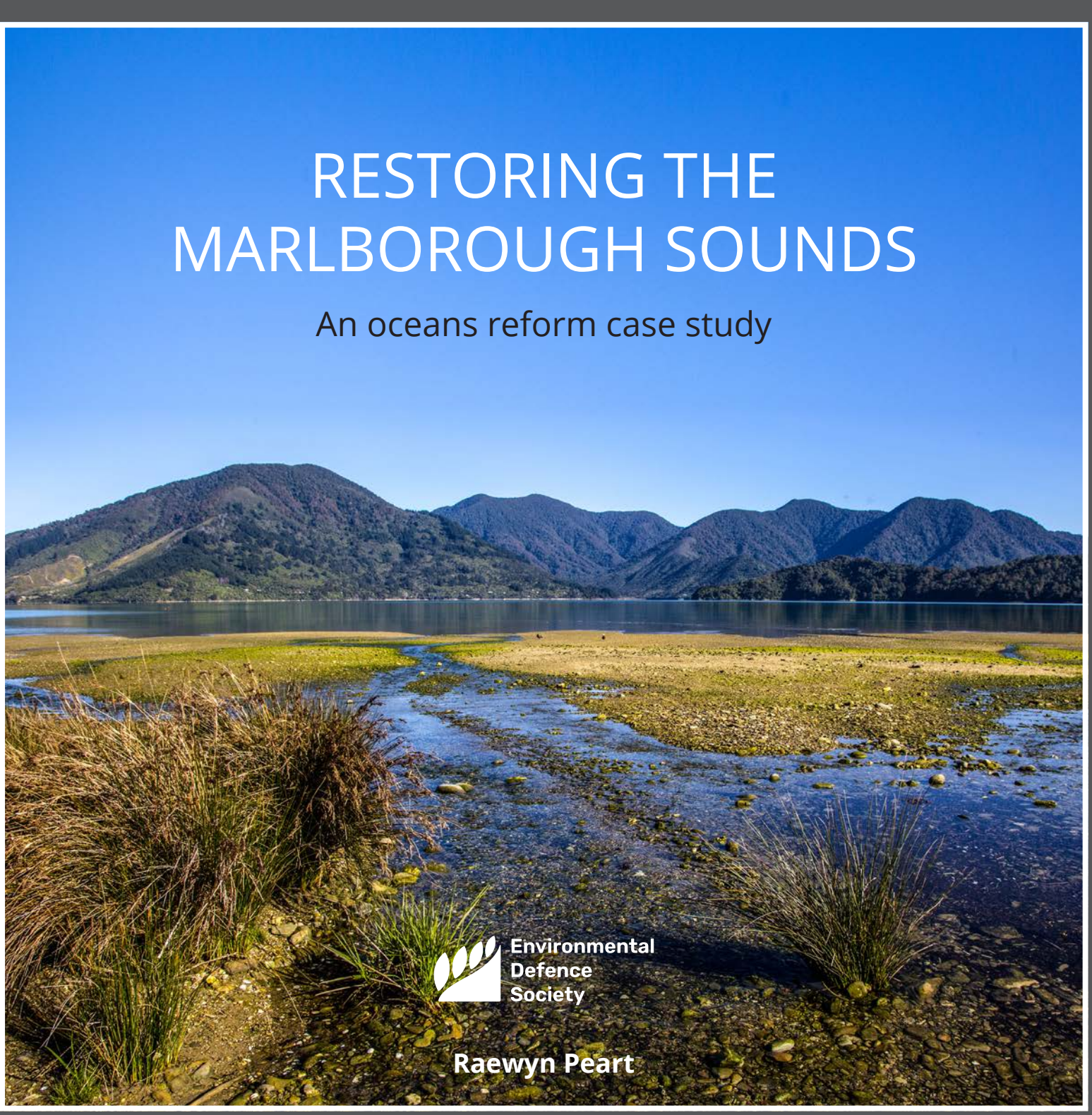
RESTORING THE MARLBOROUGH SOUNDS

An oceans reform case study



Environmental Defence Society

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Acknowledgements

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List of abbreviations

ACE	Annual catch entitlement
AMA	Aquaculture management area
CPUE	Catch per unit effort
DOC	Department of Conservation
EDS	Environmental Defence Society
Fisheries NZ	Fisheries New Zealand
KMTT	Kotahitanga mō te Taiao
MACA	Marine and Coastal Area (Takutai Moana) Act 2011
MBIE	Ministry of Business, Innovation and Employment
MFE	Ministry for the Environment
MPI	Ministry for Primary Industries
Ngāti Apa	Ngāti Apa ki te Rā Tō
RMA	Resource Management Act 1991
TACC	Total allowable commercial catch
Te Ātiawa	Te Ātiawa o te Waka a Māui
Te Tauihu	Te Tauihu o te Waka a Maui
Te Tiriti	Te Tiriti o Waitangi / Treaty of Waitangi
TOKM	Te Ohu Kai Moana

Māori and English place names

Māori	**English**
Kura Te Au	Tory Channel
Meretoto	Ships Cove
Motuweka	Havelock
Te Anamāhanga	Port Gore
Rangitoto ki te Tonga	D'Urville Island
Te Hoiere	Pelorus Sound
Te Uku	Cape Lambert
Te Whanganui	Port Underwood
Tōtaranui	Queen Charlotte Sound
Waitohi	Picton

List of statutes referred to

Biosecurity Act 1993

Fisheries Act 1996

Fiordland (Te Moana o Atawhenua) Marine Management Act 2005

Foreshore and Seabed Act 2004

Forestry Encouragement Act 1962

Hauraki Gulf Marine Park Act 2000

Kaikōura (Te Tai o Marokura) Marine Management Act 2014

Local Government Act 2002

Local Government (Rating) Act 2002

Māori Commercial Aquaculture Claims Settlement Act 2004

Māori Commercial Aquaculture Claims Settlement Amendment Act 2011

Māori Fisheries Act 1989

Marine and Coastal Area (Takutai Moana) Act 2011

Public Works Act 1981

Resource Management Act 1991

Fisheries (South Island Customary Fishing) Regulations 1999

Te Awa Tupua (Whanganui River Claims Settlement) Act 2017

Te Ture Whenua Māori Act 1993

Te Urewera Act 2014

Treaty of Waitangi (Fisheries Claims) Settlement Act 1992

Executive Summary

1. Introduction

In 2021, the Environmental Defence Society (EDS) embarked on a project to explore options for reform of Aotearoa New Zealand's oceans management system. Phase 1 was completed in May 2022 and examined the current system, identified problems with it, and developed options for reform. EDS is currently undertaking Phase 2 of the project which is focused on developing concrete recommendations for oceans reform. As part of that work, the Society is undertaking a series of case studies. This report sets out the findings of the Marlborough Sounds case study which is based on an extensive literature review and discussions with 40 people with associations with the area.

The report has been structured around four parts. Part One provides the overall context describing the geography of the area, the trajectory of Māori and European settlement, and impacts on the marine environment. Part Two describes the significant environmental challenges facing the Marlborough Sounds community including sedimentation, loss of habitat, depletion of fish stocks and climate change. Part Three then provides an overview of marine restoration approaches and profiles three marine restoration initiatives currently being undertaken in the area. Finally, Part Four identifies potential opportunities to support marine restoration of the Marlborough Sounds.

2. Overall context

The Marlborough Sounds, located on the north-eastern edge of the South Island, comprise an intricate web of marine inlets and islands encompassing some 730 km^2 of sheltered waters and 1,500 km of shoreline. The land is steep and rugged and the soils are prone to slips and erosion. The Sounds contain a wide variety of marine habitats including deep and shallow reef systems and soft sediment habitats.

The Marlborough region is one of the earliest known Polynesian settlement areas in Aotearoa New Zealand. Rangitāne o Wairau, Ngāti Apa ki te Rā Tō (Ngāti Apa) and Ngāti Kuia were the tangata whenua of Te Tauihu prior to the 1820s. A number of Kawhia-Taranaki tribes migrated to Te Tauihu during the 1820s and 1830s. Of those, Ngāti Koata settled as a result of a tuku (gift) from an ariki (chief) of the Kurahaupo tribes. The others (Ngāti Toa Rangatira, Ngāti Rarua, Ngāti Tama and Te Ātiawa) subdued the resident Te Tauihu tribes through battle and then settled amongst them. Intermarriage took place between all eight iwi resulting in them being "bound together by whakapapa, co-residence, and overlapping customary rights".

European sealers and whalers started visiting the Sounds from the 1790s and European settlers arrived in numbers after the signing of the Te Tiriti o Waitangi / Treaty of Waitangi (Treaty) in 1840. These settlers logged most of the accessible forests and burned other vegetation to establish farms. Those within the Sounds proper were only marginal, resulting in much land eventually being either planted in radiata pine or left to revert to indigenous forest. Agriculture has continued, along with forestry, in the Te Hoiere / Pelorus catchment.

Much exotic forestry was planted in Kura Te Au / Tory Channel and Te Whanganui / Port Underwood during the early 1900s, as well as in the Te Hoiere / Pelorus catchment, and it now extends over 30,000 ha. Since the late 1990s, there has been widespread harvesting throughout different parts of the Marlborough Sounds as the exotic forests have matured, resulting in the window of vulnerability (when soils are particularly vulnerable to erosion five to eight years after harvest) being always open. This has resulted in high volumes of sediment being discharged into rivers and the coastal areas of the Sounds.

The Sounds once had a very abundant and diverse fishery. Following European settlement, the fish stocks were pursued relentlessly, and often through the use of environmentally destructive methods such as dredging and trawling. By the 1920s, fish stocks started to decline, with blue cod becoming notably harder to catch and snapper stocks dwindling.

Marine farming became established in the Sounds, during the 1960s, initially by local farmers and fishers seeking an additional form of income. Today, the industry is made up of a mixture of iwi, large companies and small family businesses. Marlborough now produces around 60 per cent of the total quantity of green-lipped mussels and king salmon grown in the country.

The Marlborough Sounds has a relatively small and stable population. There are two small settlements at Picton and Havelock and houses dotted around the many bays in the wider Sounds. Around half of the houses outside the main settlements are holiday homes. Picton's

economy is mainly based on port services (focused around the Cook Strait ferry terminal) and tourism. The coastal frontage has been significantly impacted by reclamation, dredging and port and marina development. Havelock is a service centre for the aquaculture industry and it also provides for tourism. The development of Havelock as a port (and subsequent marina) has also significantly impacted the marine area.

Since 1962, Kura Te Au / Tory Channel and Tōtaranui / Queen Charlotte Sound have been used as part of the national roll-on roll-off passenger, vehicle and rail ferry service between Wellington and Picton. Up to 1.2 million passengers travel on the Cook Strait ferries each year. Tourism is the fourth largest GDP contributor to the Marlborough District behind viticulture, marine farming and forestry. Marine tourism in the Marlborough Sounds primarily consists of a small number of boat-based tours. The Sounds are also a popular destination for cruise ships with 55 ships carrying 100,859 passengers and 43,875 crew visiting over the 2023-2024 summer.

3. Key environmental challenges

Sedimentation has long been identified as a significant driver of marine habitat loss and degradation in the Marlborough Sounds, particularly in Te Hoiere / Pelorus Sound. Some 259,000 tonnes of suspended sediment is deposited in the Havelock estuary annually. Overall, the Sound "has some of the muddiest estuarine areas in New Zealand as a result of land-use practices" with sediment accumulation rates between 5 and 20 times higher than before European settlement.

The Marlborough District Council has gathered a wealth of information about sedimentation in the Marlborough Sounds, including on its extent, potential sources, impacts and potential responses. This has been well documented in an extensive series of reports which dwarf the amount of action taken in response. Although greater control has been placed on forestry harvesting near the coastal marine area, Council has not exercised stringency to place stricter controls on forestry harvesting in the Te Hoiere / Pelorus catchment with it still being a permitted activity.

There is strong evidence to indicate that bottom trawling and scallop dredging have had a profound impact on the benthic habitats of the Marlborough Sounds. As well as the potential impacts from sediment resuspension, these activities physically remove, crush and smother species living on the seafloor, as well as change the chemistry and composition of the seafloor substrate itself. Affected species include habitat-forming organisms that create homes for other forms of marine life, and facilitate larvae settlement and juvenile recruitment, thereby supporting fish stocks.

Kelp supports greater biodiversity and recruitment by increasing the volume and complexity of three-dimensional habitat. Kelp forests also provide a significant proportion of the primary production available at the base of the food web. The health and abundance of fisheries is positively related to the extent of kelp forest. Although some kelp forests still persist on the exposed coasts, near the entrance of Totaranui / Queen Charlotte Sound, and in Kura Te Au / Tory Channel, kina barrens have become the predominant habitat type on reefs within the Sound.

Trawling is currently prohibited throughout Tōtaranui / Queen Charlotte Sound. Commercial finfishing (including by trawl) is also prohibited in the inner Te Hoiere / Pelorus Sound (eg Kenepuru Sound, Popoure Reach and Tennyson Inlet). But trawling is still permitted in a much larger area of that Sound including Beatrix Bay, Waitata Reach, Te Anamāhanga / Port Gore and Admiralty Bay. We have been unable to identify any specific spatial fisheries restrictions for scallop dredging in the Marlborough Sounds, although the scallop fishery is currently closed due to poor stock levels, meaning that dredging is not currently occurring.

The ecologically significant marine sites programme, which began in 2010, is led and funded by the Marlborough District Council with financial and in-kind support from DOC. The Council included protection of 44 sites from dredging and bottom trawling (as well as anchoring, deposition of material and reclamation) when its proposed Marlborough Environment Plan was notified in 2016. It has since sought to add 64 new significant sites and adjust boundaries of the 44 existing sites in Variation 2 to the Plan.

Many fish stocks in the Sounds are depleted as set out below.

Species	State of stock
Green-lipped mussels	Wild population likely only some 3 per cent of historical size with sub-tidal populations disappearing entirely.
Pilchards	Stock size or status unknown but not large enough to support a commercial fishery which ceased in 1949. Large schools of pilchards that were commonly seen in Tōtaranui / Queen Charlotte Sound historically, now rarely occur.

Species	State of stock
Blue cod	Stock size under target and stock likely overfished. This is despite a seasonal closure, a daily recreational bag limit of two fish per person for over 12 years, and the TACC set at its lowest level ever of just 58 tonnes (around half the 1986 level of 110 tonnes). New management measures being considered.
Scallops	Scallop stock at lowest recorded levels, with the once abundant and wide-spread beds in the Marlborough Sounds reduced to just five remaining dense beds. Fishery closed.
Pāua	Fishery effectively collapsed within the Sounds with just a small fishery remaining on the exposed east coast of Arapaoa Island and Te Whanganui / Port Underwood.
Rock lobster	Fishery in the inner Sounds likely at very low levels. Commercial fishery in the outer Sounds has a low catch per unit effort.
Hāpuku	Current status unknown but no hāpuku observed within Tōtaranui / Queen Charlotte Sound during a 2018 video survey or within the likely main spawning areas in Cook Strait.
Snapper	Anecdotally the stock may be recovering, but not nearly to the same extent as the potentially separate stock in Tasman and Golden Bays, with recreational catches not showing any recorded significant increase over the past 5 years.

Summary of state of key fish stocks in the Marlborough Sounds

Since 2020, there has been a noticeable increase in sea temperatures in the Marlborough Sounds. Further warming will likely result in a decrease in the productivity of fish stocks and marine farms and the loss of resident species. Extreme rainfall events are projected to become more severe in a climate changing future, which will likely increase sedimentation within the Sounds, unless effective land use changes are put in place.

4. Marine restoration

As changes to inshore coastal waters become more profound, and the extent of degradation more evident, attention is turning away from managing marine resources more 'sustainably' towards better understanding how the marine environment (and habitats and species within it) might be brought back to health. These efforts are typically referred to as marine 'restoration' or marine 'regeneration'.

Marine restoration efforts can be roughly divided into 'passive' and 'active'. 'Passive' restoration involves reducing or removing stressors on the marine environment in the hope that marine ecosystems can then recover on their own. 'Active' restoration involves intervening in the recovery process, to kick start it or speed natural processes up, such as through seeding or translocating species, or introducing new substrate or structures.

Passive restoration in the marine space often takes the form of marine protected areas including no-take marine reserves. There is only one marine reserve in the entire Marlborough Sounds area, located around Kokomohua Long Island, in Tōtaranui / Queen Charlotte Sound. Since the marine reserve was created rock lobster have become much more abundant.

In 2016, two mussel farmers approached the Marine Farming Association wishing to initiate a green-lipped mussel restoration project in Te Hoiere / Pelorus Sound. This resulted in the Association partnering with the University of Auckland and The Nature Conservancy to apply for co-funding from the Sustainable Farming Fund for a trial. The funds were granted in 2019. The project has also been supported by the Te Tau Ihu Iwi Fisheries Forum and NIWA.

The project consisted of placing four tonnes of adult green-lipped mussels, which had been farm grown from wild spat collected in Te Hoiere / Pelorus Sound, at five locations within the inner Sound where mussels had historically been present. The health of the mussels was monitored over a two-year period. This found an 85 per cent mussel survival rate at four of the five locations (totalling 73 per cent over all the beds). The project is continuing until 2026. Scientists have been exploring ways of increasing wild mussel recruitment and have tested the use of seaweed with attached plantigrades (post-larval mussels) with some success.

In May 2022, a kelp restoration project commenced in Tōtaranui / Queen Charlotte Sound, also led by the University of Auckland. The project has been undertaken in partnership with Te Ātiawa and has been supported by the Sustainable Seas National Science Challenge, Marlborough District Council, Port Marlborough and SLR Consulting. Between 7,500 and 9,500

kina were removed from four 0.25 ha sites. After 18 months, seaweed recovery was found at all the sites.

The results of the trials are encouraging. They indicate that it is likely possible to restore kelp and other seaweed species to the extensive kina barrens of Tōtaranui / Queen Charlotte Sound, but physical removal of kina will not be sufficient to achieve this, as they will quickly reinvade. The associated marine ecosystem will also need to be brought back into balance.

A land-based restoration project of note in the Marlborough Sounds is Te Hoiere Project. Established in 2022, this project led by Te Hoiere Kaitiaki Charitable Trust aims to restore Te Hoiere / Pelorus Sound catchment. It provides subsidies for the fencing of riparian and wetland areas; riparian and wetland planting; fish passage mitigation; and other activities that improve water quality. Ngāti Kuia are leading a project to restore the 16ha Ruapaka wetland near Canvastown, including removing willows and other invasive species and planting the area with natives.

5. Supporting marine restoration

In this section we set out some possible approaches that could support marine restoration in the Marlborough Sounds. They are preliminary only and designed to prompt discussion and deliberation.

There would likely be benefits in Marlborough District Council, Fisheries New Zealand and the Department of Conservation working more closely together, alongside iwi, in order to support the restoration of the Marlborough Sounds. This could be achieved through building on the collaborative framework provided by the Kotahitanga mō te Taiao Alliance (which has been operating since 2019), sharing services in the marine space, and jointly preparing a regular **State of our Sounds Report**.

A **Marlborough Sounds Fisheries Plan** could be prepared by iwi (potentially through Te Tau Ihu Fisheries Forum) and multi-stakeholders in order to support the application of an ecosystem-based approach to fisheries management in the Sounds. The plan could be tailored to the local circumstances; focus on fisheries management at place; and address the health of habitats, fish stocks and people in a holistic manner.

The development of an integrated **Marlborough Sounds Marine Restoration Plan** could help align and focus restoration efforts on what will make the most difference to the health of the marine area overall. It could include a mix of passive marine restoration, active marine restoration and land-based restoration actions that support each other in a synergistic manner. It could also set out what the goals of restoration are including what state the Sounds is to be restored to.

Restoration efforts could be supported through the establishment of a **Marlborough Sounds Marine Restoration Fund** which would seek to ensure all users of the Sounds play their fair part in funding the badly needed restoration effort. Potential sources of revenue for the Fund include:

- Coastal occupation charges
- Targeted rate
- Marine restoration fee for cruise ships
- Restoration levy on Cook Strait ferries
- Restoration levy on water-borne tourism activities
- Restoration levy on marina berth, launching ramp and parking fees
- Log levy on logs shipped out of the Sounds
- Restoration contribution via boating club membership
- Business contributions
- Philanthropic funding
- Blue carbon voluntary credits

Other models that have been proposed for the Marlborough Sounds marine area in the past, and which could be further developed, include the establishment of a **Marlborough Sounds Marine Park**, the establishment of the **Marlborough Sounds Guardians**, legal personhood and a local Act of Parliament.

6. Conclusions

The Marlborough Sounds is an iconic and unique marine system, has a long and fascinating history of Māori and European occupation, and is suffering severe and ongoing degradation. Key stressors are high levels of sedimentation, damage to seabed habitats from bottom trawling and dredging, over-harvesting of fish stocks and climate change.

Reversing this long-term degradation will require a concerted and integrated effort which includes passive marine restoration, active marine restoration and land-based efforts. All users of the Sounds will need to play their part, in a combined effort, if the current situation is to be turned around. This report seeks to identify some ways in which this might be achieved.

1 Introduction

Kenepuru Sound

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

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

1.1 Methodology

The case study draws on earlier work undertaken by EDS in the Marlborough Sounds, including on fisheries[2] and aquaculture,[3] and a review of relevant literature. In addition, a researcher spent eight days in the Sounds area, in April 2024, to meet with a range of parties to better understand the local context, current issues and potential solutions.

This was followed up with zoom meetings for those we were unable to meet in the field. Overall, we spoke to 40 people with associations with the area. They included Māori, local residents, environmentalists, recreational fishers, commercial fishers, divers, marine farmers, scientists, the Mayor and a councillor, and staff from the Department of Conservation (DOC) and Fisheries New Zealand (Fisheries NZ). Our discussions were held in confidence to encourage frankness. We would like to thank all those who generously gave their time to meet with us.

Through this process we obtained a wealth of information. The Marlborough Sounds is a fascinating place with a rich history, iconic natural environment, and diverse and committed community. We have endeavoured to distil, in the sections below, some key themes that became evident during our research.

1.2 Structure of report

The report has been structured around four parts.

Part One provides the overall context describing the geography of the area, the trajectory of Māori and European settlement, and impacts on the marine environment. For early history, we have strongly drawn on the Waitangi Tribunal account, set out in its report on the northern South Island Treaty claims.[4]

Part Two describes the significant environmental challenges currently facing the Marlborough Sounds community including sedimentation, loss of habitat, depletion of fish stocks and climate change.

Part Three then provides an overview of marine restoration approaches and profiles three marine restoration initiatives currently being undertaken in the Sounds area.

Finally, Part Four identifies potential opportunities to support marine restoration of the Marlborough Sounds. These are intended as preliminary only, and are designed to contribute to constructive debate within the broader community, about the best pathways forward.

Endnotes

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

2 Peart R, 2018, *Voices from the sea: Managing New Zealand's fisheries*, Environmental Defence Society, Auckland

3 Peart R, 2019, *Farming the sea: Marine aquaculture within resource management system reform,* Environmental Defence Society, Auckland

4 Waitangi Tribunal, 2008, *Te Tau Ihu o te Waka a Maui: Report on northern South Island claims*, Volume 1, Waitangi Tribunal, Wellington; also see Mitchell H and J Mitchell, 2004, *Te Tau Ihu a te Waka: A history of Māori of Nelson and Marlborough*, *Volume 1: Te tangata me te whenua – the people and the land*, Huia Publishers, Wellington and Wakatū Incorporation, Nelson which the Tribunal drew heavily on

2 Geographical context

Te Hoiere / Pelorus Sound showing rugged topography

The Marlborough Sounds, located on the north-eastern edge of the South Island, comprise an intricate web of marine inlets and islands. These were formed after a series of valleys, etched out by rivers along rocky fault lines, were flooded by rising seas after the last ice age. The Sounds encompass some 730 km^2 of sheltered waters,[9] and have a shoreline spanning around 1,500 km, comprising roughly one tenth of the country's total coastline.[1]

The Sounds are physically separated into two main enclosed marine areas: Tōtaranui / Queen Charlotte Sound which has the small town of Picton at its head, and Te Hoiere / Pelorus Sound which leads from Cook Strait into the smaller settlement of Havelock. Off to the east side is Kura Te Au / Tory Channel which joins with Cook Strait. Tōtaranui / Queen Charlotte Sound is relatively narrow and deep, whereas Te Hoiere / Pelorus Sound is more convoluted, and has many shallow and highly enclosed embayment areas. On the two outer edges of the Sounds lie the large islands of Arapaoa (to the south-east) and Rangitoto ki te Tonga / D'Urville to the north-west. To the south is Te Whanganui / Port Underwood (see Figure 2.1).

The Māori place names have notable significance. 'Te Hoiere' was the waka of the Ngāti Kuia ancestor Matuahautere. The name 'Tōtaranui' directly translates to 'many tōtara trees' potentially indicating the valuable forest in the area. But there are other interpretations. One is that the shape of the Sound is similar to a tōtara tree, with the main trunk running up the central passage and the various smaller inlets representing branches off the trunk.[2] Yet another interpretation is that the inclusion of 'tara' in Tōtaranui, which means a woman's vagina, refers to the Sounds being 'our Mother'.

> "She gives us birth she feeds us, shelters us and protects us... the Sounds is our Mother and Kura Te Au (Tory Channel) is our mother's womb."[3]

The Marlborough District Council, in association with Land Information New Zealand, has undertaken an extensive programme of multi-beam mapping of the seafloor including off Rangitoto ki te Tonga / D'Urville Island (2015), in Tōtaranui / Queen Charlotte Sound and Kura Te Au / Tory Channel (2016) and in Te Hoiere / Pelorus Sound (2019). This has revealed much fascinating information about the marine area. Video ground-truthing in Tōtaranui / Queen Charlotte Sound, in 2018, discovered additional new and notable habitats, communities and species.[4] It seems likely there is much more yet to be discovered.

The Marlborough Sounds contain a wide variety of marine habitats. There are deep reefs encrusted with bryozoans, sponges, hydroids and brachiopods. There are enormous tubeworm mounds, numerous dog cockle beds, clams and solitary cup corals. There are thick kelp forests.[5] Many soft sediment habitats once supported dense scallop beds and extensive green-lipped mussel reefs grew in Kenepuru Sound.[6] The inner Sounds and base of the main channels are mainly mud and sand with a narrow subtidal shoreline strip of rocky reef and rubble supporting higher biodiversity.[7]

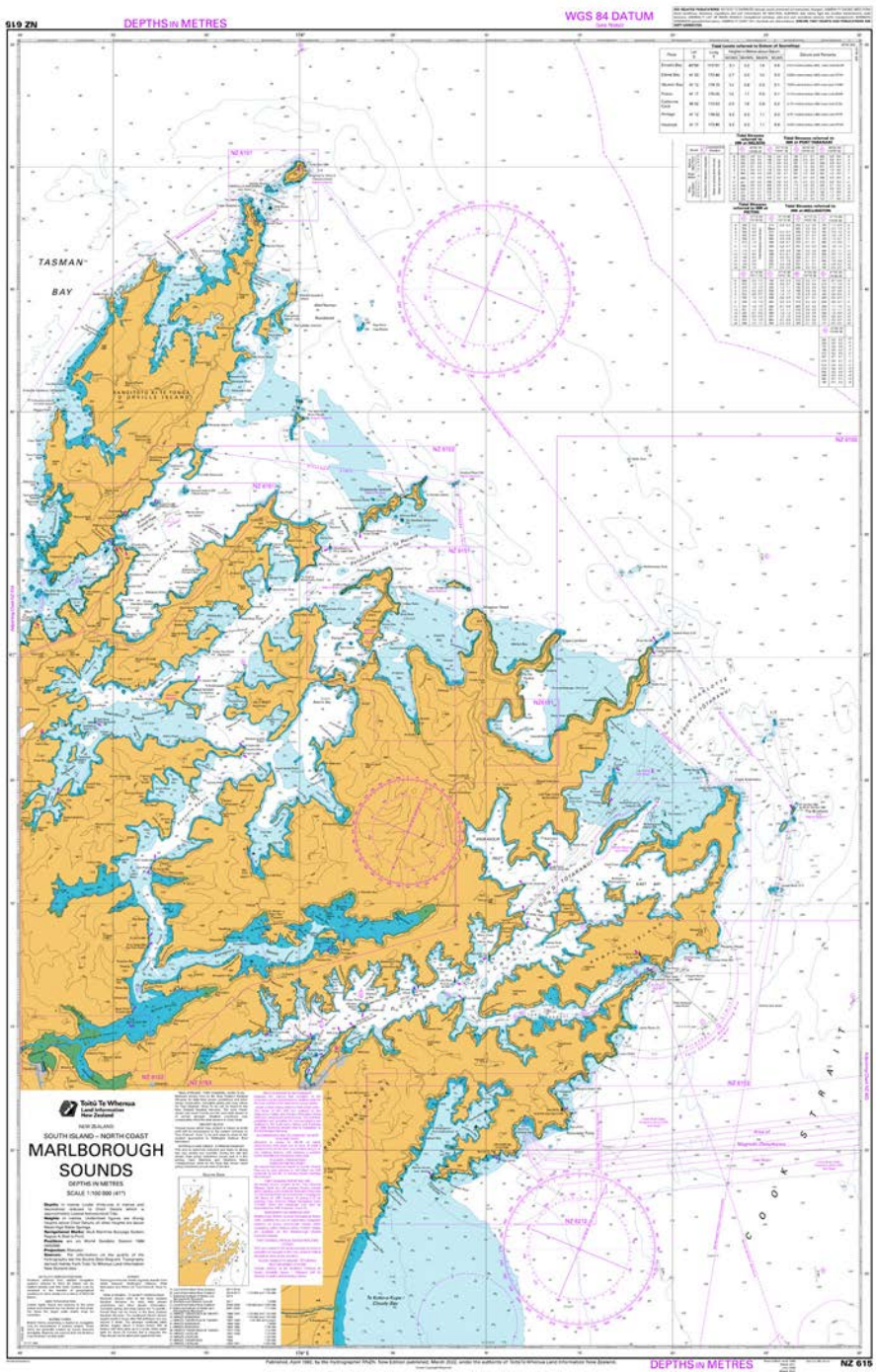


Figure 2.1: Nautical chart of the Marlborough Sounds
(Source: Land Information New Zealand)

The topography of the land within the Sounds is steep and rugged, with many long thin fingers of land stretching out into the marine area. The soils are prone to slips and erosion, particularly those within 200 metres elevation of the shoreline, which are clay rich and highly weathered.[8] The susceptibility of Marlborough to land movement is highlighted by the 7,597 landslides identified after the July 2021 and August 2022 storm events.[9]

A large catchment of around 1046 km^2 drains into the head of Te Hoiere / Pelorus Sound near Havelock largely through the Pelorus, Rai and Kaituna rivers. The catchment includes the Rai Valley which hosts a small rural settlement and a number of dairy farms.[10] There is a much smaller catchment draining into Tōtaranui / Queen Charlotte Sound which has no major rivers. Sediment-laden outflows from the Wairau and Awatere Rivers, draining into Cloudy Bay and moving up the coast with currents, affect Te Whanganui / Port Underwood and Kura Te Au / Tory Channel.

Endnotes

1 Nicol A, 2011, 'Landscape history of the Marlborough Sounds, New Zealand', *New Zealand Journal of Geology and Geophysics*, 54(2), 195-208, at 195

2 Urlich S C, E S Jorgensen and G L Coutts, 2021, *Tourism and regenerating place: Insights from Queen Charlotte Sound / Tōtaranui,* Centre of Excellence for Sustainable Tourism Report 2021.101, Lincoln University, Lincoln, at 4

3 Evidence of Stephan Oswald Huntley (Bosun) for Tahuaroa-Watson Whanau, Board of Inquiry New Zealand King Salmon Proposal, April 2019, at 18

4 See Anderson T, R Stewart, R D'Archino, J Stead and N Eton, 2020, *Life on the seafloor in Queen Charlotte Sound, Tory Channel and adjacent Cook Strait*, NIWA, Wellington, at 15-20

5 Ibid

6 Handley S, M Gibbs, A Swales, G Olsen, R Ovenden and A Bradley, 2017, *A 1,000 year history of seabed change in Pelorus / Te Hoiere, Marlborough*, NIWA, Nelson, at 28

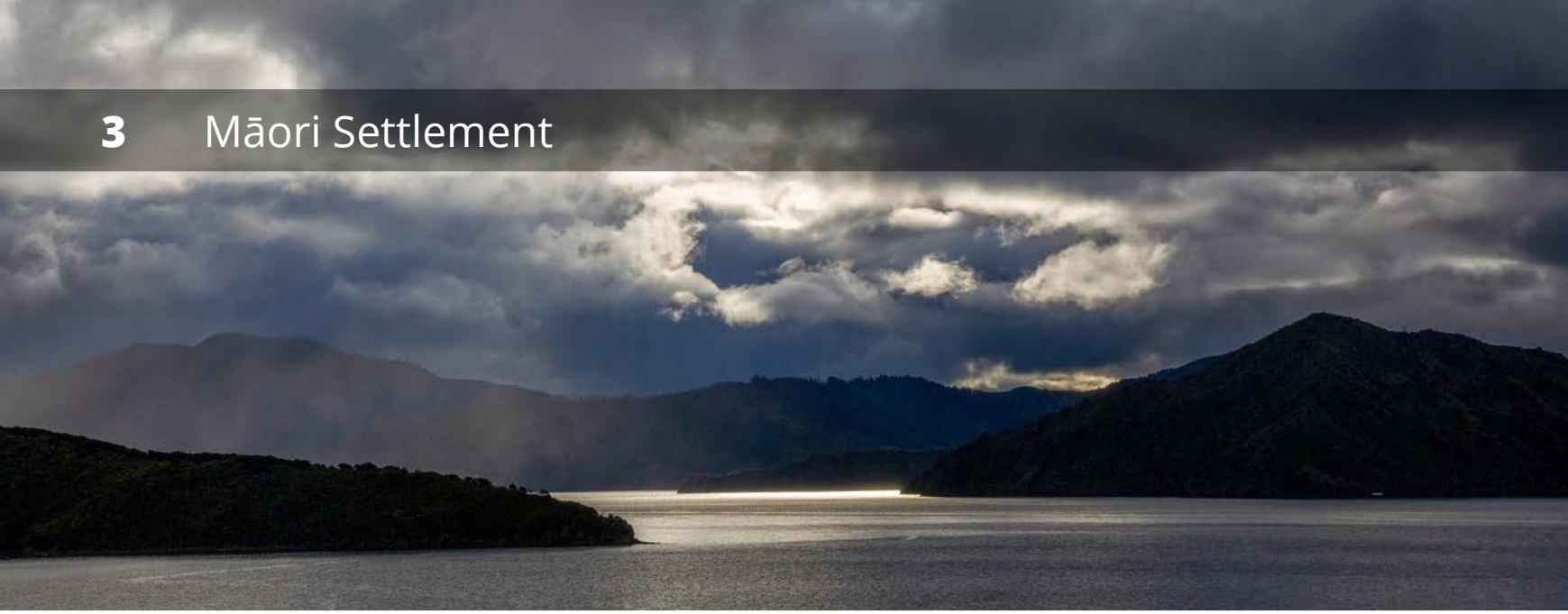
7 Brough T E, E M Leunissen and M Beentjes, 2023, *Habitat use and the impact of multiple stressors on blue cod populations off Canterbury and in the Marlborough Sounds*, New Zealand Aquatic Environment and Biodiversity Report No 323, Fisheries New Zealand, Wellington, at 6

8 Urlich S C, 2020, 'Opportunities to manage sediment from forestry more effectively in the Marlborough Sounds and contributing catchments', *NZ Journal of Forestry*, 65(2), 28-35, at 30

9 Rosser B J, A Wolter, A F Boyes, S L Lin, J Farr, E Chen, D B Townsend and K E Jones, 2023, *Phase II: Remote mapping of landslides triggered by the July 2021 and August 2022 Marlborough storms, and selected field investigations of landslide impact*, GNS Science, Lower Hutt, at 6

10 Urlich S C and S J Handley, 2020, 'From "clean and green" to "brown and down": A synthesis of historical changes to biodiversity and marine ecosystems in the Marlborough Sounds, New Zealand', *Ocean and Coastal Management*, 198, 105349, at 3

3 Māori Settlement



Tōtaranui / Queen Charlotte Sound

The Marlborough region is one of the earliest known Polynesian settlement areas in Aotearoa New Zealand, with the Wairau Bar (near Blenheim) having artefact evidence dating back to the early 13th Century.[1] The top of the South Island is collectively known by Māori as Te Tauihu o te Waka a Māui (Te Tauihu) which commemorates the fishing up of the North Island by Māui from his canoe (the South Island) and refers to the prow (te tauihu) of the canoe (o te waka) of Maui (a Maui).[2] Māori settlement of the Marlborough Sounds is closely intertwined with settlement of this entire region.

Rangitāne o Wairau, Ngāti Apa ki te Rā Tō (Ngāti Apa) and Ngāti Kuia (who are descendants of the captain and crew of the *Kurahaupo* waka) were the tangata whenua of Te Tauihu prior to the 1820s. They slowly arrived into the area from the Mahia Peninsula during the 17th Century, and intermarried with the 'original' peoples, of which not much is known.[3]

A number of Kawhia-Taranaki tribes associated with the *Tainui* and *Tokomaru* waka migrated to Te Tauihu during the 1820s and 1830s, and more intensively after 1832, as a result of being pressured in their northern territories during the musket wars.[4] Of those, Ngāti Koata settled as a result of a tuku (gift) from an ariki (chief) of the Kurahaupo tribes. The others (Ngāti Toa Rangatira, Ngāti Rarua, Ngāti Tama and Te Ātiawa) subdued the resident Te Tauihu tribes through battle and then settled amongst them. Intermarriage took place between all eight iwi resulting in them being "bound together by whakapapa, co-residence, and overlapping customary rights".[5]

3.1 Use of natural environment

Over centuries of occupation, the Māori settlers trod relatively lightly on the land and sea. The population in the Sounds was generally small, dispersed and mobile. Agriculture was not extensive, due to unfavourable soils and climate, leaving the forest and wetland systems largely intact.[6] Recent sediment cores in Kenepuru Sound showed no detectable changes in sediment, prior to European settlement, indicating the lack of early Māori impact on these indigenous ecosystems.[7]

When Captain James Cook arrived at Tōtaranui / Queen Charlotte Sound in 1770 in the *HMS Endeavour,* and anchored in Meretoto / Ships Cove, he reported a small population of 300-400 people living along the coastline.[8] He likely observed seasonal camping areas which Māori regularly visited to harvest and preserve a wide range of food species including shellfish, rock lobster, finfish and seals.[9]

Large marine mammals and birds (such as the New Zealand sea lion, elephant seal, Waitaha penguin and New Zealand fur seal) were heavily hunted by Māori, leading to the local extinction of the first three during the 15th Century, and a large decline in seal populations.[10] But the impact on finfish stocks appears to have been small. Cook's crew managed to harvest 136 kg of fish with a few hauls of a seine net. Naturalist and botanist Joseph Banks, who had accompanied Cook on the voyage from England, reported that "this is the place of greatest plenty of any we have seen".[11]

3.2 Loss of land

Things abruptly changed for Māori when the New Zealand Company arrived, in 1839, seeking to buy land for large scale European settlement.[12] When Te Tiriti o Waitangi / Treaty of Waitangi (Te Tiriti) was signed the following year, all eight Te Tauihu iwi had valid customary rights over the top of the South Island (as confirmed by the Waitangi Tribunal). At that time, the balance of rights was largely evenly distributed between those who had been defeated, but had lived on the land for many generations, and those who had defeated them (and were in control when Te Tiriti was signed) but were more recent arrivals.[13]

Spotlight on iwi interests in the Marlborough Sounds

There are many overlapping iwi interests in the Marlborough Sounds. They include:

- *Ngāti Kuia:* has mana whenua over Te Hoiere /Pelorus Sound with interests extending across to Rangitoto ki te Tonga / D'Urville Island
- *Te Ātiawa o te Waka a Māui* (Te Ātiawa): has mana whenua over Tōtaranui / Queen Charlotte Sound[14]
- *Rangitāne o Wairau:* has strong interests across the Sounds and has mana whenua over the Kaituna subcatchment of Te Hoiere / Pelorus Sound and Te Whanganui / Port Underwood[15]
- *Ngāti Koata:* has mana whenua over Rangitoto ki te Tonga / D'Urville Island with interests extending to Te Hoiere / Pelorus Sound
- *Ngāti Toa Rangatira* and *Ngāti Rarua*: have mana whenua over Te Whanganui / Port Underwood (along with Rangitāne)
- *Ngāti Apa ki te Rā Tō:* has interests in Te Anamāhanga / Port Gore and Tennyson Inlet.

After Te Tiriti was signed the New Zealand Company went on to establish a settlement at Nelson in 1842.[16] The subsequent Nelson Grant (1848) and Te Waipounamu Crown purchases (1853-56) purported to alienate virtually all of Te Tauihu from Māori ownership. This included the Sounds, apart from its two largest islands, with Rangitoto ki te Tonga / D'Urville Island and Arapaoa island remaining in customary ownership until the 1880s when title was individualised by the Native Land Court.[17] Some reserves were set aside for iwi and some land was granted to landless whānau. But much Māori reserve land was subsequently acquired under the Public Works Act 1981 or sold once title passed through the Native Land Court.

In Tōtaranui / Queen Charlotte Sound a coastal frontage was surveyed off customary land, prior to title being confirmed by the Court, in order to provide for future roads (with no compensation paid to the Māori landowners). These areas subsequently became foreshore reserves and are now administered by DOC. Other Māori land was purchased or taken (with compensation) by the Crown, a small amount for road reserves, but much larger areas for scenic reserves.[18]

3.3 Fisheries settlement

In 1988, the Waitangi Tribunal concluded that the creation of private property rights in fisheries through the quota management system (which was introduced in 1986), failed to recognise prior Māori rights protected under Te Tiriti.[19] After High Court action stopped the allocation of quota, an interim settlement was reached, where the Crown agreed to transfer $10 million and 10 per cent of existing quota to Māori.[20] Under a final settlement in 1992, the Crown provided $150 million for Māori to purchase a half share in the fishing company Sealord Products Limited, and promised that 20 per cent of all new quota for species brought into the system would be given to Māori.

The Treaty of Waitangi Fisheries Commission (or Te Ohu Kaimoana (TOKM)) was tasked with managing the fisheries assets on behalf of Māori while facilitating the allocation of quota to individual iwi. This allocation process has now largely been completed with Te Tauihi iwi receiving significant amounts of fisheries quota.

Under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992, all Māori commercial fishing claims are now settled,[21] but non-commercial fishing continues to give rise to Te Tiriti obligations. The Act requires the Minister of Fisheries to recommend regulations "to recognise and provide for customary food gathering by Māori and the special relationship between tangata whenua and those places which are of customary food gathering importance (including Tauranga ika and mahinga mataitai)".[22]

In the South Island, this obligation has been met by the passage of the Fisheries (South Island Customary Fishing) Regulations 1999. These provide for the Minister to confirm the boundaries of specific rohe moana (customary fishing areas), and the tāngata whenua for each area, as the starting point.[23] This has not proved possible to date, in Te Tauihu,

due to the complexity of overlapping rohe moana. For example, in 2000 Ngāti Koata lodged a mātaitai application for 3.2 km^2 of water space near Rangitoto ke te Tonga / D'Urville Island, and in 2005 Te Ātiawa applied for a mātaitai in Kura Te Au / Tory Channel covering 29 km^2, but neither proceeded.[24] To date, customary fishing has largely been undertaken under the recreational fishing regulations.[25]

A resolution of this situation is being reached through a kawenata (agreement) between the eight Te Tauihu tribes. This will establish a tikanga-led kaitiaki framework, based on the principle of non-exclusivity, which acknowledges the complex and overlapping interests held by various iwi over the moana. In practice, each iwi will appoint kaitiaki, but customary management of the fisheries resource will be a responsibility shared collectively by all the iwi, through the establishment of a Taumata Kaitiaki Forum.[26] The agreement should also enable mātaitai reserves to be established in the Sounds, enabling iwi to manage coastal areas to rebuild the fisheries resource.[27]

The application of the Fisheries (South Island Customary Fishing) Regulations 1999 to the Marlborough Sounds, and establishment of the Taumata Kaitiaki Forum, will provide a stronger management framework for customary fisheries and the exercise of rangatiratanga over marine space.

Mussel harvesting in Te Hoiere / Pelorus Sound

3.4 Aquaculture interests

During the early 1990s, as the aquaculture industry rapidly expanded in the Marlborough Sounds (as described below), some iwi recognised the potential of the industry to provide jobs and income. This was particularly important in the context of losing most of their customary land.[28] When the Resource Management Act 1991 (RMA) came into force, it required councils to take into account the principles of Te Tiriti,[29] as well as consult with "the tangata whenua of the area who may be so affected" when preparing proposed policy statements and plans.[30]

Following the passage of the new law, hundreds of applications for marine farms in the Marlborough Sounds were lodged. Iwi objected to some of these but were unsuccessful in preventing consent being granted.[31] Some iwi also applied for marine farm consents but were often unsuccessful (see spotlight below).

Spotlight on early iwi applications for marine farm consents

In the late 1990s, a Ngāti Kuia fishing company sought consent for two marine farms at Kaitangata Bay and Waimatete Bay in Te Anamāhanga / Port Gore, sites with which the iwi had traditional associations. The applications were part of a Ngāti Kuia strategy to provide employment and education benefits for their people.[32] The iwi submitted that granting consent would "allow Ngāti Kuia to exercise their rangatiratanga and go some way towards redressing the alienation they had undergone from their traditional resources". This was in the context of a "proliferation of marine farms in the Sounds area" which had "severely restricted" opportunities for Ngāti Kuia to provide for their well-being.[33] The applications were turned down by the Council and on appeal in the Environmental Court due to landscape, natural character and ecological impacts.

In the early 2000s, the Elkington family (which has Ngāti Koata connections) sought consent to establish a 30ha marine farm at the southern end of Penguin Bay on the eastern side of Rangitoto ki te Tonga / D'Urville Island. The purpose of the application was to develop the economic base of Ngāti Koata on the island, where there were few employment opportunities for tamariki (children). This would "stoke the home fires" on the island to support the tribe into the future.[34] The application was turned down by the Council and on appeal by the Environment Court based on impacts on natural character.

This led TOKM to convene a hui to discuss a range of Māori issues related to aquaculture, including proposed coastal tendering and charging, and the grant of long-term resource consents.[35] Te Tauihu was chosen as a pilot area, where a strategic response would be tested, in order to "gain greater recognition and understanding of Māori economic development rights in the coastal marine area".[36] The strategy had two key thrusts.

The first was to appeal several aquaculture consents in the Marlborough Sounds. TOKM financed challenges to applications in Anakoha Bay, Tawhitinui Bay and Te Whanganui / Port Underwood. This strategy was successful, in 1997 and 1998, when the consents were overturned.[37] The Court found that marine farming in the Sounds was so extensive that any significant additional farms alienated the ability of iwi to utilise the remaining coastal water space in traditional ways.[38]

As result of these decisions, it became evident to marine farm applicants "that any significant alienation of public water space in a particular iwi rohe is almost doomed to failure … if iwi are not provided with the opportunity for involvement". In practical terms, this meant "of almost all the post-1999 offshore applications of any significance in Marlborough waters, that iwi involvement in varying degrees has been negotiated by applicants before their applications are even lodged".[39]

In 2002, the Waitangi Tribunal issued a report on marine farming more generally. [40] This was in response to a claim lodged by several iwi, after the government proposed to establish aquaculture management areas (AMAs) and tender space within them, thereby alienating further marine space. The Tribunal stated that:

> Māori have a broad relationship with the coastal marine area and that, as an incident of that relationship, Māori have an interest in aquaculture, or, more particularly, marine farming. We also find that the Māori interest in marine farming forms part of the bundle of Māori rights in the marine area that represent a taonga protected by the Treaty of Waitangi.[41]

The decision prompted the Crown and Māori to reach a Te Tiriti settlement on marine farming which is enshrined in the Māori Commercial Aquaculture Claims Settlement Act 2004. Its terms were subsequently adjusted when government legislated, in 2011, to remove the requirement for new marine farms to be located within AMAs.[42] As a rule of thumb, the settlement provides 20 per cent of aquaculture space to iwi (mirroring the 20 per cent of new quota passing to iwi under the Māori fisheries settlement). However, the practical implementation of the settlement has been complicated by the constantly shifting statutory framework applying to aquaculture, and much of the space obligation has been settled through financial payments.[43]

Waitātā Reach salmon farm

3.5 Treaty settlements

On 1 August 2014, the Te Tauihu iwi settled their Tiriti claims. The settlement involved the return of some land titles, statutory acknowledgements and deeds of recognition, and financial redress. This has enabled the tribes to further re-establish their social, cultural and economic strength in the area

A review of iwi annual reports indicates that, as would be expected after the Māori fisheries settlement, all iwi (where the information is publicly available) hold fisheries quota. Some are more invested in fisheries and aquaculture (particularly Te Ātiawa and to a lesser extent Ngāti Kuia and Ngāti Apa) than others. Ngāti Koata and Te Ātiawa have sizable interests in forestry. In contrast, Ngāti Kuia, Rangitāne, Ngāti Toa Rangatira and Ngāti Rarua are more invested in property.

Notably, despite the size of the tourism industry in the Marlborough Sounds (see below), none of the iwi appear to have invested in tourism to any significant extent, unlike iwi in other parts of the country (eg Ngāi Tahu). The recently prepared Marlborough Destination Management Plan indicates that iwi are seeking visitor and tourism opportunities so this may change in the future.[44]

Te Ātiawa has developed an Iwi Environmental Management Plan (2014) which, amongst many other things, sets out a series of objectives for the moana under the overarching objective "the mauri of the coastal/ marine resources will be sustained in perpetuity, and traditional Te Ātiawa practices and iwi aspirations will be realised." One of the policies is to "Support projects aimed at enhancing the indigenous coastal/marine area ecology of the rohe."[45]

Ngāti Koata has also developed an Iwi Management Plan (2002). For coastal waters it sets out two key objectives: to maintain or enhance water quality at a level that enables the gathering or cultivation of shellfish for human consumption; and protection of the coastal environment by addressing significant adverse effects of activities that modify the foreshore or seabed.[46]

Ngāti Rārua has an Environmental Strategy (2021) which sets for the coastal and marine area an objective that "the mauri of Tangaroa is protected, enhanced and restored". The policies and methods seek that the relationship that Ngāti Rārua has with the area be acknowledged, recognised and provided for, that the development and use of coastal health index monitoring be supported, and research partnerships be established and developed, amongst other things.[47]

Ngāti Kuia is in the process of developing a Taiao Iwi Management Plan[48] and Ngati Toa Rangatira is currently scoping a plan.[49]

Te Tauihu iwi have significant commercial interests in the marine space, particularly in commercial fisheries quota and aquaculture. Some iwi also have significant rural land holdings in the catchments of the Sounds including in exotic forestry. There is currently minimal iwi involvement in tourism. Iwi management plans set out positive aspirations for better caring for and enhancing the Marlborough Sounds marine area.

3.6 Customary marine title

The second arm of the TOKM strategy (described above), was for the Te Tauihu tribes to apply to the Māori Land Court for a declaration under the Te Ture Whenua Māori Act 1993, that the foreshore and seabed of the Marlborough Sounds was Māori customary land. This failed in the High Court but partially succeeded on appeal to the Court of Appeal. In its 19 June 2003 decision, the Court of Appeal found that the Māori Land Court did indeed have jurisdiction to determine the status of the foreshore and seabed (although it did not go so far as to conclude that the area was in fact Māori land).[50]

Within a week of the court decision being released, the government announced that it would legislate to protect public rights of access to and use of the coast, while at the same time protecting customary rights.[51] In the face of very strong Māori opposition, the government passed the Foreshore and Seabed Act in November 2004. This led to Dame Tariana Turia, a Minister in the Labour-led government, resigning on the basis that the move was outright confiscation of Māori land. She subsequently formed the Māori Party.

The Marine and Coastal Area (Takutai Moana) Act 2011 (MACA) subsequently replaced the Foreshore and Seabed Act. This gives the "common marine and coastal area" special status in that it is not capable of being owned by the Crown or any other person.[52] The area extends from mean high water (on the shore) to the edge of the territorial sea (12 nautical miles from land). It includes the seabed, the water space (but not the water) and the air.[53] The Act also provides for the determination of

whether "customary marine title" exists in any part of the common marine and coastal area.

Spotlight on Marlborough Sounds claims under the Marine and Coastal Area (Takutai Moana) Act 2011

Te Tauihu iwi have lodged multiple applications to determine customary marine title within the Marlborough Sounds including:

- Te Ātiawa: Claims cover the entire Marlborough Sounds, Cloudy Bay and the eastern portion of Tasman Bay, out to 12 nautical miles
- Ngāti Kuia: Claims cover all of Te Hoiere / Pelorus Sound seawards to just past the Chetwode Islands.
- Ngāti Koata: Claims cover Rangitoto ki te Tonga / D'Urville Island and adjacent mainland coast extending out to 12 nautical miles
- Rangitāne: No claims within the Marlborough Sounds

There are also some more localised whānau claims (eg over Anatohia Bay, Onauku Bay and inner Tōtaranui / Queen Charlotte Sound). Other tribes had lodged claims over the entire Te Tau Ihu area including Ngāti Apa, Ngāti Toa and Ngāti Rarua.

Timing of the processing of the claims is uncertain. Funding to support the process has been made available through Te Arawhiti's Takutai Moana Financial Assistance Scheme. However, that scheme has recently run short of money and it seems likely that processing of most MACA applications will be significantly delayed.[54]

In addition, the New Zealand First and National Party coalition agreement contains a commitment to amend section 58 of the MACA Act (which sets out the criteria for establishing customary marine title) "to make it clear Parliament's original intent"[55] and a recent cabinet decision has confirmed this approach.[56] This is in response to the first substantive Court of Appeal decision on the statute[57] which took a broad view of the relevant provisions. The Court held that, although applicants were required to establish that they held the area in accordance with tikanga and their occupation of the area had been exclusive and continuous from 1840 to the present, they did not need to prove this had been "without substantial interruption" (as stated in section 58) if the Crown had effectively prevented this from occurring.[58] The matter has been appealed to the Supreme Court but has yet to be heard.

The government's proposal to amend the Act led to an urgent inquiry by the Waitangi Tribunal which concluded the Crown had breached several principles of Te Tiriti including those of good government, partnership, tino rangatiratanga and active protection. The Tribunal recommended the Crown halt current efforts to amend the legislation and allow the Supreme Court to hear the matter before proceeding further.[59]

Those applying for a resource consent in the coastal marine area need to notify and seek the views of all the groups that have applied for recognition of customary marine title in the consent area. If they fail to do so the application is to be returned as incomplete.[60] This effectively means that all applicants for resource consents within the Marlborough Sounds marine area now *must* consult with iwi prior to lodging the application.

If customary marine title is granted (which is not the case yet for any part of the Marlborough Sounds), then written permission is needed from the customary marine title group before any activity needing consent can proceed. Written permission is also required before a marine reserve is established or a concession granted.[61] This will put iwi in a very strong negotiating position, both in terms of ensuring that any successful proposals are environmentally sustainable and in potentially becoming commercial partners.[62]

Although marine customary title does not directly affect fishing,[63] harvest can be excluded from a recognised wāhi tapu, but not to the extent it would "prevent fishers from taking their lawful entitlement in a quota management area or fisheries management area".[64] This potential conflict with fisheries, particularly with more localised species such as rock lobster and pāua (rather than mobile finfish species), has prompted the fishing industry to join as affected parties to High Court proceedings considering the applications.[65]

The iwi exercise of rangatiratanga over the marine area looks to be further strengthened if customary marine titles are confirmed. However, proposed changes to the legislation (if they go ahead), will significantly raise the bar for obtaining title.

Wairau Bar, near Blenheim, which has some of the earliest evidence of Polynesian settlement in the country

Endnotes

1 McFadgen and P Adds, 2019, 'Tectonic activity and the history of the Wairau Bar, New Zealand's iconic site of early settlement', *Journal of the Royal Society of New Zealand*, 46(4), 459-473, at 461

2 Waitangi Tribunal, 2008, *Te Tau Ihu o te Waka a Maui: Report on northern South Island claims*, Volume 1, Waitangi Tribunal, Wellington, at 2

3 Ibid, at 20 and 27

4 Ibid, at 21

5 Ibid, at 10

6 Beaglehole H, 2022, *One hundred havens: The settlement of the Marlborough Sounds*, Massey University Press, Auckland, at 26-29; Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound / Te Hoiere,* NIWA, Hamilton, at 16

7 Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Sound / Te Hoiere,* NIWA, Hamilton, at 16

8 Waitangi Tribunal, 2008, *Te Tau Ihu o te Waka a Maui: Report on northern South Island claims*, Volume 1, Waitangi Tribunal, Wellington, at 167

9 Beaglehole H, 2022, *One hundred havens: The settlement of the Marlborough Sounds*, Massey University Press, Auckland, at 27

10 Urlich S C and S J Handley, 2020, 'From "clean and green" to "brown and down": A synthesis of historical changes to biodiversity and marine ecosystems in the Marlborough Sounds, New Zealand', *Ocean and Coastal Management*, 198, 105349, at 5

11 Beaglehole H, 2022, *One hundred havens: The settlement of the Marlborough Sounds*, Massey University Press, Auckland, at 36

12 Waitangi Tribunal, 2008, *Te Tau Ihu o te Waka a Maui: Report on northern South Island claims*, Volume 1, Waitangi Tribunal, Wellington, at 175

13 Ibid, at 26

14 Ibid, at 355

15 https://www.marlborough.govt.nz/environment/te-hoiere-pelorus-catchment-restoration-project

16 Waitangi Tribunal, 2008, *Te Tau Ihu o te Waka a Maui: Report on northern South Island claims*, Volume 1, Waitangi Tribunal, Wellington, at 219

17 Ibid, at 399 and 476

18 Ibid, at 568

19 Bargh B, 2016, *The struggle for Māori fishing rights*, Huia Publishers, Wellington, at 66–67

20 Māori Fisheries Act 1989; and see Locke K and S Leslie, 2007, *New Zealand's quota management system: A history of the first 20 years*, Motu, Wellington, at 29

21 Section 9, Treaty of Waitangi (Fisheries Claims) Settlement Act 1992

22 Section 10, Treaty of Waitangi (Fisheries Claims) Settlement Act 1992

23 Regulation 9, Fisheries (South Island Customary Fishing) Regulations 1999

24 http://www.mahingakai.org.nz/wp-content/uploads/2014/01/MFish-mataitai-taiapure-applications-july07.pdf

25 See Part 5, Fisheries (Amateur Fishing) Regulations 2013

26 https://teatiawatrust.co.nz/resource-management/south-island-customary-fishing-regulations/

27 See regulation 25, Fisheries (South Island Customary Fishing) Regulations 1999

28 Meihana P N, 2006, *From Anakoha to New York: The genesis of the foreshore and seabed claim and the marginalisation of Ngāti Kuia*, Masters of Arts in History thesis, Massey University, at 67

29 Section 8, Resource Management Act 1991

30 Schedule 1 clause 3(1)(d), Resource Management Act 1991

31 Meihana P N, 2006, *From Anakoha to New York: The genesis of the foreshore and seabed claim and the marginalisation of Ngāti Kuia*, Thesis for Master of Arts in history, Massey University, at 67

32 *Kaikaiawaro Fishing Company Limited v Marlborough District Council* W084/99 [1999] NZEnvC 308, at para 12

33 *Kaikaiawaro Fishing Company Limited v Marlborough District Council* W084/99 [1999] NZEnvC 308, at paras 18-19

34 *Jim and Rose Elkington Family Trust v Marlborough District Council* NZEnvC Auckland W069/05, 17 August 2005, at [27]

35 Meihana P N, 2006, *From Anakoha to New York: The genesis of the foreshore and seabed claim and the marginalisation of Ngāti Kuia*, Thesis for Master of Arts in history, Massey University, at 71

36 Ibid, at 71-72

37 *Director-General of Conservation v Marlborough District Council* W 89/97 (where the Council had granted consent and the Director-General of Conservation appealed); *Aqua King Limited v Marlborough District Council* W71/97 (where the Council had declined consent and the applicant appealed); and *Marlborough Seafood Limited v Marlborough District Council* W12/98 (where the Council had declined consent and the applicant appealed)

38 Crosby R, 2002, 'Te Tau Ihu Māori involvement in resource management issues', in M Kawharu, *Whenua: Managing our resources*, Reed Books, Auckland, 366

39 Ibid, at 368

40 Waitangi Tribunal, 2002, *Ahu moana: The aquaculture and marine farming report (Wai 953)*, Waitangi Tribunal, Wellington

41 Ibid, at 76

42 Māori Commercial Aquaculture Claims Settlement Amendment Act 2011

43 For example, see https://www.mpi.govt.nz/dmsdocument/8416-Deed-for-South-Island-and-Coromandel

44 Destination Marlborough, 2022, *Marlborough destination management plan*, Destination Marlborough, Blenheim, at 14

45 Te Ātiawa o Te Waka-a-Māui, 2014, *Te Ātiawa o Te Waka-a-Māui iwi environmental management plan*, Te Ātiawa o Te Waka-a-Māui, Picton, at 52 (see Policy 3 under Objective 2)

46 Ngāti Koata No Rangitoto Ki Te Tonga Trust, 2002, *Ngāti Koata No Rangitoto Ki Te Tonga Trust iwi management plan*, Ngāti Koata No Rangitoto Ki Te Tonga Trust, at 27

47 Ngāti Rārua, 2021, *Poipoia tea o tūroa: Ngāti Rārua environmental strategy*, Ngāti Rārua, Blenheim, at 27-28

48 https://ngatikuia.iwi.nz/taiao/taiao-iwi-management-plan

49 https://www.ngatitoa.iwi.nz/kaitiakitanga

50 *Ngati Apa v Attorney-General* [2003] 3 NZLR 643

51 Meihana P N, 2006, *From Anakoha to New York: The genesis of the foreshore and seabed claim and the marginalisation of Ngāti Kuia*, Thesis for Master of Arts in history, Massey University, at 82

52 Section 11, Marine and Coastal Area (Takutai Moana) Act 2011

53 See definitions of "common marine and coastal area" and "marine and coastal area" in section 9, Marine and Coastal Area (Takutai Moana) Act 2011

54 https://www.1news.co.nz/2024/05/27/major-govt-agency-fails-to-pay-bills-faces-huge-funding-shortfall/#:~:text=Under%20the%20Marine%20and%20Coastal,Takutai%20Moana%20Financial%20Assistance%20Scheme.

55 New Zealand National Party & New Zealand First, 2023, *Coalition agreement*, 54th Parliament, House of Representatives, Wellington, at 10

56 https://tearawhiti.govt.nz/assets/MACA-docs/Section-58/2025-07-25-Takutai-Moana-panui.pdf

57 *Whakatōhea Kotahitanga Waka (Edwards) & Ors v Te Kāhui and Whakatōhea Māori Trust Board & Ors* [2023] NZCA 504

58 https://www.simpsongrierson.com/insights-news/legal-updates/landmark-foreshore-and-seabed-decision-lays-groundwork-for-customary-title

59 Waitangi Tribunal, 2024, *Takutai Moana Act 2011 urgent inquiry stage 1 report (WAI 3400)*, pre-publication version, Waitangi Tribunal, Wellington

60 Section 62A, Marine and Coastal Area (Takutai Moana) Act 2011

61 Section 71, Marine and Coastal Area (Takutai Moana) Act 2011

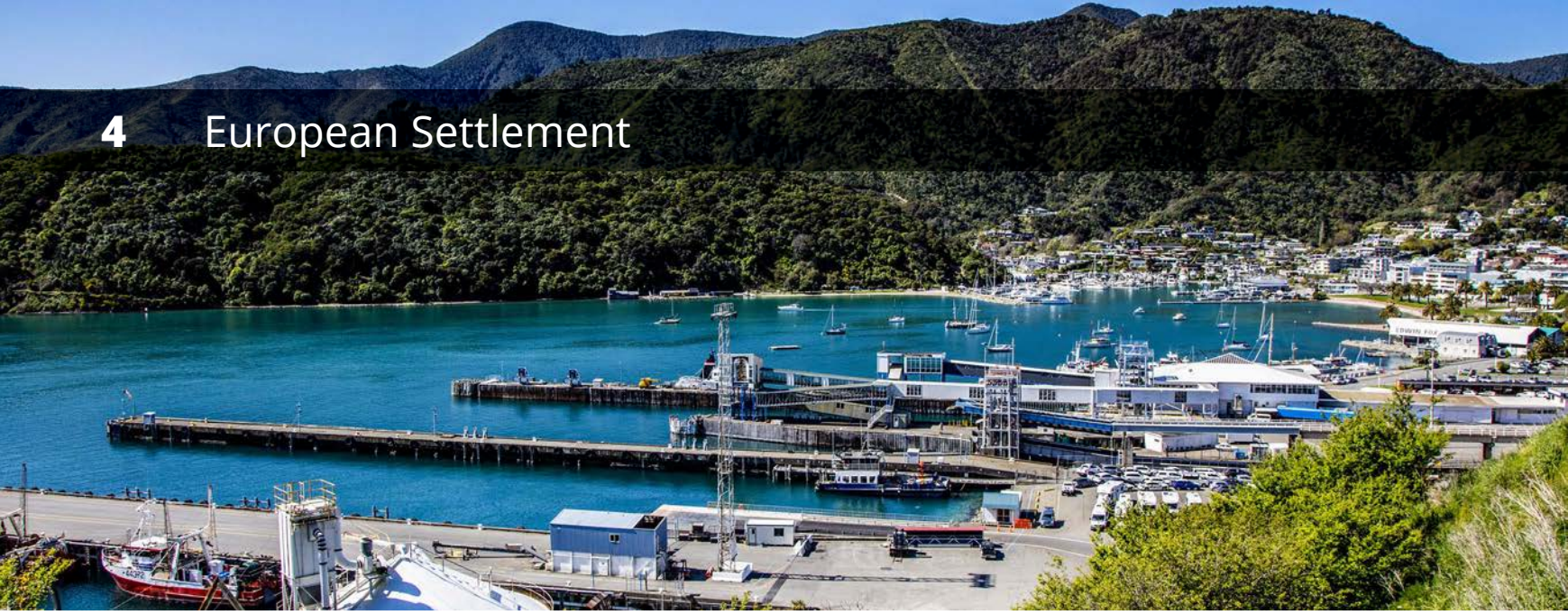
62 Section 68, Marine and Coastal Area (Takutai Moana) Act 2011

63 See section 28, Marine and Coastal Area (Takutai Moana) Act 2011 which states that "Nothing in this Act prevents the exercise of any fishing rights conferred or recognised by or under an enactment or by a rule of law"

64 Section 78 and 79, Marine and Coastal Area (Takutai Moana) Act 2011

65 For example, see *Ngā Hapū o Tokomaru Ākau* & Ors [2024] NZHC 682

4 European Settlement



Port infrastucture at Picton

European sealers and whalers started visiting the Sounds from the 1790s, with sealing peaking in the 1820s, and then quickly declining once the seals were exterminated. Whaling then became more prominent. The early whalers targeted right whales which migrated up the east coast of the South Island and stopped to calve in Cloudy Bay (to the east of Blenheim).[1]

The first whaling station was established in Kura Te Au / Tory Channel in 1827 and others soon followed. Local Māori became actively involved in the industry and most European whalers married local Māori women.[2] When the right whales were largely exterminated, the whalers turned to humpback whales, and the whaling industry continued right up until the 1960s.

After the signing of Te Tiriti in 1840, and acquisition of Māori land by the New Zealand Company and the Crown, European settlers started to significantly increase in numbers around the Sounds. This started the process of profound environmental change.

4.1 Logging

When Europeans arrived in the area, much of the Marlborough Sounds was covered in thick podocarp forest dominated by kahikatea, tōtara, matai and rimu. Beech dominated bush on the steeper land. The early European settlers first cleared flat land to enable the establishment of buildings and small farms.[3] Proceeds from logging helped finance farm development. Many timber mills sprung up from the early 1900s as the native bush was logged.

By 1880, slopes of up to 300 m elevation were cleared, and two thirds of the flatter lands were logged by 1910.[4] This served to accelerate soil erosion, through the loss of soil-stabilising root networks and forest canopy, the latter serving to reduce the velocity and volume of rainwater reaching the ground during storms.[5]

4.2 Agriculture

Parcels of land around the Sounds were offered for sale by the Provincial Government during the late 1850s and '60s. Pastoral farming reached its peak during the 1910s to 1930s, after most accessible timber had been logged, and the hills laid bare of trees. For example, it was reported in 1911 that "All along Queen Charlotte and in Tory Channel are chains of treeless hills with green patches of monotonously green sometimes light brown pastures, and marked by slips revealing the skin of the earth itself".[6]

Although burning created initial fertility in the soil, from the ash layer, this was short lived. Runoff from the steep slopes quickly leached nutrients and erosion was rife. For example, after heavy rain during the 1930s, 30 large slips were observed over a 10 km stretch of land in Kenepuru Sound.[7] South-facing slopes got little or no winter sun and the soil froze during colder months. There was also little flat land. Most farms were small

and many farming families lived barely above subsistence levels.[8] Farm advisory officer J P Beggs summarised the situation as follows:

> The country is almost all hills and most properties only have enough flat land for the placement of buildings. The country is of very low fertility, and, as it is difficult and costly to apply fertiliser, the battle against weeds (fern, tauhinu and Spanish heath) is continuous and difficult. It is necessary to use fire frequently to keep this second growth at bay.[9]

Farmers frequently burnt off regenerating regrowth in an attempt to clear the weeds and restore some fertility. Some torched the hillsides every year and became known as the 'matchbox farmers'.[10] But the burning accelerated soil erosion, further reducing productivity, in a vicious negative spiral. There was a reprieve, after World War II, when aerial application of superphosphate became available and wool prices peaked. But when fertiliser subsidies were phased out during the 1980s, many farms in the Sounds were either planted in exotic radiata forests, or left to revert to indigenous vegetation.[11]

Agriculture has continued in the Te Hoiere / Pelorus Sound catchment, with dairy farms dominating the flood plains, and sheep and deer grazing on the steeper land. Dairy intensified during the 1990s, with the advent of irrigation, with the 14,783 dairy cattle in 1988 more than doubling to 32,256 in 2002.[12]

4.3 Exotic forestry

Exotic pine species have been planted in the Marlborough Sounds since the latter half of the 1800s. Farmers increased small plantings, after 1919, when the Commissioner of Crown Lands promoted the practice.[13] In 1925, the State Forest Service sought to promote large scale pine plantations in the Sounds as part of a national programme designed to address depletion of indigenous timber. However, the only large plantation to eventuate at that time, was the 136 ha Farnham Forest which was planted in 1934 at Snake Point, the northern headland of the Bay of Many Coves (in Tōtaranui / Queen Charlotte Sound).[14]

The State Forest Service subsequently established many exotic forests in catchments and coastal areas of the Marlborough Sounds, with exotic forestry being seen as an "important factor" in the area's future development.[15] In 1940, foresters started planting pinus radiata, Douglas fir and Corsican pine in the Rai Valley. Planting was extended (during the 1960s) to the Upper Te Hoiere / Pelorus catchment, and then into the Whakamarino catchment during the 1970s.

Through agreement with the Department of Lands and Survey, which was seeking to establish a network of scenic reserves in Tōtaranui / Queen Charlotte Sound, state forestry was confined to the southern side of the Sound, on Arapaoa Island and in Kura Te Au / Tory Channel. The northern side of the Sound was to be left to revert to indigenous vegetation.[16] This saw, during the 1960s to 1980s, state plantings on steep land above Kura Te Au / Tory Channel and around Te Whanganui / Port Underwood.[17]

As well as directly engaging in forestry plantings, the government sought to incentivise planting by private landowners. This was through providing more than $1 million in soft loans for the establishment of forestry on marginal land, under the Forestry Encouragement Act 1962, resulting in the purchase and planting of large farm blocks. Taxation concessions and high wood prices (along with the removal of pastoral farming subsidies), during the late 1980s, also prompted forestry planting on less economically viable pastoral farms.[18]

By 2015, exotic forests (primarily pinus radiata) covered around 17,440 ha of land in the Marlborough Sounds proper (including Te Whanganui / Port Underwood and Kura Te Au / Tory Channel). These include forestry blocks around the coastal margins of Mahau Sound, Kenepuru Sound, Hikapu Reach and Crail and Clova Bays.[19]

There were also extensive plantings in the catchments draining into Te Hoiere /Pelorus Sound, totalling some 14,109 ha of exotic forests in 2020. Overall this comprised 13.5 per cent of the total catchment area (104,716 ha), but in some areas, forestry comprises a much greater proportion. For example, 30 per cent of the Cullens Creek catchment is in forestry and 20 per cent of the Kaituna catchment. Given the generally rugged topography of the Marlborough Sounds area, and focus on establishing forestry on marginal lands less suited to agriculture, most forests had been established on steep and highly erodible soils.[20] The problems with this became very evident when harvesting commenced.

The first significant forest to be harvested in the Sounds was Farnham in 1971. The resulting environmental devastation prompted the establishment of the Bay of Many Coves Marlborough Sounds Environment Association. Silt started pouring into the bay, suffocating scallop beds, and sunken logs which came loose while being towed to Picton created a hazard for boating.[21]

Since the late 1990s, there has been widespread harvesting throughout different parts of the Marlborough Sounds as the exotic forests have matured, meaning that the window of vulnerability (when soils are particularly vulnerable to erosion five to eight years after harvest) is always open. This has resulted in high volumes of sediment being discharged into rivers and the coastal areas of the Sounds.[22] The issue of sedimentation and how it is currently being managed is discussed in section 5 below.

Exotic forestry has also resulted in a proliferation of wilding pines across the Sounds. These not only compete with indigenous species, and detract from landscape values, but they are a major fire risk and reduce catchment water flows. The Marlborough Sounds Restoration Trust, which was established in 2003, has focused on controlling their spread.[23]

The Marlborough District Council has significant forestry holdings with an asset value of just under $18 million.[24] This is through owning 89 per cent of the Marlborough Regional Forestry Estate (the balance being owned by Kaikōura District Council). It comprises 3,355 ha of mostly (98%) pinus radiata, planted in six forestry blocks, as well as 1,438 ha of native forest managed for conservation purposes. The land is located on both sides of State Highway 1 between Blenheim and Picton, within a catchment that drains into the Wairau River, and ultimately into Cloudy Bay.[25] As noted earlier, sediment from Cloudy Bay moves northwards with the coastal currents and affects Te Whanganui / Port Underwood and Kura Te Au / Tory Channel.

The ownership of a sizeable exotic production forest by the Council provides an excellent opportunity to demonstrate best practice, such as adopting continuous cover forestry (with small coup harvesting), to protect the harvested soil from erosion.

4.4 Fishing

It is apparent that the Sounds once had a very abundant and diverse fishery. From onboard the *HMS Endeavour*, which arrived in Tōtaranui / Queen Charlotte Sound in 1770, considerable quantities and a great variety of species of fish were readily caught. Parkinson recorded snapper, tarakihi, barracouta, gurnard, horse-mackerel, dog-fish, flounder, mullet, blue cod, elephant fish, green-lipped and blue-lipped mussels and other kinds of shellfish.[26]

The high productivity of the Sounds was illustrated by the copious quantities of pilchard present there during the 1860s. In the 1880s, it was possible to regularly harvest two tonnes of the fish off the Picton wharf, with 10 tonnes being landed at times.[27] There were also reports of early settlers catching 10 tonnes of kahawai and flounders during a day's fishing from Picton.[28] In Te Hoiere / Pelorus Sound, pilchards were also reported as abundant in Tennyson Inlet, along with hāpuku in deeper water. Before the 1970s, snapper were also easily caught in the area.[29]

Following European settlement of the Sounds, the fish stocks were pursued relentlessly, and often through the use of environmentally destructive methods such as dredging and trawling. By the 1920s, fish stocks started to decline, with blue cod becoming notably harder to catch and snapper stocks dwindling. The current depletion of fish stocks is described further in section 7 below.

4.5 Aquaculture

Marine farming became established in the Sounds, during the 1960s, initially by local farmers and fishers seeking an additional form of income. Today, the industry is made up of a mixture of iwi, large companies and small family businesses. Marlborough now produces around 60 per cent of the green-lipped mussels and king salmon grown nationally.[30]

Mussel farming

The first mussel raft in the Marlborough Sounds was moored in late 1969, in Kenepuru Sound, with the first mussel farm licence granted in November 1975 for a farm in Ruakākā Bay (in Te Hoiere / Queen Charlotte Sound).[31] There are now close to 600 mussel farms occupying 2,958 ha of water space in the Sounds (although not all are operational).[32] The number of cultured mussels in the sea at any one time, is estimated at over 2 billion, a number that dwarfs the remnant wild stock:[33]

> Estimated cultured mussel populations in 2020 were 16 161 times greater than wild mussel populations in 2020 and 470 times greater than wild mussel populations at their peak in 1960 prior to significant removal by harvesting.[34]

The mussel farms are concentrated in Te Hoiere / Peelorus Sound, Te Whanganui / Port Underwood and Admiralty Bay and have mainly been located in a ribbon pattern along the shoreline (see Figure 4.1). Although this was intended to minimise conflicts with navigation and other marine users, it has meant that some farms have been located over cobble and reef areas. These habitats line the inshore coastal strip of the Marlborough Sounds and have higher biodiversity values than the soft sediments located further away from the shore.

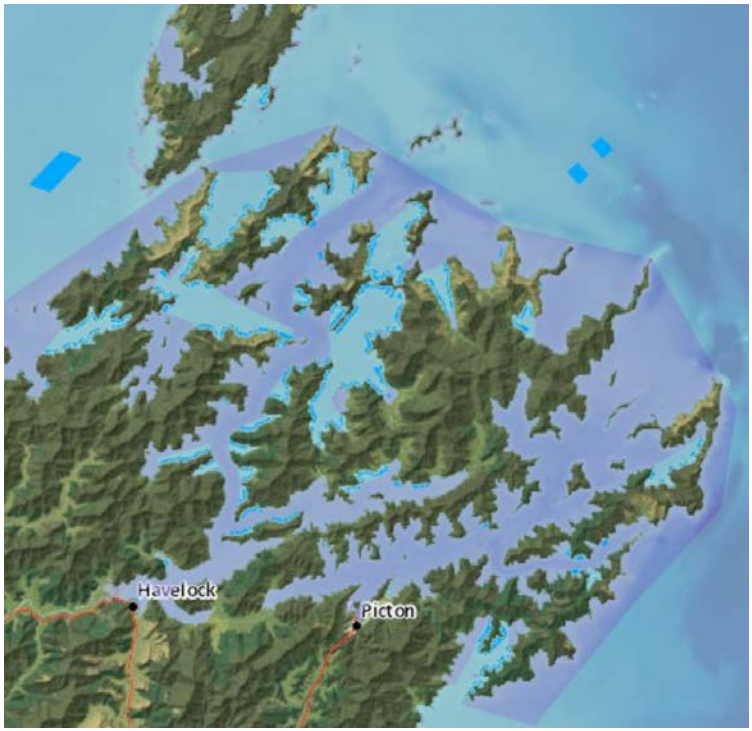


Figure 4.1 Consented marine farms in the Marlborough Sounds *(Source: Marlborough District Council)* dark blue – consented marine farms, purple shaded area – Coastal Marine Zone One, blue shaded area inside – Coastal Marine Zone Two

Mussel farming can have a range of environmental impacts which are generally milder than those from salmon farms. Shell, faeces and psuedofaeces drop to the seafloor mildly enriching sediments under the farms. Farm structures can reduce water movement which seaweeds and filter feeders rely on. The farmed mussels themselves extract phyto- and zoo-plankton for food, and if grown in large numbers in low flow areas, can potentially deplete plankton supply to the wild marine food web.[35]

Although introducing a large quantity of filter feeders into the marine system, mussel farms do not serve to remove suspended sediment from the water column, therefore not helping to address sedimentation issues in the Sounds However, they do remove a substantial amount of nitrogen from the system, estimated at around 45 per cent of the total riverine nitrogen flow into Te Hoiere / Pelorus Sound.[36] Whether this is a good or bad thing depends on the extent to which there is an oversupply of nitrogen due to catchment activities. The mussel dropper lines themselves provide habitat for around 139 species, many of which are suspension feeders, although they would be dislodged and potentially crushed during regular harvesting. Mussel drop beneath the farms can provide valuable biogenic habitat.[37]

The rate of growth of farmed mussels may provide a rough indication of the health and productivity of the marine area (acknowledging that growth is also affected by the density of farming). A 1987 paper noted that, in the Marlborough Sounds, farmed mussels grew to a harvestable size within 15-18 months.[38] Growth rates measured during 2017-19 found that it now takes much longer, on average 28 months (and 30 months if spat from Ninety-Mile Beach is used).[39] This indicates that something has changed over the past 30 years, with reduced productivity potentially impacting wild species as well.

Salmon farming

King (chinook) salmon was introduced from California, in 1901, but farming did not get underway in the Sounds for another 80 years. The first experimental salmon farm was established in Elie Bay on a mussel farm site, but the water was too warm for salmon, so the farm was moved to Ruakākā Bay.[40] Due to the introduction of feed into the marine system, salmon farms have a much greater impact on the seabed and water column, than shellfish farms. The deposition of faeces and uneaten feed leads to organic enrichment which can significantly change the seabed chemistry and ecology. That is why locating salmon farms in deep, high flow sites with good flushing is so important.

In poorly flushing sites pronounced changes have been observed. A 2013 review found that the seabed ecology at the Otanerau Bay site "had all but collapsed" and there was "persistent anoxia". Ruakākā Bay was identified as a site "close to the edge". The site at Waihinau Bay, which had been farmed since 1989, had "little, if any, resilience left in the benthic environment to assimilate large quantities of organic matter".[41] A 2024 review confirmed that sediments under the Ruakākā Bay, Forsyth Bay and Waihinau Bay farms have at times been "in anoxic and near azoic states"[42] meaning they have become devoid of oxygen and almost lacking any detectable marine life. The Forsyth Bay and Waihinau Bay sites are no longer farmed.[43] Such effects can be mitigated, to some extent, by fallowing but indicate the unsuitability of these sites for finfish farming.

The use of high flow, deeper and cooler sites for salmon farming is becoming even more important due to seawater warming. King salmon is a cold water species and the fish thrive in seawater temperatures of 15 to 16 °C. With the warming of waters in the Sounds, and recent heatwaves (see later discussion on climate change), many fish have been dying over the warm summer months.[44] Temperatures will only further increase as

the seas continue to warm.[45] The costs of motality are already substantial, totalling close to $26 million during the 2022-23 financial year.[46] This has driven moves to selectively breed fish for heat tolerance.

New Zealand King Salmon Limited is the only salmon farmer in the Marlborough Sounds and the company produces around 6,000 tonnes of fish a year.[47] It currently has 11 permitted sites (see Figure 4.2), but six of these are low flow sites which have proved marginal for salmon production due to their shallow depths, low water flow and warming seawater. Four of these are still being farmed albeit now seasonally.

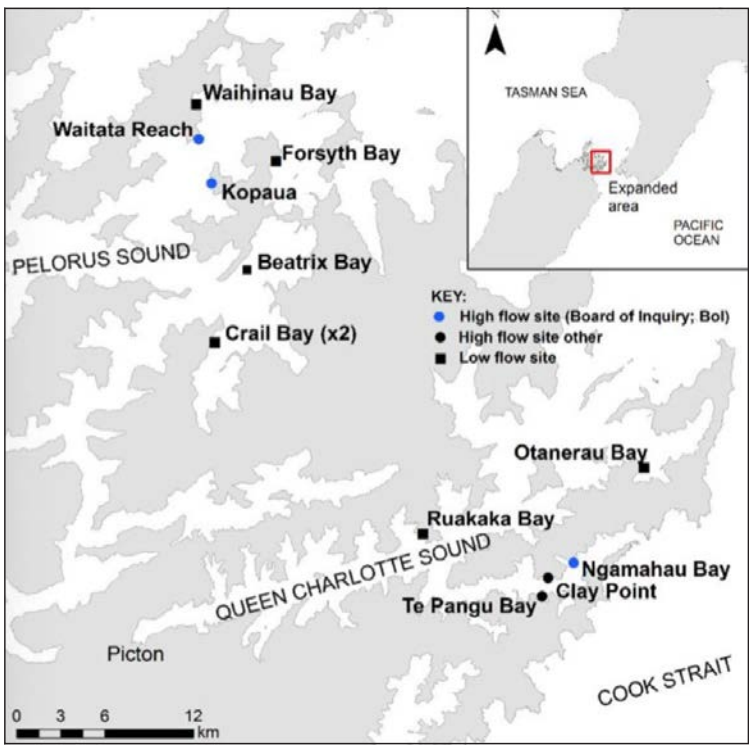


Figure 4.2 : Consented salmon farms in the Marlborough Sounds *(Source: Marlborough District Council)*[48]

In February 2024 New Zealand King Salmon Limited obtained consent for two new salmon farms of up to 12 ha, in Cook Strait, 5 kms north of Te Uku / Cape Lambert. This provides an opportunity for the company to reduce ecological pressure on its low flow sites within the Sounds.

Aquaculture management

Marlborough District Council was one of the first local authorities to develop a spatial allocation regime for marine farming. The Marlborough Sounds Resource Management Plan, which was approved by the Environment Court in 1999, effectively divided the Sounds into two zones: Coastal Marine Zone 1 where new aquaculture was prohibited; and Coastal Marine Zone 2 where applications for coastal permits could be made.[49] The designations were based on broad community agreement that aquaculture would be concentrated in the more developed Te Hoiere / Pelorus Sound (the 'working Sound') and would be largely excluded from Tōtaranui / Queen Charlotte Sound, which had greater importance for recreation and tourism. The zones were largely developed with mussel farming in mind (and not salmon).

The plan became operative in 2003 and still provides the applicable rule framework for aquaculture in the Marlborough Sounds (alongside Variation 1 to the proposed Marlborough Environment Plan which also now has legal effect – see below). New Zealand King Salmon Limited challenged this long-settled zoning in 2011 when it sought to locate farms in areas outside Coastal Marine Zone 2, largely due to its wish to obtain cooler, deeper and higher flow sites. It utilised the RMA call-in procedure and referral to a board of inquiry (which sits in place of the Council and Environment Court on appeal as the decision-making body) to apply for nine new salmon farms sites. The proceedings went all the way to the Supreme Court and three new sites were eventually consented – the Waitātā and Kopāua sites (in outer Te Hoiere) and Ngāmahau (in Kure Te Au). The Kopāua site has since proved unsuitable for salmon due to warming seawater and is no longer farmed[50]

When the Marlborough District Council notified its proposed Marlborough Environment Plan, in June 2016, it did not contain any provisions for marine farming. These had been omitted so that Council could adopt a collaborative approach to their development through the Marlborough Aquaculture Review Working Group. The recommendations of that Group formed the basis of Variation 1 Marine Farming, which was notified in December 2020, and only applies to mussel farming. Submissions on the variation have been heard by an Independent Hearings Panel and the council issued its decision in May 2023. A small number of appeals have since been lodged and they are currently under mediation.

The variation divides the Sounds into 45 coastal management units, and identifies areas suitable for marine farming in each unit, through the delineation of AMAs. Reconsenting of existing farms within AMAs is a controlled activity and they will be given priority for space in the new

AMAs. Aquaculture in enclosed waters outside the AMAs is a prohibited activity. Overall, Variation 1 seeks to maintain, but not increase, the level of consented farming in the Sounds on the basis that "the enclosed water Sounds are at, or approaching, full capacity for marine farms".[51] Separate provision is made for consenting of offshore farms (outside the inner waters of the Sounds) as a discretionary activity.[52]

Variation 1 seeks to adjust the footprint of farms to be more optimal. Currently farms are between 50-200 metres from mean high water and, under Variation 1, they are to be moved 100-300 metres from the shore. This is through shifting the inshore lines to the outer edge of existing farms when consents are renewed. This is intended to reduce shading of the seabed, help biodiversity to recover, and improve public access to the foreshore. It may also enable farms to increase the length of their dropped lines, and water flow, and therefore productivity.[53] In addition, 21 farms are to be completely relocated away from sensitive environmental features or to improve amenity or recreational values of the Sounds. New relocation space was identified for some but not all of these farms. These provisions are currently subject to appeal.

Variation 1A, which was developed by the Council with assistance from the Marlborough Finfish Farm Relocation Advisory Panel, was to apply to finfish farming. The Panel had been set up by the Minister of Fisheries to inform an earlier attempt to relocate up to six salmon farms in low flow sites to more appropriate locations under section 360A of the RMA (which enables aquaculture-related amendments to regional coastal plans to be made directly by government through an order in council). This initiative, which commenced in 2016, had failed to reach fruition.

> "At their existing sites, some salmon farms have significant adverse effects on the benthic environment (seabed) … Relocation would allow the adverse effects on the benthic environment to be addressed while providing for social and cultural benefits and maintaining or increasing economic benefits."[54]

Variation 1A proposed to create 10 new finfish AMAs that would accommodate seven of the existing salmon farms in the same location and relocate the Waihinau, Otanerau and Ruakākā Bay farms to higher flow areas. In addition, Crail Bay has two existing farms in low flow areas, and these were proposed to be dis-established on the basis that "finfish farming is inappropriate here".[55] However, Variation 1A was not ultimately proceeded with, after notification and submissions being heard, due to the lack of adequate consultation with iwi.[56]

The recent extension of existing marine farm consents by 20 years, under the Resource Management (Extended Duration of Coastal Permits for Marine Farms) Amendment Act 2024, has cut across this process. It may well disincentivise mussel farmers from moving seawards and off biogenic habitat in nearshore areas. The moving of farms was to occur over a 3-year time frame but the Act enables farmers to stay where they are for another 20 years on top of any remaining term of their current consent.

> The Resource Management (Extended Duration of Coastal Permits for Marine Farms) Amendment Act 2024 cuts across plan provisions designed to relocate marine farms out of unsuitable and ecologically sensitive areas.

Coastal occupation charging

The Council has provided a framework for coastal occupation charging in its proposed Marlborough Environment Plan. The total amount to be collected each year is based on "the actual expenditure considered necessary to promote the sustainable management of the coastal marine area".[57] The expenditure is to be set out year-to-year in the Council's Annual Plan prepared under the Local Government Act 2002.

Ratepayers will pay 25 per cent of the total costs of coastal management and occupiers of public space the remaining 75 per cent. Some uses will be given a waiver from paying the charge, based on the public benefit provided, and this will include public wharves, jetties, boat ramps and port-related facilities.[58] Charges can be spent on a range of activities including state of the environment monitoring, research, education and awareness, and "habitat and natural character restoration and enhancement".[59] These provisions, which are generally supported by the aquaculture industry, are currently under appeal.

> Coastal occupation charges could be used to help fund state of the marine environment reporting and marine restoration of the Marlborough Sounds and in this way the aquaculture industry (and other users of the Sounds) could play their part in funding its restoration.

4.6 Settlements and shipping

The Marlborough Sounds has a relatively small and stable population. There are two settlements at Picton and Havelock and houses dotted

around the many bays in the wider Sounds. Around half of the houses outside the main settlements are holiday homes.[60]

> "Not many people live and work in the Sounds anymore, we are thin on the ground." (Local resident)

Picton

Picton at the head of Tōtaranui / Queen Charlotte Sound has been an active settlement since 1854. Along with nearby Waikawa it now has a population of around 4,790. Its economy is mainly based on port services (focused around the Cook Strait ferry terminal) and tourism. Picton's coastal frontage has been significantly impacted by reclamation, dredging and port development including at nearby Shakespeare Bay where a large deepwater wharf has been established for log exports and large cruise ships.

Waikawa, located in the neighbouring inlet, has in recent years become more popular for residents with new development occurring on the erosion-prone hills. As a local resident told us "in the old days people built on easy sites but now they are building on slopes. Waikawa is yellow from clay and there is a housing development on the hill where it is coming from." The development of the 600 berth Waikawa marina, in the early 1980s, impacted shellfish beds in Waikawa estuary. The recent expansion of the marina, to accommodate a further 251 berths, has exacerbated the damage.[61]

Havelock

Havelock township, at the head of Te Hoiere / Pelorus Sound, was established in 1860. It developed as a service centre for goldmining and then for milling and the shipping of timber.[62] More recently, Havelock has become a service centre for the aquaculture industry and it also provides for tourism. The township has a small a population of around 588.[63]

The development of Havelock as a port (and subsequent marina) has also significantly impacted the marine area. Since 1910, the Havelock estuary has been successively dredged to create, widen and deepen shipping channels. Spoil from dredging has been dumped at the north-eastern end of the harbour break wall creating an artificial island.[64] The invasive wetland plant *Spartina,* was planted in 1948 and 1952, to stabilise sediment coming down the river, and reduce infilling of shipping channels.

Port Marlborough, which is wholly owned by the Marlborough District Council, operates the Picton, Shakespeare Bay and Havelock port facilities

Waikawa showing houses built on the steep slopes

as well as the marinas at Waikawa (the largest in the South Island), Picton and Havelock. It is the country's largest marina operator outside Auckland, catering for over 2,000 vessels in marina berths, boatsheds and secure compound parking. In the 2023 year, Port Marlborough paid the Council a dividend of $4.4 million.[65]

The development of settlements and ports in the Marlborough Sounds has physically impacted the adjacent marine area. The small resident population makes funding of marine restoration efforts difficult without support from other non-resident users of the area.

Cook Strait ferries

Since 1962, Kura Te Au / Tory Channel and Tōtaranui / Queen Charlotte Sound have been used as part of the national roll-on roll-off passenger, vehicle and rail ferry service between Wellington and Picton. Up to 1.2 million passengers travel on the Cook Strait ferries each year.[66] Until the mid 1990s, the ferries travelled at a relatively sedate speed of around 14 to 18 knots. However, five high speed ferries started using the route over the summer of 1994-95, travelling at speeds of up to 42 knots, and crossing the Strait in less than two hours.[67]

The effects of the much higher speed, and consequent larger wake, was immediately apparent to local residents. Sand was stripped off beaches, along with pipi and cockle beds, and sediment dumped on nearby reef systems. Wharves and other infrastructure associated with the houses dotted along the coast were smashed.[68] This prompted the formation of the 'Guardians of the Sounds' by a group of concerned Tōtaranui / Queen Charlotte Sound residents. Supported by DOC and Te Ātiawa (but notably not the Council), the Guardians sought an injunction in the Environment Court to slow the ferries down. This failed, when in 1995, the Court determined that any damage to the foreshore was not significant on the basis that a "new equilibrium" had been established with any changes to the shoreline being small, self-balancing and reversible.[69]

It was another five years before the Council took action when, in 2000, it introduced a Navigation Bylaw to reduce the speed of large vessels to a maximum of 18 knots. The fast ferries stopped operating and there was a "dramatic recovery of biological communities at impact intertidal and subtidal cobble-small boulder shore as well as intertidal and shallow subtidal bedrock shores". [70] With the Cook Strait ferries now up for replacement, it is not clear what speeds and consequent wake will be contemplated in the future.

A large number of ferry passengers use the Marlborough Sounds each year. They could contribute to marine restoration efforts through a small 'Marlborough Sounds Restoration Levy' on fares. For example, a levy of just $1 per person would raise over $1 million per year. With passenger fares of around $80 per one-way trip this would represent just a 1-2% increase in the cost of the fare.

4.7 Tourism

Tourism is the fourth largest GDP contributor to the Marlborough district behind viticulture, marine farming and forestry.[71] Marine tourism in the Marlborough Sounds primarily consists of a small number of boat-based tours. These include 'mail runs' where tourists accompany boats delivering mail and supplies to homes, baches and lodges dotted along the Sounds, wine and seafood cruises, and destination cruises to places such as Meretoto / Ships Cove and Motuara Island in Tōtaranui / Queen Charlotte Sound.

There are also guided kayak cruises, diving and wildlife viewing, as well as swimming with dolphins, with hectors, bottlenose and dusky dolphins commonly encountered.[72] We were told by one concerned tourism operator, who took guests out to see Hector's dolphins, that there was only one pod of around 20 left in the Sounds:

> They used to be everywhere and everywhere we went they followed. Hector's dolphins are displaced now. They have gone to places they have never been seen before. Tourism has displaced this taonga species.

Some cruises link with the popular Queen Charlotte Track which runs some 73 km from Anakiwa to Meretoto / Ships Cove. Boats pick up and drop off trampers from the various bays along the track. The track was opened in 1991, and as well as utilising public land, it crosses 10 private properties and Māori trust land. There are also several commercial lodges in the Sounds, including Punga Cove Resort and Furneaux Lodge in Endeavour Inlet, which link to water transport.

More recently, the Burkhart family (which has long operated a live rock lobster export business from Ward) has purchased the Marlborough Tour Company which operates the Cougar Line, Pelorus Mail Boat, Punga Cove Resort, Furneaux Lodge and Wilderness Guides and is now the largest marine-based tourism operator in the Sounds.[73]

Cruise ships

The Marlborough Sounds is a popular destination for cruise ships with 47 visiting during the 2022-23 year and 55 (carrying 100,859 passengers and 43,875 crew) over the 2023-2024 summer, the highest on record. 52 visits are scheduled for 2024-25.[74]

Given their high usage of the Marlborough Sounds, there may also be potential for the cruise ship industry to contribute to the restoration of the Sounds through a 'Marlborough Sounds Restoration Fee'.

This could be modelled on the Environment Southland scheme where cruise ships entering Fiordland and Stewart Island are charged a marine fee as set out in a Deed of Agreement between cruise ship operators and Environment Southland.[75] It is based on the gross tonnage of each cruise ship (gross tonnage x 0.385 cents). During the 2022-23 year the marine fee generated $2.2 million[76] and this has been sufficient to cover the council's total expenditure on coastal management.

Destination management plan

In 2021, Urlich et al undertook research into the future of tourism in Tōtaranui / Queen Charlotte Sound, in light of the opportunity that Covid-19 related border closures provided to reset the tourism industry. The focus was on scoping a destination management plan to support the regeneration and rehabilitation of the Sounds. The research included 12 interviews with tangata whenua, DOC, Marlborough District Council, Destination Marlborough, tourism providers and residents.[77]

The work built on the 2020 Te Tauihi Intergenerational Strategy, an initiative led by the Wakatū Incorporation.[78] Wakatū was established in 1977 to manage the Nelson Tenths land, on behalf of the Māori landholders, but it has since grown into a major regional landholder and investor in Māori businesses.[79] The Strategy is based on the over-arching vision "Tūpuna Pono" (being good ancestors) and it establishes eight intergenerational outcomes. The vision for the outcome relating to Te Taiao (the natural world) is "our relationship with the natural world is healthy". This is further explained as follows:

> Underpinning this relationship is responsibility and reciprocity, where our natural world is acknowledged as a living entity and our atua Māori. This means that the first right must be the right of nature to thrive without overuse. Any use of the environment that is granted is treated as a gift or privilege. A healthy relationship is about finding a sustainable use of our natural resources and reversing degradation that has already taken place.[80]

Urlich et al recommended the co-development of a holistic destination management plan for Tōtaranui / Queen Charlotte Sound, framed to help implement the Te Tauihu Intergenerational Strategy. Given the importance of the plan, they suggested its development should be co-led by iwi in partnership with DOC and Marlborough District Council.[81]

In their interviews, "the need to rehabilitate the Sounds" was identified as important, as was the potential for tourism to be an agent for restoration.[82] The idea of "giving back to place" also came through strongly "as not only the right thing to do, but also the responsible thing."[83] One suggestion was that tourism operators could give back to the Sounds through giving one per cent of their takings per year and putting "it into a fund so that they could help the local people and the Sounds".[84] An example of this approach is the 'birdsong levy' paid by commercial operators in the Abel Tasman National Park (see spotlight).

A spotlight on the 'Birdsong Levy'

The Abel Tasman Birdsong Trust was established in 2007 with a vision to fill the Abel Tasman National Park with birdsong once again. Funding for the Trust largely comes from local businesses who pay a 'Birdsong Levy' for each visitor they bring to the park. All the main tourism operators in the park have agreed to pay the levy including operators of boat cruises, charters, kayaks and sea shuttles.[85]

Water borne tourism operators in the Marlborough Sounds could contribute a small amount from each passenger ticket to the restoration of the Sounds marine environment. This would be in recognition of their use of, and reliance on, the marine environment. It would reflect the spirit of restorative tourism and provide tourists with confidence that their activities were making a positive contribution to the places they were visiting.

In 2022, a Destination Management Plan was completed for the entire Marlborough District, including the Sounds. It was not co-developed but was prepared by Destination Marlborough, a not-for-profit trust formed by the Marlborough District Council in 1997, and responsible for marketing Marlborough as a visitor destination.[86]

Amongst the 18 key local tourism industry strategies identified in the Plan is the "Marlborough Sounds Opportunities Project".[87] What this might consist of is left open, but the strategy may have taken inspiration from the Milford Opportunities Project which developed a vision and master plan for the future of tourism in Piopiotahi Milford Sound (see spotlight). That project came up with innovative solutions to manage demand in an over-visited site while at the same time enhancing the visitor experience, providing greater opportunities for Māori, and generating additional income for conservation activities.

Spotlight on the Milford Opportunities Project[88]

This project arose in response to significant visitor congestion within Milford Sound Piopiotahi and along the access road. Milford Sound is one of Aotearoa New Zealand's most popular visitor attractions, hosting some 870,000 visitors in 2019. It is located in Fiordland National Park and holds UNESCO World Heritage status.

A governance group was set up in 2017 to investigate how Milford Sound and the wider region should be managed for tourism. It included representatives from iwi, Southland District Council, Queenstown Lakes District Council, DOC, New Zealand Transport Agency, the Ministry of Business, Innovation and Employment (MBIE), and two tourism business operators. The governance group was led by independent chair Dr Keith Turner.

The group produced a masterplan for tourism in Milford Sound and the broader area. It sought to embed the role of Ngāi Tahu as mana whenua and Tiriti partner as well as embrace te ao Māori; protect the area; provide a world class visitor experience that enhances conservation and community (effectively regenerative tourism); provide effective, efficient, resilient and sustainable infrastructure; and provide benefits to the communities of Te Anau, Southland and Otago.

The masterplan includes several novel visitor management approaches. Control of tourist numbers visiting the Sound was to be achieved through controlling the access road. Zero emission 'hop on hop off' buses were planned to be the main transport on the road, with a park and ride system established. Most international visitors would only get access to Milford Sound via the bus system, with those in campervans only gaining access if they had a booking along the road or at Milford Lodge. Access to the road was to be via a permit system, with permits issued free to New Zealanders and at a charge to international visitors.

A fund was to be set up from the permit fees to enable investment in conservation management, infrastructure and the community. Possible projects to be funded included predator free initiatives, bird recovery, integration of culture and history, and developing tracks and pathways.

A new visitor centre and bus hub in Te Anau were also to be established to enable a stop off point before tourists head to Milford Sound. At the Sound itself, there were plans to prohibit cruise ships from entering the marine area and to remove the airport (which takes up much of the available flat land). An innovative visitor centre was planned to provide a central point for visitors to gather and gain shelter from the weather. This was to be accompanied by a new hotel and staff accommodation.

The masterplan also provided for the development of multiple experiences along the corridor between Te Anau and Milford, including shared walking and cycling trails, and enhanced accommodation. Ngāi Tahu culture and history was to be woven throughout the experience of people and place. It is not yet clear the extent to which government will support implementation of the plan.

A Marlborough Sounds Opportunities Project could be established to co-develop a visionary future for tourism in the Sounds. It could identify opportunities to enhance the visitor experience, increase iwi involvement in the industry, weave Māori history and culture into the visitor experience, and more strongly link tourism with restoration efforts on land and sea. To succeed it would need a funding source and implementation pathway.

Cruise boat docked outside Punga Cove Resort

Endnotes

1 Beaglehole H, 2022, *One hundred havens: The settlement of the Marlborough Sounds*, Massey University Press, Auckland, at 45

2 Waitangi Tribunal, 2008, *Te Tau Ihu o te Waka a Maui: Report on northern South Island claims*, Volume 1, Waitangi Tribunal, Wellington, at 169

3 Handley S, 2015, *The history of benthic change in Pelorus Sound (Te Hoiere), Marlborough*, NIWA, Nelson, at 8 and 10

4 Ibid

5 Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound / Te Hoiere*, NIWA, Hamilton, at 16

6 Loch and Fell, 1911, *Nelson Evening Mail*, Volume XLVI, 11 January, 3, cited in Handley S, 2016, *The history of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson, at 12

7 Handley S, 2015, *The history of benthic change in Pelorus Sound (Te Hoiere), Marlborough,* NIWA, Nelson, at 10

8 Beaglehole H, 2022, *One hundred havens: The settlement of the Marlborough Sounds*, Massey University Press, Auckland, at 92

9 Beggs J P, undated, Farming in Marlborough, https://www.grassland.org.nz/publications/nzgrassland_publication_1783.pdf, at 26

10 Heberley H, 1999, *Riding with whales: Stories of great Sounds women*, Cape Catley Limited, Whatamango Bay, Queen Charlotte Sound, at 219

11 Urlich S C and S J Handley, 2020, 'From "clean and green" to "brown and down": A synthesis of historical changes to biodiversity and marine ecosystems in the Marlborough Sounds, New Zealand', *Ocean and Coastal Management*, 198, 105349, at 8

12 Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound / Te Hoiere*, NIWA, Hamilton, at 21

13 Urlich S and S J Handley, 2020, 'History of pine forestry in the Pelorus / Te Hoiere catchment and the Marlborough Sounds', *New Zealand Journal of Forestry*, 65(3), 30-35, at 31-32

14 Ibid, at 32

15 Beaglehole H, 2022, *One hundred havens: The settlement of the Marlborough Sounds*, Massey University Press, Auckland, at 330

16 Ibid

17 Urlich S and S J Handley, 2020, 'History of pine forestry in the Pelorus / Te Hoiere catchment and the Marlborough Sounds', *New Zealand Journal of Forestry*, 65(3), 30-35, at 32-33

18 Ibid, at 33; Beaglehole H, 2022, *One hundred havens: The settlement of the Marlborough Sounds*, Massey University Press, Auckland, at 330

19 Urlich S C, 2015, *Mitigating fine sediment from forestry in coastal waters of the Marlborough Sounds*, MDC Technical Report 15-009, Marlborough District Council, Blenheim, at 3

20 Urlich S and S J Handley, 2020, 'History of pine forestry in the Pelorus / Te Hoiere catchment and the Marlborough Sounds', *New Zealand Journal of Forestry*, 65(3), 30-35, at 32-33

21 Manson L, 2000, *Cockle Cove: Marlborough Sounds haven for four generations*, Cape Catley Limited, Whatamango Bay, Queen Charlotte Sound, at 144-145; Beaglehole H, 2022, *One hundred havens: The settlement of the Marlborough Sounds*, Massey University Press, Auckland, at 328-330

22 Urlich S and S J Handley, 2020, 'History of pine forestry in the Pelorus / Te Hoiere catchment and the Marlborough Sounds', *New Zealand Journal of Forestry*, 65(3), 30-35, at 33

23 https://www.soundsrestoration.org.nz/wilding-pines

24 Marlborough District Council, 2023, *Annual plan 2022-23*, Marlborough District Council, Blenheim

25 Marlborough District Council, 2020, 'Marlborough regional forestry celebrates 50 years', media release, 14 December

26 Urlich S C and S J Handley, 2020, 'From "clean and green" to "brown and down": A synthesis of historical changes to biodiversity and marine ecosystems in the Marlborough Sounds, New Zealand', *Ocean and Coastal Management*, 198, 105349, at 7

27 Handley S, 2016, *History of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson, at 19-20

28 Ibid, at 15-16

29 Handley S, 2015, *The history of benthic change in Pelorus Sound (Te Hoiere), Marlborough,* NIWA, Nelson, at 18-19

30 https://www.marinefarming.co.nz

31 Dawber C, 2004, *Lines in the water: A history of greenshell mussel farming in New Zealand*, River Press, Picton, at 33 and 65

32 Toone T A, E D Benjamin, S Hadley, A Jeffs and J R Hillman, 2022, 'Expansion of shellfish aquaculture has no impact on settlement rates', *Aquaculture Environment Interactions*, 14, 135-145, at 141

33 Ibid, at 139

34 Ibid

35 Peart R, 2019, *Farming the sea: Marine aquaculture within resource management system reform*, Environmental Defence Society, Auckland, at 80-87

36 Stenton-Dozey J and N Broekhuizen, 2019, *Provision of ecological and ecosystem services by mussel farming in the Marlborough Sounds: A literature review in context of the state of the environment pre- and post-mussel farming*, NIWA, Christchurch

37 Ibid

38 Hickman R W, 1987, 'Growth potential and constraints in the New Zealand mussel farming industry', *Proceedings of the New Zealand Society of Animal Production*, 47, 131-133, at 131

39 Sanford Limited, 2019, 'Mussels get their eureka moment!', media release, 18 October

40 Haworth J, 2010, *Swimming upstream: How salmon farming developed in New Zealand*, Wily Publications, Christchurch, at 113

41 Black K D, 2013, *Scientific peer-review of monitoring results from New Zealand King Salmon farms*, SRSL, Oban, at 3 and 6

42 SLR Consulting New Zealand, 2024, *Salmon farm review – Marlborough Sounds,* SLR Consulting New Zealand, Nelson, at iii

43 New Zealand King Salmon Limited, 2024, *Annual report FY 24*, New Zealand King Salmon Limited, Nelson, at 6

44 Radio NZ, 2022, 'Marlborough Sounds salmon dying after hot summer', *Radio NZ*, 30 March

45 https://niwa.co.nz/climate-change-information-climate-solvers/climate-change-and-oceans#:~:text=Oceans%20absorb%20additional%20carbon%20dioxide%20and%20heat&text=In%20fact%2C%20more%20than%2090,start%20of%20the%20industrial%20revolution.

46 New Zealand King Salmon, 2024, *Annual report FY 24*, New Zealand King Salmon, Nelson, at 6

47 Ibid

48 Marlborough District Council, undated, *Proposed Marlborough environment plan: Aquaculture variations: Variation 1A guidance document*, Marlborough District Council, Blenheim, at 7

49 Banta W and M Gibbs, 2009, 'Factors controlling the development of the aquaculture industry in New Zealand: Legislative reform and social carrying capacity', *Coastal Management*, 37(2), 170–196

50 New Zealand King Salmon, 2024, *Annual report FY 24*, New Zealand King Salmon, Nelson, at 6

51 Marlborough District Council, undated, *Proposed Marlborough environment plan: Aquaculture variations: Variation 1 guidance document*, Marlborough District Council, Blenheim, at 9

52 Ibid

53 Ibid, at 6 and 8

54 Guy N, 2016, *Consultation proposal on potential relocation of salmon farms in the Marlborough Sounds*, cabinet paper, New Zealand Government, Wellington, at 1

55 Marlborough District Council, undated, *Proposed Marlborough environment plan: Aquaculture variations: Variation 1A guidance document*, Marlborough District Council, Blenheim, at 6

56 Marlborough District Council, 2023, *Council 18 May 2023 agenda public excluded – decision and recommendations on Variation 1*, Marlborough District Council, Blenheim

57 Proposed Marlborough Environment Plan, Chapter 13, at 64

58 Ibid, at 63

59 Ibid, at 65

60 Stats NZ 2018 Census

61 Urlich S C, E S Jorgensen, and G L Coutts , 2021, *Tourism and regenerating place: Insights from Queen Charlotte Sound / Tōtaranui*, Centre of Excellence for Sustainable Tourism Report 2021.101, Lincoln University, Lincoln, at 14

62 Handley S, 2015, *The history of benthic change in Pelorus Sound (Te Hoiere), Marlborough*, NIWA, Nelson, at 8

63 https://www.marlborough.govt.nz/about-marlborough/regional-information

64 Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound / Te Hoiere*, NIWA,

Hamilton, at 20

65 Port Marlborough, 2023, *Annual report 2023*, Port of Marlborough, Picton, at 4-5

66 Destination Marlborough, 2022, *Marlborough destination management plan*, Destination Marlborough, Blenheim, at 63

67 *New Zealand Shipping Federation of New Zealand and ors v Marlborough District Council* W38/06; and McKinnon M, 2015, 'Marlborough places - Arapawa Island to Port Underwood', Te Ara - the Encyclopedia of New Zealand, http://www.TeAra.govt.nz/en/cartoon/31841/fast-ferries

68 Handley S, 2016, *History of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson, at 47; and https://www.guardiansofthesounds.co.nz/2008/ferries/fast-ferry-debacle-in-the-queen-charlotte-sounds/

69 *New Zealand Rail v Marlborough District Council* [1995] NZRMA 357 (Environment Court); also Handley S, 2016, *History of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson, at 47

70 Handley S, 2016, *History of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson, at 47

71 Destination Marlborough, 2022, *Marlborough destination management plan*, Destination Marlborough, Blenheim, at 32

72 Cross C L, 2019, *Spatial ecology of delphinids in Queen Charlotte Sound, New Zealand: Implications for conservation management*, Doctor of Philosophy in Marine Ecology thesis, Massey University, Albany

73 Hart M, 2019, 'Owners sell remaining shares of Marlborough Tour Company after 25 years', *Stuff*, 4 November

74 Brew A, 2023, 'More cruise ships to visit Picton this summer brining more than good vibes', *Stuff*, 30 August; and Port Marlborough, 2024, 'Cruise season concludes', media release 30 April

75 https://www.es.govt.nz/repository/libraries/id:26gi9ayo517q9stt81sd/hierarchy/environment/maritime/cruise-ships/documents/cruise-ship-deed-of-agreement.pdf

76 Environment Southland, 2023, *Pūrongo-ā-tau annual report 2022-23*, Environment Southland, Invercargill, at 91

77 Urlich S C, E S Jorgensen and G L Coutts , 2021, *Tourism and regenerating place: Insights from Queen Charlotte Sound/Tōtaranui*, Centre of Excellence for Sustainable Tourism Report 2021/101, Lincoln University, Lincoln, at 3

78 Wakatū Incorporation, 2020, *Te Tauihi intergenerational strategy*, Wakatū Incorporation, Nelson

79 https://www.wakatu.org/growth-of-wakatu-group

80 Wakatū Incorporation, 2020, Te Tauihi intergenerational strategy, Wakatū Incorporation, Nelson, at 14

81 Urlich S C, E S Jorgensen and G L Coutts , 2021, *Tourism and regenerating place: Insights from Queen Charlotte Sound/Tōtaranui*, Centre of Excellence for Sustainable Tourism Report 2021/101, Lincoln University, Lincoln, at 3

82 Ibid, at 21 and 28

83 Ibid, at 21

84 Ibid

85 https://www.abeltasmanbirdsong.co.nz

86 https://marlboroughnz.com/about-destination-marlborough/

87 Destination Marlborough, 2022, *Marlborough destination management plan*, Destination Marlborough, Blenheim, at 104

88 Stantec and Boffa Miskell, 2021, *Milford Opportunities Project: A Masterplan for Milford Sound Piopiotahi and the journey*, Stantec and Boffa Miskell, Auckland

5 Sedimentation

Forestry harvesting near the head of Te Hoiere / Pelorus Sound

Sedimentation has long been identified as a significant driver of marine habitat loss and degradation in the Marlborough Sounds. This is particularly the case in Te Hoiere / Pelorus Sound. Some 259,000 tonnes of suspended sediment is deposited in the Havelock estuary annually.[1] Overall, the Sound "has some of the muddiest estuarine areas in New Zealand as a result of land-use practices" with sediment accumulation rates between 5 and 20 times higher than before European settlement.[2]

5.1 Impacts of sediment

Excess sedimentation is known to have profound negative effects on marine life. It smothers benthic habitats, killing and displacing filter feeders, including shellfish. It changes biogeochemical gradients affecting benthic microalgae (including those which scallops feed on). It clogs the feeding parts of filter feeders and the gills of fish, impedes the ability of fish to find food, and causes chronic effects to their condition and behaviour.[3] Sedimentation also clouds the water, reducing light levels penetrating the seawater, and impeding photosynthesis by seagrass and seaweeds.[4]

The impact on marine plants is highlighted by the loss of seagrass in the Havelock estuary, which has experienced a 10 per cent decline (3 ha) from 2014 to 2019. It now only covers two percent of the high-tide area.[5] In the Kenepuru estuary, which receives a particularly high level of sedimentation, seagrass patches were found to cover only 0.04% of the intertidal area in 2018.[6] The extensive loss of kelp forests, to which sedimentation has also significantly contributed, is discussed below.

5.2 Sources of sediment

Sedimentation in Te Hoiere / Pelorus Sound has complex sources. Sediment-laden freshwater from the Pelorus River drives fine particles of soil out into the Sound along with surface water. The composition of the clay-rich soil from the catchment means that, when mixed with seawater, the sediment flocculates (forms larger particles) which quickly drop out of the water column and deposit onto the seabed. As the surface water moves seawards, sediment is deposited along the entire length of the Sound, with particularly large quantities ending up in the Kenepuru and Mahau Sounds.[7]

Some sediment travels as far as the Chetwode Islands at the northern entrance of the Sound. As well as receiving sediment from the catchment, the entrance also traps sediment sourced from elsewhere, which is transported into the Sound along with seawater from Cook Strait.[8]

Accompanying this seaward trajectory of sediment in the surface water, is a contra flow of bottom water, which travels from the entrance of the Sound back towards its head. This bottom water also carries sediment, including catchment-derived sediment which has been previously deposited on the seafloor, but has subsequently been resuspended into the water column. Resuspension occurs through the action of currents and swells on the seabed but also likely through the impacts of bottom trawling and dredging. Such mechanical disturbance directly propels sediment up into the water column, where it disperses, but also breaks up any natural structure that serves to reduce the amount of sediment being resuspended through natural water movement.[9]

"Disturbance and resuspension of legacy sediment in the outer Pelorus Sound by tidal currents and/or waves is highly likely to be exacerbated by fishing activities associated with scallop dredging and, less frequent, bottom trawling."[10]

The extent of this inward transport of sediment was highlighted by the finding that in Mahau Sound (located in the inner Sound), 70 per cent of the sediment on the seafloor has a marine signature (meaning that it is composed of sediment transported back into the inner Sound), and only 30 percent is directly derived from the catchment.[11] An earlier study of Beatrix Bay found that up to 90 per cent of sediment had been resuspended.[12]

The source of the *catchment-derived* portion of the sediment was investigated by analysing the composition of sediment deposited in the Havelock estuary at the mouth of the Pelorus River. This found that, on average, 55 per cent was sourced from streambank erosion and subsoil (released primarily by slips), 23 per cent from dairy pasture and 18 per cent from harvested pines. Native forest and kanuka scrub contributed just 6 percent.[13]

One key source of streambank erosion is likely the operation of dairy farms. For example, during the 2000's, the number of cow movements across the Rai River was calculated as 3 million per dairy season. Through the efforts of Marlborough District Council, to phase out direct stream crossings, these have now been reduced from 149 (in 2002) to 13 in 2018. More recent fencing off of waterways, by dairy farmers, may have served to further reduce streambank erosion.[14]

Subsoils in the Marlborough Sounds are particularly susceptible to erosion because a shallow soil mantle sits over heavily weathered rocks which can slip under high rainfall. The subsoil is more erodible than the upper soil levels and is particularly vulnerable to road and track construction which dig deeply into the land.[15]

Given that harvested pine accounts for only 1.8 per cent of the catchment land use (and native forest 72 percent) it is clear that harvested pine contributes a disproportionately high amount of sediment per hectare of land use (being 190 times more than indigenous forest). It is also likely that part of the subsoil source of sediment is from harvested pine, including slips from areas of bare soil and forestry roads.[16]

Public roads can also significantly contribute to subsoil erosion as highlighted by the estimated 67,000 m^3 of soils and subsoils that eroded from slips along a 21 km section of the Picton to Linkwater road between 1985 and 2010.[17]

Forestry harvesting in the Marlborough Sounds proper (as opposed to the Te Hoiere / Pelorus catchment) has more directly impacted the marine area. For example, Hitaua Bay in Kura Te Au / Tory Channel was described as a "relatively high quality intertidal and shallow subtidal environment rare in the Marlborough Sounds" in 2003. But by 2015, the estuary was covered in fine sediment, thought to have originated from a slip associated with forestry earthworks in 2012.[18]

Scientists undertaking a marine survey of Tōtaranui / Queen Charlotte Sound found that the seafloor at Fitzgerald Bay (at the entrance to East Bay), which was exposed to moderate surface currents and therefore was a place where sediment would not usually settle, was heavily blanketed with fine sediment including on the deep reef systems. This had either killed or seriously impacted sponges, hydroids, Galeolaria tubes and dog cockles. When investigating potential sources of sediment, it transpired that the marine area was directly below a large block of exotic forest where some areas on steep slopes had been harvested.[19]

The impact of forestry harvesting in the Sounds was further highlighted in the wake of severe floods in July 2021. Nearly 4,000 landslides were mapped after the storms, of which 35 per cent occurred in exotic plantation forests, and 29 per cent in harvested exotic forests. This means that 64 per cent of the landslides occurred on land used for exotic plantation forestry when that land use made up only around 18 per cent of land cover.[20]

5.3 Regulatory response

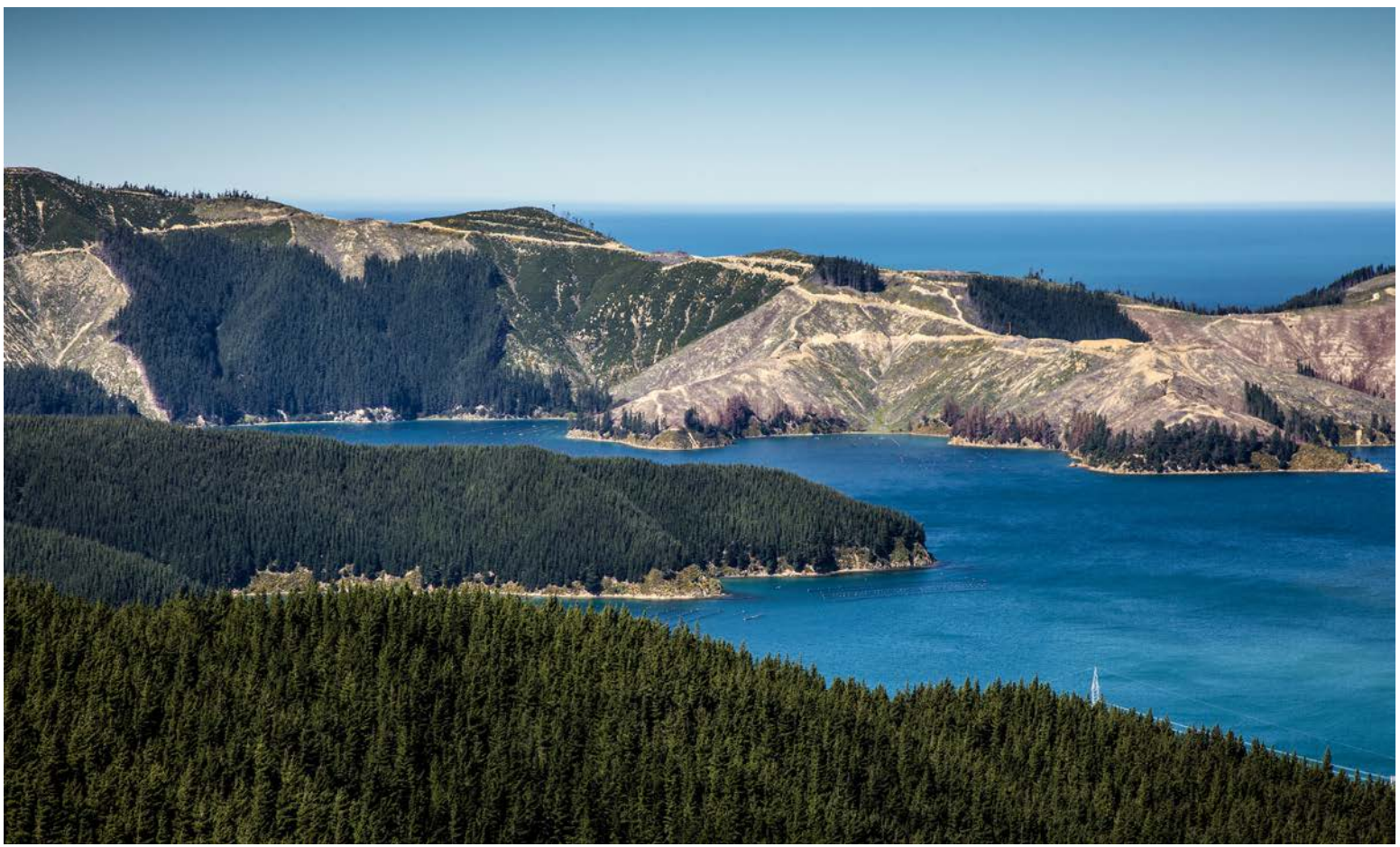
"Even when councils had funded, or had access to, many scientific studies on forestry-laden debris flows on steep convergent landforms, stringency was not exercised in erosion-prone catchments, such as in Marlborough."[21]

Marlborough District Council has gathered a wealth of information about sedimentation in the Marlborough Sounds, including on its extent, potential sources, impacts and potential responses. This has been well documented in an extensive series of reports which dwarf the amount of action taken in response. (see Figure 5.1).

Date	Title	Description
Feb 2015	The history of benthic change in Pelorus Sound (Te Hoiere), Marlborough (report prepared for Council)	Prepared by NIWA. Reviews historic changes to the seabed in Te Hoiere / Pelorus Sound including increased sedimentation from changing land use over time.
Nov 2015	Mitigating fine sediment from forestry in coastal waters of the Marlborough Sounds (MDC technical report No: 15-009)	Prepared by Council coastal scientist. Discusses a number of options to reduce transfer of fine sediment from forestry harvesting into the marine area
Mar 2016	History of benthic change in Queen Charlotte Sound / Tōtaranui, Marlborough (report prepared for Council)	Prepared by NIWA. Documents historical changes to benthic habitats in Tōtaranui / Queen Charlotte Sound including through accelerated sediment
Sep 2016	Proposed Marlborough Environment Plan notified	Commercial forestry planting and harvesting a permitted activity in the Rural Zone (subject to standards); restricted discretionary in the Coastal Environment Zone
Apr 2017	A 1,000 year history of seabed change in Pelorus Sound / Te Hoiere, Marlborough (report prepared for Council)	Prepared by NIWA. Focuses on the sources of sediment in the inner Te Hoiere / Pelorus Sound, changes over time, and impacts on shellfish communities
May 2018	National Environmental Standards for Plantation Forestry comes into effect	Most commercial forestry activities permitted. More stringent rules allowed for significant natural areas, outstanding natural features and landscapes, specified geological areas and sensitive receiving environments, or to give effect to policies 11, 13, 15 and 22 of the New Zealand Coastal Policy Statement or National Policy Statement for Freshwater Management
Feb 2020	Council issues decisions on the proposed Marlborough Environment Plan	Commercial forestry planting and harvesting still a permitted activity in the Rural Zone (subject to standards); greater setback of 200 m from the coastal marine area for replanting
Oct 2020	Significant marine site survey and monitoring programme: most recent summary report for 2019-2020 (report prepared for Council)	Prepared by Davidson Environmental Limited. Latest report from monitoring since 2014. Describes state of significant marine sites and impacts on them. For example, 2018-19 report describes impacts of large sedimentation event on Hitaua Bay; 2019-20 report records presence of sediment on subtidal seagrass in the Tory Channel.
May 2021	The Marlborough Coastal Marine Area: Environmental issues and scientific information needs for environmental management (report prepared for Council)	Prepared by Pisces Consulting. Includes a chapter on sediment
Sep 2021	Sources of fine sediment and contribution to sedimentation in the inner Pelorus / Te Hoiere (report prepared for Council)	Prepared by NIWA. Aimed to improve understanding of sources of sediment in the inner Te Hoiere / Pelorus Sound through a sediment tracing technique

Date	Title	Description
Nov 2023	National Environmental Standards for Commercial Forestry come into effect	Replaces the National Environmental Standards for Plantation Forestry and amends some of its provisions to provide for permanent carbon forests and stronger controls over slash removal
Nov 2023	Habitat use and the impact of multiple stressors on blue cod populations off Canterbury and in the Marlborough Sounds (report prepared for Fisheries NZ)	Prepared by NIWA. Aimed to identify environmental stressors on blue cod habitat. Found the abundance of juvenile cod was negatively related to increasing turbidity of seawater
Jul 2024	Cumulative effects of stressors on scallops and scallop habitats in the Marlborough Sounds (report prepared for Fisheries NZ)	Prepared by NIWA. Aimed to improve understanding of the multiple stressors on scallop populations in the Sounds. Highlights sediment as being one of the key drivers in the decline of scallops

Figure 5.1: Reports and regulatory action relevant to sedimentation in the Marlborough Sounds



Exotic forestry at Te Whanganui / Port Underwood

The November 2015 report noted that plantation forestry, a significant contributor to sedimentation, was currently a permitted activity in most of the Sounds and there was no setback from the shoreline for replanting. It also noted that the permitted standards for land disturbance have "been unsuccessful in preventing large pulses of sediment from entering coastal waters, and resulting in the smothering of benthic habitats".[22] As we were told by a local resident:

> The logging methods are bad. They bulldoze roads and haul the logs out over the ground and create silt … after the logs are gone there are 20 tracks left across the hill. The council requires culverts but there is no follow-up. No-one goes back and the culverts fill up and tracks get scowed out. There is no maintenance.

This lenient approach was maintained for rural areas in the Proposed Marlborough Environment Plan (notified in September 2016) where commercial forestry planting and harvesting was a permitted activity. The status was confirmed in Council decisions on submissions. However, more positively, the Council applied somewhat stricter rules in the coastal environment where forests were being clear-felled directly above the sea.

The notified version of the proposed plan provided a permitted activity status for replanting in the coastal environment outside 30 m of the coastal marine area (where it was discretionary). Forestry harvesting was a restricted discretionary activity with the Council having discretion over managing the effects of sedimentation, as well as effects on the Sounds high amenity and outstanding natural features and landscapes. This will enable Council to control the amount of clear-fell harvesting taking place at any one time in these areas and therefore the spatial extent of the 'window of vulnerability'.

In response to submissions by DOC and others, the Council's decision on submissions provided that commercial forestry replanting is now a controlled activity between 30 and 200 metres of the coastal marine area, which is a positive move. Although consent must be granted, conditions can be imposed. However, this does not address the impacts of forestry in the Te Hoiere /Pelorus catchment (outside the coastal environment), which is a significant sediment source for the Sounds, and where replanting and harvesting are still permitted activities.

The Council's approach is likely a response to national regulation on forestry. The National Environment Standards for Commercial Forestry 2017[23] provide that replanting of plantation forests is a permitted activity nationwide, as are earthworks, so long as specified regulations are complied with. Most of the steep land in the Marlborough Sounds has been classified 'orange', and although this is identified as having a high erosion susceptibility rating, the regulations prescribe that harvesting must be permitted in these areas also.[24] In fact, Marlborough has a greater proportion of its plantation forestry area in the high or very high susceptibility class (at 49.8%) than any other region in the country apart from Gisborne (which has 67.2%).[25]

So, from the outset, it looks like the Marlborough District Council's hands are tied. However, there is currently provision for councils to adopt more stringent rules to give effect to policies 11, 13, 15 and 22 of the New Zealand Coastal Policy Statement (amongst other things).[26] Policy 11 addresses the protection of indigenous biological diversity in the coastal environment, such as ecologically significant marine habitats, and avoidance of adverse effects on them. Policy 22 addresses sedimentation and specifically requires councils to "control the impacts of vegetation removal on sedimentation including the impacts of harvesting plantation forestry".

Council has used these policies to apply stringency within the coastal environment (ie wider setbacks and restricted discretionary activity for harvesting). But both these policies also provide scope to apply stringency to rules controlling forestry harvesting outside the coastal environment but within catchments that impact on it.[27] The future of these stringency provisions is somewhat uncertain, as the Minister of Forestry recently announced proposals to amend the National Environmental Standards for Commercial Forestry.[28]

Under current national rules, Council could exercise stringency to place stricter controls on forestry harvesting in Te Hoiere / Pelorus Sound catchment in order to reduce its contribution to excess sedimentation in the marine area. Frequent compliance inspections for forestry harvesting operations, and track, road and culvert maintenance, may also need to be prioritised.

Endnotes

1 Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound / Te Hoiere*, NIWA, Hamilton, at 13

2 Giles H, 2021, *The Marlborough coastal marine area: Environmental issues and scientific information needs for environmental management*, Pisces Consulting Limited, Hamilton, at 7

3 Urlich S C, 2015, *Mitigating fine sediment from forestry in coastal waters of the Marlborough Sounds*, MDC Technical Report 15-009, Marlborough District Council, Blenheim, at 5

4 Ibid

5 Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound / Te Hoiere*, NIWA, Hamilton, at 90

6 SLR Consulting NZ Limited, 2018, *Kenepuru Head estuary: Broadscale habitat mapping*, SLR Consulting NZ Limited, Nelson, at 24

7 Hanley S, M Gibbs, A Swales, G Olsen, R Ovenden and A Bradley, 2017, *A 1,000 year history of seabed change in Pelorus / Te Hoiere, Marlborough*, NIWA, Nelson, at 109

8 Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound / Te Hoiere*, NIWA, Hamilton, at 23-24

9 Ibid, at 92

10 Ibid, at 88

11 Ibid, at 24 and 71

12 Gibbs M M, 2001, 'Sediment, suspension, and resuspension in Tasman Bay and Beatrix Bay, New Zealand, two contrasting coastal environments which thermally stratify in summer', *New Zealand Journal of Marine and Freshwater Research*, 35, 951-970

13 Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound / Te Hoiere*, NIWA, Hamilton, at 84

14 Ibid, at 21

15 Urlich S C, 2015, *Mitigating fine sediment from forestry in coastal waters of the Marlborough Sounds*, MDC Technical Report 15-009, Marlborough District Council, Blenheim

16 Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound / Te Hoiere*, NIWA, Hamilton, at 86-87

17 Ibid, at 93

18 Urlich S C, 2015, *Mitigating fine sediment from forestry in coastal waters of the Marlborough Sounds*, MDC Technical Report 15-009, Marlborough District Council, Blenheim, at 5

19 Anderson T, R Stewart, R D'Archino, J Stead and N Eton, 2020, *Life on the seafloor in Queen Charlotte Sound, Tory Channel and adjacent Cook Strait*, NIWA, Wellington, at 283

20 Rosser B J, A Wolter, A F Boyes, S L Lin, J Farr, E Chen, D B Townsend and K E Jones, 2023, *Phase II: Remote mapping of landslides triggered by the July 2021 and August 2022 Marlborough storms, and selected field investigations of landslide impact*, GNS Science, Lower Hutt, at 15

21 Urlich S C and M N Hanifiyani, 2024, 'A stringent failure; Regulators do not use available tools to protect aquatic ecosystems from clearcut forestry impacts in New Zealand', *Journal of Environmental Management*, 370, online, at 10

22 Urlich S C, 2015, *Mitigating fine sediment from forestry in coastal waters of the Marlborough Sounds*, MDC Technical Report 15-009, Marlborough District Council, Blenheim, at 4

23 Resource Management (National Environmental Standards for Commercial Forestry) Regulations 2017

24 Regulation 63, Resource Management (National Environmental Standards for Commercial Forestry) Regulations 2017

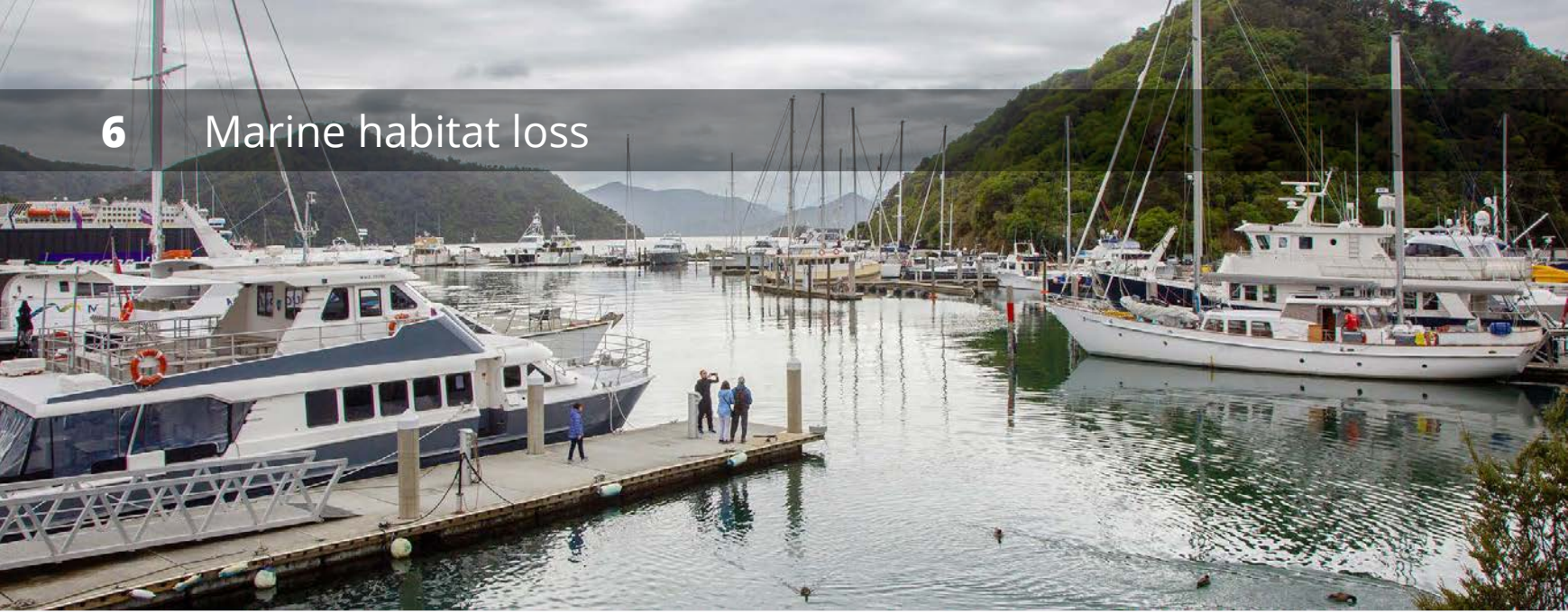
25 Urlich S C and M N Hanifiyani, 2024, 'A stringent failure: Regulators do not use available tools to protect aquatic ecosystems from clearcut forestry impacts in New Zealand', *Journal of Environmental Management*, 370, online, at 3

26 Regulation 6(1)(b), Resource Management (National Environmental Standards for Commercial Forestry) Regulations 2017

27 See Department of Conservation, 2018, *NZCPS 2010 guidance note Policy 22: Sedimentation*, Department of Conservation, Wellington, at 21

28 McClay T, 2024, Resource management reform to make forestry rules clearer, media release, 5 September

6 Marine habitat loss



Picton marina where Mediterranean fanworm has been found

"Habitat is more important than species … if there is no jungle there are no jungle animals." (Local resident)

In this chapter we explore two elements of habitat loss, the impacts of benthic-disturbing fishing gear and loss of kelp forest. Invasive marine species are also impacting marine habitats in the Sounds including the seaweed *Undaria pinnatifida* (which has been in the Sounds since the early 1990s), the clubbed tunicate *Styela clava* which is now well established in Picton and Waikawa, and the Mediterranean fanworm (*Sabella spallanzanii*) which has been found in Picton Marina (but has not yet established in the area).

6.1 Benthic disturbance

There is strong evidence to indicate that bottom trawling and scallop dredging have had a profound impact on the benthic habitats of the Marlborough Sounds. As well as the potential impacts from sediment resuspension described in section 5 above, these activities physically remove, crush and smother species living on the seafloor, as well as change the chemistry and composition of the seafloor substrate itself. Affected species include habitat-forming organisms that create homes for other forms of marine life, and facilitate larvae settlement and juvenile recruitment, thereby supporting fish stocks. We profile just two of these habitat types below.

"… benthic trawling for demersal fish and dredging for shellfish … are generally considered to have … destroyed most of the biogenic reefs which included algae meadows, rhodolith reefs, bryozoan thickets, calcareous tubeworm mounds and shellfish beds, in both Pelorus and Queen Charlotte Sound."[1]

Loss of Galeolaria mounds

In 2018, scientists observed the extent of damage to calcareous tubeworm (Galeolaria) mounds in Tōtaranui / Queen Charlotte Sound. The tubeworms form complex three-dimensional structures that can grow to more than a metre high and several metres in diameter. "Galeolaria towers once lined the deep slopes within the Sounds, and would likely have made an enormous contribution to maintaining water quality".[2]

But there are now more damaged mounds than intact ones. Video camera footage in 2018 showed that "these areas looked like something had mechanically mowed down large areas of mounds, indicating a far more extensive disturbance to the seafloor, possibly by bottom-fishing activities, such as from recreational scallop and/or commercial scallop dredges."[3] The conclusion that this damage was most likely caused by dredging was further supported by the mounds on rocky reefs, which could not be accessed by dredges, being largely intact. Several damaged sites were also close to known scallop beds.[4]

Loss of these habitats will have affected the wide assortment of species, including notable numbers of fish, that inhabit the mounds. It will also have contributed to the significant decline in water quality in the Sound. Large beds of filter-feeding organisms can decrease water turbidity (thereby increasing light penetration and the ability of seaweeds to grow), recycle nutrients and reduce eutrophication.[5] Recovery will likely be slow, as it takes up to nine years to re-establish a colony, and 50 years to create large mounds which are only produced after many generations of worms have built on top of each other.[6]

To support the future health and productivity of the Sounds, it is important that remaining Galeolaria mounds are protected from further damage, as well as areas where there is potential for future recovery.

Loss of bryozoan beds

The area colloquially known as the 'Duck Pond', a large bank around 9 km long and 4-5 km wide lying across the entrance to Tōtaranui / Queen Charlotte Sound, was most likely once covered in extensive bryozoan reefs (coral-like thickets) and horse mussel beds. Today, there are only relic patches of reef remaining, largely confined to the outer slopes or within deep channels.[7] These are areas which are less accessible to dredges and trawls and act as natural refuges.

Bottom trawling for blue cod likely occurred on the Duck Pond prior to the 1990s[8] and there have been decades of scallop dredging since that time. Such activities "would not enable these types of fragile habitats and communities to persist in those areas."[9] Recovery of the reefs will likely take some decades, and will be less likely where reef structure and horse mussels are no longer present.[10]

"The loss of these complex bry[ozoan]-reefs from across the upper sections [of the] Bank would likely have major consequences for the associated biodiversity, and for the recruitment of juvenile cod."[11]

Long-time residents of the Sounds have reported that the Duck Pond was renowned for juvenile blue cod.[12] This observation was supported by a 2018 video survey of the area which found the most common species seen amongst the remnant patch reefs to be blue cod. There were notable numbers of newly settled cod as well as large juveniles and subadults. This indicates that the area still provides important nursery habitat for the blue cod population of Tōtaranui / Queen Charlotte Sound.[13] It is therefore a "habitat of particular significance for fisheries management" to be protected under section 9(c) of the Fisheries Act 1996.

Given that trawling is no longer permitted in the Sound, the most significant threat to the recovery of the bryozoan beds on the Duck Pond is the reopening of a scallop dredge fishery there. But trawling is impacting bryozoan beds elsewhere. When surveying the area of Cook Strait adjacent to Tōtaranui / Queen Charlotte Sound, scientists reported that trawling was an "important factor" in the presence of "high amounts of relic bryozoan rubble" whereas "live reef-building bryozoa (including fine-branching species) were only recorded in very low amounts". They concluded that high-current slopes would have likely supported extensive and structurally complex bryozoan colonies prior to trawling impacts.[14]

It is important that remaining bryozoan beds in the Marlborough Sounds are protected as required under section 9(c) of the Fisheries Act. Given their significance for blue cod recruitment, reinstatement and expansion of the beds should also be supported where-ever possible to support the recovery of that fishery.

Most of the kelp forests in the Marlborough Sounds have been lost

6.2 Loss of kelp forest

"Kelp forests represent some of the most productive and diverse habitats on earth."[15]

Long time resident and paua fisherman David Baker has recounted that when he first arrived at Cape Jackson, in 1965, the outer Sounds was a pristine marine environment. A decade later he noted a decline in macrocystis (bladder kelp) and other large kelp species around Blumine Island and the Pickersgill area (on the east side of outer Tōtaranui / Queen Charlotte Sound). He observed further losses between 1980 and 1990 in the inner parts of the Sounds. Between 1990 and 2000 he noted that almost all the macrocystis had gone from the inner Sounds, except for areas with good tidal flow, and there was continued loss in the outer Sounds. This all coincided with a decline of recruitment into the pāua fishery (see section 7 below).[16]

Although some kelp forests still persist on the exposed coasts, near the entrance of Totaranui / Queen Charlotte Sound, and in Kura Te Au / Tory Channel, 'kina barrens' have become a predominant habitat type on reefs within the Sound. As a 2018 benthic survey recorded, "reefs within QCS [Queen Charlotte Sound] were mostly devoid of fleshy macroalgae … with kina-barrens being the most common and widespread shallow reef-type within QCS in depth <20m".[17] Kina barrens were also observed in Kura Te Au / Tory Channel on the mid-upper slopes along both sides of the inner, mid and outer channel. More extensive kina barrens were observed close to the entrance and they were most prevalent at depths of 15-20 m.[18]

"80 per cent of the seabed is dead in Queen Charlotte Sound. There is little seaweed left." (Local resident)

Kelp plays a critical role in the marine ecosystem. It supports popular harvested species such as pāua, kina, moki, snapper, rock lobster, blue cod and butterfish.[19] Kelp forests are 'ecosystem engineers', altering the environment and resources available to other marine organisms, and playing a crucial role in the healthy functioning of ecosystems.

For a start, they support greater biodiversity and recruitment by increasing the volume and complexity of three-dimensional habitat.[20] But even more importantly, kelp forests provide a significant proportion of the primary production available at the base of the food web. Their photosynthesis-derived food source is eaten by herbivore reef fish and invertebrate grazers, which are in turn eaten by larger fish. In a healthy coastal marine system, kelp forests likely provide around half the organic matter entering the food web, with phytoplankton production providing the other half.

Where kelp has been lost, the food web is much more reliant on a single source (phytoplankton), which is more seasonably variable and very dependant on weather patterns.[21] This means a marine environment which has lost much of its kelp forest will be less resilient to other stressors. Climate change will likely make things worse, as it can increase the variability of nutrient upwellings, and therefore the quantity of phytoplankton production each season.

The health and abundance of fisheries is positively related to the extent of kelp forest.[22] For example, scientists have attributed the supressed growth, smaller-size and lower condition of blue cod in the Marlborough Sounds (when compared with those in Fiordland) to the large-scale loss of kelp forests.[23] Much of the significant difference in reef fish biomass, between Fiordland and the Marlborough Sounds, has also been attributed to the greater amount of kelp-derived organic matter available in the fiords.[24]

"The loss of important kelp habitat has been shown to affect fish condition and growth, as well as indirectly reproduction and survival, and likely attributed to the observed slow growth and small body length of cod in the [Marborough Sounds]."[25]

Although sea water warming (see section 8 below) and sedimentation, have likely contributed to the loss of kelp forest in some areas,[26] we now know that a major cause has been a lack of sufficient predators to keep the kina (which browse on the kelp) in balance. This is evident from recent findings of experiments undertaken by Auckland University scientists in Tōtaranui / Queen Charlotte Sound, where the physical removal of kina has led to a rapid recovery of kelp. Recovery has been most marked in the removal plot subject to the greatest level of sedimentation (Motuara in the outer Sound) indicating that sedimentation is not the main cause of kelp loss, at least not in Tōtaranui / Queen Charlotte Sound.[27]

However, sediment is a significant contributor. Sedimentation stresses kelp and makes the plants more susceptible to overgrazing. This means the impact of overfishing of predators becomes more profound.[28] Large blue cod, rock lobster and snapper which prey on kina are now largely absent from the inner reef areas of the Sounds. In addition, there is evidence that chemical cues produced by rock lobster when they inhabit the reef reduce the amount of kelp consumed by kina.[29] Their removal has

destabilised the reef ecosystem, and although physical removal of kina has enabled seaweed to recover, any long-term restoration at scale will rely on the re-establishment of natural predators to bring the ecosystem back into balance.[30]

Seawater warming, sedimentation and the loss of large blue cod, rock lobster and snapper from the rocky reef systems has resulted in a loss of kelp forests in the Sounds and associated marine life and productivity. Fisheries management measures will need readjustment, along with effective sediment reduction measures, if these keystone species are to be restored in the long term.

6.3 Regulatory response

Fisheries measures

Trawling is currently prohibited throughout Tōtaranui / Queen Charlotte Sound. Commercial finfishing (including by trawl) is also prohibited in the inner Te Hoiere / Pelorus Sound (eg Kenepuru Sound, Popoure Reach and Tennyson Inlet). But trawling is still permitted in a much larger area of that Sound including Beatrix Bay, Waitata Reach, Te Anamāhanga / Port Gore and Admiralty Bay (see Figure 6.1).[31] It takes place as part of the Tasman and Golden Bays mixed trawl fishery (largely targeting flatfish, tarakihi, gurnard and snapper).[32] With the total allowable commercial catch (TACC) for SNA7 recently being increased by over 60 per cent (see below) there may be increased trawling pressure in this area.

Motueka based fishing fleet

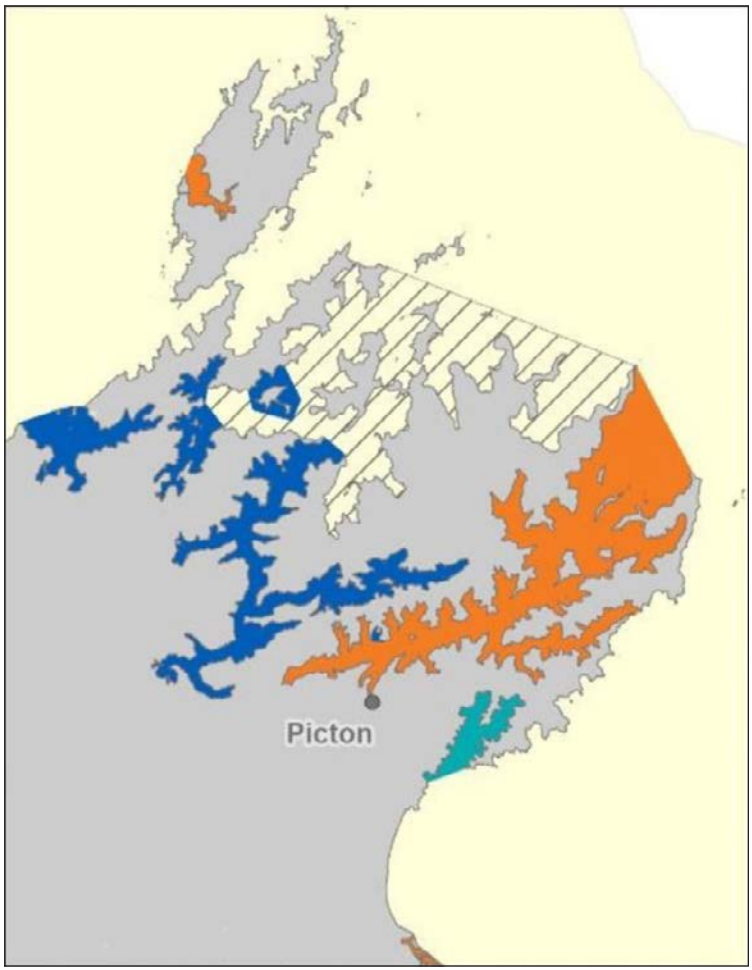


Figure 6.1 Trawling restrictions in the Marlborough Sounds
(Source: Fisheries New Zealand 2024)[33] (Orange shows a trawl net prohibition, blue shows a prohibition on commercial finfishing, green shows a prohibition on vessels longer than 20 metres, and the hatched area indicates where pair trawling is prohibited, trawling is only permitted between 1 April and 31 August, and there are some gear restrictions.)

We have been unable to identify any specific spatial fisheries restrictions for scallop dredging in the Marlborough Sounds, although the scallop fishery is currently closed due to poor stock levels, meaning that dredging is not currently occurring. Should the fishery be re-opened with the same gear settings, commercial and recreational dredging could once again take place widely throughout the Sounds.

Dredging has also been used to harvest kina in Kura Te Au / Tory Channel, a practice not used elsewhere for this species, where harvest is by free diving.[34] Dredging was resulting in a significant bycatch of seaweed, sea cucumbers, octopus and starfish which at times was of considerably larger volume than the actual kina harvested.[35] The practice was eventually banned, in October 2023, to protect the significant and highly diverse biogenic habitat and kelp beds in the area.

The 2023 ban on the use of dredging to harvest kina in Kura Te Au / Toru Channel, by the Minister of Fisheries, was in response to work undertaken by the Marlborough District Council to identify ecologically significant marine sites (see below) and which had found the area to have some of the best remaining biogenic habitat in the Marlborough Sounds.[36] This is a positive example of the Council and Fisheries NZ working constructively together to protect the health of the Marlborough Sounds marine area and something which could be further built on.

Handley (2022) has suggested that a 'just-transition' scheme could be co-created to enable commercial fishers to retire or adopt non-contact fishing methods. He proposes that "such measures could be combined with the gifting of carbon credits to offset the working of soft sediments that may contribute to the loss of organic carbon". A further suggestion is the creation of fishing zones or corridors, through spatial planning, to identify areas where it is acceptable to target soft sediment-associated species.[37]

Such an approach has been developed in the Hauraki Gulf, where 'bottom fishing access zones' have been delineated to identify places where bottom trawling and Danish seining can take place (with those fishing methods to be excluded from the rest of the Hauraki Gulf Marine Park). Four options have been consulted on[38] and await a decision of the Minister.

A transition scheme could be developed to phase out bottom trawling and dredging in the Marlborough Sounds over time.

Ecologically significant marine sites

"Ecologically significant marine sites; it's a great programme, the best in the country and well resourced." (Marine scientist)

The ecologically significant marine sites programme, which began in 2010, is led and funded by the Marlborough District Council with financial and in-kind support from DOC. In 2011, the programme released a report that identified and ranked 129 ecologically significant marine sites.[39] The

identification process drew on Council resource consenting information, a DOC study into soft sediment biogenic habitats in the Sounds, scientific papers and reports, and consultation with scientists and fishers.[40]

The seven authors of the 2011 report (brought together as an 'expert panel') developed seven criteria to assess the relative biological importance of each marine site: representativeness, rarity, diversity, distinctiveness, size, connectivity and adjacent catchment modifications.[41] Although the description of each has been tweaked over the years, these are the criteria still currently in use.[42]

A sub-set of the sites have been surveyed annually since the summer of 2014/15. The first survey in 2015, of 21 sites (and subsites) in Tōtaranui / Queen Charlotte Sound, Kura Te Au / Tory Channel and Te Anamāhanga / Port Gore, indicated that significant ecosystems were being degraded or lost at an alarming rate when compared to what was present in 2010 when Council monitoring began. It found that a net 1,318 ha of biogenic habitat, the size of Blenheim and its suburbs, had disappeared from the Sounds since the late 1980s. Nine sites, ranked as significant because of their biological values, had decreased in area by 72 per cent.[43]

The cause of the loss was trawling, dredging and sedimentation. Direct damage from regular dredging was observed between Meretoto / Ships Cove and Cannibal Cove, which resulted in physical disturbance and smothering by disturbed sediments. Recreational dredging in outer Tōtaranui / Queen Charlotte Sound was "resuspending sediment at sufficient levels to obscure the underwater camera", and anchor damage was found at Perano Shoal. In the authors' view, if these sites were not protected, they would be gradually degraded and lost.[44]

Meretoto / Ships Cove close to an area where regular scallop dredging has caused damage to ecologically significant marine sites

This was a wake up call and prompted Marlborough District Council to include protection of 44 sites from dredging and bottom trawling (as well as anchoring, deposition of material and reclamation) when its proposed Marlborough Environment Plan was notified in 2016. This was a somewhat controversial move as, at that time, exclusion of fishing methods from spatial areas had typically only been undertaken via the Fisheries Act. The provisions have been confirmed by the Council's decision on submissions.

Spotlight on protection in Marlborough Environment Plan

The Friends of Nelson Haven and Tasman Bay Inc has lodged an appeal seeking to expand the ecologically significant marine sites identified in the Marlborough Environment Plan to include all king shag breeding, roosting, feeding and foraging areas. This endemic bird species was once widespread throughout the southern North Island and northern South Island, but is now limited solely to the Marlborough Sounds area. King shag is nationally endangered, with a total population of around only 800 birds and less than 200 breeding pairs.[45] The extent of the marine sites sought to be protected include most of the Sounds apart from the inner Te Hoiere / Pelorus Sound. The appeal has yet to be heard by the Environment Court.

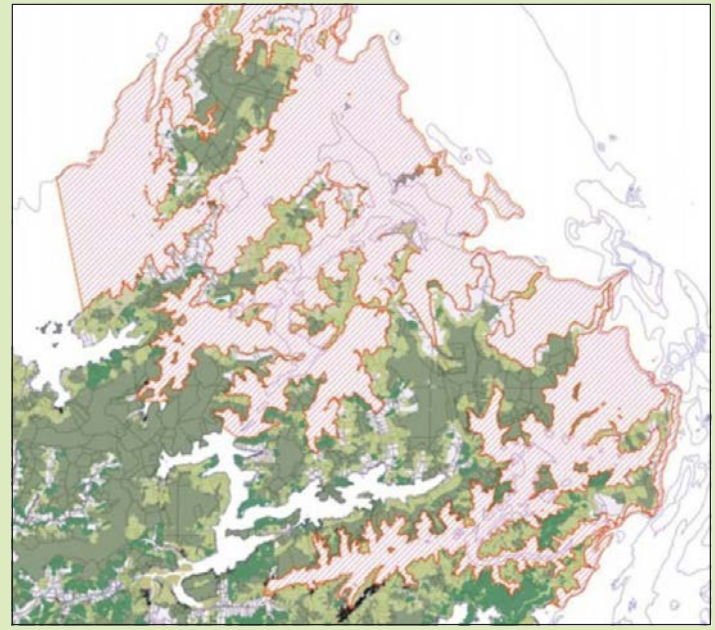


Figure 6.2: Important Bird Area where seabed protection sought
(Source: Friends of Nelson Haven and Tasman Bay Inc)[46]

Ongoing monitoring surveys (from 2016 to 2021) identified additional sites that met the criteria for biological significance, and were in need of protection, as well as boundary changes to existing protected sites. In March 2023, the Council notified Variation 2 to its proposed Marlborough Environment Plan which sought to add 64 new significant sites and adjust boundaries of 44 existing sites.[47]

Te Ātiawa lodged a submission opposing Variation 2 on the basis of cultural and commercial impacts and asked for a cultural effects assessment to be prepared. The iwi subsequently completed such an assessment (in February 2024) which concluded that the Variation would frustrate customary harvest, compromise future land access, and did not provide for effective partnership.[48] Ngāti Koata and Ngāti Toa Rangatira also lodged opposition to the proposals on the basis that tangata whenua was not sufficiently involved in the ecologically significant marine sites programme. Council notified its decision on submissions, in 3 July 2024, and essentially retained the proposals as notified with some minor changes.[49] An appeal has been lodged by a party linked to Ngāti Koata in respect of sites near Rangitoto ki te Tonga / D'Urville Island.

In the past, an iwi representative has sat on the ecologically significant marine sites expert panel, but that position currently lies vacant. One of the challenges of the programme has been to bring together the wealth of information that has been collected over more than a decade, and make it more accessible to iwi and hapū, users of the Sound and the broader public.[50] This is important as the more people understand about the special marine sites within the Sounds the more likely they are to protect them.

The ecologically significant marine sites programme has been based on a constructive partnership between Marlborough District Council and DOC with a sharing of funding, information and expertise. Although focused on discrete high value areas (the benthic 'jewels' of the Sounds), it has made a positive contribution to both public awareness of what remains (through frequent monitoring), and addressing threats to the areas through their protection. Iwi are seeking greater involvement in the programme.

Tōtaranui / Queen Charlotte Sound has many ecologically significant marine sites meriting protection

Endnotes

1 Hale R, O Lam-Gordilla, D Lohrer, J R Williams, S Handley, P Olmedo-Rojas and I Middleton, 2024, *Cumulative effects of stressors on scallops and scallop habitats in the Marlborough Sounds*, New Zealand Aquatic Environment and Biodiversity Report No 337, Fisheries New Zealand, Wellington, at 46

2 Anderson T, R Stewart, R D'Archino, J Stead and N Eton, 2020, *Life on the seafloor in Queen Charlotte Sound, Tory Channel and adjacent Cook Strait*, NIWA, Wellington, at 266

3 Ibid, at 58 and 68

4 Ibid, at 266

5 Ibid, at 267

6 Ibid, at 266

7 Ibid, at 20

8 Handley S, 2016, *History of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson, at 24

9 Anderson T, R Stewart, R D'Archino, J Stead and N Eton, 2020, *Life on the seafloor in Queen Charlotte Sound, Tory Channel and adjacent Cook Strait*, NIWA, Wellington, at 264

10 Ibid

11 Ibid, at 52

12 Ibid, at 45

13 Ibid, at 50

14 Ibid, at 286-287

15 Teagle H, S J Hawkins, P J Moore and D A Smale, 2017, 'The role of kelp species as biogenic habitat formers in coastal marine systems', *Journal of Experimental Marine Biology and Ecology*, 492, 81-98, at 81

16 Handley S, 2016, *History of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson, at 30-31

17 Anderson T, R Stewart, R D'Archino, J Stead and N Eton, 2020, *Life on the seafloor in Queen Charlotte Sound, Tory Channel and adjacent Cook Strait*, NIWA, Wellington, at 127 and 255

18 Ibid, at 174

19 Cornwall C, 2023, 'NZ's vital kelp forests are in peril from ocean warming – threatening the important species that rely on them', *The Conversation*, 12 September

20 Teagle H, S J Hawkins, P J Moore and D A Smale, 2017, 'The role of kelp species as biogenic habitat formers in coastal marine systems', *Journal of Experimental Marine Biology and Ecology*, 492, 81-98

21 Udy J A, S R Wing, S A O'Connell-Milne, L M Duratne, R M McMullin, S Kolodzey and R D Frew, 2019, 'Regional differences in supply of organic matter from kelp forests drive trophodynamics of temperate reef fish', *Marine Ecology Progress Series*, 621, 19-32, at 20-21

22 Teagle H, S J Hawkins, P J Moore and D A Smale, 2017, 'The role of kelp species as biogenic habitat formers in coastal marine systems', *Journal of Experimental Marine Biology and Ecology*, 492, 81-98

23 Kolodzey S and S R Wing, 2022, 'Life history traits vary between geographically distinct populations in a protogynous hermaphrodite', *Ecosphere*, 13:e4237, at 10

24 Udy J A, S R Wing, S A O'Connell-Milne, L M Duratne, R M McMullin, S Kolodzey and R D Frew, 2019, 'Regional differences in supply of organic matter from kelp forests drive trophodynamics of temperate reef fish', *Marine Ecology Progress Series*, 621, 19-32, at 29

25 Kolodzey S and S R Wing, 2022, 'Life history traits vary between geographically distinct populations in a protogynous hermaphrodite', *Ecosphere*, 13:e4237, at 11

26 For example, reef monitoring in Te Hoiere / Pelorus Sound since 2015 has found declines in large subtidal brown seaweed (*Carpophyllum flaxuosum*) and tubeworm (*Galeolaria*) mounds which have virtually disappeared from the area, thought likely to increases in sedimentation and/or temperature. See SLR Consulting NZ Limited, 2023, *Reef monitoring in 2022 at the New Zealand King Salmon Co. Limited high-flow farms*, SLR Consulting NZ Limited, Nelson, at 70

27 Radio NZ, 2024, 'Why removing kina is restoring the balance in marine systems', *Radio NZ*, 20 February

28 Udy J A, S R Wing, T Jowett, S A O'Connell-Milne, L M Durante, R M McMullin and S KolodZey, 2019, 'Regional differences in kelp forest interaction chains are influenced by both diffuse and localised stressor", *Ecosphere*, 10(10), at 10

29 Curtis J S and S R Wing, 2024, 'Size-specific reduction in kelp consumption by New Zealand urchins exposed to chemical cues form the red rock lobster', *Ecosphere*, 15(7), online

30 Radio NZ, 2024, 'Why removing kina is restoring the balance in marine systems', *Radio NZ*, 20 February

31 Fisheries (Challenger Area Commercial Fishing) Regulations 1986

32 Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound / Te Hoiere*, NIWA, Hamilton, at 88; Hale R, O Lam-Gordilla, D Lohrer, J R Williams, S Handley, P Olmedo-Rojas and I Middleton, 2024, *Cumulative effects of stressors on scallops and scallop habitats in the Marlborough Sounds*, New Zealand Aquatic Environment and Biodiversity Report No 337, Fisheries New Zealand, Wellington, at 26

33 See chapter 11: Benthic (seabed) impacts – technical summary, in Fisheries New Zealand, 2021, *Aquatic environment and biodiversity annual review*, Fisheries New Zealand, Wellington

34 Fisheries New Zealand, 2023, *Review of commercial kina dredging in Kura Te Au/Tory Channel, Marlborough Sounds*, Fisheries New Zealand Discussion Paper No 2023/23, Fisheries New Zealand, Wellington

35 Ibid

36 Ibid

37 Handley S, 2022, *Technical options for marine coastal habitat restoration in Te Tauihu*, NIWA, Nelson, at 86

38 Fisheries New Zealand, 2023, *Bottom fishing access zones in the Hauraki Gulf Marine Park*, Fisheries New Zealand Discussion Paper 2023/19, Fisheries New Zealand, Wellington

39 Davidson R, C Duffy, P Gaze, A Baxter, S DuFresne, S Courtney and P Hamill, 2011, *Ecologically significant marine sites in Marlborough, New Zealand*, Marlborough District Council and Department of Conservation, Blenheim

40 Ibid, at 18

41 Ibid

42 See for example Appendix 1 in Davidson R J, A Baxter, C A J Duffy, S Handley, P Gaze, S DuFresne and S Courtney, 2019, *Expert panel review of selected significant marine sites surveyed during the summer of 2019-2020*, Marlborough District Council and Department of Conservation, Blenheim

43 Davidson R J and L A Richards, 2015, *Significant marine site survey and monitoring programme: Summary 2014-15*, Davidson Environmental Limited, Nelson

44 Ibid, at 44-49

45 Bell M (ed), 2022, *Kawau pāteketeke/King shag (*Leucocarbo carunculatus*) research 2018-2022*, Toroa Consulting Limited, Blenheim, at 7

46 Friends of Nelson Haven and Tasman Bay Inc, 2020, Notice of appeal against decisions on the proposed Marlborough Environment Plan, at 23

47 Walker L and E Toy, 2022, *Section 32 report – Variation 2 – ecologically significant marine sites*, Marlborough District Council, Blenheim, at 7-8

48 Bennett J, 2024, *Cultural effects assessment: Ecologically significant marine sites (ESMS) Variation 2*, Prepared for the Marlborough District Council, Te Ātiawa o Te Waka-ā-Māui Trust, Waikawa, at 19

49 Marlborough District Council, 2024, *Decision and report: Variation 2: Ecologically significant marine sites*, Marlborough District Council, Blenheim

50 Giles H, O Wade and E Toy, 2022, *Operational review of and 5-year plan for the ecological significant marine sites (ESMS) programme (2022)*, Marlborough District Council and Pisces Consulting, Nelson and Hamilton, at 21

7 Depletion of fish stocks

Recreational boats at Waikawa Marina

In this section we track the depletion of wild green-lipped mussel, pilchard, blue cod, scallop, pāua, rock lobster, hāpuka and snapper stocks in the Marlborough Sounds. On their own, many of these stocks are in poor health but, cumulatively, the review serves to highlight the alarming decline in fish stocks in the area.

There may also be depletion of other stocks in the Sounds. We were told by recreational fishers that kahawai was once abundant, with surface schools in the Sounds, but it is now only occasionally seen and that tarakihi, which was once common in recreational catches, is now rare. Conversely fishers have observed an explosion of spiny dogfish.

7.1 Green-lipped mussels (kūtai)

In the late 1880s, there were green-lipped mussel reefs in Te Hoiere / Pelorus Sound with "apparently no end". Mussels were commonly harvested by Māori and used as koha (gifts), for funeral gatherings (tangi) and for feasting during celebrations.[1] The wild mussel population was at least 5 to 6 million prior to commercial harvesting commencing in the 1960s.[2] The spatial extent of the beds is uncertain, but has been estimated at around 350 ha of subtidal beds, and possibly a further 1,650 ha of mussels on intertidal reefs. More recently, very small mussel recruits were observed on *intertidal beds* located on rock substrate, highlighting the ecological importance of these remnant intertidal reefs.[3]

It has been postulated that the historic *subtidal* mussel beds, located on soft sediment habitats, may have established after the 1860s due to wood debris from European land clearance washing into the sea (and forming a suitable substrate for settlement). An increased supply of nutrients due to the frequent burning of vegetation and application of superphosphate fertiliser may have further supported mussel establishment. However, so far, there has not been sufficient evidence to prove or disprove this hypothesis.[4]

Commercial dredging for green-lipped mussels started in 1962, in Kenepuru Sound, where the mussels formed a thick carpet particularly in the "upper grounds". The dredges removed the 'crust' of mussels exposing the underlying muddy seafloor. Large mussels were also harvested from Forsyth Reef in the outer Sound. By 1968, up to 11 boats were dredging for the mussels, and the reefs were rapidly depleted.[5]

It was at this point that the first measure to conserve the mussel beds was put in place, apparently due to fears that the loss of mussels would affect snapper fishing, and the associated tourist trade. This indicates early appreciation of the connections between healthy benthic habitats and productive fish stocks (something that has been largely overlooked in later years of fisheries management). The area within harbour limits was closed to dredging, in 1968, with hand picking still permitted most of the year.[6]

Scientific surveys of green-lipped mussels, undertaken in 1969, recorded over 70 locations in Kenepuru Sound with harvestable quantities of mussels. Between 1968 and 1973, some 2,159 tonnes or over 4.9 million mussels were harvested from the area. The industry then rapidly declined, along with the mussel reefs, and farm grown mussels provided for market demand.[7]

These historical mussel beds have never recovered despite the cessation of dredging for over 50 years. A 2020 shoreline survey of Te Hoiere / Pelorus Sound found just 107,932 intertidal mussels, and no subtidal mussels, remaining.[8] These small, remnant wild populations are only around three per cent of their historical size.[9]

The reason for lack of recovery is not fully known. There seems to be ample spat supply so it may be related to loss of suitable substrate for mussel settlement. Mussels have two main settlement phases. In the first, young larvae exude byssal threads (strong silky protein fibres) to attach to filamentous surfaces such as hydroids and tufting algae. After the young mussels have grown in size they metamorphose into spat, drift, and then reattach within adult mussel beds or other substrate in a second settlement phase.[10]

The loss of seagrass beds in Kenepuru Sound, along with small seaweed and reef organisms more generally, may have caused a shortage of suitable settlement sites for the juvenile larvae. Increased sediment has also likely hindered recruitment and survival. In addition, there may be negative feedback mechanisms due to the overall degradation of the marine environment.[11]

> "The factors that have prevented the intrinsic recovery of mussel beds in Pelorus Sound are considered complex. They likely involve interactions and feedback between multiple factors including: historic fishing pressure reducing mussel standing stocks, acceleration of sedimentation affecting availability of nutrients, sediment attenuating light diminishing phytoplankton and seabed plant production, and sediment smothering and choking spat. These factors will be compounded by low densities of mussels and seabed plants that cannot provide positive feedback mechanisms that could enhance and reinforce wild mussel survivorship."[12]

Commercial harvest of green-lipped mussels was bought into the quota management system in 2004. A TACC of 1,500 tonnes was set for the GLM7A stock, which covers the Nelson and Marlborough Sounds area, but there have been no reported commercial landings since 2014-15 when 8.3 tonnes was landed. Despite this, the TACC has remained unchanged since 2004. An estimated 28,000 mussels were harvested by recreational fishers in 2022-23 although it is not clear where these were from. There is no stock assessment or biomass estimates for the stock.[13]

Given the lack of a commercial fishery in green-lipped mussels, the tiny proportion of historic beds which remain, and the failure of the stock to rebuild over many decades, a precautionary fisheries management approach would seem warranted. This could include reducing the TACC for GLM7A to zero (or to a minimal amount) at least until stocks have recovered. It should also include spatially protecting and regularly monitoring a network of wild intertidal mussel beds to protect source stocks for spat production and restoration efforts.

7.2 Pilchards (mohimohi)

As mentioned earlier, pilchards were once very prolific in the Marlborough Sounds. The fish were locally referred to as the 'Picton herring' or 'Picton bloater' due to their notable abundance. They play a vital role in the coastal food web, linking the primary production of phytoplankton (which they consume along with oragnic detritus and small zooplankton) to species further up the food web including kingfish, kahawai, snapper and blue cod, which consume the small fish.[14] Pilchards also create 'boil ups' when they form compact surface schools and are preyed on by marine mammals and seabirds.[15]

A small fishery in Picton supplied local smokehouses and saltworks, during the 1880s, with smoked fish sold in the North Island and exported to the Pacific Islands. After 1900, harvest of the fish declined, with its main use being groper bait. In 1942, a full scale commercial fishery developed in the Sounds, with the introduction of purse seining and establishment of a cannery. The harvest was promising in the first season, when 274 tonnes were caught, and more than 200 tonnes were harvested during the subsequent two years. Then harvests declined sharply. In 1949, only 11 tonnes were caught before the fishery closed.[16]

Pilchards in the Marlborough Sounds are managed as part of the PIL7 stock which takes in all of the top of the South Island and much of the West Coast. Since 2002, a TACC of 150 tonnes has been set for that larger area, but there has been no commercial fishery in the Sounds itself since the 1940s. There have been no stock assessments or estimates of current biomass. Large shoals of the fish, as regularly occurred in the

past, are now rarely seen in the Sounds.[17] The lack of recovery suggests an ecological tipping point has been passed, with potentially significant implications for the overall productivity of the Sounds fisheries.[18]

7.3 Blue cod (rāwaru)

Blue cod is the iconic finfish species of the Marlborough Sounds and was once plentiful. It is an important commercial species and is the most sought after recreational catch. It is also an important mahinga kai species and of cultural importance to Māori.[19] But by the 1980s, locals were struggling to catch cod, whereas previously "you could catch a decent cod in most places around Picton".[20] Figure 7.1 provides a timeline of management measures for the stock and paints a picture of long-term and ongoing decline.

Once prolific wild green-lipped mussel beds are now scarce in the Marlborough Sounds

Date	Management tools deployed
1986	Entered quota management system. TACC of 110 tonnes Recreational daily bag limit of 12 Minimum size limit of 30 cm
1987-89	TACC increased to 136 tonnes (as result of quota appeals)
1993	TACC reduced to 95 tonnes Recreational daily bag limit reduced to 10 Minimum size limit increased to 33 cm
1994	Recreational daily bag limit reduced to 6 Minimum size limit reduced to 28 cm
1995	TACC reduced to 70 tonnes
2003	Recreational daily bag limit reduced to 3 Minimum size limit increased to 30 cm
2008	Recreational fishery closed in inner Marlborough Sounds
2011	Recreational fishery reopened Recreational daily bag limit reduced to 2 Recreational slot size limit between 30 and 35 cm Recreational limit of no more then 2 hooks when fishing in Marlborough Sounds blue cod area Recreational seasonal closure from 1 September to 19 December
2015	Slot limit removed and minimum size limit of 33cm Seasonal closure applied to commercial fishers
2022	TACC reduced to 58 tonnes Stock assessed as being below target and overfishing likely

Figure 7.1: Management settings for blue cod in the Marlborough Sounds

The TACC has now been reduced by half, from 110 tonnes in 1986 (when it was first brought into the quota management system), to just 58 tonnes

in 2022. The daily bag limit for recreational fishers has also reduced from 12 to two over the same period. It has sat at two fish per person per day for over 12 years. The recreational fishery was closed for a short period in 2008, and recovered to some extent, but once it reopened the stock was quickly depleted once again.

> "The Marlborough Sounds fishery is sad. We had blue cod closures and when it opened there was a gold rush mentality with hundreds and hundreds of vessels." (Local resident)

Commercial fishers only landed 39 tonnes during the 2022-23 fishing year, the lowest commercial harvest of the stock since 2001 (see Figure 7.2). The port price in 2020/21 was reported as $7.64/kg[21] making the total value of landed fish to the harvesters last year around just $300,000. The majority of this was harvested through potting in the outer Marlborough Sounds and around Rangitoto ki te Tonga / D'Urville Island. The industry is dwindling, with only two vessels currently active (and only one of those having operated in the fishery long term).[22]

Estimates of recreational take are also low, with an estimated 30 tonnes harvested in 2023, just half of the estimated take of 63 tonnes five years earlier in 2018 (of which 56 per cent or 35 tonnes was thought to be taken in the Marlborough Sounds).[23] However, these estimates do not include incidental fishing mortality, when undersized fish are hooked by recreational fishers and then returned to the sea. Fisheries NZ reported in 2024 that "in some places considerably more fish are caught and returned than kept".[24] Anecdotally we were told this is a significant problem, with as many as 10 fish being hooked, for every two kept.

The latest stock assessment for BCO 7 does not paint a positive picture. Surveys have shown a predominance of male fish which is an indicator of high fishing pressure. When socially dominant males are harvested, the larger females become males, thereby reducing the number of reproducing females and the population's reproductive capacity. A healthy population would have roughly equal numbers of males and females but surveys in 2017 and 2021 have shown males at 72 per cent and females at just 27 per cent. Almost all harvested fish are males as few females reach harvestable size (at around six years of age) before turning male.[25]

This imbalance in sex ratios, and lack of large females, undoubtedly has a major impact on productivity. For example, it is estimated that the reproductive output of the Fiordland blue cod population (where the sex ratio is more in balance and females are larger) is 14.8 times higher than the population in the Sounds.[26]

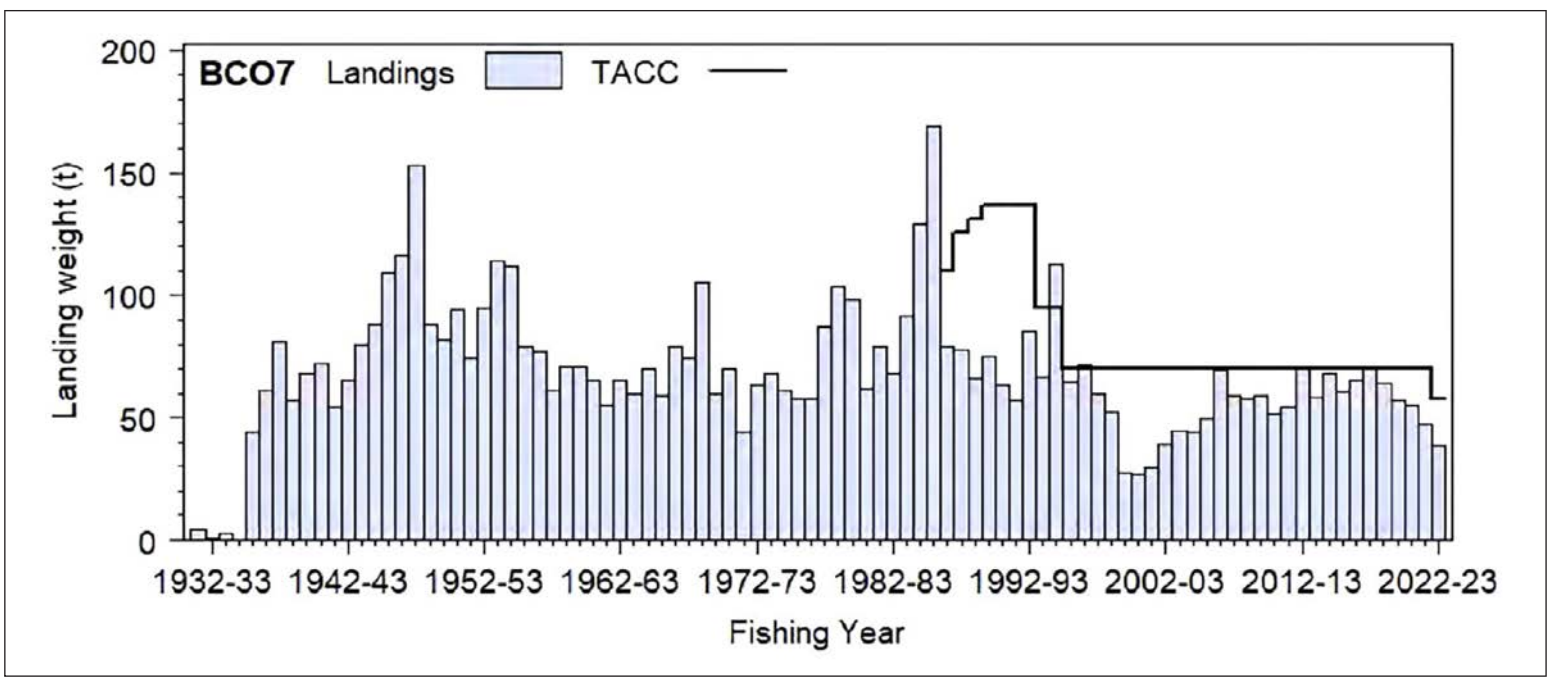


Figure 7.2 Reported commercial landings and TACC for BCO7 1932-33 to 2022-23 *(Source: Fisheries New Zealand)*[85]

The habitat necessary for blue cod juveniles to survive and recruit into the fishery is also increasingly scarce in the Sounds. In particular, juveniles are known to prefer reef margins, bryozoan thickets and cobble reef which, as discussed above, have been impacted by trawling, dredging and the positioning of marine farms.[27] Sedimentation has also had an impact, with the habitat change from rocky bottom to sandy silt, likely reducing the area suitable for blue cod. Notably, fewer juvenile cod are found in areas with muddy seawater.[28]

Blue cod has been identified as a low productivity stock and therefore the management target has been set at a level corresponding to a spawning biomass of 45 percent of B_0 (the original unharvested biomass). The current status of the stock is below this target but how much below is not known. What *is* known, is that the stock is being overfished, and biomass is expected to decrease under current management arrangements. The level of depletion is highlighted by blue cod catch rates in surveys, undertaken within the Long Island Marine Reserve (the only marine reserve in the Marlborough Sounds and covering a small area of just 619 ha), being five times higher than in fished areas.[29] Blue cod typically have a small home range, making them particularly susceptible to localised depletion, and particularly responsive to marine protection.

Fisheries NZ has established a Blue Cod Working Group to assist with the development of new management measures for BCO7. Current proposals include extending the seasonal closure and closing some areas to fishing to enhance spawning capacity.[30] Overall, a holistic and ecosystem-based approach is likely needed, which addresses both habitat loss and localised depletion.

7.4 Scallops (tipa)

Scallops are highly valued and sought after by customary, recreational and commercial fishers. They are most often found in depths of 10 to 50 metres, on shell, gravel or sand substrate, and more commonly in semi-enclosed areas where circulating currents retain larvae. They are broadcast spawners and therefore require a high density of adults for eggs to be successfully fertilised.

Scallop larvae spend about three weeks in the water column before attaching to seaweeds, hydroids and the like with fine byssus threads.[31] For example, in Te Hoiere / Pelorus Sound, they have been found attached to brown alga, red algae attached to horse mussels and drifting seagrass debris.[32] Spat are not found on bare seafloor indicating that populations of scallops require associated living shellfish and plant communities to endure.[33] There is also evidence that scallop juveniles survive better in more complex habitats, where there are other organisms growing above the seabed, such as horse mussels or bryozoans.[34]

The Marlborough Sounds scallop stocks are managed as part of a larger quota management area including Tasman and Golden Bays (SCA7). The main harvest method is dredging. The story of this stock is one of successive depletion and collapse (see Figure 7.3). Commercial dredging of scallops in Te Tauihu commenced in the 1950s. By 1975, the wild fishery was in decline, and by 1980 it had collapsed. It was then closed for two years. Natural recruitment had failed, when the seabed was no longer suitable for recruitment, likely due to the loss of suitable settlement sites for spat in the heavily dredged fishery.

"... the loss of attachment substates (live sessile organisms such as filamentous algae, sponges, ascidians, bryozoans, bivalves, and tube-dwelling polychaetes, and dead shell material that may support filamentous species) is a significant contributor to benthic spat mortality and settlement and growth failure. The loss of benthic biogenic structure is assumed to be related to physical disturbance of the seafloor by bottom fishing (dredging and trawling gear)."[35]

The scallop fishery in the Marlborough Sounds is highly depleted and is currently closed

Dredging fundamentally impacts the seabed through both removing and crushing organisms that live there, but also by suspending substrate material in the water column, which then settles at differential rates. The heavy items such as gravel and sand settle first and the finest particles such as clay settle last. This means that repeated dredging can reduce a sandy/gravelly seabed substrate to something which is much muddier and no longer suitable for scallop survival.[36]

The collapse of scallop settlement led to an 'enhanced' fishery being developed. Spat was caught on collector bags, strung on long-lines, and then placed on the seabed in closed commercial fishery areas. The areas were opened for scallop dredging, once the shellfish had reached legal size, sometimes in a rotational pattern. This approach enabled the fishery to reopen for some years with notably high harvests (although not as high as in the early 1970s).

Scallops were brought into the quota management system in 1992. In 1994, management of CRA7 was effectively devolved to quota holders, in the form of the Challenger Scallop Enhancement Company. It was the Company, rather than the Minister, that largely determined the rules applied to fishing each year.[37] By the early 2000s, the scallop fishery was again in decline despite enhancement efforts, and commercial harvest ceased in Tasman Bay in 2006 and Golden Bay in 2011. It appeared the

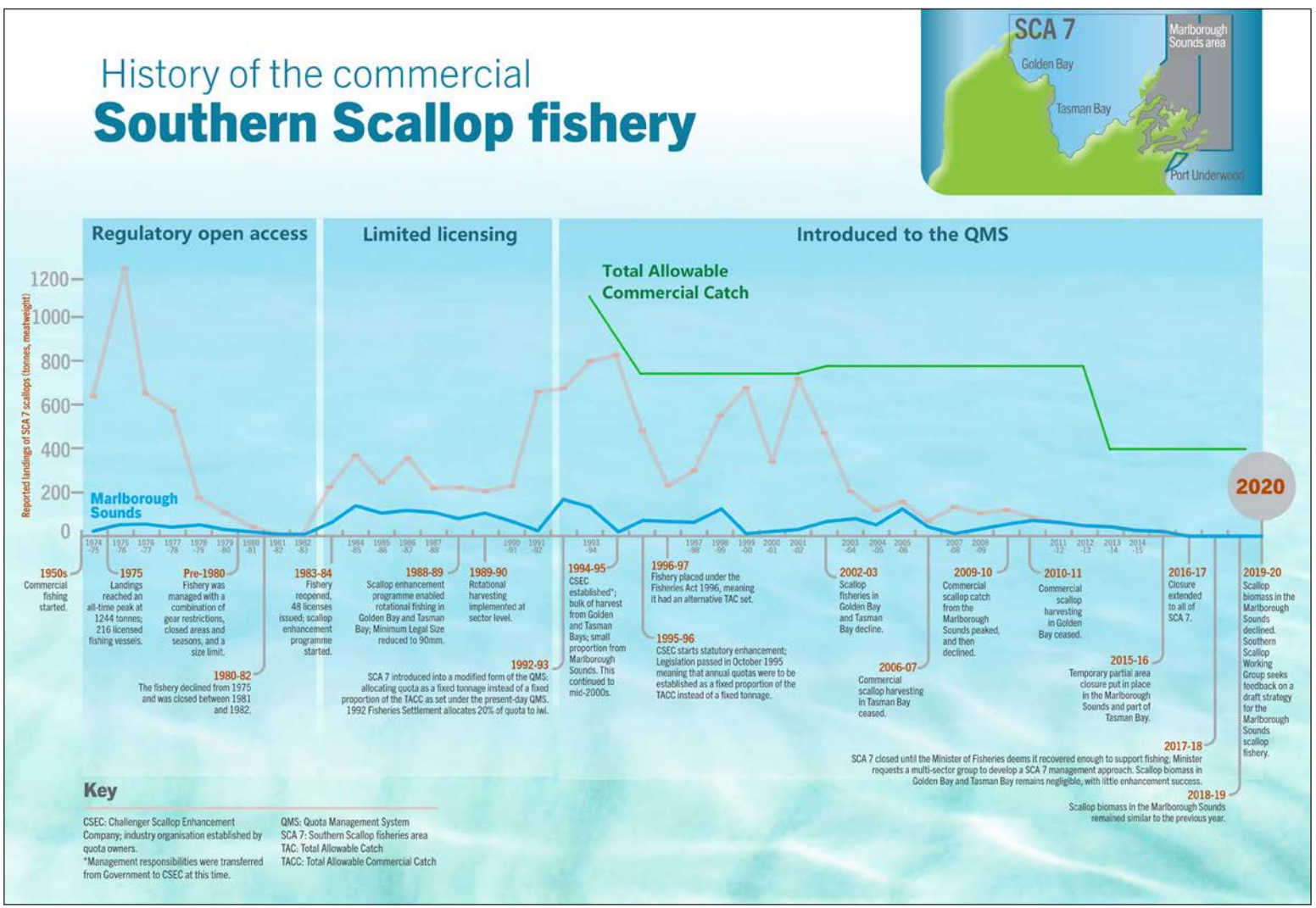


Figure 7.3 History of the commercial scallop fishery (SCA7) *(Source: Fisheries NZ)*[86]

seabed was now, not only unable to support juvenile recruitment, but the adult scallops were also struggling to survive there and spawn.

At that point, fishing effort concentrated on the wild unenhanced fishery in the Marlborough Sounds (which was part of the same quota management area). No effective measures were put in place to manage this displaced effort, despite the collapse of the major scallop beds in SCA7 (In Tasman and Golden Bays), and therefore the evident risk that this could also happen in the Sounds. Scallop harvest in the Marlborough Sounds peaked, in 2009, and the beds then also quickly went into decline. Prior to closure, commercial and recreational scallop dredging intensities were highest in the Tawhitinui and Waitātā Reaches (in the vicinity of Maud Island) in the outer Te Hoiere / Pelorus Sound.[38]

> "After Tasman closed then the fleet came and hit the banks in Queen Charlotte. They came in a group and divided up the area for each and dredged every bit. There was a storm of silt. They harvested all the areas." (local resident)

Because of the devolved management arrangements, during this crucial period, the Ministry for Primary Industries (MPI) had taken a hands off approach, relying on the information provided to it by the Company. It was only in 2015 that MPI decided to commission its own survey of scallop biomass. This found the stock to be at its lowest ever recorded level. There were few beds remaining in Golden and Tasman Bays, at a viable density to fish, and abundance was rapidly declining in the Marlborough Sounds.[39]

During the 2015-16 scallop season commercial fishers harvested just 22 tonnes (meat weight) primarily from the Marlborough Sounds and the recreational harvest was thought to be around 11 tonnes. The TACC, which had been unchanged since 2014 (due to other measures being used to manage harvest levels year by year), was still at 400 tonnes.

In July 2016, the Minister decided to close the Marlborough Sounds scallop fishery completely. In particular he was concerned that the "relatively few remaining dense beds, which are likely to be the areas fished, are also the key areas for sustainability as scallops need to be at sufficient density to ensure breeding success".[40] The Company opposed the closure claiming that the process it took to develop a harvest plan each year would ensure sustainability. The Company denied that the fishery was in decline and at its lowest recorded levels. It argued for no action to be taken until a further survey was undertaken.[41] In 2017, the Minister closed the entire SCA7 fishery.

> An in-depth investigation into the cause of the collapse of scallop beds in the Marlborough Sounds concluded that "reduced biogenic habitat and increased sediment loading, linked to fishing and forestry respectively, were likely key drivers of scallop population dynamics."[42]

Follow up biomass surveys were undertaken in 2019 and 2020. The 2020 survey found that recruited biomass was low, and very low in Tasman and Golden Bays. In the Marlborough Sounds, potential commercially fishable densities were only found in five scallop beds in the outer Sounds: at Guards Bay, Meretoto / Ships Cove, the Chetwodes, Wyens Banks and Dieffenbach Point.[43] The extent of depletion is highlighted when these findings are compared with the wide distribution of scallop beds found by dredge surveys between 1994 and 2012 as shown in Figure 7.4.

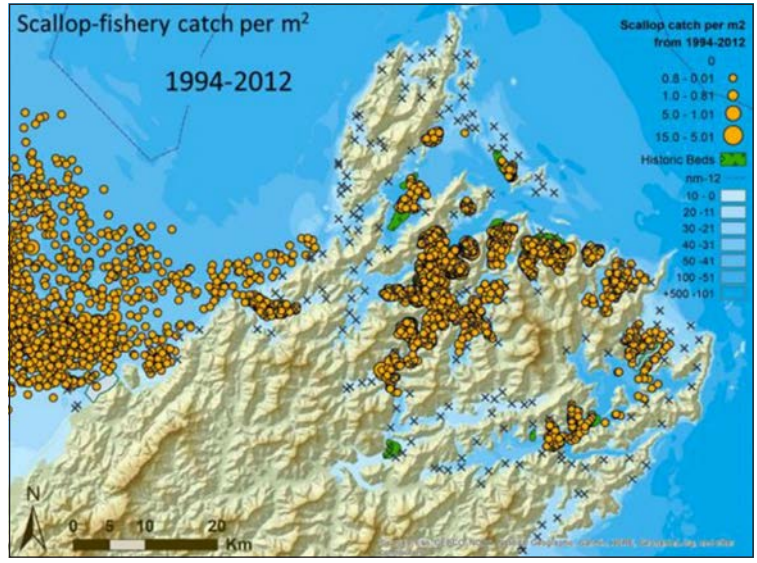


Figure 7.4: Scallop surveys showing catch per m² from 1994-2012 in the Marlborough Sounds *(Source Anderson et al., 2020)*[44] **(x shows dredge stations where no scallops were recorded).**

To help develop a new management approach, Fisheries NZ established a Southern Scallop Working Group, which in 2020 released a strategy for the Marlborough Sounds fishery.[45] This has been approved by the Minister as a fishery plan under Section 11A of the Fisheries Act. It was followed, in 2021, by an implementation plan.[46]

"... there is little evidence to suggest the SCA 7 resource is recovering. We need a refreshed management approach to address this." (Southern Scallop Working Group Strategy for the Marlborough Sounds)[47]

As well as setting new sustainable harvest targets, the Strategy proposes to identify scallop beds in the Marlborough Sounds that can sustain regular or periodic rotational fishing, and those that should not be dredged.[48] This presupposes that it is appropriate to reinstate dredging as a harvest method, possibly with enhancement, in some parts of the Sounds. Given that this approach has demonstrably failed in Tasman and Golden Bays, which are no longer able to support harvestable scallop beds at all, it would be surprising if it were to prove sustainable in the more fragile Marlborough Sounds. This is particularly the case, given the already degraded state of the Sounds marine environment, and the other pressures on it including heavy sedimentation and climate change.

There is already strong evidence that scallop dredging has caused profound damage to complex benthic habitats in the Sounds including those of importance to the blue cod fishery (as described above). In addition, we were told by recreational fishers that the Sounds provides a nursery ground for blue cod, and that small cod have become more prolific recently due to the cessation of scallop dredging which disturbed the seabed where juveniles settle.

This highlights the interlinkages between the scallop and blue cod fisheries and the dangers of considering the management of each separately. It also indicates the importance of investigating alternative harvest methods (such as free diving, scuba or remote grab technology) if the scallop fishery were to recover sufficiently to reopen. However, the Southern Scallop Strategy Implementation Plan does not include any planned investigation into alternative harvest methods.

The Southern Scallop Strategy proposes to "address non-fishing impacts on scallops" such as land based impacts and to "improve scallop habitat quality and quantity in the Marlborough Sounds".[49] Both of these suggest the need to be thinking about the health of scallop stocks within a wider frame and one which is integrated with a restoration strategy for the marine environment of the Sounds more broadly.

7.5 Pāua

Pāua is a taonga for iwi in the Sounds, is important for recreational fishers, and supports a valuable commercial fishery. Pāua live on shallow coastal reefs, commonly at depths of between one and five metres. They are herbivores, preferring to feed on drift algae, but they also graze on seaweed attached to the reef. Pāua are relatively sedentary and can form large localised aggregations. This means they are particularly susceptible to localised depletion, which in turn can affect spawning success, as they are broadcast spawners.[50]

Pāua can be outcompeted by kina, which at high densities appear to exclude pāua.[51] This means that the development of kina barrens throughout much of the enclosed Sounds area, and Kura Te Au / Tory Channel, has likely excluded pāua. Pāua are also affected by high levels of sediment, which can increase the mortality of larvae in the water column, disrupt settlement surfaces, and smother the juveniles. In addition, as described above, sediment impedes the health of seaweed, thereby impacting the food source of pāua.[52]

"Over the past decade and a half, on the west coast of D'Urville Island all the seaweed has gone. So there is no pāua. It is starting to affect the fishery around the outside of all the sounds to Port Gore. There is virtually nothing." (Local fisherman)

The commercial PAU 7 fishery (which includes the top of the South Island as well as the top portions of the east and west coast) used to be one of the largest in the country, just slightly smaller than the fishery at the Chatham Islands. But commercial catches have declined since the 1980s, with the reported landings in 2022-23 of just 76.54 tonnes, being the lowest on record. This can be compared with the peak reported landing of 490 tonnes during the 1980-81 year (see Figure 7.5). Recreational harvest has also plummeted from an estimated 14.13 tonnes during the 2011-12 fishing year to just 2.87 tonnes in 2022-23.[53]

A small part of the PAU7 fishery (on the east coast) was impacted by the Kaikōura earthquake, in 2016, when the coastline was uplifted. But overall the picture is one of a declining fishery over time. This has been most marked in the Marlborough Sounds proper and around Rangitoto ki te Tonga / D'Urville Island. These areas accounted for 40 tonnes of commercial catch during the 2000s but this has declined to "very low levels" in recent years. Despite the reduction in harvest, there has been little recovery, indicating that the fishery has effectively collapsed within the Sounds.

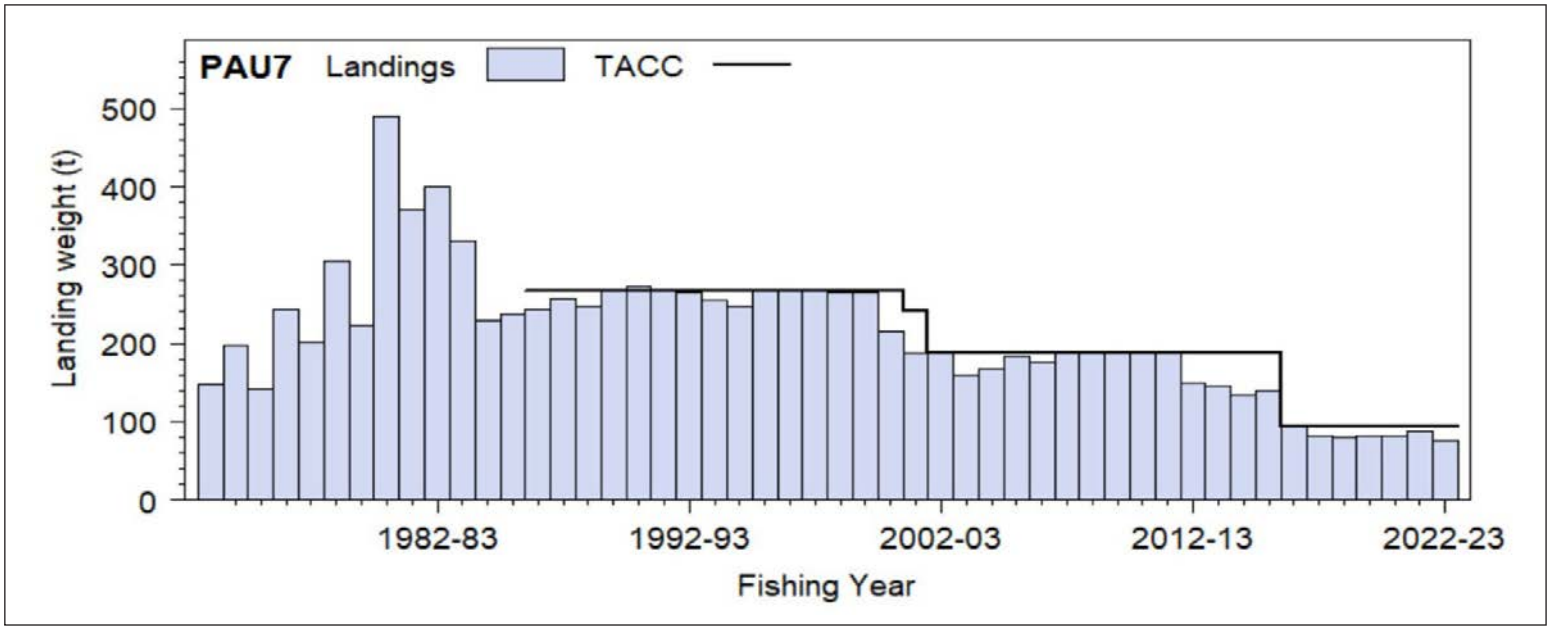


Figure 7.5 Reported commercial landings and TACC for PAU7 1973-74 to 2022-23 *(Source: Fisheries New Zealand)*[87]

Commercial blue cod long lining boat docked at French Pass

Most of the fishery is now concentrated on the exposed east coast outside of Arapaoa Island and Te Whanganui / Port Underwood.[54] A stock assessment in 2015 put the biomass at 16 to 21 per cent of the unharvested biomass (B_{0}) well below the management target of 33 per cent.[55]

Management settings have effectively followed the decline of the fishery despite efforts of commercial fishers to shelve part of their annual catch entitlement (ACE), from time to time, to reduce the pressure on the fishery (see Figure 7.6). A draft fisheries plan for PAU7 has been developed by the industry representative body PauaMAC7 but has not yet been approved by the Minister. It proposes three main management tools to address the decline: shelving ACE, applying catch spreading and variable minimum harvest sizes at the sub-quota management area level, and enhancing local pāua populations through out-planting and translocation.[56] None of these address the habitat drivers of decline, possibly because fishers consider these to be outside their mandate.

The outer coast near Te Whanganui / Port Underwood (shown here) is one of the few areas in the Sounds where pāua is now commercially harvested

Date	Management measure
1986	Introduced to quota management system with TACC 250 tonnes
1989	TACC increased to 267.48 tonnes (as a result of quota appeals)
2000	Commercial fishers voluntarily shelve 20% of TACC
2001	TACC reduced to 240.73 tonnes
2002	TACC reduced to 187.24 tonnes
2003-2006	Commercial fishers propose to shelve 15% of ACE
2012 and 2013	Commercial fishers voluntarily shelve 20% of ACE
2014	Commercial fishers voluntarily shelve 28% of ACE
2016	Kaikōura earthquake occurs which uplifts the coast impacting the pāua fishery on the east coast of the South Island and resulting in displaced effort TACC reduced to 93.62 tonnes (50% reduction)
2017	Commercial fishers voluntarily shelve 10% of ACE (annual landings average 81.5 tonnes)
2019	Daily bag limit for recreational fishers reduced from 10 to 5 and the accumulation limit reduced from 20 to 10

Figure 7.6: Management settings for PAU7

Pāua enhancement trials have been conducted off the Kaikōura coast in the wake of the 2016 earthquake. They included reseeding hatchery juveniles (with some success), larval outplanting (with disappointing results), and translocating rocks with pre-settled larvae on them (with encouraging results). However, the researchers concluded overall that "stock enhancement is not a substitute for good fishery management. All of the methods … are costly in terms of time and money, and do not guarantee success."[57]

The pāua fishery has collapsed in much of the Sounds and this is likely associated with loss of seaweed (which provides critical food and habitat for pāua), the development of kina barrens (which prevent kelp from re-establishing and outcompete pāua), and increase in sedimentation. Restoring pāua stocks will likely require a multi-faceted approach that addresses all these stressors.

7.6 Rock lobster (kōura)

Rock lobsters are a taonga for iwi, a popular species for recreational fishers, and the most valuable inshore commercial species. They are long lived rocky reef animals. They have a complex life cycle, with the young larvae drifting on ocean currents at the edge of the continental shelf for at least a year, before metamorphising into puerulus, swimming to the shore and settling on shallow reefs.[58]

Rock lobsters are ecosystem engineers, in that they help keep the rocky reef healthy, by predating on kina. As described above, the overharvesting of rock lobster (and other predators such as large blue cod and snapper) releases kina from predation, enabling numbers to rapidly expand, and in turn to overgraze the kelp leading to the complete removal of the kelp forest. In turn, the loss of kelp forest likely reduces the recruitment of rock lobsters back onto the reef,[59] in a negative spiral that operates until the localised rock lobster stock has collapsed.

Since 1992, the National Rock Lobster Management Group has been the primary source of advice to Fisheries NZ on the management of rock lobster stocks.[60] The Marlborough Sounds rock lobster fishery is included in a much larger quota management area which includes the top of the South Island, as well as much of its east coast, down past Banks Peninsula to the Waitaki River. From this area, the bulk of the catch is taken from along the coastline from Kura Te Au / Tory Channel to Motanu, with 25 to 34 vessels operating in the fishery.[61] Reported catch rates have been stable at around 350 tonnes (the harvest cap) since 1999. Recreational catch was estimated at 43.47 tonnes in 2011-12 and just slightly lower at 40.96 tonnes in 2017-18.[62] There is no estimate of recreational catch for the Sounds fishery.

CRA 5 is split into a number of statistical areas with the Marlborough Sounds included in Area 933. The main Sounds fishery operates from Picton to Te Whanganui / Port Underwood. A small number of commercial vessels also work from Nelson to Rangitoto ki te Tonga / D'Urville Island.[63] No information is reported by Fisheries NZ regarding the current state of the Marlborough Sounds fishery apart from catch per unit effort (CPUE) (based on kilograms caught per pot lift) reported by fishers. For area 933, CPUE has reduced from 0.586 in 2013-14 to just 0.446 in 2018-19.[64]

Given that a harvested rock lobster typically weighs between 0.6 to 1 kg,[65] this means that on average, commercial fishers in the Sounds are only pulling up around one animal for every two pot lifts. It is only the extremely high price that can be obtained for live rock lobster (with a port price of around $95 per kg) that makes such a low yield fishery at all financially sustainable.

This low CPUE in the Marlborough Sounds is in stark contrast to the rest of the CRA 5 fishery, along the east coast, which has rates three to four times higher. The Sounds CPUE is at similar levels to those for the Hauraki Gulf (the lowest CPUE reported), Bay of Islands and north-east coast of the North Island[66] where kina barrens are also extensive.[67]

There are anecdotal reports of rock lobster being historically abundant in the Sounds including being "present on every rocky point" in Tōtaranui / Queen Charlotte Sound. The widespread use of SCUBA was credited with their demise[68] although remnant populations likely persist in areas that are hard to fish. Their scarcity was highlighted when an 11-day video survey of the benthic habitats in Tōtaranaui / Queen Charlotte Sound and Kura Te Au / Tory Channel rarely spotted rock lobsters (although acknowledging that some could be hidden out of sight in deep crevices).[69]

Rock lobsters are now rarely seen within the Marlborough Sounds

It seems likely that rock lobster populations within the Sounds have naturally low recruitment levels meaning they are not able to sustain significant fishing pressure. Puerulus settling in CRA5 are largely sourced from Fiordland, travelling up the coast on the ocean current.[70] Given the high currents through Cook Strait, it may be that relatively few puerulus make it into the Sounds proper, leaving that stock reliant on a small level of local recruitment which diminishes as the stock is depleted. However, we were advised by someone with a long history in the rock lobster fishery that rock lobsters regularly walk into the Sounds through Kura Te Au / Tory Channel thereby boosting the population.

We were told by a quota holder that there is no commercial rock lobster fishing in the Sounds proper at all now, only a small fishery in the northern entrance to Kura Te Au / Tory Channel, and in the outer Sounds. Because the Sounds is included in a much larger fishery, which is healthier, the stock assessments and management measures applied do not reflect or address localised depletion (see Figure 7.7).

Date	Management measure
1990	Brought into the quota management system. TACC 465.2 tonnes
1991	TACC 433.7 tonnes
1992	TACC 337.7 tonnes
1993	TACC 303.7 tonnes
1999	TACC 350 tonnes (and remains unchanged)
2020	Accumulation limit reduced to 18 rock lobsters. Lobsters need to be telson clipped

Figure 7.7 Management settings for CRA5

Rock lobster populations are at low levels within the Sounds, and are unlikely to recover until harvest pressure is reduced, and kelp forests have been restored. In turn, the restoration of rock lobster populations (along with other kina predators) is likely required for the sustainable restoration of kelp beds.

7.7 Hāpuku

In 1908 it was reported that "there have at times appeared immense shoals of the fish [groper] at or near the surface of the sea, so that a boat could not be rowed among them without striking them with the oars, and numbers of them have at such times been caught with the harpoon or hooked with a gaff".[71]

Hāpuku are long lived fish, reaching over 60 years of age. They congregate around pinnacles, reefs and ledges and can be rapidly depleted from these areas and not readily recover. Historically, hāpuku were abundant in shallow coastal waters and were caught by Māori close to shore.[72] However, marine scientists undertaking a video camera survey of Tōtaranui / Queen Charlotte Sound and Kura Te Au / Tory Channel (in 2018) did not see any hāpuku at all. This included off Diffenbach Point which is a place where hāpuku has been commonly caught in the past.[73]

There is a line fishery for hāpuku in the outer Marlborough Sounds. But this is managed as part of much larger quota management area (HPB 7) which extends across the whole top of the South Island and down much of the west coast. Around 109 tonnes are taken by commercial fishers. A total of 10.83 tonnes is estimated to be taken by recreational fishers in the Marlborough Sounds, out of a total recreational catch in HPB7 of 35.4 tonnes.[74] There has been a history of progressive decline in the stock, with successive drops in annual reported commercial landings (see Figure 7.8).

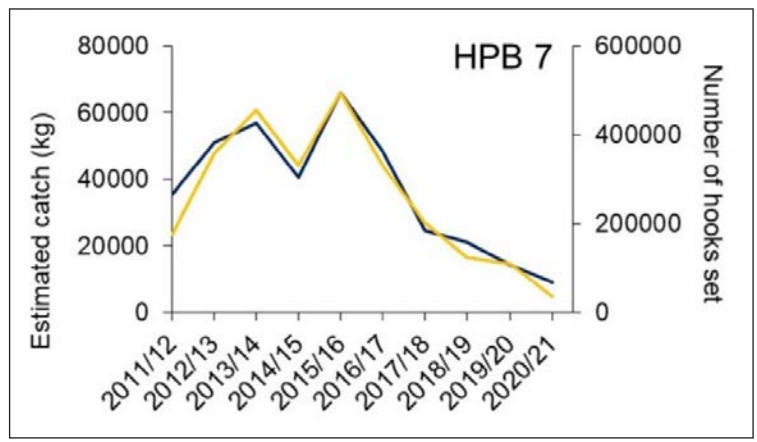


Figure 7.8 Estimated catch when hāpuku and bass targeted for HPB7 *(Source: Fisheries New Zealand, 2021)*[75]. Hāpuku and bass recorded as the target (dark blue line - left axis) and the total number of hooks set (yellow line - right axis)

The stock was reviewed in 2021 due to concerns raised by tāngata whenua, recreational fishers and some commercial fishers about the decline in commercial landings and localised depletion. It is a low knowledge stock with its current status unknown.[76]

In 2022, the TACC for HPB 7 was reduced to 97 tonnes (which brought it only slightly below current harvest levels), and the recreational limit was reduced from 5 to 2 per person per day, with an accumulation limit of 3 per person. No spatial closures were proposed to protect pinnacles or spawning areas, or to address localised depletion.

Cook Strait has always supported the main fishery for hāpuku in Aotearoa New Zealand, primarily associated with the rocky reefs systems there, where fishers target deep rock faces. Fisheries tagging research has also suggested that the Cook Strait is a likely spawning ground for hāpuku.[77] However, somewhat concerningly, marine scientists during the 2018 survey did not see any hāpuka off these reefs.

"If Cook Strait is a key spawning area, and these were once important hāpuka reefs, then the decline of hāpuka on these reefs would likely have important, possibly dire, consequences to the broader population. Protection of these high-relief deep reefs may provide an important step in the recovery of hāpuka to the region."[78]

Urgent measures may be required to protect the Cook Strait hāpuku reefs if there is to be any hope of the fish populations recovering and reinhabiting the shallower reefs of the Sounds.

7.8 Snapper (tāmure)

Snapper were undoubtedly once very prolific in the Marlborough Sounds. Prior to bulk harvesting taking place in the Kenepuru Sound, pink schools of spawning snapper were a common sight in summer, and early fishermen only kept the snapper "whose tails stuck out of a sugar sack" indicating snapper longer than 80cm.[79]

Since 1986, snapper in the Sounds have been managed as part of a very large quota management area which includes the entire top of the South Island and most of its west coast (SNA7). The main spawning and nursery area for SNA7 is in Golden and Tasman Bays which is where the fishery is concentrated. A tagging study undertaken during 1978-1982 indicated that snapper in the Marlborough Sounds area is a separate stock, with limited mixing with those in the Tasman-Golden Bay area.[80] However, no more recent research has been undertaken to determine whether this is still the case. There is no separate stock assessment so the state of the Marlborough Sounds stock is effectively unknown.[81]

There is no longer a targeted commercial harvest of snapper in the Sounds, although there is a mixed finfish trawl fishery in the outer areas, as described above. The recreational harvest in the Sounds is thought to be about 15 per cent of the total recreational catch for SNA7 (which is 139 tonnes) making it around 20 tonnes. This is two-thirds of the blue cod recreational catch, of 30 tonnes, indicating that snapper now comprises a significant proportion of the overall recreational catch. They are more commonly caught in Te Hoiere / Pelorus Sound.[82]

SNA7 was considered under the 2024 sustainability round with a decision to increase the TACC from 450 to 720 tonnes.[83] This was based on a stock assessment that indicated increasing stock size and very large numbers of young fish recruiting into the fishery. However, this sharp increase in abundance has been assessed in the Tasman and Golden Bays stock, but not in the Sounds. National Panel Survey data indicates that recreational catches in the Sounds have changed little between 2017-18 and 2022-23 and this is supported by Waikawa ramp surveys which show no trend in the harvest index. However, we were told by recreational fishers in the area that the snapper fishery has been steadily recovering. The bag limit within the Marlborough Sounds fishery is currently 3 per day (just 1 more than blue cod).[84]

The current status of snapper within the Sounds is unknown. Fisheries NZ estimates of recreational catches do not indicate any significant increase over the past five years although there is anecdotal evidence of some recovery. However, it does not appear the snapper stock in the Sounds is experiencing the same level of rebound as the Golden-Tasman Bays stock. This could reflect the loss of juvenile habitat and overall poor health of the Sounds marine environment.

The current status of snapper within the Marlborough Sounds is unknown but it is not rebounding to the same extent as the Tasman-Golden Bay stock *(Tanya Peart)*

Endnotes

1 Toone T A, E D Benjamin, J R Hillman, S Hadley and A Jeffs, 2023, 'Multidisciplinary baselines quantify a drastic decline of mussel reefs and reveal an absence of natural recovery', *Ecosphere*, 14:e4390, at 5

2 Ibid, at 6

3 Handley S, Gibbs M, A Swales, G Olsen, R Ovenden and A Bradley, 2017, *A 1,000 year history of seabed change in Pelorus Sound / Te Hoiere, Marlborough*, NIWA, Nelson, at 26

4 Ibid, at 106

5 Ibid, at 26

6 Ibid

7 Toone T A, E D Benjamin, J R Hillman, S Hadley and A Jeffs, 2023, 'Multidisciplinary baselines quantify a drastic decline of mussel reefs and reveal an absence of natural recovery', *Ecosphere*, 14:e4390, at 6

8 Ibid

9 Toone T A, E D Benjamin, S Hadley, A Jeffs and J R Hillman, 2022, 'Expansion of shellfish aquaculture has no impact on settlement rates', *Aquaculture Environment Interactions*, 14, 135-145, at 141-142

10 Handley S, 2015, *The history of benthic change in Pelorus Sound (Te Hoiere), Marlborough*, NIWA, Nelson, at 29; Cummings V, E Jorgensen, E Benjamin and L Wichman, 2024, *Considerations for rehabilitation of shellfish and shellfish habitat in Marlborough Sounds*, Sustainable Seas National Science Challenge, Wellington, at 37

11 Handley S, Gibbs M, A Swales, G Olsen, R Ovenden and A Bradley, 2017, *A 1,000 year history of seabed change in Pelorus Sound / Te Hoiere, Marlborough*, NIWA, Nelson, at 107-109

12 Ibid, at 109

13 Fisheries New Zealand, 2024, *Fisheries Assessment Plenary, May 2024: Stock assessments and stock status,* Fisheries New Zealand, Wellington, at 552-555

14 Urlich S C and S J Handley, 2020, 'From "clean and green" to "brown and down": A synthesis of historical changes to biodiversity and marine ecosystems in the Marlborough Sounds, New Zealand', *Ocean and Coastal Management*, 198, 105349, at 10

15 Fisheries New Zealand, 2024, *Fisheries Assessment Plenary, May 2024: Stock assessments and stock status,* Fisheries New Zealand, Wellington, at 1208

16 Baker A, 1972, *Reproduction, early life history, and age-growth relationships of the New Zealand pilchard,* Sardinops neopiulchardus *(Steindachner),* New Zealand Marine Department, Wellington, at 9

17 https://www.theprow.org.nz/yourstory/picton-bloaters/

18 Urlich S C and S J Handley, 2020, 'From "clean and green" to "brown and down": A synthesis of historical changes to biodiversity and marine ecosystems in the Marlborough Sounds, New Zealand', *Ocean and Coastal Management*, 198, 105349, at 10-11

19 Brough T E, E M Leunissen and M Beentjes, 2023, *Habitat use and the impact of multiple stressors on blue cod populations off Canterbury and in the Marlborough Sounds*, New Zealand Aquatic Environment and Biodiversity Report No 323, Fisheries New Zealand, Wellington, 4

20 Handley S, 2016, *History of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson, at 25

21 Fisheries New Zealand, 2022, *Review of sustainability measures for blue cod (BCO 7) for 2022/23*, Fisheries NZ Discussion Paper 2022/07, Fisheries New Zealand, Wellington, at 11

22 Fisheries New Zealand, 2024, *Fisheries Assessment Plenary, May 2024: Stock assessments and stock status,* Fisheries New Zealand, Wellington, at 181

23 Ibid, at 159; and Fisheries New Zealand, 2022, *Review of sustainability measures for blue cod (BCO 7) for 2022/23*, Fisheries NZ Discussion Paper 2022/07, Fisheries New Zealand, Wellington, at 7

24 Fisheries New Zealand, 2024, *Fisheries Assessment Plenary, May 2024: Stock assessments and stock status,* Fisheries New Zealand, Wellington, at 160

25 Ibid, at 166

26 Kolodzey S and S R Wing, 2022, 'Life history traits vary between geographically distinct populations in a protogynous hermaphrodite', *Ecosphere*, 13:e4237, at 12

27 Brough T E, E M Leunissen and M Beentjes, 2023, *Habitat use and the impact of multiple stressors on blue cod populations off Canterbury and in the Marlborough Sounds*, New Zealand Aquatic Environment and Biodiversity Report No 323, Fisheries New Zealand, Wellington, at 4; Handley S, 2016, *History of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson, at 39

28 Brough T E, E M Leunissen and M Beentjes, 2023, *Habitat use and the impact of multiple stressors on blue cod populations off Canterbury and in the Marlborough Sounds*, New Zealand Aquatic Environment and Biodiversity Report No 323, Fisheries New Zealand, Wellington, at 2

29 Fisheries New Zealand, 2024, *Fisheries Assessment Plenary, May 2024: Stock assessments and stock status,* Fisheries New Zealand, Wellington, at 202

30 Fisheries New Zealand, 2024, *Marlborough Sounds blue cod review*, Fisheries New Zealand Discussion paper No 2024/29, Fisheries New Zealand, Wellington

31 Fisheries New Zealand, 2022, *Fisheries assessment plenary, November 2022: Stock assessments and stock status*, Fisheries New Zealand, Wellington, at 494-495

32 Handley S, Gibbs M, A Swales, G Olsen, R Ovenden and A Bradley, 2017, *A 1,000 year history of seabed change in Pelorus Sound / Te Hoiere, Marlborough*, NIWA, Nelson, at 107

33 Fisheries New Zealand, 2022, *Fisheries assessment plenary, November 2022: Stock assessments and stock status*, Fisheries New Zealand, Wellington, at 494-495

34 Hale R, O Lam-Gordilla, D Lohrer, J R Williams, S Handley, P Olmedo-Rojas and I Middleton, 2024, *Cumulative effects of stressors on scallops and scallop habitats in the Marlborough Sounds*, New Zealand Aquatic Environment and Biodiversity Report No 337, Fisheries New Zealand, Wellington, at 7

35 Ibid, at 7-8

36 Ibid, at 8

37 Peart R, 2018, *Voices from the sea: Managing New Zealand's fisheries*, Environmental Defence Society, Auckland, at 74

38 Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound / Te Hoiere*, NIWA, Hamilton, at 88

39 Ministry for Primary Industries, 2016, *Review of sustainability measures for the southern scallop fishery (SCA 7) in 2016: Discussion Document*, MPI Discussion Paper 2016/19, Ministry for Primary Industries, Wellington

40 Guy N, 2016, *Ministers decision on the southern Scallop fishery (SAC7) for the 2016-17 season*, Ministry for Primary Industries, Wellington, at 2

41 Ministry for Primary Industries, 2016, *Review of sustainability measures for the southern scallop fishery (SCA 7) in 2016: Discussion Document*, MPI Discussion Paper 2016/19, Ministry for Primary Industries, Wellington, at 7

42 Hale R, O Lam-Gordilla, D Lohrer, J R Williams, S Handley, P Olmedo-Rojas and I Middleton, 2024, *Cumulative effects of stressors on scallops and scallop habitats in the Marlborough Sounds*, New Zealand Aquatic Environment and Biodiversity Report No 337, Fisheries New Zealand, Wellington, at 1

43 Williams J R, R Bian, L Olsen and J Stead, 2021, *Survey of scallops in SCA7, May 2020*, New Zealand Fisheries Assessment Report 2021/19, Fisheries New Zealand Wellington, at 1

44 Anderson T, R Stewart, R D'Archino, J Stead and N Eton, 2020, *Life on the seafloor in Queen Charlotte Sound, Tory Channel and adjacent Cook Strait*, NIWA, Wellington, at 265

45 Southern Scallop Working Group and Fisheries New Zealand, 2020, *Southern scallop strategy: Marlborough Sounds*, Fisheries New Zealand, Wellington

46 Southern Scallop Working Group, 2021, *Implementation plan: Southern scallop strategy: Marlborough Sounds*, version 1.1, Fisheries New Zealand, Wellington

47 Southern Scallop Working Group and Fisheries New Zealand, 2020, *Southern scallop strategy: Marlborough Sounds*, Fisheries New Zealand, Wellington, at 3

48 Ibid, at 10

49 Ibid, at 10-11

50 Cummings V, E Jorgensen, E Benjamin and L Wichman, 2024, *Considerations for rehabilitation of shellfish and shellfish habitat in Marlborough Sounds*, Sustainable Seas National Science Challenge, Wellington, at 36

51 Fisheries New Zealand, 2024, *Fisheries Assessment Plenary, May 2024: Stock assessments and stock status,* Fisheries New Zealand, Wellington, at 1070-1071

52 Sustainable Seas National Science Challenge, 2023, *Upholding the value of pāua quota*, Sustainable Seas National Science Challenge, Wellington, at 9; and Cawthron Institute, 2021, Case study: Climate change and shellfish aquaculture, at https://www.cawthron.org.nz/research/climate-change-shellfish-aquaculture/

53 Fisheries New Zealand, 2024, *Fisheries assessment plenary, May 2024: Stock assessments and stock status,* Fisheries New Zealand, Wellington, at 1066-1067

54 See stock assessment for PAU7 at Fisheries New Zealand, 2024, *Fisheries assessment plenary, May 2024: Stock assessments and stock status,* Fisheries New Zealand, Wellington, at 1188-1202

55 Pāua fisheries plan for PAU7, November 2022, at https://www.mpi.govt.nz/dmsdocument/57946-Paua-fisheries-plan-for-PAU-7

56 Ibid, at 3

57 Gerrity S and D R Schiel, 2024, 'Assessing methods of enhancement for New Zealand blackfoot abalone *(Haliotis iris)* populations affected by mass mortalities', *New Zealand Journal of Marine and Freshwater Research*, online, at 24

58 Fisheries New Zealand, 2022, *Fisheries assessment plenary, November 2022: Stock assessments and stock status*, Fisheries New Zealand, Wellington, at 281

59 See Hinojoa I A, B S Green, C Gardener and A Jeffs, 2015, 'Settlement and early survival of southern rock lobster, *Jasus edwardsii*, under climate-driven decline of kelp', *ICS Journal of Marine Science*, 71 (Issue Supplement 1), i59-i68

60 https://www.mpi.govt.nz/dmsdocument/45631-National-Rock-Lobster-Management-Group

61 Fisheries New Zealand, 2022, *Fisheries assessment plenary, November 2022: Stock assessments and stock status*, Fisheries New Zealand, Wellington, at 272

62 Ibid, at 267 and 276

63 Ibid, at 272

64 Fisheries New Zealand, 2022, *Fisheries assessment plenary, November 2022: Stock assessments and stock status*, Fisheries New Zealand, Wellington, at 272

65 https://www.seafood.co.nz/species/rock-lobster

66 Fisheries New Zealand, 2022, *Fisheries assessment plenary, November 2022: Stock assessments and stock status*, Fisheries New Zealand, Wellington, at 269

67 See Kerr V C, R V Grace and N T Shears, 2024, 'Estimating the extent of urchin barrens and kelp forest loss in northern Aotearoa, New Zealand', *New Zealand Journal of Marine and Freshwater Research*, online 23 April which found that urchin barrens covered 30 per cent of shallow reefs in fished areas

68 Handley S, 2016, *The history of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson, at 25

69 Anderson T, R Stewart, R D'Archino, J Stead and N Eton, 2020, *Life on the seafloor in Queen Charlotte Sound, Tory Channel and adjacent Cook Strait*, NIWA, Wellington, at 20

70 Chiswell S M and J D Booth, 2008, 'Sources and sinks of larval settlement in *Jasus edwardsii* around New Zealand: Where do larvae come from and where do they go?', *Marine Ecology Progress Series*, 354, 201-217, at 213

71 The Fisheries Court, 1890, *Otago Witness*, 23 January, 17 cited in *The history of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson, at 21

72 Fisheries New Zealand, 2021, *Review of sustainability measures for hapuku and bass (HPB 7 & HPB 8) for 2022/23*, Fisheries NZ Discussion Paper No 2021/26, Fisheries New Zealand, Wellington, at 7

73 Anderson T, R Stewart, R D'Archino, J Stead and N Eton, 2020, *Life on the seafloor in Queen Charlotte Sound, Tory Channel and adjacent Cook Strait*, NIWA, Wellington, at 178

74 Fisheries New Zealand, 2021, *Review of sustainability measures for hapuku and bass (HPB 7 & HPB 8) for 2022/23*, Fisheries NZ Discussion Paper No 2021/26, Fisheries New Zealand, Wellington, at 5 and 9

75 Ibid, at 6

76 Ibid

77 Anderson T, R Stewart, R D'Archino, J Stead and N Eton, 2020, *Life on the seafloor in Queen Charlotte Sound, Tory Channel and adjacent Cook Strait*, NIWA, Wellington, at 208

78 Ibid

79 Handley S, 2016, *History of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson, at 24

80 Drummond K and P Mace P, 1984, 'South Island snapper tagging results', *Catch*, 11, 6–7

81 Fisheries New Zealand, 2024*, Fisheries Assessment Plenary, May 2024: Stock assessments and stock status,* Fisheries New Zealand, Wellington, at 1643

82 Fisheries New Zealand, 2024, *Review of sustainability measures for snapper (SNA7), flatfish (FLA7), and elephantfish (ELE7) for 2024/25*, Fisheries New Zealand Discussion Paper No 2024/24, Fisheries New Zealand, Wellington, at 5

83 Ibid, at 2; Jones S, 2024, *Changes to fisheries sustainability measures for the 2024 October round*, Minister for Oceans and Fisheries decision letter, Parliament, Wellington

84 Ibid, at 5

85 Ibid, at 155

86 https://www.mpi.govt.nz/assets/On-page-images/sca7-history-as-pic.png

87 Fisheries New Zealand, 2024*, Fisheries Assessment Plenary, May 2024: Stock assessments and stock status,* Fisheries New Zealand, Wellington, at 1186

8 Climate change

Mussel farm, Forsyth Bay

Since 2020, there has been a noticeable increase in sea temperatures in the Marlborough Sounds. Council seawater monitoring at 22 sites has shown that both Te Hoiere / Pelorus Sound (average of 15.7°C and peaking at 20.4°C) and Tōtaranui / Queen Charlotte Sound (average of 14.7°C and peaking at 20.8°C) had record breaking high temperatures in 2022 and 2023. Proximity to warm waters in Cook Strait (affected by Tasman Sea marine heatwaves) is the likely explanation for higher temperatures in the outer Te Hoiere / Pelorus Sound. Rates of warming in Tōtaranui / Queen Charlotte Sound are slower which may be due to cooler waters moving through Kura Te Au / Tory Channel.[1]

Warming seawater will likely affect cold water species which may move south and/or into deeper waters. These include bladder kelp, blue cod and the habitat forming red algae Adamsiella. Sponge communities may become bleached and there could be more frequent harmful algae blooms impacting wild communities and aquaculture.[2] Some species may benefit from warmer waters (at least for a time), including snapper, which can have more successful recruitment in warmer years.[3] However, seawater may also more strongly stratify, restricting nutrients in the surface waters and therefore overall productivity.[4] In addition, increased acidification of seawater may impact calcifying organisms such as juvenile pāua.[5]

A recent review of the impacts of ocean warming on flatfish, trevally and jack mackerel concluded that catches would likely increase with sea water warming, but only until an 'optimal' temperature was reached, after which catches would likely decrease. We are already close to that optimal point which means that decreases in catches could soon be experienced and magnify over time. Impacts will likely be more marked on species, such as flatfish and trevally, which cannot easily migrate.[6]

Summertime temperatures are already above those in which salmon exhibit thermal stress and "additional warming will further reduce the suitability of these waters for salmon farming".[7] Although green lipped mussels are successfully farmed in the warmer northern waters of Aotearoa New Zealand, spawning times of mussels in the Marlborough Sounds may shift with warming, making them closer to spawning in the north and reducing the ability of marine farmers to harvest year round spat supply. There will also likely be further drops in productivity as there is an inverse correlation between water temperature and mussel condition.[8] Other indirect effects of climate change for aquaculture are likely to be changes in phytoplankton composition (and therefore food supply for mussels) and increases in some species, such as snapper, which may predate on juvenile mussels.[9]

Extreme rainfall events are projected to become more severe in a climate changing future,[10] which will likely increase sedimentation within the Sounds, unless effective land use changes are put in place. Seawater warming may combine with high sedimentation levels to produce even greater negative impacts. For example, temperature-induced kelp loss has been found to be greater when water clarity is poor, "indicating that the Marlborough Sounds may be vulnerable to greater biogenic habitat loss due to interacting stressors."[11]

Climate change will likely exacerbate other stressors on the Marlborough Sounds marine environment making the need for marine restoration efforts even more critical and urgent.

Clear-fell forestry harvesting in the Marlborough Sounds. Climate change will likely increase the intensity of storm events and resultant sediment flows from bared soils

Endnotes

1 Marlborough District Council, 2023, *Coastal water quality monitoring 2015-2023: Temperature trends*, Marlborough District Council, Blenheim; and Hart M, 2023, '"Sobering": Marlborough Sounds reach record-breaking sea temperatures', *Stuff*, 23 November

2 Marlborough District Council, 2023, *Coastal water quality monitoring 2015-2023: Temperature trends*, Marlborough District Council, Blenheim

3 Lewis J, 2022, 'Different fish heading south for warmer water', *Otago Daily Times*, 7 January

4 Lundquist C, V Cummings, L Hansen and E Mielbrecht, 2023, *State of knowledge: Climate change and New Zealand's seafood sector*, Fisheries New Zealand, Wellington

5 Ibid

6 Mediodia H J, I Noy and V Kahui, 2024, 'The impact of ocean warming on selected commercial fisheries in New Zealand, *Australian Journal of Agricultural and Resource Economics*, 68, 587-607

7 Broekhuizen N, D R Plew, M H Pinkerton and M G Galf, 2021, 'Sea temperature rise over the period 2002-2020 in Pelorus Sound, New Zealand – with possible implications for the aquaculture industry', *New Zealand Journal of Marine and Freshwater Research*, 55(1), 46-64, at 61

8 Ibid

9 Ibid

10 Macara G, J Woolley, D Morrish, A Sood, S Stuart, C Eager, C Zammit, S Wadhwa and N Fauchereau, 2021, *Climate change projections and impacts for Marlborough*, NIWA, Wellington

11 Hale R, O Lam-Gordilla, D Lohrer, J R Williams, S Handley, P Olmedo-Rojas and I Middleton, 2024, *Cumulative effects of stressors on scallops and scallop habitats in the Marlborough Sounds*, New Zealand Aquatic Environment and Biodiversity Report No 337, Fisheries New Zealand, Wellington, at 52

Part 3: MARINE RESTORATION

9 Overview of marine restoration

Inner Tōtaranui / Queen Charlotte Sound

"Managers of marine systems are concentrating less on the preservation of pristine habitats and more on recovery..."[1]

As changes to inshore coastal waters become more profound, and the extent of degradation more evident, attention is turning away from identifying how marine resources might be used more 'sustainably' and towards better understanding how the marine environment (and habitats and species within it) might be brought back to health. These efforts are typically referred to as marine 'restoration' or marine 'regeneration'. Such terms are often used interchangeably.

Marine 'restoration' can imply that the goal is to 'restore' or reinstate what was originally there. However, this is often not possible given the extent of degradation and transformation that has already occurred. 'Regeneration' is a broader term, referencing bringing new life or vigour to an area, and may more closely approximate what most 'restoration' efforts are endeavouring to achieve. Overall this highlights the importance of defining what the aims of any 'restoration' or 'regeneration' efforts are. In this report we have used the term 'restoration' in this broader context.

Marine restoration efforts can be roughly divided into 'passive' and 'active'. 'Passive' restoration involves reducing or removing stressors on the marine environment in the hope that marine ecosystems can then recover on their own. 'Active' restoration involves intervening in the recovery process, to kick start it or speed up natural processes, such as through seeding or translocating species, or introducing new substrate or structures.

Passive restoration efforts may not work if the marine system has passed a 'tipping point', thereby shifting into a stable but less abundant and biodiverse state. In such cases, the marine ecosystem will not shift back to its former state on its own, even when the stressors that pushed it over the line in the first place are reduced. There may also be keystone species missing that are required to bring the system back into balance (eg large predators on rocky reefs).

"The larger the area of degradation, the greater the distances that species will have to travel to colonise it, and the more fragmented the patches of non-degraded environment are, the less likely there will be sufficient recruits available."[2]

Passive restoration may also be exceedingly slow. For example, it has taken decades for the kelp forest to recover in the marine reserve at Leigh after fishing was excluded.[3] However, on the positive side, passive restoration can be undertaken at scale (ie setting aside large marine protected areas).

Active restoration can be expensive and have uncertain results. It can also be difficult to scale up. It is often the case that we simply do not know enough to effectively restore marine ecosystems through physical

interventions. And such interventions can have unintended consequences. This was highlighted with the enhancement of the Challenger scallop fishery (discussed above), which prolonged the dredge fishery in Tasman and Golden Bays, thereby supporting ongoing seabed damage. The impacts of this were eventually so profound that the substrate can no longer sustain scallop communities. Cessation of dredging has not resulted in any noticeable 'passive' recovery indicating a tipping point has likely been passed. The once prolific and extensive scallop beds have now been lost, possibly forever.

> "Marine ecosystems are prone to tipping points, particularly in coastal zones, where dramatic changes are associated with interactions between cumulative stressors (e.g. shellfish harvesting, eutrophication and sediment inputs) and ecosystem function."[4]

So if we actively intervene, we need to do so with care, and with regular monitoring and recording of what we do and its outcomes, before scaling up.

Often it will be a matter of turning a negative mutually reinforcing spiral of environmental drivers into a positive reinforcing one. It is increasingly clear, as we trial different restoration techniques (eg see below), that recovery will not likely be achieved by focusing on single species restoration efforts (such as restoring just green-lipped mussels or just scallops). More probably, a group of mutually supporting species will need to be restored, for recovery of any one species to be successful. There is a danger of repeating the weaknesses of single species fisheries management in the Marlborough Sounds, in the restoration sphere.

Active and passive restoration efforts will also need to be designed to support each other. Active restoration efforts are unlikely to be successful in the long term if the pressures that resulted in the loss of species and ecosystems in the first place continue unabated. There is no point restoring scallop beds if dredges are then permitted to further degrade the habitat they require to survive, or pāua, if harvesting of large predators that keep the kelp forests in balance is still permitted.

There is also no point restoring filter feeders if high levels of sediment entering the marine environment continue unabated, so they unable to successfully recruit. This is why land-based restoration will be critically important, alongside marine restoration efforts, to reduce stressors on the marine environment.

In many cases, active restoration will be reliant on remnant *wild* populations of a species to provide a source of wild spat and juveniles (such as the remnant wild mussel beds in Te Hoiere / Pelorus Sound and scallop beds in the outer Sounds). It will therefore be critical that passive restoration measures protect these wild communities from further loss in order to provide opportunities for, and to support, active restoration efforts.

This all highlights the need for an integrated restoration approach, which could take the form of a 'marine restoration plan' (as discussed below), so that all the elements needed to bring a marine ecosystem and its myriad of species back to health are considered and addressed together. Without such an integrated approach, it seems likely that restoration efforts will remain small-scale, patchy and achieve mixed results.

In the following sections we describe some current marine restoration efforts before turning in Part Four to identifying opportunities to better support marine restoration efforts there.

Endnotes

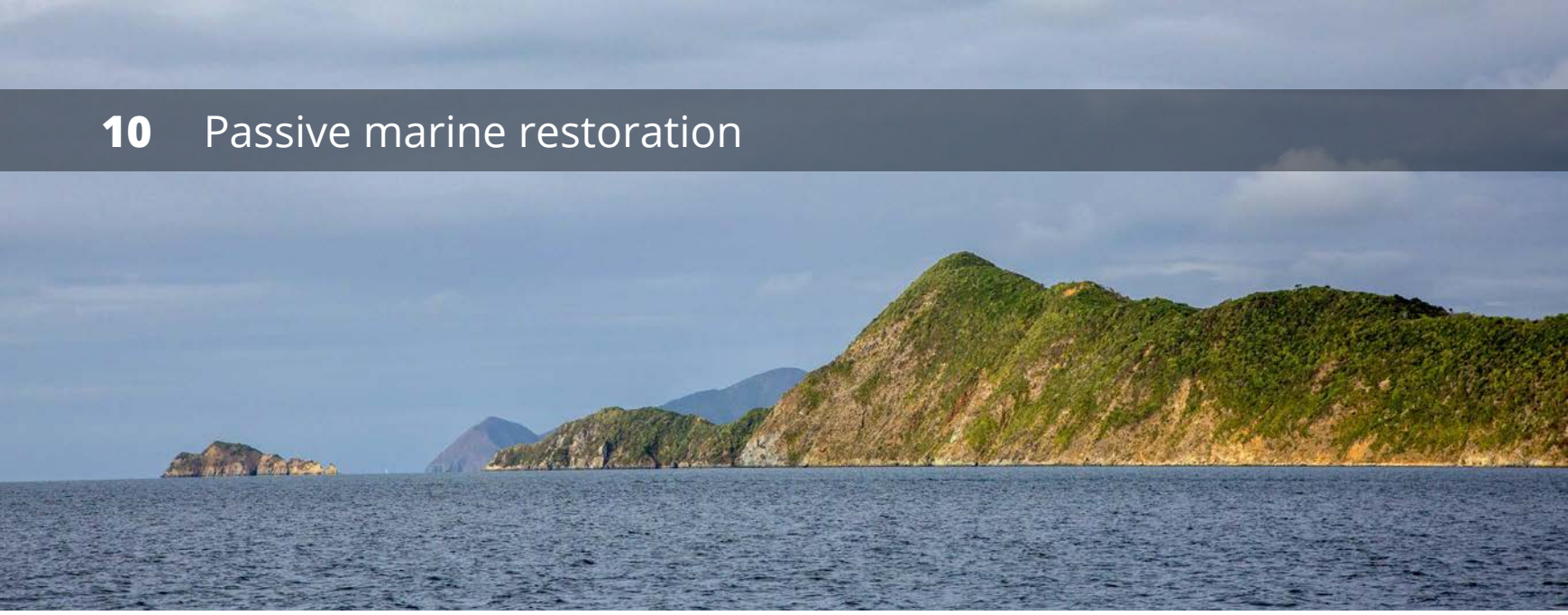
1 Hewitt J, R Gladstone-Gallagher and S Thrush, 2022, 'Disturbance-recovery dynamics inform seafloor management for recovery', *Frontiers in Ecology and the Environment*, 20(1), 564-572, at 564

2 Ibid, at 565

3 See for example, Shears N T and R C Babcock, 2003, 'Continuing trophic cascade effects after 25 years of no-take marine protection', *Marine Ecology Progress Series,* 246, 1-16

4 Thrush S F, J E Hewitt, R V Gladstone-Gallagher, C Savage, C Lundquist, T O'Meara, A Viellard, J R Hillman, S Mangan, E J Douglas, D E Clark, A M Lohrer and C Pilditch, 2021, 'Cumulative stressors reduce the self-regulating capacity of coastal ecosystems', *Ecological Applications*, 31(1), 2021, e02223, at 1

10 Passive marine restoration



Kokomohua / Long Island

"When you dive in the area, the difference is stark between the inside and outside of the marine reserve. Inside the reserve there is a huge abundance of kelp, kōura and blue cod. The kelp is so thick it's hard to find the lobsters. Outside the reserve there is less of everything and way more bare rock..." (Monique Ladds, DOC)[1]

Passive restoration in the marine space often takes the form of marine protected areas including no-take marine reserves. There is only one marine reserve in the entire Marlborough Sounds area, located around Kokomohua / Long Island, in Tōtaranui / Queen Charlotte Sound. This was first proposed by the Marlborough Combined Underwater Club whose members were inspired by the marine reserves established at the Poor Knights Islands and Leigh. They voluntarily stopped fishing around the island four years prior to the marine reserve coming into effect.[2]

The reserve was established in April 1993. It extends a quarter of a mile (463 m) from the shore, right around the island and northern rocks, covering a total waterspace of 6.2 km^2. It protects some 0.8 per cent of the sheltered waters of the Sounds from all forms of fishing.

The marine reserve has been regularly monitored, since 1992, and this is the longest running monitoring programme for any marine reserve in the country. In 2014, monitoring found that legal sized blue cod were three times more abundant in the reserve than outside and rock lobsters were 11.45 times more abundant. In addition, pāua were larger and more abundant and the numbers of small kina had decreased (likely due to predation by the large snapper, blue cod and rock lobster).[3] This impressive increase in rock lobster numbers has been maintained since that time (see Figure 10.1).

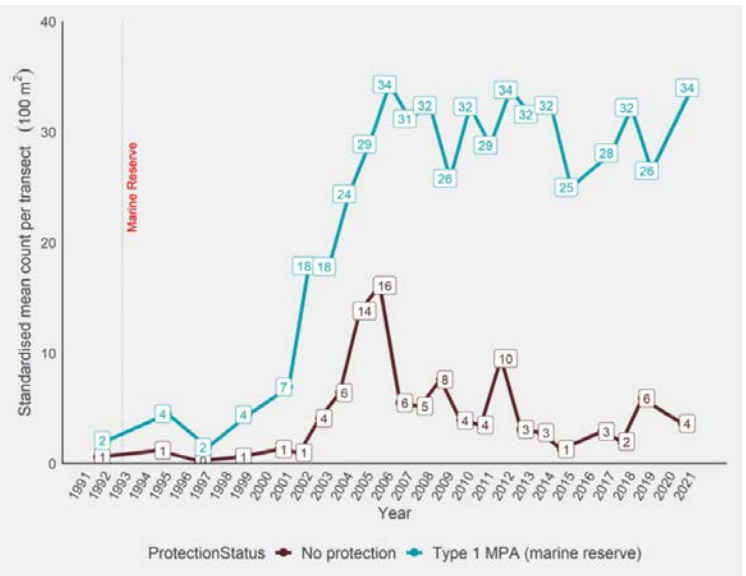


Figure 10.1 Rock lobster abundance per diver transect within and outside the Long Island-Kokomohua marine reserve *(Source: Department of Conservation)*[4]

In addition to the marine reserve, there are finfishing closed areas in Double Cove (in Tōtaranui / Queen Charlotte Sound) and Maud Island in Te Hoiere / Pelorus Sound. The adjacent land on Maud Island is a scientific reserve. There is also the Cook Strait Cable Protection Zone which excludes all fishing and anchoring apart from some harvesting along the coastal fringe out to 200 metres (where the take of rock lobster, pāua and kina is permitted as well as the use of set nets and finfish pots). It extends from Fighting Bay on the coast south-east of Te Whanganui / Port Underwood to Oteranga Bay in the North Island.[5] We have not been able to identify any marine monitoring in any of these areas.

The marine reserve at Kokomohua / Long Island has been highly successful in restoring a healthy population of rock lobster to the reef systems there. It also has much healthier blue cod populations.

Inner Tōtaranui / Queen Charlotte Sound

Endnotes

1 Department of Conservation, 2023, 'Counting koura in the Sounds – Long Island Kokomohua Marine Reserve', Blog, 15 May

2 Interviewee

3 Davidson R J, L A Richards, W Able and M Aviss, 2014, *Long Island-Kokomohua marine reserve, Queen Charlotte Sound: Update of biological monitoring, 1992-2014*, Davidson Environmental Limited, Nelson, at 3

4 Department of Conservation, 2023, 'Counting koura in the Sounds – Long Island Kokomohua Marine Reserve', Blog, 15 May

5 Transpower and Ministry of Transport, undated, *Cook Strait Submarine Cable Protection Zone*, Transpower, Christchurch and Ministry of Transport, Wellington, at 8-9

11 Active marine restoration

Farmed mussels have been used to assist restoration efforts in Te Hoiere / Pelorus Sound

Active marine restoration within the Marlborough Sounds has included efforts to restore wild green-lipped mussel beds in Te Hoiere / Pelorus Sound and kelp forests in Tōtaranui / Queen Charlotte Sound. We describe these projects in the sections below.

11.1 Green-lipped mussel beds

In 2016, two mussel farmers approached the Marine Farming Association wishing to initiate a green-lipped mussel restoration project in Te Hoiere / Pelorus Sound. This resulted in the Association partnering with the University of Auckland and The Nature Conservancy to apply for co-funding from the Sustainable Farming Fund for a trial. The funds were granted in 2019. The project has also been supported by the Te Tau Ihu Iwi Fisheries Forum and NIWA.[1]

The mussel farmers raised the need for the project because of the historical depletion of wild mussel beds, and the potential benefits of increased spat supply for the marine farms, if wild stocks were restored.[2] In this sense, there was a commercial as well as environmental interest in the development of the green-shell mussel bed restoration project.

The project consisted of placing four tonnes of adult green-lipped mussels, which had been farm grown from wild spat collected in Te Hoiere / Pelorus Sound, at five locations within the inner Sound where mussels had historically been present. Three sites were within Kenepuru Sound, one was at Māori Bay where the Kenepuru joins the larger Te Hoiere / Pelorus Sound area through Poupure Reach, and one was in rocky habitat at Grant Bay located in the large semi-enclosed area which has multiple mussel farms and includes Beatrix Bay. These sites had differing benthic environments ranging from a predominance of coarse sand to a predominance of mud, and also differing water current speeds.[3]

After their deposition, the health of the mussels was monitored over a two-year period. This found an 85 per cent survival rate at four of the five locations (totalling 73 per cent over all the beds). This is promising, and much higher than in similar trials in the North Island, where the survival rate has been just 26 per cent. There was also significantly higher amounts of spat on collectors at the mussel restoration sites, when compared with control areas, but no live recruits were observed in the mussel beds themselves.[4]

The mussels placed in Grant Bay, which was only 100 m from a mussel farm, had zero survival after 18 months. This was thought likely due to a high abundance of sea stars, which predate on the mussels, and are known to be present in high numbers under mussel farms.[5] In addition, the mussels did not spread out into a mat as occurred for those on soft sediment, meaning individuals at the bottom of the heap died and potentially provided a stronger attractor for predators.[6] This suggests that mussel reef restoration and mussel farms may not be spatially compatible, at least not while the wild reefs are being re-established.

The study also investigated the potential for restoration of *inter-tidal* mussel reefs, which historically in the Kenepuru Sound have recorded elevated numbers of juveniles, when compare to *subtidal* beds. Although placing sub-tidally grown farmed mussels in inter-tidal areas showed a

75 per cent survival rate over 12 months, no recruitment was evident there either.[7]

"Most of the mussels put on the seabed survived and built habitats for other marine organisms. Ongoing surveys of the beds show twice as many seaweeds, four times more blue cod and higher amounts of invertebrates such as sea cucumbers, compared to adjacent habitats."[8]

The current project is continuing until 2026. Scientists have been exploring ways of increasing wild mussel recruitment and have tested the use of seaweed with attached plantigrades (post-larval mussels) with some success. This highlights the positive relationship between mussel spat and seaweed[9] which has been long evident from the mussel industry's reliance on spat attached to beach cast seaweed collected from Ninety Mile Beach. It supports the proposition that restoration efforts may need to focus on a mix of marine species rather than restoring one at a time.

Restoration trials for green-lipped mussels in Te Hoiere / Pelorus Sound are showing some promise with adult mussels placed on the seabed and in inter-tidal areas showing high survival rates. There still appears to be a recruitment bottleneck which may require restoration efforts to broaden out to multi species.

11.2 Kelp forests

"The most exciting change we have seen has been the return of over 200 beautiful adult giant kelp, along with common kelp and brown seaweed across all the depths of the reef [at Motuara Island]."[10]

In May 2022, a kelp restoration project commenced in Tōtaranui / Queen Charlotte Sound, also led by the University of Auckland. The project has been undertaken in partnership with Te Ātiawa and has been supported by the Sustainable Seas National Science Challenge, Marlborough District Council, Port Marlborough and SLR Consulting.[11]

Between 7,500 and 9,500 kina were removed from four 0.25 ha sites at Tahuahua (Blackwood Bay), Ōruawairua (Blumine Island), Meretoto / Ships Cove and Motuara Island. These sites were carefully selected to profile a range of different environmental conditions, and were located along a continuum from the inner to the outer Sounds. Regular surveys were undertaken every two to three months to monitor for seaweed recovery, and to remove any new kina that had moved onto the sites.[12]

After 18 months, recovery was found at all the sites. The most sheltered site at Tahuahua saw some recovery but mainly along the shallow fringe area. The mid-range site at Ōruawairua showed dense growth in some of the shallower areas with mostly brown seaweed recolonising. At Meretoto / Ships Cove, which has similar seawater conditions to the Ōruawairua site, there was extensive recovery of brown seaweed and some juveniles of common and giant kelp species were re-establishing. Recovery at the final site, at Meretoto / Ships Cove, was the most impressive. This had the lowest water quality of all the sites and higher wave motion. There was recovery of adult giant kelp along with common kelp and brown seaweed across all depths of the reef.[13]

The results of the trials are impressive and encouraging. They indicate that it is likely possible to restore kelp and other seaweed species to the extensive kina barrens of Tōtaranui / Queen Charlotte Sound, but physical removal of kina will not be sufficient to achieve this in the longer term, as they will quickly reinvade. The associated marine ecosystem will also need to be brought back into balance.

The management implications of the kina removal trials have been summed up as follows: "Ultimately kina removal is a useful tool for recovery, it's just that it alone doesn't address the underlying problem which is the lack of large fish like blue cod and crays, which prey on the kina and naturally keep them in balance. These kina removals have kick-started the change … we need a wider approach to ensure lasting recovery."[14]

Endnotes

1 https://www.marinefarming.co.nz/mussel-bed-restoration/

2 https://www.marinefarming.co.nz/mussel-bed-restoration/

3 Benjamin E D, S J Handley, A Jeffs, L Olsen, T A Toone and J R Hillman, 2022, 'Testing habitat suitability for shellfish restoration with small-case pilot experiments', *Conservation Science and Practice*, DOI 10.1111/csp2.12878, at 3

4 Ibid, at 3 and 8

5 Ibid

6 Sean Handley, pers comm

7 Toone T A, J R Hillman, E D Benjamin, S Hadley and A Jeffs, 2022, 'Out of their depth: The successful use of cultured sub-tidal mussels for intertidal restoration', *Conservation Science and Practice*, DOI: 10.1111/csp22.12914

8 Marlborough District Council, 2024, 'Restoring wild mussel beds in the Top of the South', news release, 5 March

9 Toone T A, J R Hillman, E D Benjamin, S Hadley and A Jeffs, 2023, 'Provision of early mussel life stages via macroalgae enhances recruitment and uncovers a novel restoration technique', *Journal of Experimental Marine Biology and Ecology*, 566, 151919

10 Hart M, 2024, 'Kina removal helps Marlborough Sounds ecosystems recover', *Stuff*, 18 February

11 Sustainable Seas National Science Challenge, 2023, 'Kina removal shows promising outcomes for kelp forests', web news, 4 August

12 Hart M, 2024, 'Kina removal helps Marlborough Sounds ecosystems recover', *Stuff*, 18 February

13 Ibid

14 Ibid

12 Land-based restoration

Rai Valley, Te Hoiere / Pelorus Sound catchment

A land-based restoration project of note in the Marlborough Sounds is Te Hoiere Project. Established in 2022, this project led by Te Hoiere Kaitiaki Charitable Trust aims to restore Te Hoiere / Pelorus Sound catchment. The Trust is co-chaired by trustees from Ngāti Kuia and the Marlborough District Council. Dairy NZ and Beef and Lamb are involved in the project as is the forestry sector.

> "We work together to restore the mauri of Te Hoiere land, waters, and coast which flourish, along with peoples' wellbeing and livelihoods." (Te Hoiere Project Vision)[1]

The project has received $8 million from DOC as part of its Ngā Awa River Restoration Programme and $12 million from the Ministry for the Environment (MFE) as part of its At Risk Catchments Programme.[2] It provides subsidies for the fencing of riparian and wetland areas; riparian and wetland planting; fish passage mitigation; and other activities that improve water quality. In 2023, it was reported that 29,365 riparian and wetland plants had been planted, 25.5 km of fencing completed, 16.8 ha of wetland protected and five farm biodiversity plans prepared. Restoration activity was being undertaken on 38 properties.[3]

Ngāti Kuia is leading a project to restore the 16 ha Ruapaka wetland near Canvastown, including removing willows and other invasive species and planting the area with natives. The iwi has established a native nursery, using seeds eco-sourced from Ruapaka, and this employs rangatahi (the younger generation). The area has considerable cultural significance being a very early and significant Ngāti Kuia settlement located on an important walking and waka route from Motuweka / Havelock. It was also a significant source of harakeke (flax) and celebrated eel fishery.[4]

Te Hoiere project is now facing a funding cliff, as current government funding is expected to run out during 2024 and 2025. The challenge will be keeping key staff employed, and retaining the confidence of the community, while alternative sources of funds are secured.

Te Hoiere project is making positive progress in restoring Te Hoiere / Pelorus catchment, including the Ruapaka wetland, but the future of the project is unclear as government funding is slated to run out.

Forestry harvesting in the Rai Valley

Endnotes

1 Te Hoiere Project, 2023, *Annual report*, Te Hoiere Katiaki Charitable Trust, Canvastown, at 4

2 Radio NZ, 2019, 'Marlborough's at-risk catchment secures restoration funds', 6 December

3 Kotahitanga mō te Taiao Alliance, 2023, *Te pūrongorongo ā tau: Annual impact report 2023*, Kotahitanga mō te Taiao Alliance, Nelson, at 26

4 https://www.tehoiere.org.nz/about/catchment-actions/a-significance/ruapaka

13 Agency collaboration

Picton waterfront

In this Part we set out some ideas on approaches that could support marine restoration in the Marlborough Sounds. These are very preliminary and designed to prompt discussion and deliberation only. Much more kōrero (discourse) is required to identify and evaluate potential solution pathways.

When resources are scarce, it makes sense to draw those that are available together to ensure efforts are aligned and support each other. This can help reduce overlaps and gaps, and support obtaining the 'best bang for your buck'. Currently, there are three main governmental agencies which manage marine activities in the Marlborough Sounds: Marlborough District Council, Fisheries NZ and DOC.

There would likely be benefits in the agencies working more closely together, alongside iwi, in order to support the restoration of the Marlborough Sounds. In this section we explore three mechanisms to potentially achieve this: the Kotahitanga mō te Taiao Alliance (which has been operating since 2019), shared services in the marine space, and the regular joint preparation of a 'State of our Sounds' report.

13.1 Kotahitanga mō te Taiao Alliance

The Kotahitanga mō te Taiao (KMTT) Alliance (or 'collective action for our natural world'), formed in 2019, and initially comprised DOC, all the councils in Te Tauihu (including Marlborough District Council) and Te Tauihu iwi. MFE and Fisheries NZ subsequently joined the iwi-government alliance. The Nature Conservancy was brought on board in 2020 to act as programme manager for the initiative.

The purpose of the Alliance is to "align and collaborate on conservation projects across the Buller, Marlborough, Nelson and Tasman region to provide a collaborative voice for conservation". The vision, scope and principles underpinning the Alliance are set out in a signed memorandum of understanding.[1] Members have agreed a KMTT Strategy, which covers the entire Te Tauihu (top of the South) region, and focuses on landscape scale conservation. It includes objectives for the Marlborough Sounds (see below) which are pitched at a generally broad level.

Waimahara Wharf, Shakespeare Bay

Spotlight on the KMTT Strategy provisions for the Marlborough Sounds

The KMTT Strategy includes a specific chapter on the Marlborough Sounds and Cook Strait area. This contains a set of key objectives as follows:[2]

- Shellfish beds are restored to a level where harvesting can be sustained.
- Sediment inputs from rivers, streams and seabed disturbance are at ecologically sustainable levels that allow benthic ecosystems to thrive.
- Shellfish and biogenic habitats/communities are protected and restored.
- Estuarine ecologies are restored and managed, and coastal retreat is provided for as sea levels rise.
- Integrated management of land and sea.
- Communities and industries change land use and sea-based activities to approaches that allow them to flourish, while halting ecologically unsustainable practices.
- Restoration of native ecosystems on all islands and defensible peninsulas.
- Threatened ecosystems and species are secured and restored.
- The formal identification and protection of key land areas that are important to biodiversity.
- Landscape-level pest and weed pressures are reduced and that is sustained over time.

The Strategy has been designed to "facilitate collective action, enable access to funding opportunities to enable and enhance delivery on biodiversity outcomes".[3] Although the Alliance does not directly incorporate community members or NGOs, the KMTT Strategy is intended to act as an umbrella to support aligned community initiatives. This includes providing support for community funding applications. The Alliance is also developing its own priority projects.

The Nature Conservancy has more recently led a 'Restoration by Design' process to develop an Operational Plan for the Strategy. This includes a 'ki uta ki tai' (from mountains to sea) element which is aimed at supporting "iwi leadership to restore our marine environment", putting "shellfish at the centre of restoration", supporting "the marine blue economy to transition to more environmentally friendly methods" and continuing to "scope projects to align with the KMTT strategy, including iwi led".[4]

The main KMTT initiative in the Marlborough Sounds, with potential impacts on the marine area, is Te Hoiere catchment restoration project described above. Restoration work is intended to eventually extend into the marine area, but this phase 2 of the project has yet to be fully designed and does not have funding.

The KMTT Alliance and Strategy, although covering a much wider geographic area than the Marlborough Sounds, provides a valuable framework which could support stronger agency and iwi collaboration on marine restoration initiatives.

13.2 Shared services

Marlborough District Council, DOC and Fisheries NZ all provide marine management services in the Sounds. The Council manages land and sea activities including forestry, land clearance, earthworks, aquaculture, marinas, jetties and the like. It is also tasked with managing the impacts of fishing and other activities on indigenous marine biodiversity. The Council is headquartered out of the Sounds (but only a 20 minute drive away) in Blenheim. It has a service centre in Picton which houses the Nautical and Coastal Team which is responsible for state of the environment monitoring of the coastal environment, research, advocacy and liason with the community and government agencies. The Council hosts the Harbourmaster in its Picton office who manages shipping activity and marine pollution within harbour limits (which includes all of the Sounds). As already noted, the Council also owns Port Marlborough, which operates the port and marinas and has a pilot boat.

DOC's operational work in the Sounds is carried out by a district team based in Picton (with a smaller field centre in Havelock) with regional support functions based in Nelson. DOC manages an extensive network of scenic reserves in the Sounds (including much of the Queen Charlotte Track), as well as the Sounds Foreshore Reserve, which extends around some 900 km of the Marlborough Sounds coastline. There are several predator-free islands within the Sounds, which support a number of

threatened species that have been lost from the mainland. DOC also manages and monitors the Long Island-Kokomohua marine reserve and issues commercial marine mammal watching and swimming permits. DOC has oversight of protected species including marine mammals and seabirds. In particular (and as noted above), the Sounds hosts the only population of the nationally endangered New Zealand king shag

Fisheries NZ is in charge of managing all harvested marine species and the environmental impacts of fishing activity. The Marlborough Sounds comes under the Inshore Fisheries South Team which is managed out of Dunedin. This team manages the sustainability review of stocks in the Sounds and other fisheries decision-making matters. Fisheries NZ has a smaller office in Blenheim, which focuses on compliance, and which operates a fisheries patrol vessel based in Picton.

The agencies have worked collaboratively together on some marine initiatives. For example, DOC has provided funding and in-kind technical support for the Council's ecologically significant marine sites programme and Fisheries NZ has supported protection of some of the sites by excluding kina dredging in Kura Te Au (as described above). In addition, the Top of the South Marine Biosecurity Partnership has brought together the Council, MPI and DOC alongside Tasman District Council, Nelson City Council, the aquaculture industry, port users and others to protect the area from invasive marine species.[5] However, there are other areas where agency coordination might usefully be strengthened.

One aspect raised with us by interviewees was on the water presence. All three agencies have patrol boats and are out on the Sounds to various extents, particularly over the summer months. It could make sense to pool this scarce resource so that each vessel is undertaking monitoring and compliance work jointly for the three agencies. This would require cross-agency training and warranting of staff to act under the legislation administered by the other agencies

Agencies in Fiordland have developed a Fiordland Compliance Strategy which "takes a collaborative approach to carrying out surveillance and compliance activities and responsibilities over this vast and isolated area".[6]

Pooling on the water capacity between the Marlborough District Council, DOC and Fisheries NZ could enable a stronger marine compliance and enforcement capability within the Marlborough Sounds.

13.3 State of the Sounds report

"Marlborough's marine biodiversity is not in good shape, particularly in the Sounds. The significant issues are: fewer fish, not as many species, serious loss of biogenic habitats, sedimentation in estuaries smothering thousands of hectares of seabed and biosecurity incursions." (State of Environment Report, 2015)[7]

The second area where the agencies might usefully combine efforts, in partnership with iwi, would be in the production of a regular 'State of the Sounds' report. There is a wealth of technical material available on the Marlborough Sounds, including extensive muilti-beam mapping, some of which has been reviewed for this report. The amount of information and number of reports available is very large and impressive. It suggests that the Marlborough Sounds might be *the* most studied inshore coastal area in the country (with the Hauraki Gulf being the only other likely contender for that title).

However, despite the wealth of material, there is no up-to-date publication which brings all the information together in one place, in a user-friendly format that is accessible to the public. The latest State of the Environment report available on the Council's website dates to 2015, and although valuable, its focus is much wider than the Marlborough Sounds marine area. It is also now dated (there is a large volume of relevant reports prepared after that date) and it suffers from a lack of information on matters outside the Council's ambit, such as the state of fish stocks and fishing activity.

A regular 'State of the Sounds' could draw on the 2015 report and update it with the wealth of information held collectively by Marlborough District Council, DOC, Fisheries NZ and Te Tauihu iwi. It could describe the current ecological health of marine habitats and species in the Marlborough Sounds, compare it to the historical baseline (to indicate the extent of change), and shows trends in condition over time (to indicate the extent to which agencies are addressing the problems).

Such a report could incorporate mātauranga Māori (to the extent this was provided by iwi) and report on cultural indicators of health and change. This could be aligned with the request from Te Ātiawa for the collaborative development of a kaitiaki monitoring programme for coastal areas of Tōtaranui / Queen Charlotte Sound and Kura Te Au / Toru Channel.[8] It could also be integrated with a cultural marine monitoring programme in Te Hoiere / Pelorus Sound, if this is included in stage 2 of Te Hoiere project.

Such a report could be instrumental in both better communicating the current State of the Sounds and direction of travel, as well as mobilising community and political support and funding for action to address decline. The three-yearly 'State of the Gulf' reports, required under the Hauraki Gulf Marine Park Act 2000,[9] have been pivotal in keeping attention focused on the extent of degradation of the Hauraki Gulf and in mobilising action to address it. The 2011 report was the trigger for the establishment of the Sea Change Tai Timu Tai Pari marine spatial planning project which has generated central government action on fisheries and marine protection.[10]

A collaboratively produced triennial 'State of the Sounds' report could help communicate the wealth of information available on the Sounds to a broader audience, keep the state of the Sounds front of mind, and help build community and political support for the changes required to address ongoing ecological decline.

Head of Te Hoiere / Pelorus Sound

Endnotes

1 See Kotahitanga mō te Taiao Alliance, 2019, *Kotahitanga mō te taiao strategy*, Kotahitanga mō te Taiao Alliance, Nelson, Appendix 3

2 Ibid, at 35-35

3 Ibid, at 4

4 Ibid, at 9

5 https://www.marinebiosecurity.co.nz

6 Fiordland Marine Guardians, 2023, *Annual report 2022/23*, Fiordland Marine Guardians, at 11

7 Marlborough District Council, 2015, *Our land our water our place: State of the environment report 2015*, Marlborough District Council, Blenheim, at 150

8 Bennett J, 2024, *Cultural effects assessment: Ecologically significant marine sites (ESMS) Variation 2*, Prepared for the Marlborough District Council, Te Ātiawa o Te Waka-ā-Māui Trust, Waikawa, at 21

9 See section 17(1((g), Hauraki Gulf Marine Park Act 2000

10 See Peart R, 2019, 'Sea Change Tai Timu Tai Pari: Addressing catchment and marine issues in an integrated marine spatial planning process', *Aquatic Conservation: Marine and Freshwater Ecosystems*, 1-13

14 Regional fisheries plan

Moored vessels at Waikawa

In this section we explore how a regional fisheries plan might contribute to restoring the Marlborough Sounds.

14.1 Problems with single-stock management

"Our bay used to be full of life. You could pick the cod you wanted to eat that night. The mountain of fish in the channel was immense. You could almost walk across them. I haven't seen anything like that in a long time. The whole bay was rippling with fish." (Local resident)

"In the Sounds blue cod is in a terrible state. It needs to be closed. Last time it was closed the fish came back. And they opened it up and by March they were all gone … Other species are in trouble; butterfish, moki and tarakihi are not in the Sounds. There are more snapper and kingfish. When I first came here [40 years ago] there were heaps of snapper but they got dragged out with a purse seine." (Local resident)

There is no doubt that the fish stocks of the Marlborough Sounds are not what they were, and that most of the more popular species are heavily depleted. This indicates that single-stock-focused fisheries management has not worked in the complex environment of the Sounds where cumulative stressors on fish stocks are at play. In section 7 of this report we reviewed a range of stocks and we have summarised the findings in Figure 14.1 below.

Species	State of stock
Green-lipped mussels	Wild population likely only some 3 per cent of historical size with sub-tidal populations disappearing entirely.
Pilchards	Stock size and status unknown but not large enough to support a commercial fishery which ceased in 1949. Large schools of pilchards that were commonly seen in Tōtaranui / Queen Charlotte Sound historically, now rarely occur.
Blue cod	Stock size under target and stock likely overfished. This is despite a seasonal closure, a daily recreational bag limit of two fish per person for over 12 years, and the TACC set at its lowest level ever of just 58 tonnes (around half the 1986 level of 110 tonnes). New management measures being considered.
Scallops	Scallop stock at lowest recorded levels, with the once abundant and wide-spread beds in the Marlborough Sounds reduced to just five remaining dense beds. Fishery closed.

Species	State of stock
Pāua	Fishery effectively collapsed within the Sounds with just a small fishery remaining on the exposed east coast of Arapaoa Island and Te Whanganui / Port Underwood.
Rock lobster	Fishery in the inner Sounds likely at very low levels. Commercial fishery in the outer Sounds has a low CPUE.
Hāpuku	Current status unknown but no hāpuku observed within Tōtaranui / Queen Charlotte Sound during a 2018 video survey or within the likely main spawning areas in Cook Strait.
Snapper	Anecdotally the stock may be recovering, but not nearly to the same extent as the potentially separate stock in Tasman and Golden Bays, with recreational catches not showing any recorded significant increase over the past 5 years.

Figure 14.1 Summary of state of key fish stocks in the Marlborough Sounds

One of the problems with single-stock-focused fisheries management is that it largely ignores the interactions between fishing activities, fish stocks and the habitats the stocks need to reproduce and survive. For example, it is evident from the analysis in the preceding sections that:

- The over-harvesting of large rock lobster and blue cod in the Sounds has contributed to the loss of seaweed forest (and development of kina barrens), which in turn has contributed to the collapse of the pāua fishery there.
- The loss of seaweed has also likely contributed to the depletion of the rock lobster fishery in the inner Sounds due to the loss of an important food source for adult lobsters.[1]
- Loss of seaweed may also be contributing to a lack of recovery of green-lipped mussels, with recruitment thought to be associated with the presence of seaweed.
- Loss of seaweed is likely contributing to low growth rates and small body size of blue cod.
- The physical damage to bryozoan beds, Galeolaria mounds and other biogenic habitats in the Sounds from dredging for scallops and trawling for finfish has removed important habitat for juvenile blue cod and snapper, thereby reducing the productivity of those stocks.
- The loss of Galeolaria mounds and other dense beds of filter feeders, as a result of scallop dredging, has likely contributed to the significant decline in water quality in Tōtaranui / Queen Charlotte Sound. Juvenile cod dislike turbid water.
- Scallop dredging and finfish trawling have changed much of the benthic substrate in the Sounds, from sand and gravel to mud, making it unsuitable for scallop recruitment and survival and less suitable for blue cod.
- Scallop dredging and finfish trawling have resuspended sediment into the water column, which is deposited onto the seabed and in Te Hoiere / Pelorus Sound is transported back up into the inner Sound. Pāua are particularly susceptible to sediment which increases the mortality of larvae and disrupts settlement.

This raises the need for a more ecosystem-based approach to fisheries management in the Sounds so these interactions can be better managed.

14.2 Ecosystems-based fisheries management

> "Everyone looks at one species at a time but you need to look at the entire ecosystem." (Local resident)

Fisheries NZ has described an ecosystems approach to fisheries management as follows:[2]

> The goal of an ecosystems approach to management is to maintain a healthy, productive, and resilient ecosystem that provides for the needs and values of current and future generations; it takes a holistic and inclusive approach to managing activities and the effects they have on the environment, aligning with a Te Ao Māori view of coastal ecosystems.

A key plank of the approach is the identification and protection of "habitat of particular significance for fisheries management" under section 9(c) of the Fisheries Act. This is due to recognition by fisheries managers that "loss of habitat and changes in habitat quality can affect juvenile fish production" and that "maintaining habitat distribution and connectivity is important for juveniles as they move into adulthood, and for adults when they breed, which all contribute to productivity".[3]

Interestingly, the draft fisheries plan for PAU7 includes a strategy to "identify areas that are particularly important for pāua larval settlement and nursery habitat" and to "work with iwi and other interested parties to ensure that important pāua habitat is protected from adverse effects of fishing and non-fishing activities".[4]

Although there is likely to be overlap between such important fisheries habitats, and the ecologically significant marine sites identified by Marlborough District Council, the former are likely to comprise additional and much larger areas. This is due to the differences in purpose for protecting such areas and criteria for their selection.

The Council's purpose in protecting marine sites under the RMA is to provide for "the protection of areas of significant indigenous vegetation and significant habtiats of indigenous fauna",[5] as well as "maintaining indigenous biological diversity".[6] Criteria that have been applied to site selection include representativeness, rarity, diversity and distinctiveness. The purpose of protecting habitat under the Fisheries Act is different in that it is to support the productivity of fish stocks.[7]

For fisheries, habitat *size* matters as well as quality, as a reduction in the availability of suitable habitat can result in 'habitat bottlenecks' that constrain fish production.[8] Criteria that have been proposed for habitat selection include "nursery, spawning or egg laying habitat" which is "currently particularly significant in supporting the productivity of fisheries resources".[9] Given the extensive loss of important fisheries habitat in the Sounds, much of what remains is likely to be "particularly significant" for fisheries productivity.

NIWA has been undertaking an exercise to identify habitats of particular significance for fisheries management within the Marlborough Sounds and the results are expected to be published later in 2024.[10] This will provide an opportunity to apply a stronger ecosystems-based lens to fisheries management, including through protecting and restoring important fisheries habitat. Such efforts could be supported by the development of a Marlborough Sounds Fisheries Plan.

14.3 Marlborough Sounds Fisheries Plan

The Fisheries Act provides for the development of fisheries plans, which are approved by the Minister, and must then be taken into account when making decisions on sustainability measures.[11] Approved fisheries plans that currently apply to the Marlborough Sounds include the Southern scallop strategy (discussed above) and the National Inshore Finfish Fisheries Plan (2022).[12]

This National Inshore Plan, which applies to all inshore finfish species around the entire country, is necessarily set at a high level. However, in the plan Fisheries NZ indicates an intention to develop and support localised fisheries management approaches. This includes "appropriate management of fish taken in mixed fisheries, giving attention to habitats critical to our fish stocks, and working closely with communities to support arrangements which lead to better outcomes at a local level".[13]

The National Inshore Finfish Fisheries Plan includes Management Objective 8 which is to "enable community stewardship of local area finfish resources". This is supported by several management actions including 8.1 which is to "support community-led, multi-stakeholder groups to identify objectives and solutions for local area fisheries management" and:

> Implement pilot programmes to trial local area fisheries management approaches including:
>
> - Developing a management framework and tools to support local area fisheries management approaches.
> - Incorporating mātauranga Māori.
> - Engaging local and central government agencies on integrated planning approaches for managing non-fishing impacts on the environment.
> - Identify and trial management tools, processes and systems to progress further development and implementation of EBFM [ecosystem-based fisheries management]. [14]

This approach lends itself to the development of an area-specific regional fisheries plan, as it is only when a marine ecosystem and associated iwi/hapu and communities are considered as a whole, that an ecosystem-based approach to fisheries management can be fully realised.

The first such area-specific fisheries plan has been developed for the Hauraki Gulf and was approved by the Minister in August 2023.[15] The plan is seen as a mechanism to advance ecosystem-based fisheries management through considering "ecosystems as a whole, recognising the physical, biological, economic and social interactions among fisheries and associate components of the ecosystem including people." It also seeks to support efforts to "substantially reduce sedimentation" that affects fisheries in the Hauraki Gulf.[16]

"For the Gulf, the traditional single-species approach to fisheries management has not served us well in the face of complex ecological interdependencies."[17]

Spotlight on Hauraki Gulf Fisheries Plan

The Hauraki Gulf Fisheries Plan sets out three high-level outcomes:

- Healthy, functioning aquatic ecosystems that support sustainable fisheries
- Fisheries resources are at levels which meet the needs of Treaty partners and stakeholders
- Inclusive and integrated regional participation in the governance of fisheries.[18]

The Plan then specifies a set of management objectives and actions to help achieve the desired outcomes. In particular, it seeks to better integrate fisheries management with addressing land-based impacts including sedimentation. Implementation of the plan is supported by a multi-sector Hauraki Gulf Fisheries Plan Advisory Group.

A similar approach could be taken for the Marlborough Sounds, with the preparation of a Marlborough Sounds Fisheries Plan by iwi (potentially through Te Tau Ihi Fisheries Forum) and multi-stakeholders. This could be tailored to the local circumstances; focus on fisheries management at place; and address the health of habitats, fish stocks and people in a holistic manner.

A Marlborough Sounds Fisheries Plan could provide an ecosystem-based framework to guide management decisions for specific fish stocks in the Sounds, as well as identify habitats of particular significance to fisheries that are in need of protection.

French Pass

Endnotes

1 MacDiarmid A B, D Freeman and S Kelly, 2013, 'Rock lobster biology and ecology: Contributions to understanding through the Leigh Marine Laboratory 1962-2102', *New Zealand Journal of Mairne and Freshwater Research*, 47(3), 313-333, at 323

2 Fisheries New Zealand, 2022, *Draft guidelines for the identification of habitat of particular significance for fisheries management*, Fisheries New Zealand, Wellington, at 4

3 Ibid, at 5

4 Pāua fisheries plan for PAU7, November 2022, at https://www.mpi.govt.nz/dmsdocument/57946-Paua-fisheries-plan-for-PAU-7, at 7

5 Section 6(c), Resource Management Act 1991

6 See functions of regional councils in section 32(1)(ga), Resource Management Act 1991

7 See definition of "ensuring sustainability" under section 8(2) of the Fisheries Act 1996 which is "maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations"

8 Morrison M, M Consalvey, K Berkenbusch and E Jones, 2008, 'Biogenic habitats and their value to New Zealand fisheries', *Water and Atmosphere*, 16(4), 20-21

9 Fisheries New Zealand, 2022, *Draft guidelines for the identification of habitat of particular significance for fisheries management*, Fisheries New Zealand, Wellington, at 7

10 Mark Morrison, pers comm

11 Sections 11A and 12, Fisheries Act 1996

12 Fisheries New Zealand, 2022, *National inshore finfish fisheries plan*, Fisheries New Zealand, Wellington

13 Ibid, at 4

14 Ibid, at 34

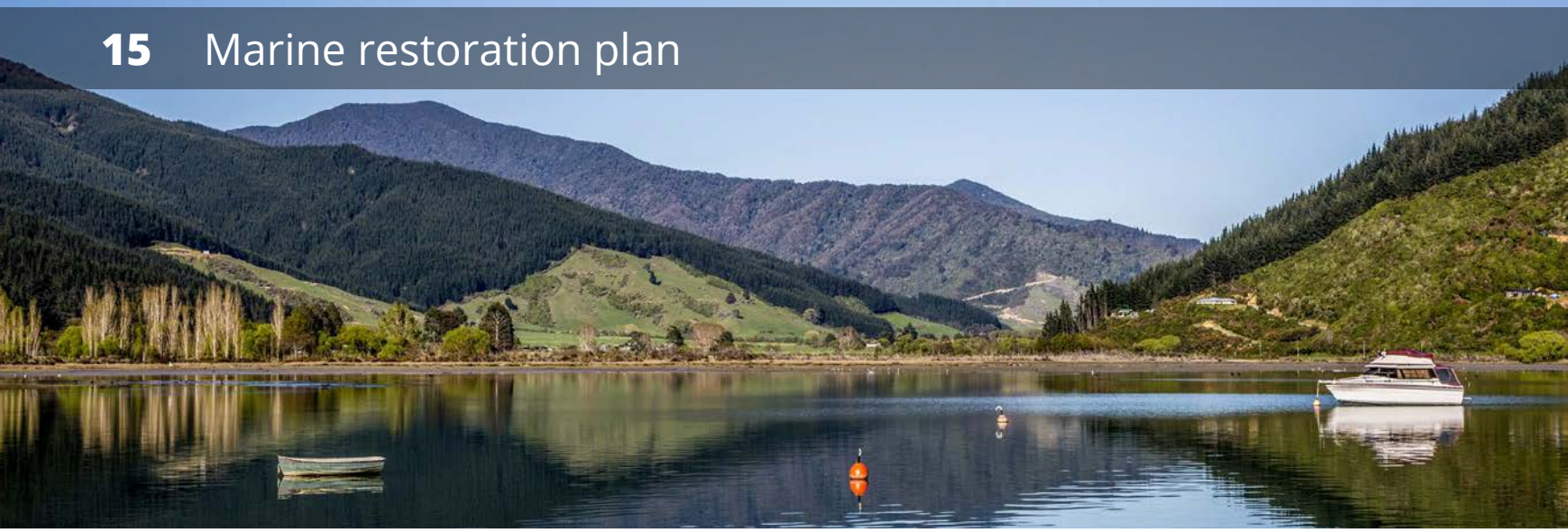
15 Fisheries New Zealand, 2023, *Hauraki Gulf fisheries plan*, Fisheries New Zealand, Wellington

16 Ibid, at 8-9

17 Hon Rachel Brooking, Minister for Oceans and Fisheries, in Fisheries New Zealand, 2023, *Hauraki Gulf fisheries plan*, Fisheries New Zealand, Wellington, at 3

18 Fisheries New Zealand, 2023, *Hauraki Gulf fisheries plan*, Fisheries New Zealand, Wellington, at 11

15 Marine restoration plan



Inner Tōtaranui / Queen Charlotte Sound

"The Marlborough Sounds is in a declining state. We are monitoring decline." (Marine scientist)

There is a wealth of reports and information on the Sounds, documenting its ecological decline, but an overall lack of effective action to address the situation. At the same time, it is clear that reversing that decline and restoring healthy marine habitats in the Sounds will take a range of coordinated actions so that passive marine, active marine and land-based restoration activities can support each other in a synergistic manner.

Such co-ordination can be provided through marine restoration planning. As well as providing strategic direction as to where restoration effort might generate the 'best bang for the buck', it can serve as a useful mechanism to support and connect existing iwi and community projects, through joining up the 'blue dots'.

15.1 Restoration planning in practice

There is a growing body of experience in Aotearoa New Zealand in developing frameworks for the restoration of large degraded natural systems. These include the strategies and action plans that have been co-developed to address degradation of the Whanganui River and Hauraki Gulf, which are described below, in order to provide some inspiration for the development of a suitable a marine restoration approach for the Marlborough Sounds.

Whanganui River

The 290 km long Whanganui River has been given legal personhood under the Te Awa Tupua (Whanganui River Claims Settlement) Act 2017. Part of the arrangements for managing Te Awa Tupua (the river), set out in the legislation, is the establishment of a strategy group called Te Kōpua. The group is comprised of iwi and multi-stakeholders and is tasked with developing, approving and monitoring the implementation of 'Te Heke Ngahuru' which is effectively a strategy for the restoration of Te Awa Tupua.[1]

In particular, Te Heke Ngahuru is to identify the issues relevant to the health and well-being of Te Awa Aupua; provide a strategy to deal with those issues; and recommend actions to deal with them. The document has legal effect in that persons exercising functions under other Acts (including the RMA, the Fisheries Act, and the Conservation Act) must "have particular regard" to it.[2]

"We have created our strategy for the awa, but below that there's no combined effort in implementation. We see a lot of investment in activity occurring across the catchment but it's not attached to a single plan."[3]

The strategy has been completed and the River iwi are now developing an action plan to guide and optimise restoration activities. This will both

serve to coordinate and combine efforts in order to "eliminate costly inefficiencies" and identify the most cost-effective investments "to improve health and wellbeing of the awa".[4]

Whanganui iwi are developing a restoration action plan to implement Te Heke Ngahuru (the strategy) for supporting the health and well-being of Te Awa Tupua.

Hauraki Gulf

The Sea Change Tai Timu Tai Pari Marine Spatial Plan is a non-statutory document which focuses on addressing the ongoing degradation of the Hauraki Gulf Marine Park. It was developed by an iwi and multi-stakeholder working group overseen by a co-governance iwi-agency body. Completed in 2016, it sets out objectives and management actions for fish stocks, aquaculture, biodiversity, and water quality amongst other things.[5]

"Tīkapa Moana / Te Moananui-ā-Toi – the Hauraki Gulf Marine Park vibrant with life, its mauri strong, productive, and supporting healthy and prosperous communities." (Vision for the Hauraki Gulf)[6]

The objectives set out in the Sea Change Plan include the following of potential relevance to the Marlborough Sounds:

- Restoring fish stocks
- Restoring heathy functioning ecosystems
- Protected, enhanced, and restored habitats
- Restored species diversity and abundance
- Sediment erosion off the land minimised
- Sediment runoff captured before it reaches the marine area
- Sediment already deposited in the marine environment stabilised.

The Plan also identifies new space for aquaculture, but this aspect is likely not needed in the Marlborough Sounds, given the Marlborough District Council's existing work on developing AMAs in the coastal marine area (as described above).

The Sea Change Tai Timu Tai Pari Plan for the Hauraki Gulf addresses a range of issues similar to those being faced in the Marlborough Sounds. They are being implemented through a regional fisheries plan and bespoke marine protection legislation.

The Sustainable Seas National Science Challenge has distilled guidance on marine spatial planning drawn from the ten years of research by the Challenge. The guidance indicates that such planning can be applied at small and regional scales.[7] It also emphasises the importance of making a start, and that much can be achieved through drawing on local knowledge and leadership. We have explored the concept of MSP, what it can deliver and how it might be applied, in much more depth in our accompanying working paper 'Restoring the Sea: The role of marine spatial planning'. We encourage readers to refer to that paper for a deeper understanding of the MSP appproach.[8]

"A major barrier to the use of MSP is the perception that MSP requires substantial data and technical capacity to be implemented. However, MSP does not necessarily require extensive quantitative data and complex tools. Simple maps informed by local knowledge can be used ..."[9]

There is growing experience in planning to restore large natural systems, in Aotearoa New Zealand, which can be drawn on to design an approach tailored for the Marlborough Sounds.

Boat sheds on the Waikawa foreshore

15.2 Marlborough Sounds Marine Restoration Plan

> "What we are lacking is spatial planning so we know where to focus our effort for management and restoration." (Marine scientist)

The development of an integrated marine restoration plan for the Marlborough Sounds could help align and focus restoration efforts on the things that will make the most difference to the health of the marine area overall. It could include a mix of passive marine restoration, active marine restoration and land-based restoration actions that support each other in a synergistic manner. It could also set out what the goals of restoration are including what state the Sounds is to be restored to.

This would be in line with the proposed Marlborough Environment Plan where objective 6.2 is to "preserve and promote the restoration of the natural character of the coastal environment..." and policy 6.2.8 is to "encourage and support Marlborough's tangata whenua iwi, private landowners, community groups, businesses and others in their efforts to restore the natural character of the coastal environment....". It is also notable that Te Ātiawa has called for "a shared plan for the protection and preservation of the natural, ecological and cultural values of Tōtaranui and Kura Te Au" to be "developed in partnership between Te Ātiawa and the Council".[10]

Such an initiative could build on, and learn from, the integrated planning process ('Marlborough Marine Futures') that was undertaken under the umbrella of the Marlborough Sounds Integrated Management Trust between 2014 and 2017. This sought to bring all parties together under a collaborative framework, was supported by the Marlborough District Council, but eventually foundered due to lack of central government agency support.

Te Whanganui / Port Underwood

A Marlborough Sounds Marine Restoration Plan could be developed under the framework of the KMTT Alliance (where central government agencies are partners) or it could be a separate initiative. Whatever model is adopted, the Plan will likely need its own governance body that can oversee its preparation, implementation and review. A big flaw in the implementation of the Sea Change Plan was the dissolution of the governance group and stakeholder working group (which developed the Plan) once it was completed so there was no carry-over into implementation.

"A significant challenge (which already exists for implementation of things like the KMTT Strategy) is how to ensure that undertakings are incorporated into the prioritisation and resourcing decisions of each agency."[11]

A Marlborough Sounds Marine Restoration Plan could be prepared in several parts, with each part led by the relevant iwi in partnership with the statutory agencies (eg Marlborough District Council, DOC, Fisheries NZ and MFE) and in collaboration with the community. However, given the multiple overlapping iwi interests in the Sounds, and the relevant statutory acknowledgements, this may not be feasible. An overall initiative could be overseen by a multiple iwi-agency partnership body, with the Plan itself prepared through a collaborative multi-stakeholder process to help generate buy-in from all sectors.

The governance group could also oversee the operation of the proposed Marine Restoration Fund discussed below, which could fund the Plan preparation process as well as ongoing implementation. The Restoration Plan would in effect set priorities for the expenditure of that money.

Unless there is legislative change, the Plan would initially be non-statutory but it could be subsequently implemented by bespoke legislation. This has been done in Fiordland with the Fiordland (Te Moana o Atawhenua) Marine Management Act 2005, in Kaikōura with the Kaikōura (Te Tai o Marokura) Marine Management Act 2014, and will be shortly in the Hauraki Gulf (with the Hauraki Gulf/Tīkapa Moana Marine Protection Bill 2024). Such legislation is more likely to be successfully achieved if the Plan is well-founded and has broad support from iwi, industry and the community. The strength of bespoke legislation is that it can be tailored to the needs of the specific marine area, iwi and community.

Notably, in Fiordland, the marine planning process was initiated by commercial fishers; in Kaikōura by Ngāti Kuri (a hapū of Ngāi Tahu); and in the Hauraki Gulf by the Hauraki Gulf Forum (a multi-agency and iwi statutory integration body). In the case of Fiordland and Kaikōura, statutory Guardians were subsequently established to oversee implementation and provide ongoing advice to Ministers.

A Marlborough Sounds Restoration Plan could be linked to the legal personhood and guardian model discussed below, if they were pursued, and it could help guide future iterations of the Marlborough Sounds Fisheries Plan proposed above as well as catchment restoration efforts.

A Marlborough Sounds Restoration Plan could provide a strategic framework and set out a range of coordinated actions for passive marine, active marine and land-based restoration activities that can support each other in a synergistic manner to restore the health of the Sounds.

Endnotes

1 See sections 30-36, Te Awa Tupua (Whanganui River Claims Settlement) Act 2017

2 Sections 36-37, Te Awa Tupua (Whanganui River Claims Settlement) Act 2017

3 Nancy Tuaine, Kaihautū, Ngā Tāngata Tiaki o Whanganui quoted in Ellis M, 2024, 'Whanganui River iwi take next steps to restore Te Awa Tupua', *Te Ao Māori News*, 20 July

4 Ellis M, 2024, 'Whanganui River iwi take next steps to restore Te Awa Tupua', *Te Ao Māori News*, 20 July

5 Sea Change Tai Timu Tai Pari, 2017, *Sea Change Tai Timu Tai Pari Hauraki Gulf marine spatial plan*, Waikato Regional Council, Hamilton

6 Ibid, at 17

7 Lundquist C, M Bennion and T Brough, 2024, *Enabling effective marine spatial planning for ecological and economic wellbeing*, Guidance document, Sustainable Seas National Science Challenge, Wellington, at 1

8 Peart R, D Koolen-Bourke and S Sadibe, 2024, *Restoring the Sea: The role of marine spatial planning*, EDS Oceans reform project working paper 1, Environmental Defence Society, Auckland

9 Lundquist C, M Bennion and T Brough, 2024, *Enabling effective marine spatial planning for ecological and economic wellbeing*, guidance document, Sustainable Seas National Science Challenge, Wellington, at 2

10 Bennett J, 2024, *Cultural effects assessment: Ecologically significant marine sites (ESMS) Variation 2*, Prepared for the Marlborough District Council, Te Ātiawa o Te Waka-ā-Māui Trust, Waikawa, at 21

11 Peer reviewer

16 Marine restoration fund

Inter-islander ferry, Tōtaranui / Queen Charlotte Sound

There is only a small, and largely static, resident population in the Marlborough Sounds meaning that residents will likely be unable to fund the extent of restoration work required to bring the Sounds back to health. However, there are many more users of the Sounds and it seems only fair that they should also contribute.

There are several mechanisms through which funds could be raised from users as indicated throughout the text above and set out below. These funds could be paid into a Marlborough Sounds Restoration Fund which could support the development and implementation of a Marine Restoration Plan as well as other restoration efforts by iwi and the community. Key design questions for the Fund would need to be resolved, including who should hold the funds, manage them and decide how funding is allocated. It might be possible to establish a Marlborough Sounds Marine Restoration Trust for this purpose or expand the ambit of an existing body.

Potential sources of revenue for the Marlborough Sounds Restoration Fund include the following, which could help ensure all users of the Sounds play their fair part in funding the badly needed restoration effort:

- *Coastal occupation charges*: Marine restoration funding could be built into the planned Marlborough District Council expenditure in the coastal marine area which is to be 75 per cent funded through these charges. This would enable the aquaculture industry, alongside others, to significantly contribute to the restoration of the Sounds in recognition of its extensive use and dependence on the marine area.

- *Targeted rate*: The Marlborough District Council could levy a targeted rate under the Local Government (Rating) Act 2002 for marine restoration. This could be applied to land activities which generate a disproportionate amount of sediment (per hectare) entering the marine area such as as exotic forestry harvesting.

- *'Marine restoration fee' for cruise ships*: Cruise chips are now a major user of the Sounds marine space, with 55 ships arriving over the 2023-24 summer carrying some 100,869 passengers. A small levy on cruise ships, as has already been imposed in Fiordland, could help generate funds for restoration in recognition of the importance the Sounds play as part of the cruise ship tourism offerings.

- *'Restoration levy' on Cook Strait ferries*: A small levy on ticket price for passengers on the Cook Strait ferries would recognise the vessels' frequent use of the Tōtaranui / Queen Charlotte Sound Sound and Kura Te Au / Tory Channel. Given the around 1.2 million passengers that travel through the area annually, a small increase could generate significant funds.

- *'Restoration levy' on water-borne tourism activities*: A small levy on the ticket price for Sounds cruises would be a way that tourism could give back to the Sounds in the spirit of regenerative tourism. Such a model has been applied in the Abel Tasman National Park.

- '*Restoration levy' on marina berth, launching ramp and parking fees*: The Sounds are heavily used by recreational craft, and a small levy on the facilities used by these vessels would enable the recreational sector to play its part in the restoration effort.

- *'Log levy' on logs shipped out of the Sounds*: Clear-fell forestry harvesting has had a significant impact on the health of the Sounds and a small levy on logs exported from the area would recognise these impacts and help fund the restoration effort.[1]

- *'Restoration contribution' via boating club membership*: Those belonging to boating clubs (in the Sounds and Wellington) may wish to positively contribute to the restoration of the Sounds by contributing part of their club subscription fees to restoration initiatives. This model was adopted by the Outdoor Boating Club, in Auckland, which donated half its subscription fees towards the restoration of Motuihe Island.[2]

- *Business contributions*: The users of the Sounds such as Port Marlborough, the Marine Farming Association, New Zealand King Salmon Limited, Sanford, Moana, Talley's and others could be encouraged to provide financial and in-kind support for marine restoration initiatives. Port Marlborough has already been supporting the Tōtaranui / Queen Charlotte Sound kelp restoration initiative and it has an aligned long-term corporate goal of "environmental restoration".[3] The Marine Farming Association has been supporting the green-lipped mussel restoration trials in Te Hoiere / Pelorus Sound. These efforts could be built on and other businesses brought into the fold.

- *Philanthropic funding:* Where there is a good restoration plan, philanthropic funding can follow. This was evidenced in the Hauraki Gulf where, on the back of the Sea Change Tai Timu Tai Pari Plan, Foundation North established the Gulf Innovation Fund Together (G.I.F.T.) which has granted over $11 million to explore and refine "approaches to test, scale and create new systems to restore the mauri" of the Gulf.[4] The Nature Conservancy, which has its New Zealand branch headquartered in Nelson and is managing the KMTT Strategy, is part of a large international NGO which works in 77 countries and territories. It might potentially be able to attract overseas funds into restoration of the Sounds. Other philanthropic funding could be attracted, particularly if there is a solid plan setting out fundable propositions.

- *Blue carbon voluntary credits*: These are based on the sequestration and storage of carbon by marine systems, which is measured and verified and then used to support credits which are sold on the voluntary carbon market. Sequestration can either be by plants rooted in the coastal zone (such as seagrass and salt marshes), or carbon sequestered in deep marine sediments, through the deposition of kelp and other plant material. The extent of kelp carbon sequestration in the Cook Strait canyon systems, which are located close to the outer Sounds, is currently being investigated.[5] This could help provide a funding source for kelp restoration.

Marine restoration planning and implementation will require significant funds. These could be obtained from a number sources, ensuring that all users of the Sounds and those that impact on it pay their fair share, and be brought together into a Marlborough Sounds Restoration Fund.

Endnotes

1 Suggestion from peer reviewer

2 Peart R, 2016, *The story of the Hauraki Gulf*, Bateman Books Limited, Auckland, at 316

3 Port Marlborough, 2023, *Annual report 2023*, Port Marlborough, Picton, at 6

4 https://www.giftofthegulf.org.nz

5 See https://bluecarbon.co.nz/quantifying-blue-carbon/

17 Other models

Waikawa

Other models which had been floated for the Marlborough Sounds, from time to time, include creating a Marlborough Sounds Marine Park, creating a Guardians group for the Marlborough Sounds, and providing the marine area with legal personhood. We discuss each of these below before considering the utility of a local Act of Parliament to implement them.

17.1 Marlborough Sounds Marine Park

The Marlborough Sounds Maritime Park, which covered 50,825 ha of scattered reserve land (including the foreshore reserves), was established in 1973. Unlike the Hauraki Gulf Maritime Park, it did not have its own legislation, or a dedicated statutory Parks Board. Instead, the four existing reserves boards amalgamated and operated under the 'maritime park' brand. The initiative was dis-established in 1987 at which time reserve management was taken over by DOC. There have since been two very different efforts to revive the concept of a 'marine park' in the Marlborough Sounds. Neither obtained sufficient traction to succeed.

The first was the concept of a Marlborough Sounds Marine Park with a Marine Park Authority to administer it. This was developed as part of the Marlborough Marine Futures project mentioned above. The idea drew on the Australian Great Barrier Reef model (and notably not that of the Hauraki Gulf Marine Park), with modifications planned to provide for Māori needs and values. The concept envisaged a multiple use management area, which prioritised conservation, and zoning plans to provide for potentially conflicting uses.[1]

The Marine Park Authority was to be a stand alone management agency for the Sounds, that integrated protection and use, and performed the combined roles of central and regional government. In particular, it was to carry out investigations, prepare zoning and management plans for the Marine Park, and perform advisory and educational functions. Management was to be collaborative and facilitate partnership with tangata whenua.[2] This would have necessitated considerable institutional change and, overall, was probably too ambitious for the political environment of the time.

A quite different concept was promoted, in 2016, as part of a government consultation document on a new Marine Protected Areas Act. It took the form of a 'Marlborough Sounds Recreational Fishing Park' encompassing all of the Sounds proper up to an outer line running from Cape Kaomaru (on the tip of Arapaoa Island), to Cape Jackson, and then up to Stephens Island north of Rangitoto ki te Tonga / D'Urville Island. The purpose of the proposed park was "to enhance the enjoyment and value of recreational fishing … by reducing the localised impact of commercial fishing". The park was to prohibit commercial finfishing but still allow commercial harvest of other species in the area including pāua, scallops and rock lobster. It was to be managed by MPI assisted by a stakeholder advisory group appointed by the Minister of Fisheries.[3]

The impact of the proposal on the health of the Sounds marine environment may have been mixed. The proposal would have excluded finfish trawling from the outer Te Hoiere / Pelorus Sound which could

have reduced benthic damage and sediment resuspension. However, it would have still allowed commercial scallop dredging (and associated impacts on benthic habitats and sediment) and harvest of rock lobster (with potential contribution to kina barrens). Conversely, it would have prohibited the small commercial blue cod effort in the outer Sounds which utilises a fishing method with minimal environmental impacts (potting) and therefore arguably should have been supported.

The establishment of a multi-stakeholder advisory body might have enabled a more holistic approach to fisheries management. However its remit only included finfish species, and recreational harvest of them, rather than encompassing a more holistic view of the marine environment.

There have been two types of marine parks proposed for the Marlborough Sounds in the past, one based on the Australian Great Barrier Reef model, and the other focused on improving the recreational fishing experience by excluding commercial harvest of some species.

17.2 Marlborough Sounds Marine Guardians

"The Guardians model represents a mechanism by which government agencies can achieve their statutory mandates through devolution to the regions with appropriate governance and oversight." [4]

Students at Marlborough Girls College took a different tack when contemplating future management of the Sounds, promoting a guardians model which built on the Fiordland and Kaikōura approaches.

The Fiordland Marine Guardians were established in 2005, and they provide advice and make recommendations to Ministers, as well as promote the integrated management of the area and monitor its state.[5] The Guardians are appointed by the Minister and include one member nominated by Te Rūnanga o Ngāi Tahu.[6] The Kaikōura Marine Guardians were established in 2014 and provide advice to Ministers. Members are appointed by the Minister which must represent Te Rūnanga o Ngāi Tahu, the Kaikōura community and a range of other interests.[7]

The 'Sounds Marine Guardians', as proposed by the Girls College students, was to comprise a group of iwi, government, Council and community members. The Guardians would potentially be given statutory power to make a suite of marine orders such as "no-take" areas, line-only fishing areas, no seabed disturbance and traditional Māori fishing reserves. This is not too dissimilar to the Marine Park Authority discussed above but without the associated marine park (although a marine area would likely be delineated for the guardians to operate within).

The proposal received support from the Marlborough District Council, and then Prime Minister Jacinda Adern (during 2018-2019) and there was talk of a local Act of Parliament to implement it.[8] However, it also failed to gain sufficient traction to proceed.

The Guardians model could potentially be coupled with legal personhood (discussed below) with the Guardians being the 'human face' of the legal person (the marine system). Alternatively, the Guardians could be a more hands on multi-stakeholder management body operating under the auspices of an iwi-Crown partnership body acting on behalf of the legal person.

The establishment of a statutory 'Guardians' body for the Sounds has in the past received significant support, has some merit, and could be further explored.

17.3 Legal personhood

The concept of legal personhood has become more popular in Aotearoa New Zealand in recent years. It was first applied to Te Urewera in 2014[9] and then to the Whanganui River in 2017.[10] Mount Taranaki is also poised to be given legal personhood.[11] All these models are a result of Te Tiriti settlements. They share a lot in common but also have tailored provisions for the specific circumstances in each case. The common provisions include:

- A declaration that the natural entity has all the rights of a legal person
- Vesting in the natural entity Crown-owned land (including in the case of the Whanganui river, the river-bed)
- The establishment of a statutory body to act on behalf of the natural entity and be its 'human face'. The body is typically comprised of a mix of iwi and Crown appointees.
- The preparation of a strategy and/or plan setting out how the natural entity is to be managed and/or restored

The model to date has only been applied to two national parks and a river, but there appears no obvious reason why it could not equally be applied to a marine area. MACA goes some way along this path. The "common marine and coastal area", which extends from mean high water to the edge of the territorial sea and includes the seabed, the water space (but not the water) and the air, cannot be owned by the Crown or any person. So in some sense it might be said to already own itself.

However, a wider application of the legal personhood model needs to be treated with some caution. Although legal personhood can serve to protect the environment, it is not an environmental protection tool *per se,* but "an indigenous reconciliation tool". There is inherent tension in trying to align a Western legal tool with a Māori traditional and spiritual worldview and to provide for the diverse aspirations of different iwi within it.[12]

There has been some interest in applying the concept to all or part of the Marlborough Sounds. In conducting interviews on tourism in Tōtaranui / Queen Charlotte Sound, Urlich et al (2021) reported that "A Kaumatua called for Tōtaranui to be the first moana in Aotearoa New Zealand to become a legal person so as to elevate its value and care in the public consciousness."[13] They were also told by a Te Ātiawa kaumatua that Tōtaranui "was always referred to as a living entity well-known to the old people."[14] Legal personhood also resonates with the concept of the Sounds being "our Mother" referred to earlier.

The current legal personhood models have all been created as part of Te Tiriti settlements. As Te Tauihu iwi have already settled, and such arrangements were not included in their settlement, special purpose legislation would be required to apply the model in the Sounds.

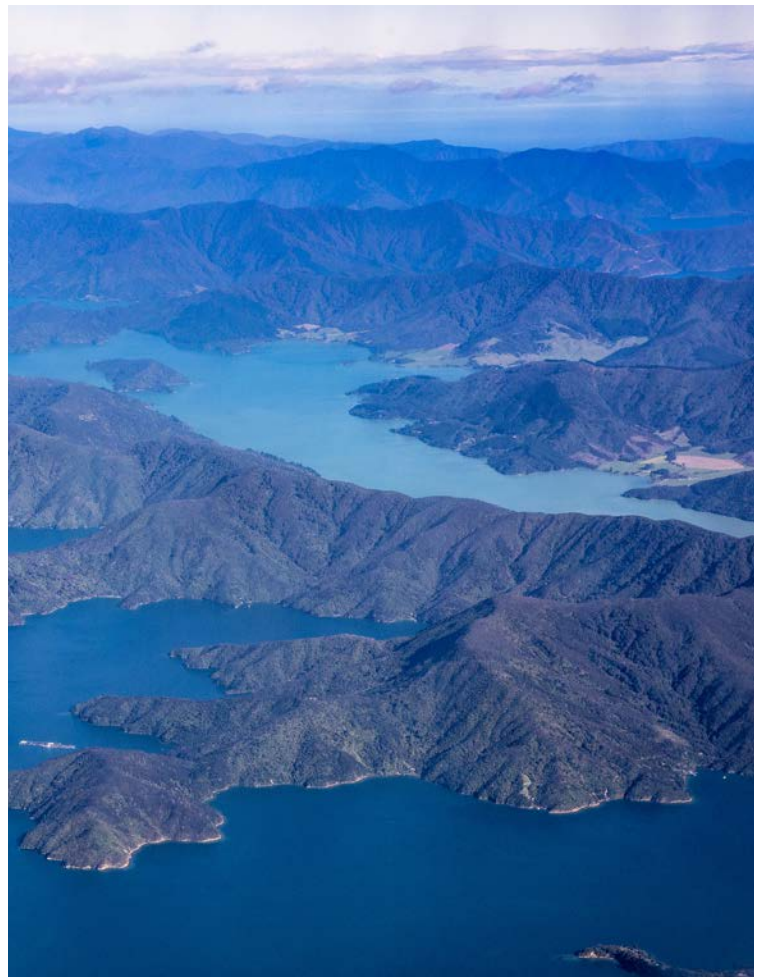
The practice of applying legal personhood to natural systems is now well established in Aotearoa New Zealand. Legal personhood could be given to Tōtaranui / Queen Charlotte Sound, Te Hoiere / Pelorus Sound or the entire Marlborough Sounds area but this would need strong iwi support.

17.4 Local Act of Parliament

Such novel arrangements could potentially be created through the mechanism of a local Act of Parliament. A local Bill can be promoted by a council for the area within its jurisdiction. It can only deal with matters confined to that particular locality but can change the effect of general law in that place. Although a local bill cannot directly amend a public (national) Act it can include consequential amendments to such legislation. The Bill must be introduced by a Member of Parliament, usually the local MP.[15]

As the entire Marlborough Sounds is within the jurisidiction of the Marlborough District Council this makes it feasible to apply at least some bespoke marine management arrangements through a local Act of Parliament. However, the statutory provisions would need to be drafted with care, to ensure they did not stray into the area of amending national legislation.

The utility of a local Bill to strengthen marine management in the Sounds could be further explored.



Looking across Tōtaranui / Queen Charlotte Sound into Kenepuru Sound, with the Ruakākā salmon farm in the foreground

Endnotes

1 http://www.portunderwoodassoc.org/wp-content/uploads/2017/07/MMF-Newsletter-June2-2017.pdf

2 http://www.portunderwoodassoc.org/wp-content/uploads/2017/07/MMF-Newsletter-June2-2017.pdf

3 Ministry for the Environment, 2016, *A new Marine Protected Areas Act: Consultation document*, Ministry for the Environment, Wellington

4 Urlich S, D Fearn, B McConaghey, H Dickson, S Hemingway, H Willis, J Pillans, S Wilkey, O McClelland-Peterson and M Bentley, 2019, 'Marine guardians – a novel solution to improving our marine environment', *Resource Management Journal*, 10-14, at 14

5 Section 13, Fiordland (Te Moana o Atawhenua) Marine Management Act 2005

6 Section 15, Fiordland (Te Moana o Atawhenua) Marine Management Act 2005

7 Sections 6 and 7, Kaikōura (Te Tai o Marokura) Marine Management Act 2014

8 Angeloni A, 2018, 'Student's dream of marine guardians in Marlborough gets council backing', *Stuff*, 25 September; Angeloni A, 2019, 'PM Jacinda Adern to check if local bill would work for marine guardians in Marlborough, *Stuff*, 6 June

9 Te Urewera Act 2014

10 Te Awa Tupua (Whanganui River Claims Settlement) Act 2017

11 Te Pire Whakatupua mō Te Kāhui Tupua/Taranaki Maunga Collective Redress Bill 2024

12 Evans M, 2024, "Is "legal personhood" a tool or a distraction for Māori relationships with nature?, *Mongabay News*, 8 July

13 Urlich S C, E S Jorgensen, and G L Coutts , 2021, *Tourism and regenerating place: Insights from Queen Charlotte Sound / Tōtaranui*, Centre of Excellence for Sustainable Tourism Report 2021/101, Lincoln University, Lincoln, at 21

14 Ibid, at 4

15 Office of the Clerk of the House of Representatives, undated, Introducing local and private bills, at https://www.parliament.nz/media/4600/introducing-local-and-private-bills.pdf

18 Conclusion

Aerial view of the Marlborough Sounds showing forestry harvesting above Te Whanganui / Port Underwood

The Marlborough Sounds is an iconic and unique marine system, which has a long and fascinating history of Māori and European occupation, and is suffering severe and ongoing degradation. Key stressors are high levels of sedimentation, damage to seabed habitats from bottom trawling and dredging, over-harvesting of fish stocks and climate change.

Reversing this long-term degradation will require a concerted and integrated effort which includes passive marine restoration, active marine restoration and land-based efforts. All users of the Sounds will need to play their part, in a combined effort, if the current situation is to be turned around. This report seeks to identify some ways in which this might be achieved.

References

Anderson T, R Stewart, R D'Archino, J Stead and N Eton, 2020, *Life on the seafloor in Queen Charlotte Sound, Tory Channel and adjacent Cook Strait*, NIWA, Wellington

Angeloni A, 2018, 'Student's dream of marine guardians in Marlborough gets council backing', *Stuff*, 25 September

Angeloni A, 2019, 'PM Jacinda Adern to check if local bill would work for marine guardians in Marlborough*, Stuff*, 6 June

Baker A, 1972, *Reproduction, early life history, and age-growth relationships of the New Zealand pilchard,* Sardinops neopiulchardus *(Steindachner)*, New Zealand Marine Department, Wellington

Banta W and M Gibbs, 2009, 'Factors controlling the development of the aquaculture industry in New Zealand: Legislative reform and social carrying capacity', *Coastal Management*, 37(2), 170–196

Bargh B, 2016, *The struggle for Māori fishing rights*, Huia Publishers, Wellington

Beaglehole H, 2022, *One hundred havens: The settlement of the Marlborough Sounds*, Massey University Press, Auckland

Beggs J P, undated, Farming in Marlborough, https://www.grassland.org.nz/publications/nzgrassland_publication_1783.pdf

Bell M (ed), 2022, *Kawau pāteketeke/King shag (*Leucocarbo carunculatus*) research 2018-2022*, Toroa Consulting Limited, Blenheim

Benjamin E D, S J Handley, A Jeffs, L Olsen, T A Toone and J R Hillman, 2022, 'Testing habitat suitability for shellfish restoration with small-case pilot experiments', *Conservation Science and Practice*, DOI 10.1111/csp2.12878

Bennett J, 2024, *Cultural effects assessment: Ecologically significant marine sites (ESMS) Variation 2*, Prepared for the Marlborough District Council, Te Ātiawa o Te Waka-ā-Māui Trust, Waikawa

Black K D, 2013, *Scientific peer-review of monitoring results from New Zealand King Salmon farms*, SRSL, Oban

Brew A, 2023, 'More cruise ships to visit Picton this summer bringing more than good vibes', *Stuff*, 30 August

Broekhuizen N, D R Plew, M H Pinkerton and M G Galf, 2021, 'Sea temperature rise over the period 2002-2020 in Pelorus Sound, New Zealand – with possible implications for the aquaculture industry', *New Zealand Journal of Marine and Freshwater Research*, 55(1), 46-64

Brough T E, E M Leunissen and M Beentjes, 2023, *Habitat use and the impact of multiple stressors on blue cod populations off Canterbury and in the Marlborough Sounds*, New Zealand Aquatic Environment and Biodiversity Report No 323, Fisheries New Zealand, Wellington

Chiswell S M and J D Booth, 2008, 'Sources and sinks of larval settlement in *Jasus edwardsii* around New Zealand: Where do larvae come from and where do they go?', *Marine Ecology Progress Series*, 354, 201-217

Cornwall C, 2023, 'NZ's vital kelp forests are in peril from ocean warming – threatening the important species that rely on them', *The Conversation*, 12 September

Crosby R, 2002, 'Te Tau Ihu Māori involvement in resource management issues', in M Kawharu, *Whenua: Managing our resources*, Reed Books, Auckland

Cross C L, 2019, *Spatial ecology of delphinids in Queen Charlotte Sound, New Zealand: Implications for conservation management*, Doctor of Philosophy in Marine Ecology thesis, Massey University, Albany

Cummings V, E Jorgensen, E Benjamin and L Wichman, 2024, *Considerations for rehabilitation of shellfish and shellfish habitat in Marlborough Sounds*, Sustainable Seas National Science Challenge, Wellington

Curtis J S and S R Wing, 2024, 'Size-specific reduction in kelp consumption by New Zealand urchins exposed to chemical cues form the red rock lobster', *Ecosphere*, 15(7), online

Davidson R J and L A Richards, 2015, *Significant marine site survey and monitoring programme: Summary 2014-15*, Davidson Environmental Limited, Nelson

Davidson R J, A Baxter, C A J Duffy, S Handley, P Gaze, S DuFresne and S Courtney, 2019, *Expert panel review of selected significant marine sites*

surveyed during the summer of 2019-2020, Marlborough District Council and Department of Conservation, Blenheim

Davidson R, C Duffy, P Gaze, A Baxter, S DuFresne, S Courtney and P Hamill, 2011, *Ecologically significant marine sites in Marlborough, New Zealand*, Marlborough District Council and Department of Conservation, Blenheim

Davidson R J, L A Richards, W Able and M Aviss, 2014, *Long Island-Kokomohua marine reserve, Queen Charlotte Sound: Update of biological monitoring, 1992-2014*, Davidson Environmental Limited, Nelson

Dawber C, 2004, *Lines in the water: A history of greenshell mussel farming in New Zealand*, River Press, Picton

Department of Conservation, 2018, *NZCPS 2010 guidance note Policy 22: Sedimentation*, Department of Conservation, Wellington

Department of Conservation, 2023, 'Counting koura in the Sounds – Long Island Kokomohua Marine Reserve', Blog, 15 May

Destination Marlborough, 2022, *Marlborough destination management plan*, Destination Marlborough, Blenheim

Drummond K and P Mace P, 1984, 'South Island snapper tagging results', *Catch*, 11, 6–7

Ellis M, 2024, 'Whanganui River iwi take next steps to restore Te Awa Tupua', *Te Ao Māori News*, 20 July

Environment Southland, 2023, *Pūrongo-ā-tau annual report 2022-23*, Environment Southland, Invercargill

Evans M, 2024, "Is "legal personhood" a tool or a distraction for Māori relationships with nature?, *Mongabay News,* 8 July

Fiordland Marine Guardians, 2023, *Annual report 2022/23*, Fiordland Marine Guardians

Fisheries New Zealand, 2021, *Aquatic environment and biodiversity annual review*, Fisheries New Zealand, Wellington

Fisheries New Zealand, 2021, *Review of sustainability measures for hapuku and bass (HPB 7 & HPB 8) for 2022/23*, Fisheries NZ Discussion Paper No 2021/26, Fisheries New Zealand, Wellington

Fisheries New Zealand, 2022, *Draft guidelines for the identification of habitat of particular significance for fisheries management*, Fisheries New Zealand, Wellington

Fisheries New Zealand, 2022, *Fisheries assessment plenary, November 2022: Stock assessments and stock status*, Fisheries New Zealand, Wellington

Fisheries New Zealand, 2022, *National inshore finfish fisheries plan*, Fisheries New Zealand, Wellington

Fisheries New Zealand, 2022, *Review of sustainability measures for blue cod (BCO 7) for 2022/23*, Fisheries NZ Discussion Paper 2022/07, Fisheries New Zealand, Wellington

Fisheries New Zealand, 2023, *Bottom fishing access zones in the Hauraki Gulf Marine Park*, Fisheries New Zealand Discussion Paper 2023/19, Fisheries New Zealand, Wellington

Fisheries New Zealand, 2023*, Hauraki Gulf fisheries plan*, Fisheries New Zealand, Wellington

Fisheries New Zealand, 2023, *Review of commercial kina dredging in Kura Te Au/Tory Channel, Marlborough Sounds*, Fisheries New Zealand Discussion Paper No 2023/23, Fisheries New Zealand, Wellington

Fisheries New Zealand, 2024*, Fisheries Assessment Plenary, May 2024: Stock assessments and stock status,* Fisheries New Zealand, Wellington

Fisheries New Zealand, 2024, *Marlborough Sounds blue cod review*, Fisheries New Zealand Discussion Paper No 2024/29, Fisheries New Zealand, Wellington

Fisheries New Zealand, 2024, *Review of sustainability measures for snapper (SNA7), flatfish (FLA7), and elephantfish (ELE7) for 2024/25*, Fisheries New Zealand Discussion Paper No 2024/24, Fisheries New Zealand, Wellington

Gerrity S and D R Schiel, 2024, 'Assessing methods of enhancement for New Zealand blackfoot abalone *(Haliotis iris)* populations affected by mass mortalities', *New Zealand Journal of Marine and Freshwater Research*, online

Gibbs M M, 2001, 'Sediment, suspension, and resuspension in Tasman Bay and Beatrix Bay, New Zealand, two contrasting coastal environments which thermally stratify in summer', *New Zealand Journal of Marine and Freshwater Research*, 35, 951-970

Giles H, 2021, *The Marlborough coastal marine area: Environmental issues and scientific information needs for environmental management*, Pisces Consulting Limited, Hamilton

Giles H, O Wade and E Toy, 2022, *Operational review of and 5-year plan for the ecological significant marine sites (ESMS) programme (2022)*, Marlborough District Council and Pisces Consulting, Nelson and Hamilton

Guy N, 2016, *Consultation proposal on potential relocation of salmon farms in the Marlborough Sounds*, cabinet paper, New Zealand Government, Wellington

Guy N, 2016, *Ministers decision on the southern Scallop fishery (SAC7) for the 2016-17 season*, Ministry for Primary Industries, Wellington

Hale R, O Lam-Gordilla, D Lohrer, J R Williams, S Handley, P Olmedo-Rojas and I Middleton, 2024, *Cumulative effects of stressors on scallops and scallop habitats in the Marlborough Sounds*, New Zealand Aquatic Environment and Biodiversity Report No 337, Fisheries New Zealand, Wellington

Handley S, 2015, *The history of benthic change in Pelorus Sound (Te Hoiere), Marlborough*, NIWA, Nelson

Handley S, 2016, *The history of benthic change in Queen Charlotte Sound / Totaranui, Marlborough*, NIWA, Nelson

Handley S, 2022, *Technical options for marine coastal habitat restoration in Te Tauihu*, NIWA, Nelson

Handley S, M Gibbs, A Swales, G Olsen, R Ovenden and A Bradley, 2017, *A 1,000 year history of seabed change in Pelorus / Te Hoiere, Marlborough*, NIWA, Nelson

Hart M, 2019, 'Owners sell remaining shares of Marlborough Tour Company after 25 years', *Stuff*, 4 November

Hart M, 2023, '"Sobering": Marlborough Sounds reach record-breaking sea temperatures', *Stuff*, 23 November

Hart M, 2024, 'Kina removal helps Marlborough Sounds ecosystems recover', *Stuff*, 18 February

Haworth J, 2010, *Swimming upstream: How salmon farming developed in New Zealand*, Wily Publications, Christchurch

Heberley H, 1999, *Riding with whales: Stories of great Sounds women*, Cape Catley Limited, Whatamango Bay, Queen Charlotte Sound

Hewitt J, R Gladstone-Gallagher and S Thrush, 2022, 'Disturbance-recovery dynamics inform seafloor management for recovery', *Frontiers in Ecology and the Environment*, 20(1), 564-572

Hickman R W, 1987, 'Growth potential and constraints in the New Zealand mussel farming industry', *Proceedings of the New Zealand Society of Animal Production*, 47, 131-133

Hinojoa I A, B S Green, C Gardener and A Jeffs, 2015, 'Settlement and early survival of southern rock lobster, *Jasus edwardsii*, under climate-driven decline of kelp', *ICS Journal of Marine Science*, 71 (Issue Supplement 1), i59-i68

Jones S, 2024, *Changes to fisheries sustainability measures for the 2024 October round*, Minister for Oceans and Fisheries decision letter, Parliament, Wellington

Kerr V C, R V Grace and N T Shears, 2024, 'Estimating the extent of urchin barrens and kelp forest loss in northern Aotearoa, New Zealand', *New Zealand Journal of Marine and Freshwater Research*, online

Kolodzey S and S R Wing, 2022, 'Life history traits vary between geographically distinct populations in a protogynous hermaphrodite', *Ecosphere*, 13:e4237

Kotahitanga mō te Taiao Alliance, 2023, *Te pūrongorongo ā tau: Annual impact report 2023*, Kotahitanga mō te Taiao Alliance, Nelson

Lewis J, 2022, 'Different fish heading south for warmer water', *Otago Daily Times*, 7 January

Locke K and S Leslie, 2007, *New Zealand's quota management system: A history of the first 20 years*, Motu, Wellington

Lundquist C, M Bennion and T Brough, 2024, *Enabling effective marine spatial planning for ecological and economic wellbeing*, Guidance document, Sustainable Seas National Science Challenge, Wellington

Lundquist C, V Cummings, L Hansen and E Mielbrecht, 2023, *State of knowledge: Climate change and New Zealand's seafood sector*, Fisheries New Zealand, Wellington

Macara G, J Woolley, D Morrish, A Sood, S Stuart, C Eager, C Zammit, S Wadhwa and N Fauchereau, 2021, *Climate change projections and impacts for Marlborough*, NIWA, Wellington

MacDiarmid A B, D Freeman and S Kelly, 2013, 'Rock lobster biology and ecology: Contributions to understanding through the Leigh Marine Laboratory 1962-2102', *New Zealand Journal of Mairne and Freshwater Research*, 47(3), 313-333

Manson L, 2000, *Cockle Cove: Marlborough Sounds haven for four generations*, Cape Catley Limited, Whatamango Bay, Queen Charlotte Sound

Marlborough District Council, undated, *Proposed Marlborough environment plan: Aquaculture variations: Variation 1A guidance document*, Marlborough District Council, Blenheim

Marlborough District Council, 2015, *Our land our water our place: State of the environment report 2015*, Marlborough District Council, Blenheim

Marlborough District Council, 2020, 'Marlborough regional forestry celebrates 50 years', media release, 14 December

Marlborough District Council, 2023, *Annual plan 2022-23*, Marlborough District Council, Blenheim

Marlborough District Council, 2023, *Coastal water quality monitoring 2015-2023: Temperature trends*, Marlborough District Council, Blenheim

Marlborough District Council, 2023, *Council 18 May 2023 agenda public excluded – decision and recommendations on Variation 1*, Marlborough District Council, Blenheim

Marlborough District Council, 2024, *Decision and report: Variation 2: Ecologically significant marine sites*, Marlborough District Council, Blenheim

Marlborough District Council, 2024, 'Restoring wild mussel beds in the Top of the South', media release, 5 March

McFadgen and P Adds, 2019, 'Tectonic activity and the history of the Wairau Bar, New Zealand's iconic site of early settlement', *Journal of the Royal Society of New Zealand*, 46(4), 459-473

McKinnon M, 2015, 'Marlborough places - Arapawa Island to Port Underwood', Te Ara - the Encyclopedia of New Zealand, http://www.TeAra.govt.nz/en/cartoon/31841/fast-ferries

McClay T, 2024, 'Resource management reform to make forestry rules clearer', media release, 5 September

Mediodia H J, I Noy and V Kahui, 2024, 'The impact of ocean warming on selected commercial fisheries in New Zealand, *Australian Journal of Agricultural and Resource Economics*, 68, 587-607

Meihana P N, 2006, *From Anakoha to New York: The genesis of the foreshore and seabed claim and the marginalisation of Ngāti Kuia*, Master of Arts in History thesis, Massey University

Ministry for Primary Industries, 2016, *Review of sustainability measures for the southern scallop fishery (SCA 7) in 2016: Discussion Document*, MPI Discussion Paper 2016/19, Ministry for Primary Industries, Wellington

Ministry for the Environment, 2016, *A new Marine Protected Areas Act: Consultation document*, Ministry for the Environment, Wellington

Mitchell H and J Mitchell, 2004, *Te Tau Ihu o te Waka: A history of Māori of Nelson and Marlborough*, *Volume 1: Te tangata me te whenua – the people and the land*, Huia Publishers, Wellington and Wakatū Incorporation, Nelson

Morrison M, M Consalvey, K Berkenbusch and E Jones, 2008, 'Biogenic habitats and their value to New Zealand fisheries', *Water and Atmosphere*, 16(4), 20-21

New Zealand King Salmon Limited, 2024, *Annual report FY 24*, New Zealand King Salmon Limited, Nelson

New Zealand National Party & New Zealand First, 2023, *Coalition agreement*, 54th Parliament, House of Representatives, Wellington

Ngāti Koata No Rangitoto Ki Te Tonga Trust, 2002, *Ngāti Koata No Rangitoto Ki Te Tonga Trust iwi management plan*, Ngāti Koata No Rangitoto Ki Te Tonga Trust

Ngāti Rārua, 2021, *Poipoia tea o tūroa: Ngāti Rārua environmental strategy*, Ngāti Rārua, Blenheim

Nicol A, 2011, 'Landscape history of the Marlborough Sounds, New Zealand', *New Zealand Journal of Geology and Geophysics*, 54(2), 195-208

Peart R, 2016, *The story of the Hauraki Gulf*, Bateman Books Limited, Auckland

Peart R, 2018, *Voices from the sea: Managing New Zealand's fisheries*, Environmental Defence Society, Auckland

Peart R, 2019, *Farming the sea: Marine aquaculture within resource management system reform,* Environmental Defence Society, Auckland

Peart R, 2019, 'Sea Change Tai Timu Tai Pari: Addressing catchment and marine issues in an integrated marine spatial planning process', *Aquatic Conservation: Marine and Freshwater Ecosystems*, 1-13

Peart R, D Koolen-Bourke and S Sadibe, 2024, *Restoring the Sea: The role of marine spatial planning*, EDS Oceans reform project working paper 1, Environmental Defence Society, Auckland

Port Marlborough, 2023, *Annual report 2023*, Port Marlborough, Picton

Port Marlborough, 2024, 'Cruise season concludes', media release, 30 April

Radio NZ, 2019, 'Marlborough's at-risk catchment secures restoration funds', 6 December

Radio NZ, 2022, 'Marlborough Sounds salmon dying after hot summer', *Radio NZ*, 30 March

Radio NZ, 2024, 'Why removing kina is restoring the balance in marine systems', *Radio NZ*, 20 February

Rosser B J, A Wolter, A F Boyes, S L Lin, J Farr, E Chen, D B Townsend and K E Jones, 2023, *Phase II: Remote mapping of landslides triggered by the July 2021 and August 2022 Marlborough storms, and selected field investigations of landslide impact*, GNS Science, Lower Hutt

Sanford Limited, 2019, 'Mussels get their eureka moment!', media release, 18 October

Sea Change Tai Timu Tai Pari, 2017, *Sea Change Tai Timu Tai Pari Hauraki Gulf marine spatial plan*, Waikato Regional Council, Hamilton

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

Shears N T and R C Babcock, 2003, 'Continuing trophic cascade effects after 25 years of no-take marine protection', *Marine Ecology Progress Series,* 246, 1-16

SLR Consulting NZ Limited, 2018, *Kenepuru Head estuary: Broadscale habitat mapping*, SLR Consulting NZ Limited, Nelson

SLR Consulting NZ Limited, 2023, *Reef monitoring in 2022 at the New Zealand King Salmon Co. Limited high-flow farms*, SLR Consulting NZ Limited, Nelson

SLR Consulting New Zealand, 2024, *Salmon farm review – Marlborough Sounds,* SLR Consulting New Zealand, Nelson

Southern Scallop Working Group and Fisheries New Zealand, 2020, *Southern scallop strategy: Marlborough Sounds*, Fisheries New Zealand, Wellington

Southern Scallop Working Group, 2021, *Implementation plan: Southern scallop strategy: Marlborough Sounds*, version 1.1, Fisheries New Zealand, Wellington

Stantec and Boffa Miskell, 2021, *Milford Opportunities Project: A Masterplan for Milford Sound Piopiotahi and the journey*, Stantec and Boffa Miskell, Auckland

Stenton-Dozey J and N Broekhuizen, 2019, *Provision of ecological and ecosystem services by mussel farming in the Marlborough Sounds: A literature review in context of the state of the environment pre- and post-mussel farming*, NIWA, Christchurch

Sustainable Seas National Science Challenge, 2023, 'Kina removal shows promising outcomes for kelp forests', web news, 4 August

Sustainable Seas National Science Challenge, 2023, *Upholding the value of pāua quota*, Sustainable Seas National Science Challenge, Wellington

Swales A, M M Gibbs, S Handley, G Olsen, R Ovenden, S Wadhwa and J Brown, 2021, *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound / Te Hoiere*, NIWA, Hamilton

Teagle H, S J Hawkins, P J Moore and D A Smale, 2017, 'The role of kelp species as biogenic habitat formers in coastal marine systems', *Journal of Experimental Marine Biology and Ecology*, 492, 81-98

Te Ātiawa o Te Waka-a-Māui, 2014, *Te Ātiawa o Te Waka-a-Māui iwi environmental management plan*, Te Ātiawa o Te Waka-a-Māui, Picton

Te Hoiere Project, 2023, *Annual report*, Te Hoiere Katiaki Charitable Trust, Canvastown

Thrush S F, J E Hewitt, R V Gladstone-Gallagher, C Savage, C Lundquist, T O'Meara, A Viellard, J R Hillman, S Mangan, E J Douglas, D E Clark, A M Lohrer and C Pilditch, 2021, 'Cumulative stressors reduce the self-regulating capacity of coastal ecosystems', *Ecological Applications*, 31(1), e02223

Toone T A, E D Benjamin, S Hadley, A Jeffs and J R Hillman, 2022, 'Expansion of shellfish aquaculture has no impact on settlement rates', *Aquaculture Environment Interactions*, 14, 135-145

Toone T A, E D Benjamin, J R Hillman, S Hadley and A Jeffs, 2023, 'Multidisciplinary baselines quantify a drastic decline of mussel reefs and reveal an absence of natural recovery', *Ecosphere*, 14:e4390

Toone T A, J R Hillman, E D Benjamin, S Hadley and A Jeffs, 2022, 'Out of their depth: The successful use of cultured sub-tidal mussels for intertidal restoration', *Conservation Science and Practice*, DOI: 10.1111/csp22.12914

Toone T A, J R Hillman, E D Benjamin, S Hadley and A Jeffs, 2023, 'Provision of early mussel life stages via macroalgae enhances recruitment and uncovers a novel restoration technique', *Journal of Experimental Marine Biology and Ecology*, 566, 151919

Transpower and Ministry of Transport, undated, *Cook Strait Submarine Cable Protection Zone*, Transpower, Christchurch and Ministry of Transport, Wellington

Udy J A, S R Wing, S A O'Connell-Milne, L M Duratne, R M McMullin, S Kolodzey and R D Frew, 2019, 'Regional differences in supply of organic matter from kelp forests drive trophodynamics of temperate reef fish', *Marine Ecology Progress Series*, 621, 19-32

Urlich S C, 2015*, Mitigating fine sediment from forestry in coastal waters of the Marlborough Sounds*, MDC Technical Report 15-009, Marlborough District Council, Blenheim

Urlich S C, 2020, 'Opportunities to manage sediment from forestry more effectively in the Marlborough Sounds and contributing catchments', *NZ Journal of Forestry*, 65(2), 28-35

Urlich S, D Fearn, B McConaghey, H Dickson, S Hemingway, H Willis, J Pillans, S Wilkey, O McClelland-Peterson and M Bentley, 2019, 'Marine guardians – a novel solution to improving our marine environment', *Resource Management Journal*, 10-14

Urlich S C and S J Handley, 2020, 'From "clean and green" to "brown and down": A synthesis of historical changes to biodiversity and marine ecosystems in the Marlborough Sounds, New Zealand', *Ocean and Coastal Management*, 198, 105349

Urlich S and S J Handley, 2020, 'History of pine forestry in the Pelorus / Te Hoiere catchment and the Marlborough Sounds', *New Zealand Journal of Forestry*, 65(3), 30-35

Urlich S C and M N Hanifiyani, 2024, 'A stringent failure: Regulators do not use available tools to protect aquatic ecosystems from clearcut forestry impacts in New Zealand', *Journal of Environmental Management*, 370, online

Urlich S C, E S Jorgensen and G L Coutts, 2021, *Tourism and regenerating place: Insights from Queen Charlotte Sound / Tōtaranui*, Centre of Excellence for Sustainable Tourism Report 2021.101, Lincoln University, Lincoln

Waitangi Tribunal, 2002, *Ahu moana: The aquaculture and marine farming report (Wai 953)*, Waitangi Tribunal, Wellington

Waitangi Tribunal, 2008, *Te Tau Ihu o te Waka a Maui: Report on northern South Island claims*, Volume 1, Waitangi Tribunal, Wellington

Waitangi Tribunal, 2024, *Takutai Moana Act 2011 urgent inquiry stage 1 report (WAI 3400)*, pre-publication version, Waitangi Tribunal, Wellington

Wakatū Incorporation, 2020, *Te Tauihi intergenerational strategy*, Wakatū Incorporation, Nelson

Walker L and E Toy, 2022, *Section 32 report – Variation 2 – ecologically significant marine sites*, Marlborough District Council, Blenheim

Williams J R, R Bian, L Olsen and J Stead, 2021, *Survey of scallops in SCA7, May 2020*, New Zealand Fisheries Assessment Report 2021/19, Fisheries New Zealand Wellington

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Reversing this long-term degradation will require a concerted and integrated effort which includes passive marine restoration, active marine restoration and strengthened catchment management. All users of the Sounds will need to play their part, in a combined effort, if the current situation is to be turned around. This report outlines potential ways to achieve this.

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