aha ngā mahi hei whakatika?
*What is being done?*

## Response

The harbourmaster's maritime team and harbour wardens are busy ensuring a safe maritime environment in Northland through the maintenance of navigational aids, enforcement of bylaws and harbourmaster's directions, and ensuring that the region is prepared for an oil spill.

All of Northland's harbours and coastal marine area are provided with a 24/7 emergency response for environmental and navigational hazards by council's maritime team. Annual patrols are carried out over the summer holiday period to ensure adherence to bylaws and deal with incidents that arise during this part of the year when recreational boating is at its busiest and there are many holidaymakers in Northland.

The maritime team maintains 340 aids to navigation and 74 signs throughout the Northland region. Each of the 414 aids to navigation and signs are maintained on a six yearly rolling maintenance programme to international standards. In 2020, council also installed an offshore wind and wave data buoy outside the Bay of Islands harbour, to monitor conditions outside of the harbour, to assist with the safe pilotage of cruise ships and to help commercial and recreational vessels heading offshore. The data can be accessed and viewed by the public via our environmental data hub: www.nrc.govt.nz/waves

*In 2020, NRC installed an offshore wind and wave data buoy outside the Bay of Islands harbour, to monitor conditions outside the harbour, to assist with the safe pilotage of cruise ships and to help commercial and recreational vessels heading offshore.*

### Key Fact

NRC's Maritime team maintains 340 navigation aids and 74 signs through our region.

The maritime team and harbour wardens are constantly monitor the harbours and mooring fields of Northland for abandoned and derelict vessels. Identifying and removing contaminants such as oil and dangerous goods from these vessels before they sink helps to protect Northland's coastal environment.

*This vessel had dirty fish holds, its bilge tanks were full of oil and diesel and there were tonnes of rubbish on board. Vessels this size can only be removed from the water in Whangārei where there is the appropriate sized equipment.*

Whangārei Harbour has a steady stream of tankers coming into the Marsden Point fuel terminal and large bulk carriers loading and unloading at Northport. This shipping activity puts us at risk if a major oil spill occurs. Our team has prepared an Oil Spill Contingency Plan and holds regular training exercises to ensure the right people and equipment can be put into action quickly. Council conducts two training exercises each year and maintains 30 trained oil spill responders to help protect Northland's marine and coastal environment in the event of a spill. Fourteen members of this team are also part of the National response team and need to be available to respond to an incident anywhere in New Zealand or the South Pacific region if required. We have a large amount of oil spill equipment housed at Marsden Point to help us do the job, and council's maritime vessels are available to be deployed quickly in the event of a spill.

*A Beach Clean-up at Marsden Point during an oil spill incident in December 2015. This spill from a vessel at Marsden Point required the clean-up of 8 tonnes of heavy fuel oil that was spilt into the Whangārei Harbour.*

## He aha kei tua?
## *What is the outlook?*

Pressures will continue to increase on the maritime sector as growth in commercial and recreational vessel movements are expected to increase. The Southern Hemisphere is becoming a premiere destination for cruise ships and the number of cruise ship visits has increased post Covid-19 pandemic. Larger cruise ships are being built to carry more passengers so our infrastructure will need to keep pace to accommodate larger vessels.

Northport's bulk cargo port and Channel Infrastructure's fuel terminal at Marsden Point are expected to remain important regional and national shipping facilities for the near future. Northport has a consent to build an extra berth and has plans for further growth of their port facilities. In 2024, a resource consent application by Northport for an expansion to their facility, including the reclamation of 11.7 ha of the harbour and 1.72 million tonnes of capital dredging and associated disposal was declined by independent commissioners[27]. Northport has subsequently appealed the decision. In their decision, the commissioners accepted that had they granted the consent there would have been a range of significant positive effects, including a range of economic and social benefits associated with a dedicated container terminal at Whangārei. However, they found that the adverse effects of the reclamation's scale, which would result in the severance of the physical relationship to this cultural landscape, the beach, the dunes and the takutai moana (marine and coastal area), would be significant and irreversible[27].


*Whangārei Harbour received its first cruise ship visit on 4 February 2024 and five cruise ships are scheduled to visit over the 2024/25 summer season*

There is sustained demand for moorings and marina berths. Existing marinas are already close to capacity despite recent growth in marina facilities and most designated mooring areas are full. This will increase the demand for new moorings outside of designated mooring areas, which risks impacting the general public's right to navigate and securely anchor their vessels. The proliferation of moorings in areas with high natural character is also of increasing concern to local communities and hapū.

Swing moorings are also generally restricted to vessels 18 m in length. The trend towards bigger vessels is likely to increase the need for new marina facilities that can berth these larger vessels. Insurance companies are also assessing whether they will continue to insure vessels on swing moorings. If insurance companies withdrew from this market, the costs to council associated with abandoned and derelict vessels could increase where owners fail to take responsibility for their vessels.

The number of abandoned vessels and wrecks is expected to increase as many of the older vessels that were constructed during the maritime boom of the 1970s and 1980s reach the end of their life. More vessels are now being constructed using glass reinforced plastic and we're seeing an increase in the length and size of these vessels, with many vessels now larger than 20 metres. It's anticipated that there will be considerable costs associated with the recovery and disposal of these vessels involved in incidents.

The types of recreational craft are also changing, as different types of propulsion systems like battery powered vessels are introduced. Infrastructure will need to be developed to meet the need for electric craft to charge including the possibility of commercial electric sea gliders starting operation. There's also a trend of foiling vessels being developed and typically these vessels travel faster than conventional craft which may cause safety issues especially in confined harbour areas.

The outlook points to an increase in maritime activities in Northland. This will support business and enterprise opportunities in Northland but increase pressures on the environment and our natural resources. Maritime activities will need to be carefully managed to ensure the opportunities are realised and hazards are minimised.

# 3.4 Coastal development

Our estuaries, harbours and coastline have always been highly valued by Māori as a source of food and other commodities, and settlements were often built along the coast. When Europeans first started to arrive in New Zealand, settlement originally occurred along the coast and more recently beach holiday settlements have grown around our estuaries and sandy beaches.

## He aha ngā pāpātanga?
*What are the issues?*

The shorelines of our estuaries and harbours have been significantly modified since the arrival of Europeans, with large areas of saltmarsh drained and reclaimed for agricultural use and urban development. Some of the natural shorelines of our estuaries have been replaced with hard protection structures such as sea walls. There has been a proliferation of structures in our coastal environment, which can affect amenity values and natural character of our shoreline and beaches. Some of this development has led to permanent loss of coastal habitats.

*Reclamation and the proliferation of structures and seawalls has impacted the amenity values and natural character of our shoreline and beaches.*

The failure of poorly constructed structures and seawalls can pose additional risks. The use of synthetic human-made materials which have replaced more traditional construction materials - such as wood – can result in plastic pollution over time. Poorly constructed and maintained structures can also pose a safety risk to the public.


*Left: The failure of sandbags installed in 2015 for erosion control, releasing thousands of broken pieces of polypropylene fibres along Baylys Beach. Right: A pontoon that broke up during a storm released thousands of polystyrene pieces along the foreshore of the Cavelli Islands in 2014.*

Our open coast habitats have also been modified. Large areas of Northland's coastal dunes have been destroyed or modified to make room for production land and residential development. This has caused loss of habitat for native species and removed the protective function of the dunes against natural hazards like coastal erosion. Our remaining dunes are under pressure from increased beach use. Vehicles, walking and animals can destroy dune vegetation and create dune blow-outs, leading to loss of sand inland. They can also damage archaeological sites and kill the threatened plant and animal species that call the dune home.

*Aerial images of Ninety-mile Beach in 1959 and 2023 show how our once expansive dune habitats have been modified to make way for forestry and agricultural land. Image from 1959 - Credit: Whites Aviation Alexander Turnbull Library. Image from 2023 - Credit: Photoblique.*

*The degradation and loss of sand dune habitat has had a major impact on the fairy tern or tara iti, with a population of less than 40 individual clinging on at Waipū, Mangawhai, Pākiri and South Kaipara Head. Credit J Lurling.*

# E pēhea ana te ora ināianei?
## *What is the current state?*

Between 2019 and 2023, 784 resource consents were issued for activities in the coastal marine area, including 56 consents for discharges into coastal waters and three discharges to air in the coastal environment. In total, there are now 4,305 consented coastal activities, which cover a wide range of activities including marine farms, marinas, reclamation, stormwater discharges, structures, and seabed extraction.

The loss of public access to the coastal environment and the 'privatisation' of the coast remains an issue. Between 2019 and 2023, five consents were granted allowing the reclamation of 8,169m$^2$ of coastal marine area – permanent loss of coastal habitat and public space. A further 26 consents were granted allowing the occupation of 135,980m$^2$ of the coastal marine area. The total area of public space lost is the equivalent of 20 rugby fields.

Council has individual monitoring programmes for all coastal permits it issues. The frequency of monitoring will depend on the scale of the activity and the potential adverse environmental effects. Where council finds non-compliances with resource consent conditions, or unauthorised structures, follow-up action is taken, which may also include enforcement action. Coastal structures are a key focus for council and between 2019 and 2023, all coastal structures will have been inspected at least once. In the last five years, 834 inspections were undertaken with 76% of structures fully compliant and 24% non-complaint. Noncompliance can range from rotten wood piles, decking or corroded fasteners, to the complete failure of a structure.

*An unauthorised Seawall at Tinopai constructed out of old vehicle tyres was removed following enforcement action by Council.*

### Key Fact

There were 345 resource consents issued for coastal structures, including 53 seawalls, throughout Northland between 2019 and 2023.

### Key Fact

Consents for four new marinas, were granted between 2019 and 2023, providing an additional 241 marina berths.

# He aha ngā mahi hei whakatika?
*What is being done?*

## Response

Council has a difficult job balancing the demand for space in the coastal environment for infrastructure, aquaculture, ports, marinas, and moorings to support the economic prosperity of Northlanders, with the need to maintain the natural character of the coast, and its environmental, cultural, and recreational values. Council manages development in our coastal environment through policies and rules in the Proposed Regional Plan for Northland[10]. The Proposed Regional Plan covers a broad range of activities, including rules for use and development in the coastal marine area, mangrove removal, marine farming, dredging and structures like seawalls. There are strict rules that regulate the construction and occupation of space by a structure in the coastal marine area. Most large structures will require a resource consent – so that the effects of the activities can be carefully considered – and any potential adverse effects managed and mitigated.

Council's coastal compliance team monitors each coastal structure every three years to determine if it is being well maintained. It's important that all structures are kept in good state to minimise the potential for structure failure and discharges of parts of a structure and contaminants to coastal waters, which can cause pollution and navigational hazards to boats and other vessels.

Sometimes activities are undertaken in the coastal environment, without the necessary resource consents. The public can report pollution events or environmental incidents to our 24/7 hotline. Our staff responded to 357 environmental incidents within the coastal environment, between 2019 and 2023, including the construction of illegal structures, disturbance of the seabed, mangrove removal and sand removal.

The construction of unauthorised structures such as seawalls, jetties and boat ramps being built in the coast is a growing issue for council. After Cyclone Gabrielle council received more reports from members of the public that unauthorised seawalls had been built and has had to take enforcement action in some cases. A recent high-profile incident resulted in the Environment Court directing an individual to remove extensive structures at Langs Beach, including a network of unauthorised gabion baskets, a concrete base plinth and a boat ramp that had been constructed on the public esplanade reserve in front of his property, without any resource consents[28].

*Council's coastal monitoring team responded to 357 coastal incidents reported to between 2019 and 2023.*

*Council responded to 46 complaints of unauthorised structures in the coastal marine area between 2019 and 2023, including this unauthorised seawall, constructed using building debris as backfill.*

# He aha kei tua?
## *What is the outlook?*

Northport has long term plans for further development and expansion of its port facility and there are development plans in place for further growth of marinas and residential development at Marsden Cove and Port Nīkau.

Demand from coastal landowners for seawalls and other hard protection structures is likely to increase in the face of rising sea levels and increased storm intensity. Community opposition to hard protection structures is also like to increase, as concern about loss of natural habitat, access and amenity values grow. Greater collaboration between territorial and regional authorities will be needed to integrate coastal development and protection measures without diminishing existing amenity or cultural values.

Residential development and population growth along our coast is expected to continue which will bring with it additional demand for facilities, such as boat ramps, jetties and marinas. The proliferation of coastal structures to support future demand will have impacts on the environment and on the ability of the public to access and enjoy common marine areas.

### Key Fact

Northport has an existing consent for an additional 270m of linear berth (berth 4) which is not yet constructed and is currently appealing an independent commissioner's decision to decline consent for an additional 11.7 ha reclamation for an additional 250-metre wharf extension.

*Reclamation of 35.7ha of Whangārei Harbour for the development of Northport, has created economic opportunities for Northland, but at the expense of public access, cultural values, and the natural character of our coastline. Credit: Photoblique.*

# He rangahau whakapūaho

## CASE STUDY 5

## *Coastal development in Whangārei Harbour*

In Whangārei Harbour, early European settlement occurred in Whangārei around a timber mill and later gum trade, but in recent years, coastal development has occurred close to the entrance of the harbour. The construction of an oil refinery, a bulk cargo port and residential growth along the foreshore between Marsden Point and One Tree Point have all occurred in the last 60 years. Coastal development along this stretch of shoreline, highlights the competing demands on space in the coastal environment for port and infrastructure facilities, residential growth, and the general public's desire to use and access the coast for its recreation and amenity values.

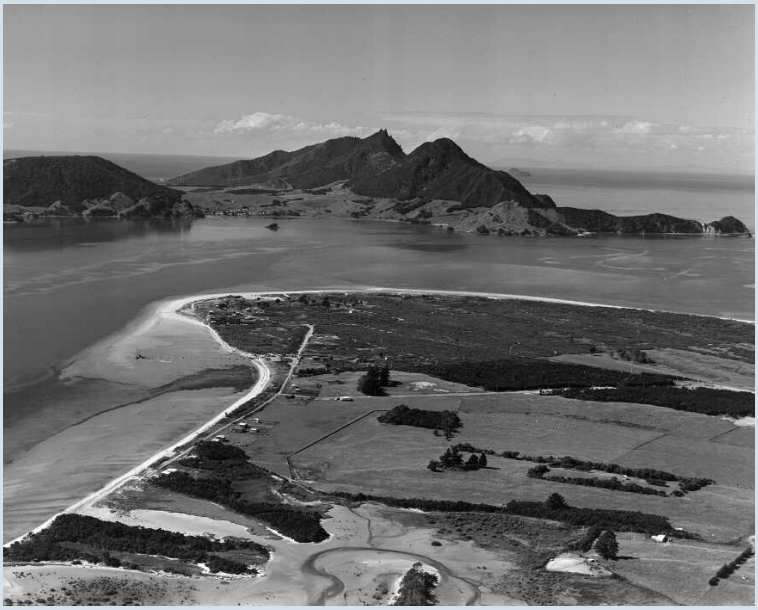
The area is of cultural importance to tangata whenua, as a strategically important Tauranga waka and a large food basket or 'pātaka' with mahinga kai areas where Patuharakeke have traditionally gathered kaimoana such as oysters, pipi, tuangi (cockle), tipa (scallop), and ika (fish) species. The large-scale modification of the shoreline has had significant impacts on the social and cultural values for Patuharakeke as tangata whenua of the area and eroded their ability to exercise kaitiakitanga.

*In 1942, coastal dunes extended around Marden Point and the natural shoreline was largely intact with less than 20 houses located between Marsden Bay and One Tree Point.*

### A new refinery and port facility

As recently as the early 1960s, the shoreline of the harbour between One Tree Point and Marsden Point was essentially in a natural state. Coastal dunes extended around Marden Point and there were fewer than 20 houses along the shoreline. This all changed rapidly in the 1960s with the construction of a new oil refinery at Marsden Point in 1962. This was followed in 2000, with the construction of a new two berth port facility at Marsden Point with a third berth constructed in 2007.

While the refinery and port have promoted economic growth, supported jobs, and facilitated the export of forestry products from the wider Northland Region, the expansive facilities have restricted access to the shoreline, reclaimed large areas of the harbour and necessitated dredging of the Harbour. These modifications have had impacts on the coastal ecosystem, the natural character of the shoreline and social and cultural values of the harbour. The facilities have restricted access to traditional fishing and shellfish gathering sites and desecrated a highly valued cultural landscape for local hapū.



*Marsden Point in 1962, Credit: Alexander Turnbull Library. Aerial photograph taken by Whites Aviation.*

*Today, Northport, a fuel terminal, and an inland marina had been constructed along with extensive residential and industrial expansion. Credit: Photobligque.*

## Residential development and coastal erosion

Industrial and commercial facilities have since grown up around these facilities and residential development has occurred along the foreshore between Marsden Point and One Tree Point. This development has occurred on sandstone cliff, which is vulnerable to coastal erosion. The eroding cliff face has promoted the Whangārei District Council and private property owners to construct sea walls along much of the shoreline, which has frustrated local hapū, Patuharakeke.

In 2017, Patuharakeke opposed a seawall planned by the District Council, highlighting that the cliffs, which are classed as an outstanding natural feature in the Regional Policy Statement, are an important cultural landscape that should be protected. The cultural impact assessment prepared by Patuharakeke identified that "The cliffs form part of that landscape and have an important story to tell of the natural history of our whenua and moana" and expressed concern that the placement of rocks at the base of the cliff would result in the geological feature being obscured. The impact assessment also highlighted that visual, landscape and amenity values are affected when changes to the beach profile result in the loss of beach area available for people to sit and enjoy the beach at high tide.

*An unauthorised sea wall at One Tree Point, comprising, concrete blocks, tyres and material containing asbestos.*


*The Coastal cliffs and foreshore at One Tree Point have been identified as an outstanding natural feature in the Regional Policy Statement.*

Patuharakeke also objected that the proposal amounted to "public expenditure for the private advantage of a small number of property owners in a subdivision behind the cliffs, to the detriment of a notable landscape feature, the diminishing of the amenity value of the coast to others and we are concerned of a worrying precedent of denying the effects of environmental change and the need for strategic retreat in the face of sea level rise"[29].

*Whangārei District Council spent more than half a million dollars to replace an old timber wall at One Tree Point with a rock revetment in 2017*[30].

## New marina development

In 2008, the construction of a new inland marina commenced – resulting in further alteration of the shoreline and the creation of new coastal marine area – when the excavated canals were flooded. While the marina and associated residential development has promoted economic growth and provided a new marina, boat launching facilities and vessel haul-out and maintenance facility, it has come at the expense of the natural character of the shoreline. The development impacted on the ecological values of Marsden Bay and the harbour, through capital and ongoing maintenance dredging of an access channel through Marsden Bay.

The last 60 years have seen dramatic change along the shoreline from a largely intact seascape to a highly modified shoreline with a mosaic of industrial, commercial, and residential land uses. The future challenge will involve managing further development without compromising the high ecological values that remain, such as seagrass and shellfish beds still present along the shoreline. Sea level rise and coastal erosion will also continue to be a risk to existing and future development along the shoreline.

*In 2008 a new inland marina was constructed at Marsden Bay, by excavating large canals on agricultural land and then flooding them with saltwater.*

*Ongoing maintenance dredging is required to maintain access to the marina via a human-made channel across Marsden Bay.*

# 4 Changing climate and coastal hazards

## Te Tirohanga whānui

*Overview*

Northland is surrounded by the sea and many Northland communities are located on our coast. Many of these communities are already exposed to coastal hazards such as coastal flooding and coastal erosion. As our climate changes and sea levels rise, some of these risks will increase. There will also be impacts on the plants and animals that live in our moana and vulnerable habitats like coastal dunes.

# Climate Change

**Many communities already face coastal hazards like flooding and erosion. Climate change and rising sea levels will increase these risks. New Zealand has high per capita emissions, with most of Northland's emissions coming from agriculture and transport.**

## Sea Surface Temperature

- Oceans are warming, potentially becoming too warm for some marine life.
- Kaimoana species may be at risk.
- Warmer waters may help new marine pests survive and spread.

## Coastal Erosion

- Residential development too close to the shore is a problem.
- Erosion threatens cultural and historical sites like marae and urūpa.
- Natural buffers like dunes have been lost or degraded due to forestry, agriculture, and development.
- Vehicle damage to dunes is a major issue.

## Sea Level Rise

- Sea levels are rising as oceans absorb heat from global warming.
- Warmer water expands and melting glaciers and ice caps increase the volume of the ocean.

## Ocean Acidification

- Oceans are becoming more acidic due to absorption of carbon dioxide from fossil fuels.
- Acidification makes it difficult for animals like pāua and crayfish to grow shells and skeletons.

## Coastal Flooding

- Many properties and facilities are already at risk of coastal flooding, which will increase with rising sea levels.
- Coastal communities may face higher insurance premiums or lose access to insurance.

# 4.1 Sea surface temperature

Since the industrial revolution, the burning of fossil fuels has released carbon dioxide and other heat-trapping gasses into the atmosphere, causing the atmosphere to heat up by about 1.1°C compared to pre-industrial levels[1].

Most of the trapped heat has been absorbed by the world's oceans, which has reduced the amount of warming that has been experienced on land. Because the world's oceans are vast, so far, the warming of our oceans has been modest, but these are already having impacts on marine ecosystems.

*90% of excess heat trapped because of climate change to date has ended up in the ocean[2]*

## He aha ngā pāpātanga?
## *What are the issues?*

Increasing sea temperatures may impact what species can live and thrive in our coastal waters. The water may become too hot for existing species that live in our moana, and we may see the arrival of more warmer water species. A recent mass death of more than half a million mussels on Northland's west coast was attributed to heat stress according to Dr Andrew Jeffs, a marine scientist at the University of Auckland. Hot weather coincided with midday low tides and high-pressure systems, which held the tide up for longer, meant that mussels were exposed to extended period of hot sunshine[3].

Changes to what species can survive and thrive off our coastline may impact social values if important recreational and cultural kaimoana species cannot tolerate increased temperatures. From an economic perspective, Northland has a productive seafood and marine farming industry, which may also be affected by changes to marine ecosystems from warming waters.

# E pēhea ana te ora ināianei?
## *What is the current state?*

StatsNZ reports the state and trends for the temperature of surface waters around Aotearoa New Zealand, using two satellite data sets. The trend analysis shows that overall sea-surface temperature increased between 1982 and 2023, despite periods of shorter-term warming and cooling[4]. Sea surface temperatures in the Northeastern and the Western North Island Coastal Regions, which include the Northland Region, increased by 0.19 and 0.25°C per decade respectively. This data is consistent with average global sea surface temperatures reported by the US EPA[5]. They have reported that from 1901 to 2023, the temperature rose at an average rate of 0.08 degree per decade.

### Key Fact

Between 1982 and 2023, each coastal region around New Zealand had their warmest years recorded in either 2022 or 2023[4].

### Key Fact

Sea surface temperatures have increased across all nine coastal regions around New Zealand by between 0.19 and 0.34°C per decade[4].

# He aha ngā mahi hei whakatika?
## *What is being done?*

### Response

Responding to rising air and sea surface temperature is something everyone can take action to address. While New Zealand's overall emissions are small in the global picture, the country has some of the highest emissions per capita in the world[6]. New Zealand has a long-term target for all greenhouse gases (except methane from waste and agriculture biological processes) to reach net zero by 2050 and central government has set limits on the emissions New Zealand can produce over time and long-term plans to keep the country on track.

### Regional response

At a regional level we're also taking action. In 2022 a greenhouse gas emission inventory was commissioned for Te Taitokerau[7]. This inventory identified that roughly 86% of Northland's emissions come from agriculture and transport. The remainder comes from stationary energy, waste, industrial processes and product use. This inventory will help local businesses, industries and communities take action to reduce emissions.

At an organisational level NRC has an emissions reduction plan that will reduce the organisation's carbon pollution by eliminating council's use of fossil fuels in our operations and infrastructure, investing in renewable energy and zero-emissions technology, and encouraging our region to transition to a net-zero emissions economy.

Council has been a keen early adopter of EV technology and has six full electric vehicles and 20 hybrid electric vehicles in our Fleet. NRC's two rooftop solar arrays generated over 110 MWh in 2023, which is enough power to drive over 632,768 EV kilometres, cutting about $113,835 from council's annual vehicle fuel bill.

*Council has been a keen early adopter of EV technology and has six full electric vehicles and 20 hybrid electric vehicles in our fleet.*

*Council's solar array on our Dargaville office produced 87 MWh in 2023.*

## Key Fact

By 2100 under Representative Concentration Pathway 8.5 (RCP8.5), sea surface temperature is projected to have increased by 2.5°C[8].

# He aha kei tua?
## *What is the outlook?*

Predicting future ocean warming is complex and relies on scientists modelling changes to sea surface temperature under future $CO_2$ scenarios. Because it's not known how much $CO_2$ will be released by human activities in the future, scientists have to use different scenarios. These future $CO_2$ scenarios are often referred to as Representative Concentration Pathways (RCPs). There are four RCPs that range from a low level of effort to curb future emissions of greenhouse gases (RCP8.5) to a high level of effort and rapid uptake of modern technology to reduce future emissions from transport and energy generation. The numerical values of the RCPs (2.6, 4.5, 6.0 and 8.5) refer to the concentration of carbon dioxide in the atmosphere by 2100 and are associated with predicted average air temperature increases of 1.0, 1.8, 2.2 and 3.7°C between 2081 and 2100. Using these RCPs, a recent study projected increases in the average sea surface temperature of 0.8°C under RCP4.5 and 1°C under RCP8.5 by 2050 and increases of 1.1°C under RCP4.5 and 2.5°C under RCP8.5 by 2100 in water around New Zealand[8].

Predicting how increasing sea surface temperature will impact Northland's marine species is the next step to understanding what rising ocean temperatures may mean for Northlanders and our coastal ecosystems. Recent research by Moana Project modelled what would happen to ocean temperatures under different scenarios and how these temperature changes could affect different kaimoana species. Kūtai or green-lipped mussels (*Perna canaliculus*) get stressed when water temperatures exceed 24°C and low-level mortalities occur when they are exposed to high temperatures for more than 30 days[9]. Their results showed that under a high-emission scenario, temperature stress will affect kūtai in the upper part of the North Island towards the end of the century[9]. Kūtai, is a valued kaimoana species and 65% of the mussels grown in New Zealand aquaculture farms come from spat collected at Te Oneroa-a-Tōhē/Ninety Mile Beach.

*Warming water may cause temperature stress to valued cultural and commercial shellfish species such as kūtai.*

# 4.2 Sea level rise

Rising global temperatures are also causing the sea level to rise. The oceans have absorbed most of the heat caused by global warming, and as water becomes warmer it expands. In addition, rising temperatures have increased the volume of water in our oceans from melting glaciers and ice caps.

Another factor that affects sea level rise, is any vertical movement of the land. Sinking land or subsidence leads to higher sea level rise, while uplifting land reduces sea level rise and seaward migration of coastlines. When sea level is measured relative to land this is called 'relative' sea level.

*Boat sheds at Kissing point, Whangārei inundated in a high tide.*

## He aha ngā pāpātanga?
## *What are the issues?*

Rising sea level increases the risk of coastal erosion and coastal flooding around our shoreline. Higher salinity further up our streams and rivers may affect drinking water supplies and saltwater intrusion may occur impacting freshwater aquifers[10].

Sea level rise will also threaten our coastal habitats from a process called coastal squeeze. As sea levels rise, coastal ecosystems, like intertidal flats, saltmarsh and mangroves are all at risk of being lost if these ecosystems cannot migrate landwards because of human-made structures like roads, stockbanks, seawalls and coastal settlements.

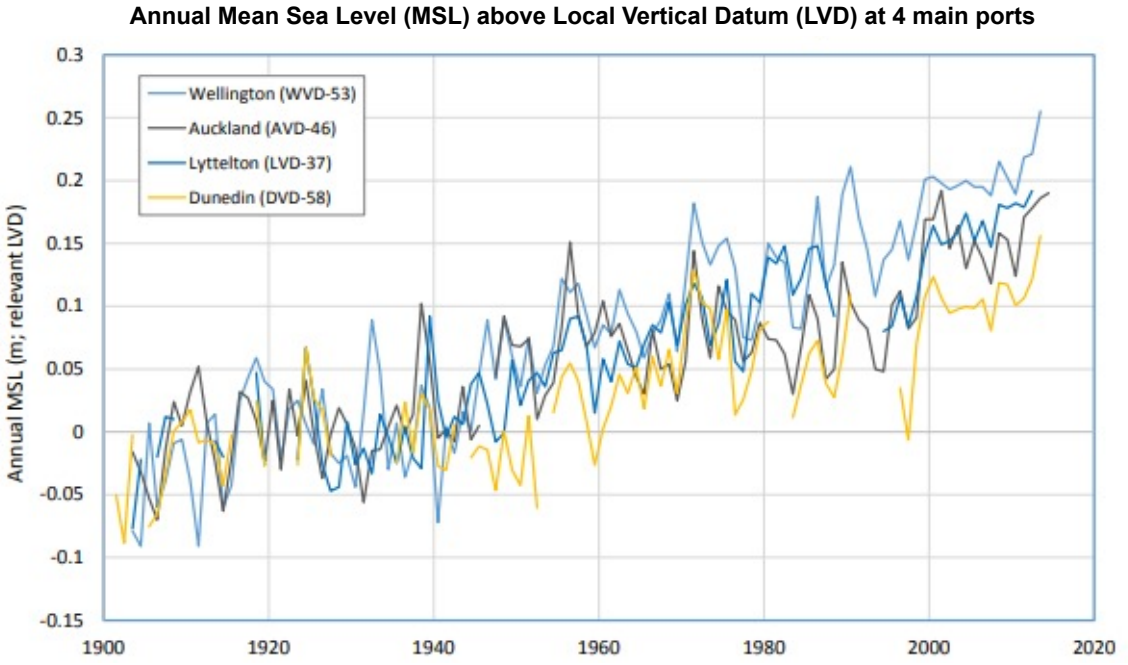
*As sea level rises, the ability for saltmarsh and mangrove habitat to naturally migrate landward, will be restricted by roads, stockbanks, buildings and agricultural land. Credit: Photoblique.*

# E pēhea ana te ora ināianei?
## *What is the current state?*

StatsNZ reports the rise in annual mean sea level relative to land at four long-term tide gauges, and two tide gauges with shorter records[11]. Based on data to 2020, the annual mean coastal sea level has risen at all six monitoring sites around Aotearoa. The Auckland tide gauge, which is the closest site to Northland, recorded a relative sea level rise of 1.71 mm per year between 1901 and 2020[11].

The data also shows that the rate of sea level rise is accelerating[11, 12]. The rate of sea level rise has doubled in the 60 years to 2020 at three out of four tide gauges: Wellington, Lyttleton and Dunedin; compared with mean rates from 1901 through to 1960[11]. These findings are consistent with global data, which shows that global average sea level has risen between 210 and 240mm since 1880, and that sea level rise has more than doubled from 1.4mm per year throughout most of the twentieth century to 3.6mm per year from 2006 to 2015[13].

In 2022, the NZ SeaRise: Te Tai Pari O Aotearoa programme released location specific sea-level rise projections out to the year 2300 for every 2 km of the coast of Aotearoa[14], which can be accessed through a new online tool. This tool allows Northlanders to see how much and how fast sea level will rise along their shoreline and by when under different climate change scenarios.




*The rate of sea level rise has doubled in the 60 years to 2020 at three out of four tide gauge; Wellington, Lyttleton and Dunedin, compared with mean rates from 1901 through to 1960[12]*

# He aha ngā mahi hei whakatika?
*What is being done?*

## Response

As well as taking climate action to reduce our emission of greenhouse gasses, many of councils actions respond to risks that are intensified by climate change such as sea level rise. This includes:

- reducing the risk of flooding by investing in flood management schemes in several Northland areas, and developing flood warning systems;
- investing in science and research, such as natural hazard mapping, so the tools and information are available to plan for future climate change scenarios; and
- doing climate change risk assessments.

## Adaptation

In 2022, Northland Regional Council, in partnership with the region's three district councils, agreed on a strategy to undertake climate adaptation planning across the region. This is in response to the current impacts on our region from climate change, especially in the coastal environment.

The Te Taitokerau Climate Adaptation Strategy[15] outlines a programme of work to consider how our communities will response to climate change through adaptation. The approach acknowledges that climate change will impact all aspects of life in Te Taitokerau, including our cultural heritage, ecological environments, economic welfare, and social wellbeing. This joint approach to community adaptation planning is to ensure Councils uphold their accountabilities to its people through a changing and uncertain future.

The success of community adaptation planning is reliant on political support. Sustained funding and resourcing commitments are needed from councils and central government agencies, as well as prolonged participation from communities. The recent example of Kaipara District Council withdrawing from their own adaptation planning project creates the conditions for negative adaptation outcomes. After significant local community buy-in to the project, the result has been to heighten climate change anxiety and exacerbates inequalities in one of our region's most vulnerable coastal communities.

# He aha kei tua?
*What is the outlook?*

Predicting sea level rise is again dependent on future $CO_2$ emissions, but there is near certainty that the sea will rise 20 to 30 cm by 2040[16]. By the end of the century, depending on whether global greenhouse gas emissions are reduced, it could rise by between 0.5 and 1.1 m[16]. Unfortunately, in Northland a lot of development has taken place close to the coast, including residential development, roads, high risk industrial sites and waste water infrastructure. Rising sea levels will increase the risks from coastal erosion and flooding, which is outlined in the next two sections.

# 4.3 Coastal erosion and coastal squeeze

Coastal erosion is a natural process that is part of normal beach behaviour. In its natural state our sandy beaches are dynamic, accreting seaward and eroding landward in response to sediment supply, climate, and ocean conditions[17]. Some of the factors that control the shoreline include hydrodynamic processes (such as swell, waves, tides, and storm surge); the geomorphology of the shoreline (the shape and exposure of the beach and the presence of geological features like headlands and islands); the sediment budget; vertical land movement; and sea-level rise[17].

Human activities have impacted the natural dynamic processes of our coastline by altering sediment flows from rivers, dredging channels in our harbours and estuaries, extracting sands and gravel from nearshore areas, reclaiming land and building coastal protection structures. Humans have also modified the shoreline by removing dunes and coastal vegetation[17]. In many places where a foredune has survived or been restored but is too narrow to function effectively. Dunes need adequate space to be able to move. In a natural system dunes and other coastal habitats would migrate inland when threatened by erosion and sea-level rise. However, human infrastructure, such as roads and housing, prevents this migration, leading to 'coastal squeeze' where habitat is lost as it cannot migrate inland.

## He aha ngā pāpātanga?
*What are the issues?*

A substantial proportion of residential property and infrastructure has been built too close to the sea, potentially putting them at risk of coastal erosion. As our sea levels rise more people, and property will be at risk from coastal erosion. Unfortunately, residential development is still occurring in hazard prone areas, and the current legislative framework makes it difficult for district council's to give sufficient weight to high-risk hazard areas in their decision making.

Coastal squeeze is also a threat to our rare and unique coastal dune habitats and the species that live in them. Since humans arrived in Aotearoa, New Zealand, 80.5% of our coastal dune ecosystems have been lost[18], destroying an important natural defence to coastal hazards and sea level rise. Our remaining dunes have also been impacted by pest plants and animals, and human disturbance like vehicle use, walking and riding through our dunes.

Coastal erosion will also have an impact on our archaeological heritage and cultural values as many important historical and cultural sites like marae and urupā are located close to the coast.

*Residential property within coastal hazard zones at Matapōuri.*

### Key Fact

Māori climate commissioner Donna Awatere-Huata recently said that 80 per cent of the country's marae and urupā were on the coast or near flood-prone rivers[19].

*Motorbikes in duneland at Karikari Peninsula, where vehicles are destroying middens and threatened plants.*

# E pēhea ana te ora ināianei?
*What is the current state?*

## Open coast soft shoreline erosion

Most soft shoreline erosion currently occurring in Northland and visible after a major storm, such as Cyclone Gabrielle, is temporary erosion that is associated with natural dynamic shoreline fluctuations. Erosion may occur after an individual storm, but open coast soft shoreline typically recovers naturally within a relatively short time period.

Recent research by the University of Auckland, that investigated shoreline change in Te Taitokerau from the 1930s to present day, found that overall, on the east coast of Northland there was effectively no shoreline change while the west coast showed an overall accretion of approximately 0.4 metres per year[20].

However, while there may have been no overall increase in erosion there has been an explosion of coastal development which has created problems when short-term erosion does occur. Some of this subdivision has encroached too far seaward, leaving little natural buffer, and sometimes extending into the dynamic coastal shoreline itself. The remaining natural buffer, like our coastal dunes, are often modified, reducing their ability to protect the shoreline and recover naturally following storm events. A lot of our dunes have been invaded by pest plants and exotic grasses such as kikuyu and buffalo grass and in some cases, exotic grasses have been planted or spread from adjacent reserves. Unfortunately, these exotic plants are not as effective as native dune plants like spinifex and pīngao at repairing storm damaged dunes.

When development has occurred within the dynamic coastal shoreline zone, it can lead to an increase in hard protection structures, as people try to protect private property following storms. These hard protection structures can reduce the environmental, cultural and amenity value of our beaches and may exacerbate erosion issues further along the shoreline.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*Erosion of coastal dunes at Matapōuri Beach after Cyclone Gabrielle.*

*Erosion of coastal dunes at Ruakākā Beach after Cyclone Gabrielle.*

*Residential development at Wellington's Bay (Whangaumu Bay) has occurred too close to the shoreline, leaving properties vulnerable to erosion during storms.*

## Erosion of hard coasts

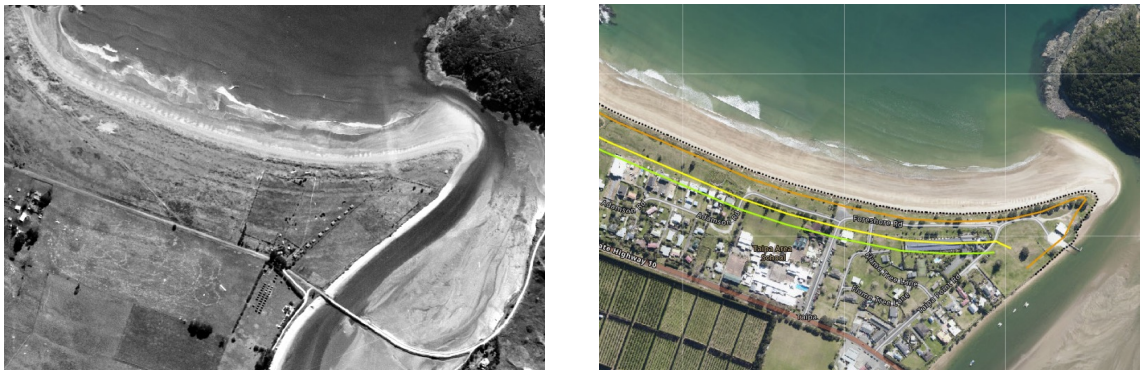
Erosion of hard coasts like rocky coasts and cliffs is different to soft shoreline erosion, as erosion of rocky or hard coasts is permanent. In Northland, there is very little data about the rate of retreat for our hard coasts. For most of our coastline, erosion of hard shoreline is probably of little consequence but there are several locations such as Hihi, Ōmāpere, Opononi, and One Tree Point where erosion of coastal cliffs is occurring close to coastal communities.

*Erosion of hard shorelines like coastal cliffs is permanent.*

# He aha ngā mahi hei whakatika?
*What is being done?*

## Response

Northland Regional Council has commissioned work to analyse and map coastal erosion hazards at 42 sites around Northland to better understand its impact into the future [21]. The assessments were developed by Tonkin &Taylor using 2018 LiDAR (Light Detection and Ranging) elevation data and a probabilistic assessment method. The assessment use scenarios based on the likelihood that erosion will extend landward to a given point (e.g. 66% likelihood) under different rates of sea level rise, including a rapid sea level rise scenario. Maps displaying historic shorelines back to the 1950s, and four coastal erosion hazard zones have been produced and are available on the NRC hazard portal. The maps provide a visual tool for district councils, iwi/hapū, and coastal communities to understand the risk posed by coastal erosion.



*An aerial image in 1963, shows there was just ten small properties on dune habitat at Taipā Beach. Since then, new residential development, a hotel and a school have all been constructed on what was once coastal dunes, within the mapped coastal erosion zones.*

### Key Fact

CoastCare dune restoration work has been undertaken at almost 40 sites around Northland's coast between 2015 and 2023, with 98,000 native plants planted over that time.

Our coastal dunes are a vital natural buffer to coastal hazards and are home to unique ecosystems and species. Council is helping to protect and restore the region's dunes and beaches through our CoastCare programme, building partnerships between community, iwi/hapū, district councils and DOC. Between January 2019 and December 2023, restoration work has been undertaken at 32 sites around Northland with 72,636 native plants planted over that time. Ongoing restoration work includes planting, fencing and plant and animal pest control.

Education and advocacy are an integral part of the CoastCare programme which aims to increase public awareness of dune processes, what everyone can do to protect our dunes and beaches, and nature- based solutions to coastal hazards, through NRC's website, online campaigns, events, and conversations with coastal communities. Most planting and other work is undertaken by volunteers, including schools, which provides an opportunity to learn more about the coastal environment and how dunes work.

*Working bee on Taipā dunes with local hapū.*

*Waipū cove after storm damage and the same location following dune restoration work.*

# He rangahau whakapūaho

## CASE STUDY 6

## *Mātihetihe dune restoration project*

Northland Regional Council CoastCare have been working with Mātihetihe Marae since 2020 to restore the dunes which provide vital protection to the marae. The dunes are also culturally significant and the marae and kura are named after the native dune plant mātihetihe (*Spinifex sericeus*) which covers the dunes. In summer, the seedheads, or 'tumbleweeds' blow around the dunes and beaches.

The dunes in front of the marae had been badly damaged by vehicles and the marae made the decision to fence the dunes off and work to restore them, as well as educating the community on the importance of the dunes. The marae applied for an Environment Fund grant to cover the cost of fencing the dunes off, and several planting days have been held and CoastCare signage designed and made. Te Kura o Mātihetihe have been involved with the project from the start.

Since 2020, 4,500 mātihetihe seedlings have been planted around the outside edges of the 'bowl'. The fenced area has been building as the plants spread and grow and the 'bowl' is gradually reverting to a natural dune shape. The marae and kura continue to maintain the fence and plant each winter and are planning to gradually replace invasive marram grass (*Calamagrostis arenaria*) with the native mātihetihe, further improving the health of the dune system.


*Left: Ana Bercich, Mātihetihe Marae, who has been leading the project collecting spinifex seed heads in 2019. Right: Planting day with Te Kura o Mātihetihe and Mātihetihe Marae in 2020, with newly installed fence in background.*

*Left: Tamariki from Te Kura o Mātihetihe and kaitiaki from Mātihetihe Marae planting dunes near the marae in September 2023.*
*Right: Mātihetihe (spinifex) spreading out of fenced area and building the dune.*

# He aha kei tua?
## *What is the outlook?*

Currently most of the coastal erosion occurring in Northland is short term-and is associated with natural dynamic shoreline fluctuations. However, projected sea level rise and an increase in storm events, is likely to cause long-term erosion. Unfortunately, a substantial number of our coastal developments have occurred too close to the sea, potentially putting them at risk of coastal erosion.

## Economic risks and insurance retreat

Continued demand for coastal residential development and intensification of existing urban areas on the coast suggests that climate risks are not being fully understood and reflected in homeowners' decisions to purchase or renovate coastal property[22]. A realignment of coastal property values to reflect increased climate change risks may have wider economic and social impacts. The Reserve Bank has recently noted that premiums for residential property insurance have 'significantly outstripped' the general rate of inflation and is concerned that this may lead to people being unable to afford home insurance in the future[23]. Insurance companies are already taking an ever more granular risk-based approach for individual properties, with a possible consequence that homeowners in vulnerable coastal communities may face prohibitively high premiums or might lose access to insurance altogether. At the same time, banks are becoming increasingly aware of the risks of declining insurance coverage on properties they lend towards.

## Coastal protection

Coastal protection is expensive, and tough decisions will need to be made about what land can be protected and who should pay for it. There is often an expectation by communities and individuals that local or central government will cover the cost of protection. However, there is no legislative requirement for councils (regional or district) to provide coastal protection to private property.

Where hard protection structures are built, they will have an impact on the environmental, cultural, aesthetic, and recreational values of our beaches and shoreline. When hard defences are constructed on eroding beaches, as erosion proceeds the beach in front of the seawall narrows and the beach can disappear completely.

Communities will need to decide how to value and prioritise cultural assets like urupā and marae, residential property, productive land, and infrastructure. As well as economic costs, coastal erosion will have social and cultural effects. Coastal erosion and the threat of it, will have an impact on the wellbeing and mental health of affected individuals and communities. Balancing the competing demands of property owners to protect their homes from erosion and the public's desire to enjoy our beaches may exacerbate tensions in coastal communities. Political and social tensions may also arise because of decisions taken to address coastal erosion.

## Coastal squeeze

There will also be an impact on our ecological heritage. Our remaining coastal dune habitat is often constrained on the landward side by residential development and roads. Without space to migrate landward in response to rising sea levels, we will lose more of this rare and unique habitat and the animals that live there.

*Residential development has occurred on our dune systems in Bream Bay. As sea levels rise there will be no space for dunes to migrate landward, potentially leading to the loss of this habitat.*

### Key Fact

The two largest weather-related insurance events in New Zealand's history have occurred in the last 5 years[24]

# 4.4 Coastal flooding

Coastal inundation (flooding) occurs when conditions like storm surge and large waves combine with high tides and low-pressure systems to cause flooding of low-lying coastal land. Areas close to where estuaries, rivers and creeks meet the sea are particularly vulnerable because high seas can cause rivers to back up in land[25].

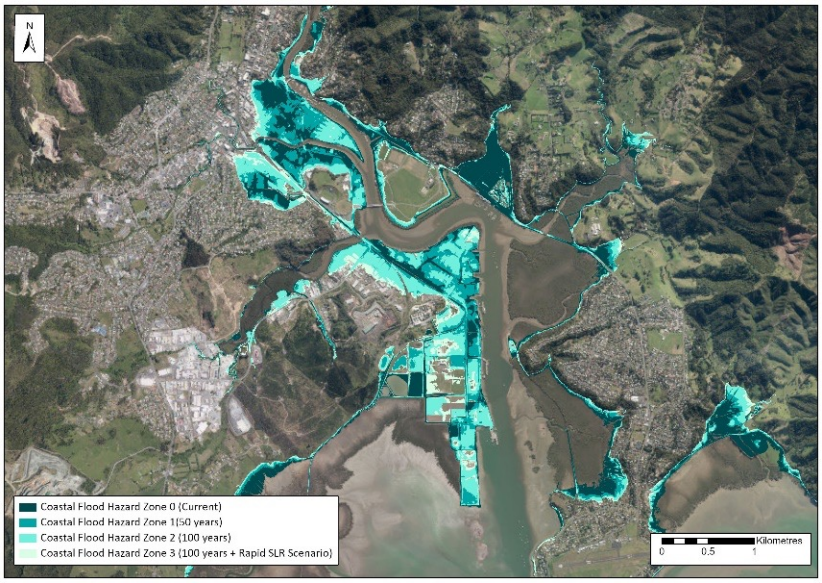
## He aha ngā pāpātanga?
*What are the issues?*

Coastal flooding poses a threat to people, property, productive land, and infrastructure. Large waves can also create other hazards besides inundation, including rip currents, beach erosion or hazardous driving conditions. Higher salinity water up rivers and streams may also affect potable water supplies and pasture can be damaged for up to a year from salt burn[25].

*Boat sheds at Kissing point, Whangārei, inundated by coastal flooding.*

## E pēhea ana te ora ināianei?
*What is the current state?*

Council has used the latest models for coastal flooding to assess how the region's assets including homes, marae, community facilities, waste facilities and hazardous sites are 'exposed' to flooding events[26]. When modelling coastal flooding for a one-in-one-hundred-year coastal storm event, it was found that 8268 residential homes, 34 marae, 274 community facilities, four waste facilities and 205 hazardous sites are currently exposed to coastal flood risk.




*Large areas of Whangārei CBD and industrial areas along Port Road are within mapped coastal flood hazard zones.*

# He aha ngā mahi hei whakatika?
*What is being done?*

## Response

In April 2021, Northland Regional Council released a new update to Northland's coastal erosion and coastal flooding maps, to help our communities and decision makers understand the risks and plan better for the future[21]. The maps consider a range of variables to produce projections of extreme water levels around Northland's coastline. These water level projections are mapped to a high-resolution topographic model of the coast to give four different coastal flood hazard zones. These zones indicate the extent of land that has been assessed as likely or potentially at risk of flooding or erosion by the sea, currently and over the next 50 and 100 years.

The two major variables that influence the coastal flood hazard zones are the size of a given storm event, and the amount of sea level rise. The severity of a coastal storm can be described in terms of its likelihood (e.g. a 'one in one-hundred-year storm'). How quickly sea level rise happens is related to global greenhouse gas emissions, and the levels used are based on recommendations from the Ministry for the Environment. These reports and the associated maps have been published on the NRC's Natural Hazard Portal, which can be accessed via the NRC website.

# He aha kei tua?
*What is the outlook?*

Rising sea level and increasing storm intensity are likely to increase the frequency of coastal flooding and flooding will extend further inland, meaning more people and property are likely to face increased flood risk in the future. A lot of our towns and infrastructure have been built close to the coast, and development is still occurring within coastal flood hazards zones. As coastal flooding increases, the impact on people's properties and livelihoods is expected to increase.


*Woods Road, Whangārei floodwall.*

# 4.5 Ocean acidification

Around a third of all the carbon dioxide added to the earth's atmosphere from burning fossils fuels has dissolved into the ocean. While this has helped to reduce the warming experienced on land it has altered the pH of our oceans and coastal waters. pH is a measure of how acidic or alkaline a solution is. The lower the pH the more acidic the solution is. When carbon dioxide dissolves in seawater the ocean becomes more acidic. Prior to the industrial revolution the ocean had a pH of 8.2, while today the pH is 8.1. Although this may not sound like a big change, pH is measured on a logarithmic scale, which means that each decrease of one pH unit equates to a ten-fold increase in acidity[27]. The acidity of the ocean today is greater than at any point in the past two million years[27].

## He aha ngā pāpātanga?
*What are the issues?*

Lots of marine plants and animals, like pāua, pipi, kina and crayfish have calcium carbonate structures in their bodies. Ocean acidification reduces the concentration of carbonic ions in the ocean, which makes it more difficult for these plants and animals to form and grow their shells and skeletons, and at low pH the shells may even begin to dissolve.

Many marine animals, that are vulnerable to ocean acidification are important taonga and kaimoana species like pāua, kina and kūtai. Impacts on these species may impact the ability of tangata whenua to undertake mahinga kai and kaitiakitanga within their rohe. They may also be an impact on Northland's seafood and aquaculture industries, as some important species like oysters and kōura have shells made from calcium carbonate.

## E pēhea ana te ora ināianei?
*What is the current state?*

Stats NZ reports changes in the pH of New Zealand's subantarctic surface waters (Munida Transect) from 1998 to 2020 and at selected coastal sites from 2015 to 2021[29]. Due to the high variability in the data and the relatively short time period for the coastal sites no trends are reported for these sites. However, results, for the surface waters off the Otago Coast (Munida Transect) show that acidity had increased by 8.6% between 1 January 1998 and 31 December 2020. This corresponds to a decrease in pH from 8.092 to 8.057[29].

### Key Fact

The oceans have absorbed about one third of the $CO_2$ emitted from burning fossil fuels[27]

### Key Fact

The lobster fishery is one of New Zealand's most lucrative fisheries with exports worth around $300 million in 2019[28]. T'he current value of the commercial fishing catch limit of CRA 1, which encompasses the Northland Region is estimated to be over $112miilion[28]

# He aha ngā mahi hei whakatika?
*What is being done?*

## Response

At a regional level our best response to ocean acidification is to take action to reduce emissions of carbon dioxide, which causes ocean acidification. In 2022, a greenhouse gas emission inventory was commissioned for Te Taitokerau[7] and at an organisational level there is an emissions reduction plan that will reduce council's carbon pollution by eliminating the use of fossil fuels in our operations and infrastructure, investing in renewable energy and zero-emissions technology, and encouraging our region to transition to a net-zero emissions economy.

# He aha kei tua?
*What is the outlook?*

As for predictions of sea surface temperatures increases and sea level rise, increases in ocean acidity is dependent on future $CO_2$ scenarios. Under the Representative Concentrations Pathways (RCP) 2.6, pH is projected to remain within its current range (8.1) but under RCP 8.5, surface water pH is projected to decline by 0.335 to ~ 7.77 by 2100[6].

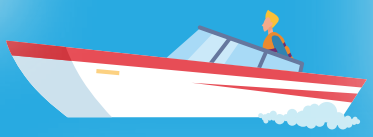
*Many marine plants and animals are vulnerable to ocean acidification, including taonga and kaimoana species. This could impact on Northland's aquaculture industries, like oyster farming.*

# 5 Marine Biosecurity

# Biosecurity

- Northland has a large port and fuel terminal, with a steady stream of tankers and cargo ships.
- The Bay of Islands is a popular cruise ship destination, with nearly 100 ships visiting each summer.

- Vessel biofouling is a major pathway for marine pests entering Northland.
- Marine growth on boat hulls facilitates the attachment and transport of pest species.
- Commercial and recreational vessels arrive in Northland from domestic and overseas ports.
- Northland is a popular destination for recreational boating, with 2000 vessels visiting annually.





- The Northland Regional Pest and Marine Pathway Management Plan helps manage pest species risks.
- Council's Marine Biosecurity Team conducts about 2000 hull inspections annually, with 10% revealing a marine pest.

- Marine pests from overseas can impact native marine plants and animals, modifying ecosystems and negatively affecting native species and habitats.
- Marine pests can harm the aquaculture industry by damaging infrastructure, competing for food, and spreading disease.
- Northland's subtropical climate supports the establishment and spread of marine pests.
- Warming sea temperatures may aid the survival and spread of new marine pests.

- Marine pests like the Mediterranean fanworm can form dense beds, outcompeting native species.
- In 2023, the invasive seaweed Caulerpa was found in Omakiwi Cove, forming dense fields on the seabed.
- Council is working with local hapū and MPI to eliminate Caulerpa.

# 5.0 Marine Biosecurity

Northland's broad habitat range, coupled with the region's subtropical climate, contributes to a biodiversity of marine life that is greater than any other region in New Zealand. However, these marine and estuarine ecosystems are under constant threat from invasive pest species.

Pathways for marine pests into and around New Zealand include maritime transport, aquaculture, and the live marine species trade[1]. Once new species arrive, Northland's climate is conducive for their successful establishment and rapid proliferation. A major pathway for marine pests in Northland is via vessel biofouling. Significant growth can occur on boat hulls, creating an environment suitable for attachment and transport of pest species. In Northland, the volume of commercial and recreational vessel traffic is substantial; around 400 large commercial vessels and over 2,000 recreational vessels arrive annually, a large proportion of which come from overseas into busy ports in Whangārei and the Bay of Islands.

## He aha ngā pāpātanga?
## *What are the issues?*

Marine pests can modify marine ecosystems, negatively impacting native species and habitats. Species like the Mediterranean fanworm (*Sabella spallanzanii*) can occur in dense beds of up to 1,000 individuals per square meter, outcompeting native species for food and habitat. Recent studies show that fanworm cause significant changes to ecosystem structure[2] and interfere with nutrient cycling[3].

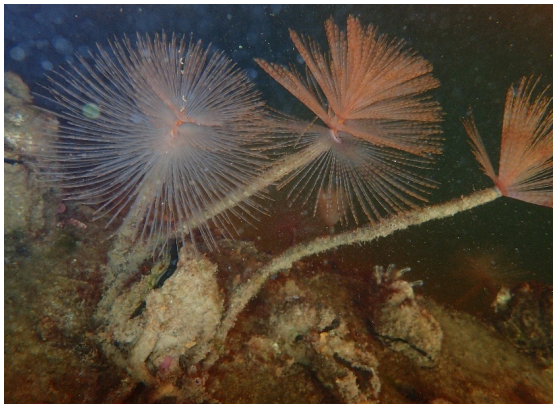
Other species invade and alter natural environments, such as the Japanese mantis shrimp (*Oratosquilla oratoria*) that burrows in soft sediment[1]. Others, like the Asian paddle crab (*Charybdis japonica*), aggressively outcome their native counterparts for food and habitat[1]. Sessile species such as tunicates (*Styela clava, Eudistoma elongata*), and fanworm, grow prolifically on hard substrates, occurring in densities significant enough to interfere with local biological processes. Invasive macroalgae, such as Undaria seaweed (*Undaria pinnatifida*), grows very rapidly, outcompetes native species for light and nutrients, and transforms diverse macroalgal forests into single-species stands[1].

Marine pests can also negatively impact the aquaculture industry by damaging aquaculture infrastructure, competing with stock for food, and spreading disease. In New Zealand, the emergence of a disease syndrome in Pacific oyster caused by ostreid herpesvirus (OsHV-1) in 2010, following mass mortality events in Europe, had dramatic impacts on productivity, with up to 100% mortality of spat[4].

The severity of the outbreak lead to the bankruptcy of some business, the abandonment of farms, and redundancies of farm employees[5].

Marine pests can affect recreational and commercial fisheries by modifying important fish habitat, competing with target fish for food, predating upon native fish, fouling shellfish, interfering with, and damaging fishing gear, and spreading disease. For example, exotic Caulerpa (*Caulerpa brachypus* and *Caulerpa parvifolia*) has the potential to smother native seagrass beds and cover soft sediment habitat, which may alter the abundance of fish and shellfish species that are unable to utilise that habitat.

Marine pests may also affect the mauri (life force) of our takutai moana, compete with or prey on taonga species, impact the availability of kaimoana and the ability of mana whenua to undertake mahinga kai and kaitiakitanga within their rohe.



*Mediterranean Fanworm (Sabella spallanzanii) in Marsden Cove Marina. NRC Marine Biosecurity M Nevill-Jackson*

## E pēhea ana te ora ināianei?
*What is the current state?*

One hundred and twenty-four non-indigenous marine species have already been reported to be established in Northland[6]. Many are not considered problematic as they have minimal impact, however seven have been classified as pests by Northland Regional Council in the Regional Pest and Marine Pathway Management Plan as they exhibit a range of demonstrable negative impacts.

In May 2023, the invasive green seaweed exotic Caulerpa (*Caulerpa brachypus* and *Caulerpa parvifolia*) was found washed up at Omakiwi Cove in the Bay of Islands, which lead to the discovery of significant densities in the Te Rāwhiti inlet, Bay of Islands. Its discovery is a major concern because it can spread rapidly, forming vast, dense underwater fields. It's feared that exotic Caulerpa will outcompete native species for space and alter the balance of local ecosystems creating monospecific meadows[7], presenting a huge risk to the ecology of the Bay of Islands, recreational activities, and cultural values. The shallow, clear waters around the central islands of the eastern Bay of Islands and the Rāwhiti channel are home to subtidal seagrass beds and an algal-turf biome that has not been described elsewhere in New Zealand[8].

*Exotic Caulerpa can out compete native species forming thick dense fields on the seabed. It can spread rapidly via small pieces that are transported by vessels (on anchors and anchor chains) and other marine equipment, such as dive gear or fishing lines.*

### Key Fact

Around 400 large commercial vessels and over 2000 recreational vessels arrive in Northland annually with a large proportion coming from overseas.

### Key Fact

124 non indigenous marine species have already been reported to be established in Northland

# He aha ngā mahi hei whakatika?
*What is being done?*

## Response

We've been proactively building and developing our response capability to marine pest incursions, with a dedicated team of marine biosecurity officers, specialists, and divers operating in Northland.

## Vessel hull surveillance

On 1 July 2018, the Northland Regional Pest and Marine Pathway Management Plan[1] became operative, which is a key tool to help manage the risk from pest species. The plan includes rules requiring vessels that enter Northland or move within Northland to have clean hulls to minimise the spread of invasive marine species. To complement these rules, a vessel hull surveillance programme is conducted from October to May each year throughout harbours, marinas, and anchorages in Northland. The aims of the program are to inspect 2,000 vessels each season, identify the level of biofouling on vessel hulls, look for pest species, and respond to incursions when pests are found. Since the 2018/2019 season over 12,000 vessels have been inspected, with approximately 10% of these inspections revealing a marine pest.

If a marine pest is found, a case-by-case assessment is made to determine the correct course of action, which could include requesting rectifying actions by the vessel owner including haul out and hull clean. Several factors are considered when determining the severity of the risk to the marine environment, including the species found, the number of individuals, and the location of the vessel.

*Regional council divers and its contractors inspect approximately 2,000 vessels every year and have inspected more than 12,000 vessels since 2018.*

Rapid detection coupled with fast actions to mitigate the spread of pest species has ensured many of Northland's unique and high-value marine ecosystems are still free of pests.

## Education and advocacy

To raise awareness of the importance of good marine biosecurity practices several outreach, education, and engagement activities are undertaken throughout the Northland region. These events range from giving presentations about marine biosecurity in local high school science classes, to running species identification workshops for marine conservation volunteers, educators, and marina staff.

*NRC staff share their expertise with teachers at a marine pest identification workshop in Whangārei.*

## How can you help?

Like possums, managing marine pests requires everyone to do their bit. NRC staff can't be everywhere, so public reporting findings of any unusual marine animals is heavily relied on. Everyone can help by learning what marine pests look like, reporting them if you think you've seen one and if you have a boat make sure its hull is clean before you set sail. For more information about marine pests and how you can help visit the marine biosecurity page on our website.

# He rangahau whakapūaho

## CASE STUDY 7

## *Fighting Caulerpa*

In May 2023, haukāinga of Te Rāwhiti identified the exotic Caulerpa species, *Caulerpa brachypus* and *Caulerpa parvifolia*, within their rohe. Once identification was formally confirmed, a collective of Biosecurity New Zealand, council and local hapū, initiated a response. Together, hapū, council, and MPI established a joint strategy aimed at eliminating Caulerpa in Te Rāwhiti. Both a rāhui and a Controlled Area Notice (CAN) have been implemented. Furthermore, council and NIWA dive teams have made extensive efforts to gauge the extent of the infestation, using benthic mats and chlorine for treatment.

Exotic Caulerpa functions as an ecosystem engineer, dramatically altering our marine habitats. Its propensity to outcompete and replace native seagrasses and other benthic species can set off trophic cascades, disrupting the food web from the base upwards. The current exotic Caulerpa proliferation will diminish access to kai moana and significantly impact ecological biodiversity, and our way of life.

*Below left: Caulerpa brachypus and Caulerpa parvifolia within Omakiwi Cove, Te Rāwhiti, Bay of Islands. Below right; Experimental suction dredge equipment has been trialled, as a method to undertake large scale removal of exotic Caulerpa*

The Northland response has been driven by a strong partnership between Ngāti Kuta, Patukeha, the Northland Regional Council, and Biosecurity New Zealand. This collaboration has been essential in developing effective removal methods and documenting the ecological impacts of the response. Ngāti Kuta and Patukeha have been instrumental at every stage, securing funding from the Minister, providing oversight and guidance in selecting methodologies, and supporting operational delivery. The success of this response has relied on the strength of the hapū-council partnership, demonstrating the importance of working together to protect the marine environment.

In late 2023 a local contractor was engaged by Council and hapū to develop a mechanical suction dredge to help with our removal efforts. Initial testing and modifications were conducted from February to April 2024, followed by a secondary testing phase from April to July 2024. This innovative system, operated from a barge, uses rotating brushes mounted on an excavator arm to suction exotic Caulerpa from the seafloor. The dredged material is processed through two large trommels, which separate the exotic Caulerpa from finer sediment and sand. The exotic Caulerpa is then retained and disposed of on land, while the sediment and sand are returned to the seafloor. Preliminary results are promising, with the system achieving an average removal rate of over 1,000m$^2$ per day when fully operational. In parallel with mechanical operations, diver-based efforts have continued to support the removal process. Ensuring complete removal of exotic Caulerpa biomass is essential, as the seaweed can regenerate from small fragments. Diver-operated suction dredges have been used to eliminate remnants missed by the mechanical dredge. Divers have also conducted pre- and post-dredge ecological surveys to monitor changes in faunal abundance and diversity resulting from the dredging activities.

## He aha kei tua?
*What is the outlook?*

The risk of new marine pests arriving in Te Taitokerau is likely to remain elevated as commercial shipping and arrivals by international yachties increase, and domestic recreation vessel numbers continue to grow. Warming sea water temperatures may also aid the survival and spread of new marine pests.

To counter the continued risk, NRC is looking to utilise technology and develop new surveillance and control measures.  Additionally, building relationships with hapū will be a strong focus, with staff looking to facilitate capacity building of mana whenua to enhance monitoring within their rohe moana.

# Ngā Whakatepenga
## *Conclusions*

The coast is central to Northland's history, culture, and way of life. The oceans carried our ancestors from distant lands to create new lives and communities in Te Taitokerau. It has long been a source of food and livelihoods for Northlanders and a means of transport for waka and ships bringing people and resources to and from our land. It's a place for relaxation and to socialise with friends and whānau and interact with the natural world.

*The health of our moana underpins the health of our people*

But the ocean is under pressure - this report looks at how pollution from land is affecting our coastal environment, and how activities in the coast, like fishing and coastal development are causing habitat degradation and threatening our marine life. The report also examines the risks posed by marine pests to our coastal ecosystems and the challenges our coastal communities face from coastal hazards and climate change.

## Estuaries

The most acute pressure is on our estuarine environments. Estuaries are the receiving environment for the freshwater network so are under pressure from activities that take place on the land, such as forestry, farming, and urban development, as well as activities in the coastal marine area. Our monitoring has shown that concentrations of sediment, metals, nutrients, and contaminants like plastics are highest close to inputs of freshwater. Sediment is perhaps the biggest threat to our estuarine environments and our estuaries have endured an order of magnitude increase in sediment accumulation rates since the arrival or humans in Aotearoa. The increase in sediment loads reaching our estuarine environments has caused a dramatic shift from sandy to mud dominated habitats which has had profound impacts on the ecological communities that live there.

Our estuaries are also home to a large number of maritime activities, such as shipping, recreational boating, and our maritime industry. These maritime activities bring with them associated pressures on the coast, such as the need to dredge navigation channels, construct marinas, boat ramps and port facilities, and provide space for moorings. Maritime activities also bring with them the risk of maritime incidents, such as oil spills, abandoned vessels, wrecks, and risks associated from the introduction and spread of marine pest species.

Our estuarine shoreline has also faced pressure from population growth and coastal development. Historically, large areas of saltmarsh and intertidal flats were drained and reclaimed for productive land, urban development, and infrastructure such as roads and ports. More recently the shorelines of our estuaries have been modified by hard protection structures, such as sea walls to protect houses and infrastructure that has been built too close to the coast.

Despite the lengthy list of pressures, our estuaries have displayed remarkable resistance and many of our estuaries still support high ecological values. Even within Whangārei Harbour and the Bay of Islands where human pressure has been most intense, there are still areas of high ecological values and high natural character. Whangārei Harbour boasts extensive subtidal seagrass beds, and recently turf algae beds were found in the Bay of Islands, that have not been reported elsewhere in New Zealand[1].

## The open coast

While the most intense pressure has been exerted on our estuaries, our open coast shoreline has not been immune from human modification. The most prominent impact on our open coast shoreline has been habitat loss and the modification of our coastal dune ecosystems. Forestry, farming, and residential development have all encroached onto our dune habitats, and much of what remains has been heavily impacted by human disturbance like vehicle use, walking and riding through our dunes, and pest plants and animals.

Beyond our estuarine environments, the pressure on our coastal environments from land-based activities

becomes less intense. The biggest pressure on our open coast is undoubtedly fishing. Fishing has had a significant impact on the populations of target species, damaged the seabed and had broader impacts on our coastal ecosystems. As a result, several of our fish and shellfish populations are a fraction of their pre fished condition and some of our fisheries have been closed to allow them to recover.

The international renowned marine reserve Poor Knights, off Northland's east coast, provides a glimpse of what our marine ecosystem could look like, and the recent adoption of two new marine protected areas in the Proposed Regional Plan for Northland[2], provides cause for optimism. This has increased the area of 'no take' marine protected areas In Northland from just 2,126.51ha to 14,003.51 ha (a 559% increase). It has also provided a unique opportunity for local hapū, who petitioned for the new protected areas, to exercise kaitiaki and be actively involved in the restoration of taonga species and the mauri of the moana.

## Coastal hazards and climate change

Northland is surrounded by the ocean so many of our communities are already exposed to coastal hazards such as coastal flooding and coastal erosion. A significant amount of residential property, marae, community facilities, waste management facilities and hazardous sites are currently exposed to coastal flood risk. As our climate changes and sea levels rise, some of these risks will increase. Climate change will impact all aspects of life in Te Taitokerau, including our cultural heritage, economic welfare, and social wellbeing.

There will also be impacts on the plants and animals that live in our moana and vulnerable habitats like coastal dunes. As our coastal waters warm some marine plants and animal may not be able to survive, while rising sea levels may cause a loss of beaches, intertidal habitats, and saltmarsh. Our changing climate may also exacerbate other existing pressures on the coastal environment. For example, Northland is expected to experience an increase in droughts and severe rainfall events which has the potential to double the sediment loads reaching our coast by 2090[3]. Increasing sea surface temperatures may also increase our biosecurity risk by allowing the establishment of new marine pests, which are currently prevented from establishing here by our climate.

## Biosecurity

Northland's subtropical climate, together with the high volumes of commercial shipping, cruise ships and arrivals by international yachts, means that our coastal environment is under constant threat from non-indigenous invasive species. If a new marine pest successfully established itself in Northland, it could have catastrophic impact on our native species and habitats, impact our aquaculture and fishing industries, and affect the cultural and recreational value of our moana.

While the threat is ever-present, council has proactively been building and developing our response capability to marine pest incursions, with a dedicated team of marine biosecurity officers, specialists, and divers. The adoption of the Northland Regional Pest and Marine Pathway Management Plan[4] was a significant achievement and a big step forward helping us to manage the risk from pest species. Our response to the recent arrival of the exotic green seaweed Caulerpa, demonstrated the preparedness of our biosecurity team, local hapū and the marine industry, and has spawned innovative new response tools.

## The state of our coastal environment

Any assessment of the state of our environment is a construct of the observer, the timeframe of the observation, and the reference point of the comparison. The observer is conditioned by personal values and preconceptions, and the 'current' state of knowledge of the environment and each issue or impact. In the 1940s, plastic was seen as a luxury item and a sign of modernity, but as plastic pollution grew and our understanding of its impacts on wildlife and the environment developed, our perception of plastic evolved. While its versatility is still acknowledged today and it remains a highly valued material, consumers have grown concerned by its impact on the environment and governments have legislated against its use in single-use items and how it should be disposed of.

The observer can also be influenced by the concept of shifting baselines - the gradual change in our expectations for the condition of the natural environment across generations. Over time, knowledge of the natural world is lost, and our

understanding of what is 'pristine' or 'untouched' is contaminated as the baseline becomes more degraded. Our understanding of the 'baseline' or reference condition, influences any assessment of the health of the coastal environment. The taiao and moana that Kupe witnessed when he discovered Aotearoa, would be unrecognisable to Northlanders today. Mountains cloaked in ancient kauri forest, clear rivers, deafening birdlife, and bountiful fish stocks that he encountered are hard for us to comprehend and envisage today. Assessed against this prehuman reference point, there has been significant degradation of our marine environment, some of which is likely irreversible.

If viewed from a narrower timeframe some progress has been made. Today, commercial whaling, the felling of virgin kauri forest and the large-scale reclamation of saltmarsh for farmland seems incomprehensible. Legislation and policy are now focused on sustainable development with regulation like the Resource Management Act 1991[5], attempting to balance economic development and the environment.

But even when assessed against a shorter period, the health of the marine environment is still under stress. The RMA was enacted over 32 years ago, but during this period the way land and water is used has proven to be unstainable for the natural environment. Activities on the land, such as forestry, farming and urban development continue to discharge sediment, nutrients, and new contaminants like plastics to the marine environment, and current policies and rules are likely insufficient to reverse the damage.

## Te tūmanako

This report helps to outline the pressures on our marine environment and highlighted some of the actions being taken to help restore the health of our marine environment. Greater awareness and understanding of the pressures on our coast, and how the marine environment has responded to these pressures, is vital to be able to make informed decisions to protect and enhance our marine environment, beyond the cycles of political favour, across generations.

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