Your Comment on the Taranaki VTM Project

Please include all the contact details listed below with your comments.

1. Contact Details		
Please ensure that you have authority to comment on the application on behalf of those named on this form.		
Organisation name (if relevant)	Wanganui Manawatu Sea Fishing Club	Patea & Districts Boating Club
First name	[redacted]	[redacted]
Last name	[redacted]	[redacted]
Postal address	[redacted]	[redacted]
Phone number	[redacted]	[redacted]
Email ***(a valid email address enables us to communicate efficiently with you)***	[redacted]	[redacted]

2. We will email you draft conditions of consent for your comment			
☒	I can receive emails and my email address is correct	☐	I cannot receive emails and my postal address is correct

3. Please select the effects (positive or negative) that your comments address:			
☐	Economic Effects	☒	Sedimentation and Optical Water Quality Effects
☐	Effects on Coastal Processes	☒	Benthic Ecology and Primary Productivity Effects
☒	Fished Species	☒	Seabirds
☒	Marine Mammals	☒	Noise Effects
☒	Human Health Effects of the Marine Discharge Activities	☒	Visual, Seascape and Natural Character Effects
☐	Air Quality Effects	☒	Effects on Existing Interests
☒	Other Considerations (please specify): Recreational Values		

Submission to the Expert Panel – Taranaki VTM Project (FTAA#008 M)

Date: 5 October 2025

Submitted by:
Wanganui-Manawatu Sea Fishing Club
Pātea & Districts Boating Club

With comments from:
Waitōtara Pātea Fishing Club
Progress Castlecliff
Coastguard Whanganui

Dear Expert Panel Members,

On behalf of Wanganui-Manawatu Sea Fishing Club, Pātea & Districts Boating Club, Waitōtara Pātea Fishing Club, Progress Castlecliff and Coastguard Whanganui, located across the South Taranaki and Whanganui coastal marine area and represent fishers, divers, boaters, and beach users, we submit this comment in **strong opposition** to the Taranaki VTM seabed mining application (the Proposal).

Our members hold generations of lived experience and ecological knowledge of the South Taranaki Bight (STB), a region of exceptional biodiversity, cultural significance, and recreational value. The proposed mining activity poses serious and irreversible risks to the marine environment, community wellbeing, and recreational access.

Key concerns include:

- **Ecological Impact**: The proposal threatens rocky reef habitats that support species such as crayfish, blue cod, tarakihi, hapuka, and bryozoan coral. These reefs, though often undocumented in scientific literature, are well known to local fishers and divers as critical breeding and feeding grounds.
- **Sediment Plume Effects**: Mining-generated sediment plumes risk smothering reef systems, degrading water clarity, and disrupting fish behaviour. Divers rely on visibility for safety and enjoyment, and fishers report reduced catch rates in turbid conditions.
- **Community Exclusion**: Recreational users have been excluded from monitoring, decision-making, and impact assessments. The Applicant's reliance on speculative recovery models and outdated community profiles fails to reflect current realities and undermines trust.
- **Direct Conflict and Undermining of Local Stewardship**: Our communities are actively restoring catchments, reducing sediment runoff, and protecting sensitive marine areas like Project Reef through voluntary stewardship. These efforts stand in stark contrast to the scale and intensity of the proposed mining activity.

We maintain that the application should be declined in full. Should consent be granted, we request that stringent and enforceable conditions be imposed to: Safeguard ecological integrity; Uphold recreational values; Ensure meaningful inclusion of local knowledge in environmental monitoring and adaptive management.

We appreciate the opportunity to contribute to this process and trust that the lived experience and stewardship of our communities will be given due weight in your deliberations.

Yours Respectfully,

[redacted]

[redacted]
Commodore
Wanganui Manawatu Sea Fishing Club

[redacted]

[redacted]
Commodore
Patea & Districts Boating Club

Table of Contents

1. Introduction

This submission is jointly prepared by the Wanganui-Manawatu Sea Fishing Club and the Patea & Districts Boating Club. It reflects our shared concerns regarding the proposed Taranaki VTM seabed mining consent and its potential impacts on the South Taranaki Bight (STB) an area of immense ecological, recreational, and cultural value.

In addition to our joint commentary, written contributions have been provided by Coastguard Whanganui, the Waitotara & Patea Fishing Club, and Progress Castlecliff. These perspectives are included in full in Appendix A and further strengthen the collective voice of recreational marine users and communities.

Together, we represent a broad cross-section of recreational interests with deep intergenerational knowledge and enduring connections to the STB. representing both our members and the wider recreational marine community, those who regularly fish, dive, and boat in the STB to Whanganui coastal marine waters. We call this collective representation of ‘our recreational users’. Our lived experience informs a strong commitment to protecting the integrity, accessibility, and biodiversity of this unique marine environment.

We welcome further engagement with the Expert Panel and the Applicant and appreciate the opportunity to be involved in all future developments, decisions, and opportunities for local recreational input.

1.1 Club Histories and Community Context

1.1.1 Pātea & Districts Boating Club

Established in 1965, the Patea & Districts Boating Club operates from the Pātea River mouth and has over 130 financial members. It was founded with a strong focus on safety and rescue, and quickly engaged with local councillors to improve ramp access and emergency preparedness. The club hosts an annual fishing competition and maintains facilities including a concrete boat ramp, jetty, wash-down station, trailer parking, and clubhouse. Members are active in bottom fishing, pelagic game fishing, diving, and community events.

1.1.2 Wanganui- Manawatu Sea Fishing Club

Originally an arm of the Wanganui Motor Boat Blub, the Wanganui and Manawatu Sea Fishing Club formally separated and was founded in 1972. The club is now located on Wharf Street in Whanganui, this club has approximately 250 members from across South Taranaki, Whanganui, Rangitikei, and Manawatū. It hosts four seasonal community competitions annually and facilitates the National Masters Game Fishing Event. The club has worked closely with the Whanganui Port and Te Pūwaha Project, supporting port operational dredging operations and ramp facility upgrades. Members engage in game fishing, reef fishing, diving, and marine conservation.

2. Why South Taranaki- Whanganui is unique for fishing and recreational use

South Taranaki Bight (STB) is a distinctive and highly valued region for recreational fishing and diving in Aotearoa New Zealand, offering a rare combination of ecological richness, and geological uniqueness. The area is characterised by a broad, shallow continental shelf that extends well offshore, creating an accessible marine environment for small vessels and recreational users.

South Taranaki's shallow seabed supports a rich mix of benthic habitats, sandy flats, rocky outcrops, and reef systems, that provide ideal conditions for marine life. Shaped by ancient volcanic and sedimentary processes, the seafloor features undulating contours, low ridges, and patchy reefs that enhance biodiversity and support both recreational fishing and diving.

Its exposed west coast location, shaped by the Tasman Sea, creates dynamic ocean conditions that attract experienced fishers, divers, and boaters seeking both challenge and reward. The region benefits from the mixing of warm subtropical and cooler temperate currents, which enhances nutrient availability and supports seasonal fish migrations. Local fishers and divers often report dynamic surface activity, including baitfish schools, bird workups, and gamefish sightings particularly during the warmer months.

The region's frequently rough sea conditions, driven by prevailing winds, swells, and weather systems can act as a natural buffer against overuse, limiting access during certain periods and helping to reduce pressure on sensitive marine habitats. This intermittent inaccessibility contributes to the resilience of local ecosystems and supports the long-term sustainability of recreational use.

Catch success in STB is often described as outstanding "the best fishing in the country, without a doubt!"[1] when compared to other regions in New Zealand. Visitors are frequently surprised by the abundance of fish and the speed at which daily limits can be reached often within just one to three hours of fishing. This high productivity, combined with the diversity of species and the quality of the marine environment, makes the area a standout destination for both casual and experienced recreational fishers.

Local knowledge plays a key role in navigating the area's variable swells, tides, and currents, and contributes to a strong sense of connection between communities and the sea. Access to the coast is relatively easy compared to more remote regions, with boat ramps, and community infrastructure supporting a vibrant and active recreational community. Together, these natural and social features make STB a unique and treasured destination for recreational marine use.

[1] Personal Communication with a local retired commercial fisherman, now recreational fisherman from Whanganui who has fished extensively around New Zealand (September 2025).

3. Activities undertaken and values of 'our recreational users'

3.1 Fishing, Boating and Diving Values

Our recreational users possess deep, intergenerational connections to this marine environment. These waters are not only a source of food but also a foundation for social connection, cultural identity, and recreational enjoyment. This enduring relationship has cultivated a rich body of local knowledge, shaped by hands-on experience and careful observation over decades.

Activities undertaken by our recreational users include:

- **Fishing** (Inshore and outshore, bottom & surface, shore-based, boat-based, and competition-based)
- **Scuba diving**
- **Boating and navigation**
- **Beach use and swimming**
- **Environmental observation and informal monitoring**

Through these activities, our members have developed practical expertise in reading the water—understanding how tides, currents, and weather patterns influence fish behaviour and habitat conditions. They can detect subtle changes in water clarity, temperature, and the presence of baitfish or seabirds, which often signal shifts in marine life activity. This observational knowledge is critical for locating fish, assessing ecosystem health, and identifying sensitive habitats such as spawning grounds and reefs.

Beyond technical skill, our recreational users hold a deep appreciation for the biodiversity and ecological balance of the region. They observe species interactions, seasonal migrations, and the effects of environmental changes on fish abundance. Many actively avoid disturbing vulnerable habitats and support conservation efforts to sustain fish populations and marine health.

Shared values among our recreational users include:

- **Stewardship** — protecting sensitive habitats and promoting sustainable practices.
- **Knowledge** — understanding local marine conditions and marine ecology.
- **Community** — fostering connection through shared experiences and traditions.
- **Responsibility** — encouraging safe boating, ethical fishing, and environmental education.
- **Wellbeing & Enjoyment**— recognising the mental health benefits of time spent on and near the water.

Fishing competitions are a cornerstone of club activity. These events bring together fishers of all ages, promote responsible fishing, and support the local economy through accommodation, hospitality, and marine services. They also serve as important social gatherings, strengthening community ties and passing on traditions.

The potential impacts of seabed mining, such as reduced fish abundance, habitat degradation, and restricted access pose a serious threat to the viability of these competitions and the broader recreational culture. Declining catch success and participation could lead to fewer events, reduced sponsorship, and diminished community engagement. We discuss in further detail below adverse effects on these values which are likely to arise from the proposal, see Section 4.3 of this report.

4. Submission

4.1 Community Exclusion

Despite the significant recreational use of the South Taranaki coastline, there has been a notable lack of engagement by the Applicant with recreational fishing and diving communities. This includes well-established local clubs and informal user groups who regularly access and rely on the coastal marine environment for fishing, diving, and other water-based activities.

These communities possess valuable local knowledge about the area's marine conditions, species behaviour, and ecological changes, insights we consider that are critical for understanding the potential impacts of proposed activities such as seabed mining. Despite the Applicant's claims of engagement, there has been no direct consultation with recreational users over the past decade. This is not merely a concern; it is a fundamental failure. Without meaningful engagement, the Applicant cannot credibly claim to understand, represent, or assess the values, experiences, or potential effects on this community. The absence of consultation means the proposal lacks the necessary information to evaluate recreational impacts. Moreover, the Applicant has made no effort to understand how we, as recreational users, wish to be consulted, included, or engaged. This exclusion undermines the integrity of the application and disregards a significant and long-standing user group of the South Taranaki coastal environment.

The Recreational Fishing Baseline Monitoring Plan[2] outlines a range of data collection methods; boat ramp surveys, camera observations, and club surveys to establish a baseline for recreational fishing activity in the South Taranaki Bight (STB). However, this plan has been developed **without any prior engagement** with the recreational fishing, diving, boating, and beachgoing communities who will be directly affected.

The Applicant has not consulted with recreational users to understand how we want to be engaged, what information we consider meaningful, or how monitoring should be designed to reflect our values and experiences. **There has been no buy-in, no participation, and no opportunity for input from the very people whose activities are being measured.**

The proposed surveys and camera monitoring may appear methodologically sound, but without community involvement in their design, they risk being irrelevant, mistrusted, or poorly targeted. For example, the use of cameras at boat ramps raises privacy and trust concerns that have not been addressed with affected communities. Similarly, the ramp and club surveys rely on voluntary participation, yet no effort has been made to build relationships or trust with local clubs and users to ensure meaningful engagement.

Most critically, this monitoring plan is being proposed **after** the application has been submitted **not before** meaning the Applicant has proceeded without any baseline understanding of recreational use patterns, values, or concerns. This undermines the credibility of the application and its ability to assess effects on recreation.

[2] Trans-Tasman Resources Ltd. (2023). *Taranaki VTM FTA application: Appendix Section 5 – Environmental Management and Monitoring Plans* (Section 12: Recreational Fishing Baseline Monitoring Plan). Fast Track Consenting. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0014/4343/Taranaki-VTM-FTA-Application-Appendix-Section-5.pdf

We assert that the Applicant has failed to meet a basic standard of engagement. The monitoring plan cannot be considered robust or representative until recreational users are actively involved in its design, implementation, and interpretation. This failure reflects a broader pattern of exclusion and disregard for the recreational users in the STB.

Our expertise and perspectives are essential for thoroughly evaluating all potential impacts and ensuring that input from local recreational users is appropriately incorporated into the decision-making process.

Therefore, we require that engagement is undertaken with our recreational community.

4.2 Applicants Assessment of Recreational Use and Effects

The application's assessment of recreational use and effects, as informed by the application document[3] and Austin & Buchan (2016)[4] contains several notable omissions and statements that do not align with our views as collective recreational users:

Exclusion of Whanganui as a Key Access Point:
Section 5.13.5.2 of the application fails to recognise Whanganui as a main public access and activity point for marine recreation. This is a significant oversight, as Whanganui is one of the busiest and most important gateways for recreational boating and fishing in the region.

Disagreement on Offshore Fishing Activity:
The application document[5] states that *"recreational areas in the South Taranaki Bight include the coastal fishing and cray-fishing resource extending approximately 20km offshore (at The Traps and Graham Bank)"* and that *"very little recreational fishing occurs more than 20km offshore along the entire west coast of the North Island and within the vicinity of the project area"*
Our local recreational users disagree with these statements. While it is true fishing occurs within 20km of the shore, it is normal for recreational fishing activity to occur beyond this distance, particularly during favourable weather and for targeting specific species. The application underestimates the extent and variability of offshore recreational use, recreational fishers report fishing over 50km offshore.

Potential for Visual and Social Effects:
Austin & Buchan (2016)[6] notes*:*

"There is the potential for the visual amenity experienced by offshore recreational fishers and divers to be affected to a minor / moderate degree. However, most recreational fishing and diving occurs closer to the shore than the estimated location of the sediment plume, and therefore few fishers and divers are likely to experience visual changes."

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[3] Trans-Tasman Resources Ltd. (2025, April 15). Taranaki VTM Project: Fast-Track Act application [Application]. Trans-Tasman Resources Ltd. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0017/4337/Taranaki-VTM-FTA-Application.pdf
[4] Austin, K., & Buchan, D. (2016). *Social Impact Assessment of Trans-Tasman Resources Ltd Iron Sand Mining Project* (Re-issue of October 2013 report). Corydon Consultants Ltd. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0009/4320/Report-30-Croydon-Social-Impacts-Assessemnt-FINAL.pdf
[5] Trans-Tasman Resources Ltd. (2025, April 15). Taranaki VTM Project: Fast-Track Act application [Application]. Trans-Tasman Resources Ltd. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0017/4337/Taranaki-VTM-FTA-Application.pdf
[6] Austin, K., & Buchan, D. (2016). *Social Impact Assessment of Trans-Tasman Resources Ltd Iron Sand Mining Project* (Re-issue of October 2013 report). Corydon Consultants Ltd. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0009/4320/Report-30-Croydon-Social-Impacts-Assessemnt-FINAL.pdf

"There is the potential for moderate adverse social effects on offshore recreational fishing and diving along the coastline from Patea to Whanganui."

However, the Report also concedes that "*assessments commissioned by TTR on the effects on coastal processes and fish habitat and stocks have found that significant changes are unlikely**. However, these assessments have not been undertaken for specific sites of importance or for the full range of species that are important to the fishing and diving community. Therefore the SIA cannot be certain about the significance of the effects on recreation.***"

These commentaries are contradictory. While moderate adverse social effects on offshore recreational fishing and diving are acknowledged, the report simultaneously downplays these impacts based on assumptions about activity locations and plume dispersion without site-specific data or meaningful engagement.

The assessments commissioned by the Applicant do not cover the actual sites used by recreational communities, nor the full range of species important to fishers and divers. Without this, the significance of effects on recreation cannot be reliably determined.

The lack of engagement means the Applicant has no clear understanding of how visual changes, ecological impacts, or access restrictions will affect recreational users. The result is an incomplete and unreliable assessment that underestimates the real risks to the amenity, enjoyment, and cultural connection our recreational users have with the South Taranaki Bight

Mitigation Recommendations:
Austin & Buchan (2016)[7] recommends mitigation measures, including improvements to recreation infrastructure, a recreational fishing and diving management and monitoring plan, and the establishment of an advisory group with representatives from local fishing and diving groups to provide input to monitoring and mitigation.

The recommendation has not been followed through in regard to recreational representation in proposed monitoring plans, ***refer to Section 4.13 in this report.***

Outdated Community Profile:
The Austin & Buchan (2016)[8] community profile has not been updated since 2013. Since then, awareness of the Taranaki VTM project has grown significantly, and there have been new discoveries of reefs and changes in the local economy. We believe the views of the community profiled may have changed since the early project scoping, and that the current assessment may not reflect present-day values, concerns, or usage patterns.

The application and its supporting assessments do not fully capture the scale, diversity, and evolving nature of recreational marine use in STB. Key access points, offshore activity, and recent changes in community awareness and marine discoveries are underrepresented or omitted.

[7] Austin, K., & Buchan, D. (2016). *Social Impact Assessment of Trans-Tasman Resources Ltd Iron Sand Mining Project* (Re-issue of October 2013 report). Corydon Consultants Ltd. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0009/4320/Report-30-Croydon-Social-Impacts-Assessemnt-FINAL.pdf

[8] Austin, K., & Buchan, D. (2016). *Social Impact Assessment of Trans-Tasman Resources Ltd Iron Sand Mining Project* (Re-issue of October 2013 report). Corydon Consultants Ltd. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0009/4320/Report-30-Croydon-Social-Impacts-Assessemnt-FINAL.pdf

We require updated and locally informed data be prepared to ensure that all significant recreational access points and user groups are properly considered in the impact assessment and mitigation planning.

Lack of Recreational Boat Activity Data:

The application does not provide any robust estimates or analysis of the number of recreational fishing boats operating off the South Taranaki–Whanganui coast each year. This is a significant omission, as boat-based fishing is a major component of recreational marine use in the region, with high levels of participation and strong community reliance on access to coastal waters for fishing and diving activities.

Without a clear understanding of the scale and patterns of recreational boat activity, the application cannot accurately assess the potential disruption to access, safety, or fishing success that may result from seabed mining operations. Austin & Buchan (2016)[9] report highlights that most recreational fishing and diving is undertaken by local residents and visitors from surrounding regions, and that access points such as Whanganui and Pātea boat ramps are heavily used, particularly during favourable weather and sea conditions

Local data from Coastguard Wanganui indicates there are approximately 1,000 registered boats using the Whanganui boat ramp. Assuming an average of 2 to 4 people per vessel, this equates to an estimated 2,000 to 4,000 individuals accessing the coastal marine area for recreation. On fine fishing days, it is common to see the Whanganui boat ramp carpark full, along with the Wanganui-Manawatu Sea Fishing Club carpark, both sides of Wharf Street, and boats queued along Heads Road, amounting to an estimated 250 to 300 boats. With an average of three people per boat, this represents approximately between 750 and 900 people using the marine area in a single day. Similarly, at the Pātea boat ramp, around 70 boats may be launched on a good day, representing an additional 210 people at sea.

These figures highlight the high level of recreational use and the importance of this coastline to local communities. Report 29, Greenaway (2016)[10] notes '*On a good weekend day, there can be as many as 150 boats fishing the area out of Whanganui, and most would head north*'and that the majority of boats observed in the region are trailer craft, and that fishing effort is concentrated within 10–20 km of the coast.

Therefore, we require the Applicant to engage directly with local clubs, Coastguard units, and marine users to gather meaningful data on recreational boat use. This information should be incorporated into the social impact assessment to ensure a more accurate and representative understanding of how the proposed activity may affect the region's recreational values and community wellbeing.

4.3 Local Recreational Use and Knowledge

This submission section outlines the recreational use of the area by local communities, with a focus on fishing and diving activities. It draws on local knowledge and observations to describe key fishing and

[9] Austin, K., & Buchan, D. (2016). *Social Impact Assessment of Trans-Tasman Resources Ltd Iron Sand Mining Project* (Re-issue of October 2013 report). Corydon Consultants Ltd. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0009/4320/Report-30-Croydon-Social-Impacts-Assessemnt-FINAL.pdf

[10] Greenaway, R. (2016). *Recreational and tourism effects: Assessment of effects for the Taranaki VTM project* (Report 29). Fast Track Consenting. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0017/4319/Report-29-Greenaway-Recreational-and-Tourism-Effects-FINAL.pdf

diving grounds, including their typical conditions and accessibility. We describe how weather patterns, wave and swell dynamics, tidal influences, water clarity, and currents shape the recreational experience. Additionally, we present insights into commonly targeted fish species and seasonal variations in marine life, contributing to a broader understanding of how the area is valued and used by recreational users.

Additionally in Appendix B we present two references ***Netting Coastal Knowledge: A report into what is known about the South Taranaki–Whanganui marine area*** (Department of Conservation, July 2006) and ***Biogenic habitats on New Zealand's continental shelf: Local ecological knowledge from commercial fishers*** (Bowman & Thompson, 2016)[11] that share local knowledge of the South Taranaki Bight supplementing local knowledge presented in this submission.

This information is provided to highlight the lack of data provided in the Application, and to support the decision making process.

4.3.1 Recognition of Recreational Values

In reference to Section 3.1, we request the Expert Panel to recognise the social, cultural, and economic value of recreational marine activities and ensure that any decision on the application protects the conditions necessary for these activities to continue thriving.

Recreational fishing, boating, and diving are central to the social fabric and wellbeing of our region, supported by intergenerational knowledge and long-standing environmental stewardship. These activities depend on healthy marine habitats, clear water, and safe access to the STB. The proposed mining risks degrading these conditions and limiting access to valued areas.

Therefore, we require the protection of recreational values, ensuring that the environmental conditions essential to the continuation and vitality of recreational marine interests are upheld in any outcome of the consent process.

4.3.2 Fishing and Diving Ground Descriptions

Recreational users along the STB have developed a deep and place-based understanding of the marine environment, reflected in the unique terminology used to describe fishing and diving grounds. These names are not arbitrary, they represent decades of local experience, ecological observation, and cultural connection to the sea. Each site is valued for its distinct habitat, species composition, and suitability for specific activities such as fishing, diving, and harvesting kaimoana.

Refer to Figure 4-2 for map showing the general location of these local fishing areas; below is a summary of key recreational grounds and their known characteristics:

- **Whanganui Wide**: A broad offshore area targeted for snapper, gurnard, grey shark, barracouta, kahawai, tuna, and scallops. The seabed is primarily sandy with shallow bryozoan reef patches.

[11] Bowman, M. H., & Thompson, D. R. (2016). *Biogenic habitats on New Zealand's continental shelf: Local ecological knowledge from commercial fishers* (NZAEBR-174). Ministry for Primary Industries. https://webstatic.niwa.co.nz/library/NZAEBR-174.pdf

- **Kai Iwi**: A nearshore sandy bottom area known for snapper, gurnard, lemon shark, grey shark, and kahawai. Popular for small boat fishing, kayak accessible, and land based fishing. A drop off has been described to run parallel to the shore from the Whanganui River to Kai Iwi.
- **Graham Bank**: A productive offshore reef system supporting hapuka, terakihi, cod, snapper, barracouta, kingfish, trevally, and grey sharks. Known for deeper bottom fishing. Graham Bank itself is a sand bank that doesn't hold a lot of fish however inside and outside of Graham Bank strong fishing grounds.
- **North and South Traps**: Highly biodiverse reef systems supporting cod, crayfish, snapper, kingfish, john dory, copper blue and red moki, kina, terakihi, Spanish and packhorse lobster, leatherjacket, and other reef species. These sites are ecologically rich and culturally significant.
- **Waitōtara Reefs**: Shallow reefs, 3–4m high, with abundant sponges and rocky structure similar to Project Reef. Species include cod, crayfish, snapper, kingfish, john dory, moki, gurnard, and kina.
- **Round Rock**: A steep rocky outcrop with consistently clear diving visibility. Supports all general reef species including cod, crayfish, snapper, kingfish, john dory, trevally, and terakihi.

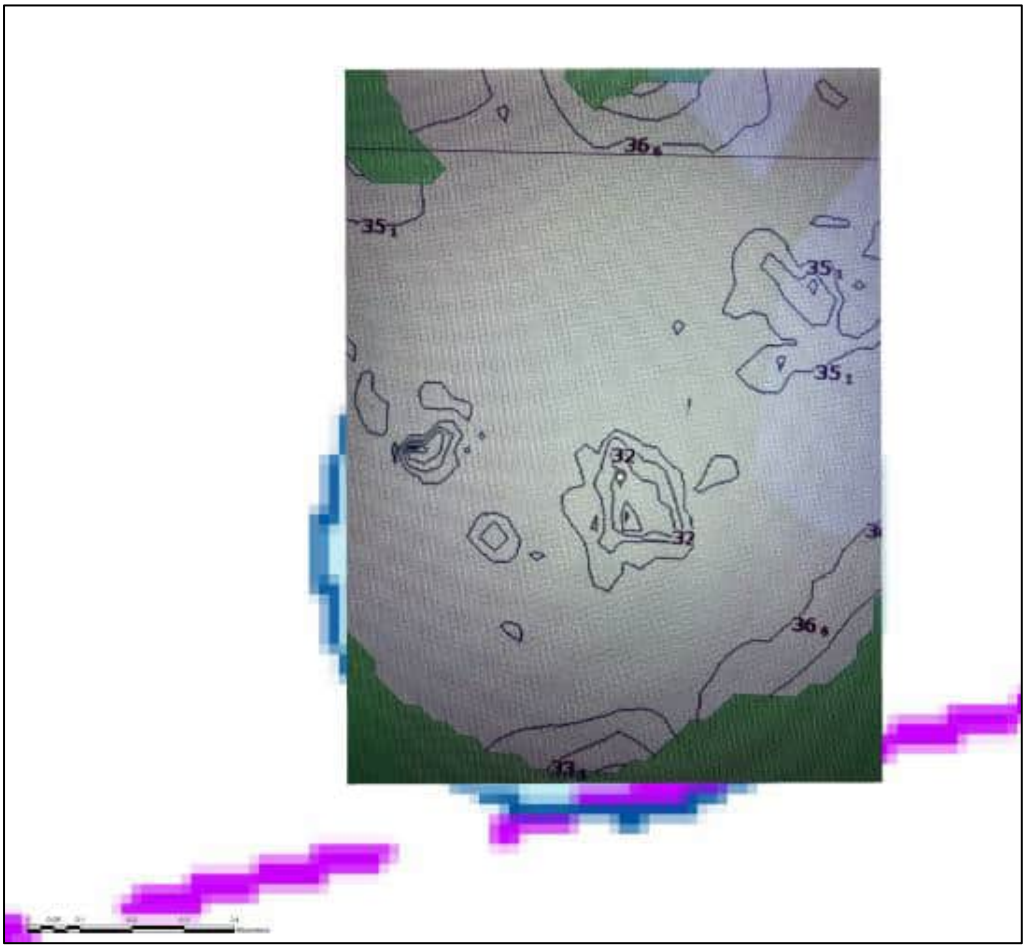

Figure 4-1: Round Rock Reef, Recreational Bathymetric Mapping[12] on Chart NZ 45 Cape Egmont to Rangitikei River

- **Waverley Reefs:** A shallow rocky reef structure, holding snapper, blue cod, and terakihi.
- **Outer Reefs & Bottom Rock**: Located approximately 25 km east of the proposed mining site, these bryozoans and rocky scattered reefs rise up to 1.5m from the seabed at depths of around 42m. They are prized for their crystal-clear visibility and absence of silt, supporting hapuka, terakihi, cod, snapper, barracouta, and grey sharks.
- **Pātea Banks**: A mixed habitat sand area and rocky structure supporting snapper, gurnard, cod, scallops, kahawai, grey shark, and kingfish. Frequently accessed from the Pātea River mouth.
- **Rolling Ground**: A dynamic offshore sandy area targeted for cod, mackerel, barracouta, snapper, kingfish, kahawai, trevally and warahau and seasonal tuna species including albacore and bluefin.
- **Oil Rig**: Similar species composition to Rolling Ground, with cod, mackerel, barracouta, snapper, kingfish, kahawai, and tuna.

[12] Whanganui Based Fisherman. *Recreational Bathymetric Mapping of Round Rock* (September 2025)

- **Rylands**: A high-relief rocky reef with thick kelp forests and vertical faces up to 10 metres. No sand present. Supports cod, crayfish, snapper, kingfish, john dory, terakihi, trevally, and moki species.
- **Project Reef:** This site holds a special protected status within the recreational community, upheld through a long-standing informal agreement among local divers and fishers to leave it undisturbed. Known for its exceptional ecological richness and abundance of kaimoana, Project Reef is treated as a de facto marine reserve, despite having no formal legal designation. The community's voluntary mindful harvesting from here reflects a deep respect for the reef's biodiversity and its role as a reference site for healthy reef ecosystems. Any disturbance particularly from sedimentation or seabed modification would violate this informal protection and undermine decades of community-led stewardship.

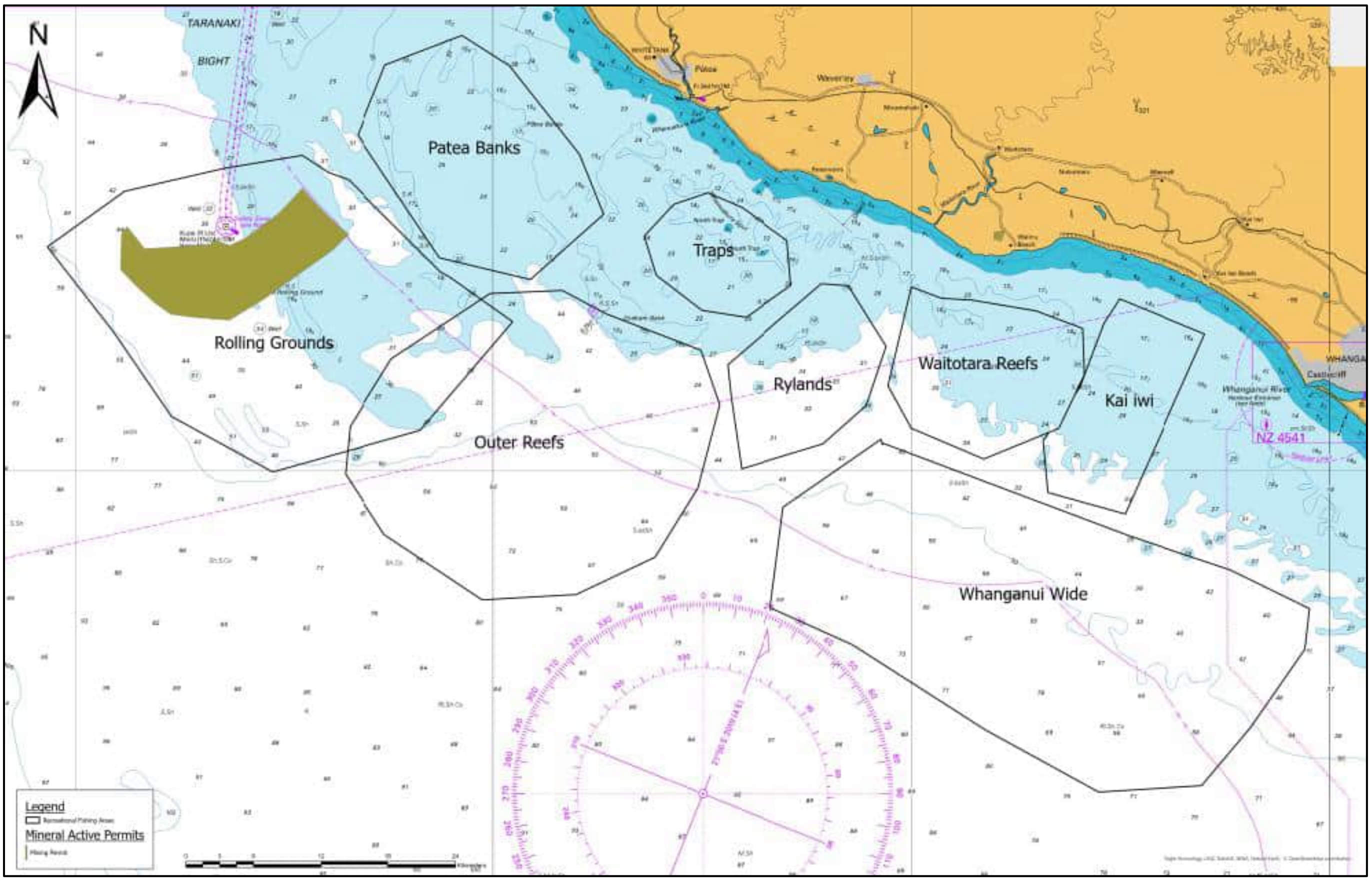

Figure 4-2: Indicative Local Fishing Areas on Chart NZ 45 Cape Egmont to Rangitikei River.

These sites are not only recreational destinations they are part of a living marine landscape that supports community wellbeing and cultural practices. The knowledge embedded in these place names and species associations reflects a long-standing relationship between people and place.

Therefore, we require that the unique local knowledge embedded in the naming and use of these grounds be recognised as a legitimate source of environmental data and cultural value, informing the decision-making process and ongoing monitoring frameworks.

Additionally, we strongly oppose any activity that risks degrading these valued grounds.

4.3.3 Diving in 1980 – 1990's

Diving in the 1980s was a markedly different experience, as described by long-standing club members. Locating reef structures relied heavily on local knowledge and visual landmarks such as aligning the Waipipi ironsands buoy, a white building, and a row of trees onshore to return to previously dived spots. Divers also used early paper sounders like the Furuno FE450, which provided only basic contours and occasional fish signals. In the 1980s, one member even acquired Royal New Zealand Navy bathymetric maps of the area from 1974 to help identify new reef structures to explore. Memorable discoveries included a large flat rock with another perched on top, sheltering crayfish beneath, found at a location inside the South Trap[13].

Divers from the 1980s and 1990s recall that the North and South Traps rarely had much silt; instead, the crevices between rocks were filled with clean white sand[14]. However, changes have been observed over time. One diver noted a significant reduction in kelp on the South Trap during a 2008 dive, compared to the abundant kelp seen in the 1980s and 1990s, a habitat often associated with healthy, well-fed kina[15].

These accounts offer early evidence of reef structure, species abundance, and habitat condition prior to recent environmental changes. They reflect long-standing local knowledge and continuity of reef use over decades, knowledge that remains relevant today.

Therefore, we require this lived experience inform impact assessments and monitoring, as the reefs described are still actively used and valued by recreational fishers and divers.

4.3.4 Recreational Marine Technology Today

Recreational marine technology has advanced dramatically in the last decade, to the point where some boats now carry equipment comparable to that used on professional survey vessels. Modern recreational fishers and divers have access to a suite of sophisticated tools that have transformed how they explore and understand the marine environment.

Key advancements include:

- **High-Performance Transducers:**
  Today's transducers offer far greater sensitivity and resolution, allowing users to detect underwater features and fish with remarkable clarity.
- **Structure and Side Scan Sonar:**
  More recreational boats are now equipped with structure and side scan sonar capable of accurately imaging the seafloor and identifying individual rocks, reefs, and fish at depths up to 50 to 60 metres.
- **Bathymetric 3D Mapping:**
  Entry-level systems now allow users to create detailed three-dimensional maps of the seafloor, with some units mapping down to 1-foot increments at depths up to 700 metres. This technology enables recreational users to discover and revisit specific underwater features with precision.

[13] Whanganui Diver,*Personal Communications*. (September 2025).
[14] Whanganui Diver,*Personal Communications*. (September 2025).
[15] Whanganui Diver,*Personal Communications*. (September 2025).

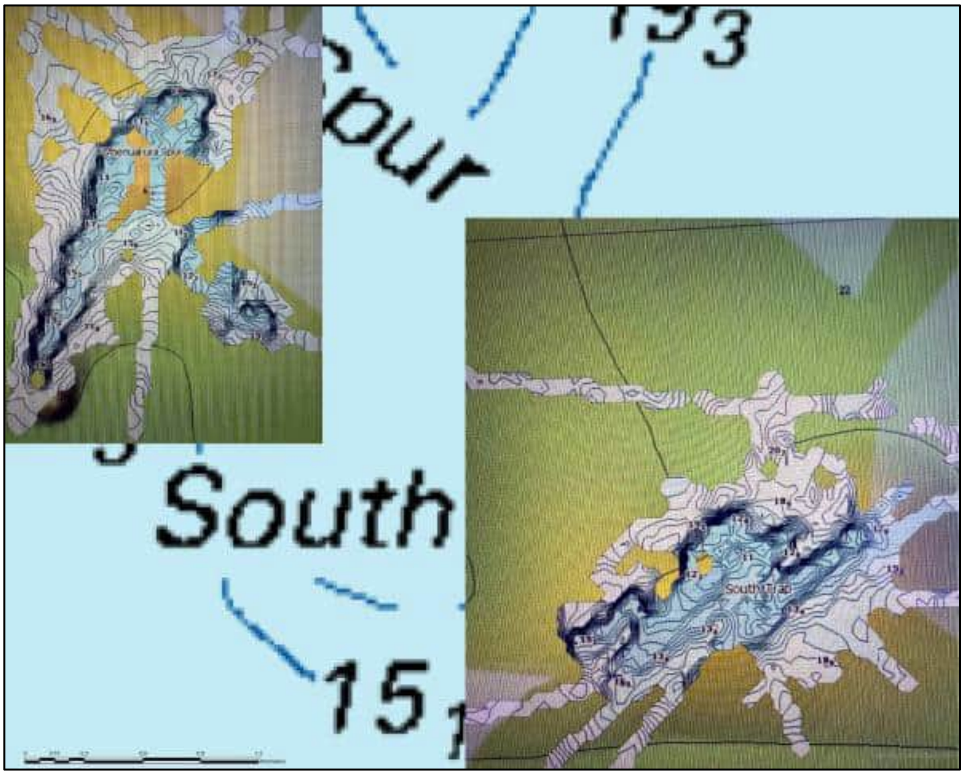

Figure 4-3: Recreational Bathymetric Mapping of the North & South Traps[16] on Chart NZ 45 Cape Egmont to Rangitikei River

- **Fishfinder Features:** Modern recreational fishfinders now offer advanced features such as dual-frequency operation, digital filtering for clearer images, and a wide range of color echo presentations. These units can accurately distinguish between different bottom types (mud, sand, gravel, rock) and identify both baitfish and larger species. With selectable output power, multiple range scales up to 1200 meters. Additional functions include audio and visual alarms for depth, fish, and temperature, automatic modes for cruising or fishing, and a white line feature to help spot fish close to the seabed.

Importantly, much of this technology is now widely available and affordable, making advanced marine exploration accessible to everyday recreational users. As a result, today's recreational fishers and divers can locate, map, and monitor marine habitats with a level of detail that was unimaginable just a decade ago at the commencement of the Taranaki VTM Project.

In recognition of these advancements, modern recreational vessels are equipped with high-resolution sonar, bathymetric mapping tools, and fishfinders capable of identifying reef structures, bottom types, and species distributions at significant depths. This technology has empowered local users to build sophisticated and site-specific knowledge bases of the STB.

Therefore, we require that this community-generated data and observational capacity be considered as a legitimate source of environmental information. The application should acknowledge that recreational users are not passive observers but active contributors to marine

[16] Whanganui Based Fisherman. *Recreational Bathymetric Mapping of the Noth and South Traps* (September 2025)

knowledge, and their insights must inform the assessment of potential impacts on habitat, visibility, and species behaviour.

4.4 South Taranaki- Whanganui Marine Dynamics

Local knowledge, built over generations of close interaction with the coastal marine environment, provides critical insight into the natural patterns of waves, swell, tides, currents, weather limitations, water clarity, and sea surface temperature of the STB area.

4.4.1 Weather-Dependent Access for Recreational Fishing

Recreational fishing along the STB is highly sensitive to prevailing weather and sea conditions. Local fishers, divers have developed deep knowledge of the region's marine weather patterns, which directly influence when and where fishing is safe and viable. This knowledge is not theoretical—it is lived experience, built over decades of observing and responding to the dynamic coastal marine environment.

Conditions That Restrict Access

Fishing access is significantly restricted during **rough sea conditions**, particularly when:

- **Northwesterly winds exceed 15 knots**, typically generating short-period wind swell and choppy seas, making offshore fishing unsafe and uncomfortable.
- **Southerly winds above 15 knots** are associated with swells exceeding **1 metre in height**, often accompanied by confused seas and poor visibility, further limiting safe access.
- **Wind-generated swell** (short period, steep waves) creates hazardous conditions for small recreational vessels, especially when combined with strong gusts and shifting wind directions.

These conditions are common during seasonal transitions and storm events, and they naturally limit fishing pressure on the marine environment by preventing access for days and weeks at a time.

Conditions That Allow Fishing

In contrast, fishers can safely operate in:

- **Large, long-period swells** of up to **2.5 – 3 metres**, provided the swell is rolling and consistent, without accompanying wind chop. which are predictable and manageable, allowing experienced fishers to plan safe trips offshore.
- **Light winds from the North, Northeast, East, or Westerly directions**, typically under **15–20 knots**, especially when accompanied by an **improving weather forecast**.

This nuanced understanding of **wind direction, swell height, and wave period** is essential for safe recreational fishing. It also means that fishing effort is naturally moderated by weather, there is no constant pressure on the marine environment, and fishers are often forced to wait for suitable conditions.

Recreational boating activity naturally declines during **late autumn, winter, and early spring** due to more frequent conditions that restrict access, cold temperatures, shorter daylight hours, and increased wind chill. Local ramp observations confirm fewer vessels are launched during these months, reducing fishing and diving pressure on the marine environment. This seasonal drop in use reflects both safety considerations and the community's respect for natural conditions, reinforcing that recreational access is already limited without additional potential impacts from seabed disturbance.

Our recreational users believe that these weather-related limitations serve as a form of passive environmental stewardship, reducing overfishing and allowing marine ecosystems time to recover between fishing events and storm events.

Access to coastal marine areas for recreational activities is highly dependent on tidal conditions across the region. Local knowledge and long-standing use patterns indicate that:

Pātea River Mouth: Recreational access is viable for approximately two hours either side of low tide, limiting safe launching and retrieval windows for vessels. Outside of this window, the bar becomes increasingly hazardous due to shallow water, strong tidal currents, and shifting sandbanks. The Pātea Bar is widely regarded as one of the more dangerous bars on the west coast, particularly during or following rough weather, when wave energy and sediment movement can rapidly alter the channel. Local fishers report that even within the viable tide window, conditions can deteriorate quickly, requiring a high level of experience and caution.

There have been multiple fatalities and near-miss incidents at the Pātea Bar over the years, underscoring the inherent risks associated with launching from this location. These incidents are well-documented in local media and Coastguard reports.

Whanganui River Mouth: Similarly, recreational access is constrained to 1.5 to 2 hours either side of low tide, impacting both recreational and club-based boating activities. However, compared to the Pātea Bar, the Whanganui Bar is significantly safer and more navigable, particularly for small recreational vessels. The entrance channel is more stable, with fewer shifting sandbanks and less exposure to direct wave energy, making it more predictable under a wider range of conditions. Local fishers and divers consistently report that Whanganui offers a more reliable and less hazardous launching option, especially during marginal weather or swell conditions. **This relative safety makes Whanganui a preferred choice for many users, particularly when planning longer offshore trips.**

Putiki Slipway: Offers all-tide access, but is limited by the small size of the ramp, restricting its usability for larger vessels or during peak recreational periods.

Whanganui Motor Boat Club: Access is similarly tide-dependent, with a two-hour window either side of low tide for safe launching and retrieval.

Beach Launching Sites: At Kai Iwi, Waiinu, and Waverley, beach launching is not possible at high tide due to inundation and soft sand conditions. Additionally, adverse weather and high-energy wave conditions frequently restrict beach launching

Tidal constraints mean that recreational users do not have unrestricted, 24-hour access to the coastal marine environment for fishing, diving, or boating. While this presents logistical challenges, it also serves an important ecological function. The limited windows for launching and retrieval naturally regulate the intensity and frequency of recreational activities, helping to reduce cumulative pressure on fish stocks, benthic habitats, and sensitive coastal ecosystems. In effect, the tidal cycle acts as a passive management tool, enforcing breaks in activity that allow for periods of ecological recovery and reducing the risk of overfishing or habitat degradation.

Therefore, we require that consideration be given to natural limitations on access to the STB for recreational purposes, recognising this as passive environmental management, and an approach for consideration in effects of the application.

4.4.2 Travel Time to Recreational Locations

Accessing offshore recreational fishing and diving locations from Whanganui and Pātea requires significant travel time, both by road and by sea. These distances reflect the commitment of local users and the value placed on these areas for their ecological richness and recreational significance.

By Road

- **Whanganui to Pātea (towing a boat)**: Approximately **45 minutes to 1 hour**, depending on traffic. This route is commonly used by Whanganui-based fishers accessing the Pātea River mouth and northern fishing and diving ground.

By Sea – From Whanganui Bar (travelling at 24 knots)

- **Whanganui Bar to Rylands**: approximately 45 minutes
- **Whanganui Bar to Graham's Bank**: approximately 45 minutes - 1 hour
- **Whanganui Bar to Rolling Ground**: approximately 1.5 hours
- **Whanganui Bar to Outer Reefs**: approximately 1 – 1.5 hours
- **Whanganui Bar to the Traps**: approximately 45 minutes
- **Whanganui Bar to the Mining Site**: approximately 1.5 hours

By Sea – From Pātea River Mouth (travelling at 24 knots)

- **Pātea to the Mining Site**: approximately 30 minutes
- **Pātea to Rolling Ground**: approximately 30 – 45 minutes
- **Pātea to Graham's Bank**: approximately 30 minutes
- **Pātea to The Traps**: approximately 10-15 minutes

Fuel consumption for recreational fishing is now about one-third lower than it was in the 1970s and 1980s, thanks to modern, more environmentally friendly engines. As a result, boaters from Whanganui can reach northern fishing grounds more quickly and efficiently, allowing them to cover more area and spend more time fishing in a single day.

Local fishers from Whanganui routinely make decisions about where to launch based on their intended destination for the day, comparing travel times, sea conditions and forecast, tidal access, and bar conditions. For example, when targeting areas closer to the mining site or northern reefs, launching from Pātea may be preferred due to shorter sea travel and more direct access. Conversely, Whanganui Bar is used when conditions allow and destinations are further south. These decisions are made with safety, fuel efficiency, and weather forecasting in mind.

We require the application take into consideration the increasing offshore reach of recreational users beyond 20km along the STB, and the growing importance of distant reef and fishing grounds. Specifically:

- ***Local users now routinely travel further offshore, including to Outer Reefs, and the proposed mining site in the Rolling Ground (particularly in warmer months when targeting game fish species); and***
- ***The application needs to consider that recreational use is dynamic and expanding, not static, and that decisions must account for evolving patterns of access and effort.***

4.4.3 Water Clarity and Current Observations

Water clarity is highly variable and closely linked to sediment movement. Club members who dive report that visibility can drop from 10-15m to less than 1m following storm events or strong swell. Abnormal seasons like the 2024-2025 drought across the regions saw improved water clarity of 20m or more.

Club members who dive have observed that, during descent to depth, the following dive current and clarity conditions are noted:

a) direction of strong current from the north west to southeast.

b) or there are two opposing current directions i.e. surface current direction is different to the bottom current direction

c) odd occasion when there is no current and you can see the bottom from the surface. One diver recalls three dives in her 10 years of diving on this coast that this was the case. One particular dive she dropped one of her dive weights and could see it land on the bottom and was able to recover the weight easily[17].

d) at depths less than 30m, wave oscillations are noticeable while diving- members report that you can be drifting one direction then have a lag or still moment before changing to drifting the opposite direction before another lag and changing back to the first direction.

e) Tidal oscillations are also noticeable in a similar way to point d. when diving over changing tides the current changes from fast and typically strong, to slack and weak before changing direction and speeding up again to a stronger current.

f) At depths of 30 to 45m, members report that the water column currents tend to be calmer to still with minimal suspended sediment and the best visibility for diving.

g) Visibility can change depending on where you dive on a reef i.e faces of the reef that are up current can have noticeably less visibility than when diving on the sheltered down current faces of the reef.

Most divers run a fixed point anchor buoy system so there is a known point of entry. Members report in dives that it is normal to have to tightly hold onto the reef structure to avoid being swept kilometres away from a dive location[18]. When divers surface it is expected that despite their best efforts to remain around

[17] Whanganui Diver,*Personal Communications*. (September 2025).
[18] STB Divers. *Personal Communications*. (September 2025).

the anchor they will be picked up a varying distance away from their entry point easily up to a few kilometres away. For this reason South Taranaki – Whanganui divers typically run air pressure whistles to attract attention of the boatmen and have surface personal locator beacons attached to their Buoyancy Control Device (BCD) for circumstances when boatmen are struggling to locate the diver in between swell and wave chop if the conditions change whilst the diver is underwater.

Due to safety our members do not dive in 'rough sea conditions', so our knowledge of subsurface currents and conditions in 'rough sea conditions' are not known.

A local fisherman gave an account of fishing the Rolling Grounds, the area of the proposed sea bed mining, he mentioned it was not uncommon to have the tide ripping through the area at 4-4.5knot speeds, he also mentioned that the tide direction changed depending on what time of the month you were fishing sometimes the tide current would be running parallel to the coastline and at other times of the month the tide current would turn more into the coastline[19].

Another fisherman was game trawling in 2025 through the sea bed mining area, and came across a 4 degrees temperature change across a few miles, he said the sea in that area was like a washing machine flat and turbulent a bit like crossing the Whanganui bar. Whilst either side of the temperature break was flat with a large rolling swell, something that he had never seen before fishing[20]

Therefore, we require full consideration to the extensive local knowledge held by recreational fishers and divers regarding water clarity, currents, and tidal behaviour in the STB be given. Specifically:

- ***Local observations provide nuanced, site-specific insights into subsurface conditions that are not captured by broad-scale modelling, including variable current directions, tidal oscillations, and reef-specific visibility patterns.***
- ***These lived experiences highlight the complexity of the STB marine environment and should inform the interpretation and validation of technical modelling.***
- ***We require modelling inputs and assumptions (e.g. swell, current speed and direction, sediment transport, tidal cycles) to be cross-checked against verified local accounts to ensure they reflect real-world conditions.***

4.5 Marine Mammal Sightings

Club members, fishermen and their families have shared stories of encountering marine mammals during their time on the water. Sightings of orca, common dolphins, and seals have all been informally reported. One fisherman talked to the movement of whales through the STB making mention of the Grahams Bank as a shallow area where whales either diverge and take an inshore route along the coastline or turn and head offshore.

Additionally, club members who are also part of the Whanganui Aeroclub have observed large schools of dolphins during coastal flights along the South Taranaki Bight. These aerial observations provide a

[19] Whanganui Based Retired Commercial Fisherman, *Personal Communications*, September 2025.
[20] Whanganui Based Recreational Fisherman, *Personal Communications*, September 2025.

broader perspective on marine mammal activity in the region and reinforce the significance of the area as a marine mammal habitat.

Of note we bring attention to the sperm whale that washed up South of Waiinu Beach over the weekend of the 27 September 2025, the photo of the sperm whale shown in Figure 5-1 is one of the many strandings the local a local Whanganui Department of Conservation Ranger has attended and recorded over the years. We question if whale stranding record for the Coastline between Cape Egmont and Kapiti have been requested and considered when assessing marine mammal activity in the STB, a quick past paper search revealed strandings along this coast dating back to the 1940's.


Figure 4-4: Sperm Whale washed up south Waiinu Beach, 27 September 2025

If recorded, the frequent marine mammal sightings reported by local recreational users could have significantly strengthened regional population data. **The exclusion of recreational knowledge from the applicant's assessment efforts on marine mammals reflects a missed opportunity to understand the area's marine mammal habitat better.**

Therefore, we suggest the Applicant review historical marine mammal stranding records along the coastline between Cape Egmont and Kapiti and incorporate findings into population data. And we require acknowledgement of the value of recreational knowledge and local experience, which has been excluded from the Applicant's marine mammal assessment, and consider integrating this insight into the evaluation process and potential monitoring conditions.

4.6 Seabirds

While our members do not claim expertise in ornithology, their time spent on the water has led to consistent and practical observations of seabird behaviour. Fishers regularly identify species such as seagulls, gannets, shearwaters, petrels and rely on their presence as indicators of fish activity. The phrase "find the seabirds, find the fish" is a commonly held truth among recreational fishers in the region.

Seabirds are often the first sign of schooling fish, with gannets diving and gulls circling above bait balls. These visual cues are essential for locating fish and successful fishing trips. The presence and behaviour of seabirds are therefore not only ecologically significant but also directly tied to the success of recreational fishing.

Members have reported offshore several sightings of blue penguins swimming well beyond the typical coastal range.

In March 2025, within the proposed seabed mining area, two members encountered a significant surface feeding event while game trawling for tuna and marlin. They observed an expansive school of mackerel "boiling" at the surface, accompanied by hundreds of gannets and gulls actively feeding around the disturbance, an indication of high marine productivity in the area at that time.[21]

In reference to Section 5.7.2 - *Effects on Seabirds* of the application[22], we note the identified impacts on:

- Species presence and habitat integrity
- Sedimentation and its influence on foraging behaviour
- Disruption caused by vessel lighting schedules

Recreational fishers emphasise the strong reliance on seabird activity to locate fish, underscoring the direct connection between seabird health and fishing success.

Therefore, we request assessment of the ecological significance of seabirds and the recreational value they sustain, and the potential of adverse effects on these values from the proposal.

4.7 Catchment Level Erosion and Sediment Reduction Efforts

The recreational users represented by the Wanganui-Manawatu Sea Fishing Club, the Pātea & Districts Boating Club, and associated groups are not only fishers, divers, and boaters—they are also local residents, farmers, and regional ratepayers who actively contribute to the health of their environment. Many of our members are directly involved in catchment restoration and land management initiatives aimed at reducing erosion and improving water quality throughout the South Taranaki and Whanganui regions.

Significant investment and effort is being made to reduce sediment loads entering rivers and, ultimately, the coastal marine environment. These efforts include:

- Sustainable Land Use Initiatives (SLUI), supported by Horizons Regional Council and South Taranaki and Regional Erosion Support Scheme (STRESS) supported by Taranaki Regional Council, work with landowners to stabilise erosion-prone land and improve riparian margins.
- Government programmes such as Freshwater Improvement Fund, Essential Freshwater Fund and Jobs for Nature - Mahi mō te Taiao support catchment-wide restoration projects and sediment reduction strategies.
- Community-led planting and fencing of sensitive land environments.

[21] Conservation with Wanganui- Manawatu Sea Fishing Club member and local fisherman based in Whanganui (September, 2025).
[22] Trans-Tasman Resources Ltd. (2025, April 15). Taranaki VTM Project: Fast-Track Act application [Application]. Trans-Tasman Resources Ltd. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0017/4337/Taranaki-VTM-FTA-Application.pdf

While our rivers such as the Whanganui, Pātea, and Waitōtara naturally carry suspended sediment, the community is making genuine and ongoing efforts to reduce anthropogenic contributions. These actions reflect a strong commitment to protecting the marine environment, not only for recreational use but for ecological integrity and future generations.

It is therefore deeply concerning that the proposed seabed mining activity would introduce large-scale, sediment plumes into the marine environment our communities are working hard to improve and protect.

Therefore, we strongly oppose the proposed seedbed mining activity, and require consideration of the significant efforts made by recreational users to reduce sedimentation at a catchment level for the health of our waterways and our marine environment. Undermining local efforts risks sending a damaging message that local action and environmental responsibility can be disregarded.

4.8 Potential effects on human health

4.8.1 Metals and Chemical discharges

There is a lack of clarity in the application regarding which chemicals and metals may be discharged into the marine environment as a result of the proposed seabed mining activity. This uncertainty raises serious concerns among recreational fishers and divers about the potential contamination of fish and shellfish that are collected for personal consumption. Without clear information on the nature and concentration of these discharges, it is impossible to assess the risk to human health from consuming affected species.

Therefore, we require:

- ***Assessment of bioaccumulation in key species;***
- ***A human health risk assessment based on local consumption patterns.***

We strongly oppose any activity which will adversely affect human health and which would result in contaminant bioaccumulation in aquatic species.

4.8.2 Noise

The application does not adequately evaluate surface and underwater noise as potential hazards to recreational ‘human’ users in the STB. While assessments focus primarily on marine mammals, it is important to consider that recreational fishers and divers value the natural tranquillity of the marine environment. Noise impacts should extend beyond marine fauna to include potential effects on humans, such as aversion, discomfort, dizziness, or even temporary hearing loss.

Additionally, the noise assessment omits factors such as auxiliary operational noise and is based mainly on modelling of the Integrated Mining Vessel (IMV) and seabed crawler operations, without incorporating in situ measurements or considering auxiliary vessels, helicopters, and dredging noise.

Actual noise conditions in the STB remain largely undocumented, feedback from recreational users suggests the area is typically tranquil or quiet, with minimal disturbances apart from outboard motors, wave activity, radios, and onboard boating activities associated with recreational activity[23]. Consistent noise from this operation will be either a nuisance, a deterrent, or unsafe to recreational users wanting to use the area.

WorkSafe NZ[24] prescribes legal thresholds to protect workers and nearby individuals from hearing damage, in accordance with the Health and Safety at Work Act 2015[25], which mandates identification and mitigation of foreseeable workplace hazards—including those affecting nearby users.

Underwater acoustics present unique challenges, as sound travels faster and farther in water, potentially exposing divers to high-intensity noise from sonar, construction, and mining operations. International standards, such as those set by NOAA and IMO, may provide guidance for managing underwater noise exposure and ensuring diver safety.

Certain noise frequencies have been associated with attracting sharks; verbal reports from local divers indicate between five or fewer shark encounters over 10–20 years of diving in the South Taranaki Bight[26]. Divers are concerned about the potential increase in the likelihood of shark encounters whilst diving.

Recreational diving in the South Taranaki Bight includes not only rocky reefs but also sandy areas like the Rolling Grounds, where divers search for scallops and explore new ground[27]. The applicant's proposed 1 nautical mile exclusion zone is significantly smaller than the predicted 120 decibel noise limit, that is shown as being drawn from mining being situated in the centre of the mining site, and does not adequately address potential human health risks or impacts on recreational diving[28].

There is insufficient information in the application section 5.9- *noise effects*[29] and Hegley (2015)[30] to assess how underwater noise may affect diver safety, comfort, or recreational access and enjoyment.

Therefore, we require consideration is given to enjoyment values and health and safety risks posed by surface and underwater noise to recreational users in theSTB.

A comprehensive evaluation of these impacts is essential, and we require appropriate safeguards are implemented to protect public wellbeing and recreational access.

4.9 Fished Species

4.9.1 Local Observations and Fished Species Impacts

Local fishers recreational observations offer valuable insight into the health of fished species insight that must be considered when assessing the potential impacts of seabed mining.

23 Whanganui Based Recreational Fisherman, personal communications, September 2025.
24 WorkSafe New Zealand. (2018). *Noise – the law*. https://www.worksafe.govt.nz/topic-and-industry/noise/the-law/
25 New Zealand Government. (2015). *Health and Safety at Work Act 2015*. https://www.legislation.govt.nz/act/public/2015/0070/latest/DLM5976660.html
26 STB Divers, personal communications, September 2025.
27 STB Divers, personal communications, September 2025.
28 Trans-Tasman Resources Ltd. (2025, April 15). Attachment 1 - Trans-Tasman Resources - Fast Track Application - Proposed Authorised Restricted Activities and Consent Conditions. Trans-Tasman Resources Ltd. Attachment-1-Proposed-Marine-Consent-Conditions-FINAL.pdf
29 Trans-Tasman Resources Ltd. (2025, April 15). Taranaki VTM Project: Fast-Track Act application [Application]. Trans-Tasman Resources Ltd https://www.fasttrack.govt.nz/__data/assets/pdf_file/0017/4337/Taranaki-VTM-FTA-Application.pdf
30 Hegley, N. (2015). *Trans-Tasman Resources Ltd offshore iron sand extraction and processing: Assessment of noise effects* (Report No. 9101). Prepared for Trans-Tasman Resources Ltd. https://www.fasttrack.govt.nz/__data/assets/pdf_file/0016/4318/Report-28-Hegley-Assessment-of-Noise-Effects-FINAL.pdf

A long-time member of the Castlecliff Club Fishing Adjunct, shared:

"I have recreationally fished off Whanganui most of my life. Over the past few years we have seen the rapid decline in blue cod numbers. Now I venture beyond Graham's Bank and have seen a healthy fishery of blue cod. Do not destroy this area."[31]

This sentiment is echoed by many in our community. Offshore areas beyond Graham's Bank, including the northeast boundary of the proposed mining site, are now recognised as some of the last strongholds for blue cod.

A highly experienced fisher and diver active in the region since 1985, has observed:

"Despite regular fishing and diving pressure, fish and crayfish populations have remained stable at the North and South Traps. That's because offshore feeding and spawning grounds continue to support the nearshore reefs."[32]

This resilience is directly linked to habitat connectivity between nearshore and offshore zones. Disrupting these offshore areas risks severing the ecological lifeline that sustains inshore fisheries.

Another local fisher regularly targets snapper, blue cod, crayfish, and kingfish across the Traps, Graham's Bank, and the Rolling Grounds. He notes:

"At certain times of the year, snapper are everywhere can be caught throughout the STB just by drifting. In the guts of snapper are typically juvenile fish (including blue cod) and squid. Shallower inshore areas are critical nursery habitats but I would say Graham's Bank is one of the most productive and reliable areas."[33]

These seasonal movements and juvenile concentrations highlight the dynamic nature of the fishery and the importance of protecting both spawning and nursery grounds.

The proposed mining area is also important for pelagic species. Game fishers report regular catches of horse mackerel, kingfish, marlin, juvenile albacore tuna, and kahawai.

During the COVID-19 period, when commercial activity and marine traffic declined, local fishers observed signs of reef species recovery and increased presence of game fish such as bluefin tuna, albacore tuna, and marlin. Snapper numbers reportedly "exploded." These changes demonstrate the marine environment's capacity to recover when disturbances are reduced something the applicant's assessment fails to acknowledge.

The proposed seabed mining activity poses serious risks to the fish species recreational users rely on with the application section 5.6 – fished species[34] stating the following impacts to fished species:

- **Physical disturbance of seabed habitats**, including feeding and spawning grounds.
- **Sediment plumes**, which can reduce visibility, clog respiratory surfaces, and interfere with foraging.

[31] Castlecliff Club Fishing Adjunct Member & Recreational Fisherman, *Personal Communications*, September 2025.
[32] Patea Based Recreational Fisherman, *Personal Communications*, September 2025.
[33] Patea Based Recreational Fisherman, *Personal Communications*, September 2025.
[34] Trans-Tasman Resources Ltd. (2025, April 15). Taranaki VTM Project: Fast-Track Act application [Application]. Trans-Tasman Resources Ltd https://www.fasttrack.govt.nz/__data/assets/pdf_file/0017/4337/Taranaki-VTM-FTA-Application.pdf

- **Displacement of fish due to noise, turbidity, and light pollution**, reducing abundance in traditional fishing grounds.
- **Loss of nursery and spawning areas**, affecting recruitment and seasonal availability.
- **Entrainment of juvenile fish in extraction equipment**, threatening population sustainability.

Even minor changes in water clarity and seabed structure could disrupt species behaviour and reduce catch success. These impacts are not theoretical they would directly affect the viability of recreational fishing and undermine the knowledge and practices built over generations.

Our recreational users strongly oppose any activity that threatens the health of productive fishing grounds. These areas are ecologically vital and socially significant, supporting food gathering, recreation, and cultural connection to place.

If fish species are displaced from one area into another due to mining activity, this could have a direct and material impact on recreational fishers. Displacement caused by noise or sediment plumes may reduce fish abundance in traditional fishing grounds, forcing fishers to travel further, fish in unfamiliar waters, or experience reduced catch success. These changes undermine long-standing fishing practices and local knowledge, and erode the social and cultural value of recreational fishing in the region.

The applicant has not provided a thorough evaluation of how seabed mining may adversely affect fished species and recreational fishing. We therefore require full consideration of our lived experience and ecological knowledge of our members, and to recognise the real and lasting impacts this activity would have on our marine environment and recreational community.

4.9.2 Our view on the Recreational Fishing Data from Report: FN96 South Taranaki Bight Fishing

The MacDiarmid, MacGibbon, and Anderson (2024)[35] FN96 report provides a comprehensive overview of recreational fishing activity across six reporting areas in the South Taranaki Bight (STB), including Whanganui, Pātea, Waverley, Hawera, Otakeho, and Rātana.

The FN96 report *'relies on recreational fishing catch data sourced from Fisheries New Zealand's rec_data database, which includes occasional boat ramp surveys, fisher logbooks, ad hoc samples, and one-off surveys. While these datasets provide a general overview of species caught and fishing methods used, they represent only a* ***small fraction of actual recreational activity*** *and are recorded at a coarse spatial resolution that* ***does not reflect the specific fishing grounds used by local communities****.'*

Crucially, the report does not incorporate local club-sourced data, which could have significantly improved the accuracy and relevance of the findings. For example, the Pātea & Districts Boating Club offered voluntary competition data in 2013, and both the Wanganui-Manawatu Sea Fishing Club and other clubs regularly collect catch records through competitions and member trip logs.

Such collaboration would ensure that future assessments are representative, locally grounded, and responsive to the values and practices of the people most affected by proposed seabed mining activities.

[35] MacDiarmid, A., MacGibbon, D., & Anderson, O. (2024*). South Taranaki Bight fishing: 1 October 2007 – 30 September 2023 (NIWA Client Report No. 2024053WN)*. National Institute of Water & Atmospheric Research Ltd (NIWA). https://www.fasttrack.govt.nz/__data/assets/pdf_file/0019/11944/FN96-South-Taranaki-Bight-Fishing.pdf FN96

It would also strengthen the credibility of environmental reporting and support more informed decision-making.

However, the FN96 data reinforces the importance of the Whanganui to Pātea coastal zones as high-use recreational areas with ecologically diverse and culturally significant fishing grounds. The consistency of species targeted and the reliance on clear water and stable reef conditions highlight the vulnerability of these activities to sediment disturbance, turbidity, and habitat degradation.

The report highlights:

- **Whanganui (WNG)** accounted for over 50% of all reported recreational catch in the region, confirming its role as the primary hub for recreational fishing activity in the South Taranaki Bight.

  The dataset does not differentiate between where fish are caught and where vessels are launched, meaning that a substantial portion of the reported catch attributed to Whanganui is likely taken from fishing grounds off Waverley and Pātea. Based on the extensive local knowledge of our members and the well-established patterns of use, we are confident this is the case. Whanganui-based fishers routinely travel north to access these productive fishing areas, and the data likely reflects catch from a much broader footprint than the reporting boundaries suggest.

- Recreational fishing effort increased markedly from Otakeho to Whanganui, reflecting not only population density and access infrastructure, but also likley growing popularity of recreational fishing in the region. While the report presents a conservative estimate based on limited data sources, local clubs observe that more people are fishing now than ever before, including families, younger fishers, and seasonal visitors. If recreational data were collected more comprehensively—such as through regular ramp surveys, club and coastguard records, and trip logs it would likely show a clear upward trend in participation and effort, particularly around Whanganui, Pātea, and Waverley.

- Baitfishing was the dominant method across all areas, followed by longlining, jigging, and trolling.

- SCUBA diving was consistently reported, particularly in Pātea and Waverley, supporting the importance of reef-based kaimoana gathering.

- Species Composition Stability: The dominant species targeted by recreational fishers have remained consistent over the 16-year period.

- Top recreational species caught:

  - **Blue cod (*Parapercis colias*)** – 45.2% of total catch
  - **Snapper (*Pagrus auratus*)** – 17.7%
  - **Red gurnard (*Chelidonichthys kumu*)** – 10.9%
  - **Kahawai (*Arripis trutta, A. xylabion*)** – 7.3%

  We suspect the species are generally reflective of a recreational catch, however Snapper catch has likely increased in recent years, and Blue Cod is estimated to have declined over the last decade.

The FN96 report provides a general overview of recreational fishing in the South Taranaki Bight but relies on limited, coarse data that does not reflect actual fishing grounds or local activity. It excludes club-sourced records from groups like the Pātea & Districts Boating Club and Wanganui-Manawatu Sea Fishing Club, which offer more accurate and locally grounded insights. Catch data is attributed to launch sites rather than fishing locations, misrepresenting spatial patterns. Without incorporating local knowledge, the report risks underestimating recreational use and misguiding environmental decision-making.

We recommend the panel exercise caution in relying on the FN96 report, as it excludes vital local club data and misrepresents actual fishing grounds. Incorporating local knowledge is essential to ensure assessments reflect real recreational use and the communities most affected by seabed mining.

4.9.3 BCO 8 2025 Decision and Implications of the Sea Bed Mining for Blue Cod.

The recent decision by the Minister for Oceans and Fisheries to reduce recreational catch limits for blue cod (BCO 8) reflects a serious decline in stock abundance across the Taranaki–Whanganui region. Recreational catch has dropped from 50.82 tonnes in 2011 to just 8.33 tonnes in 2022, despite an allowance of 188 tonnes[36]. This steep decline has prompted Fisheries New Zealand to propose daily limits as low as 2 fish per person[37].

Our clubs support these reductions as necessary for species recovery and acknowledge the multiple pressures currently affecting blue cod, including warmer sea temperatures, increased snapper populations, and intensified fishing activity. However, we are deeply concerned that the proposed seabed mining activity will compound these pressures, particularly in offshore habitats that still support viable stocks.

At the recent 2025 Patea & Districts Boasting Club AGM when discussing the 2025 BCO8 decision members talked of observing significant declines in blue cod abundance off the Whanganui coast, however towards Patea the cod fishery was said to be in better health. Members acknowledged blue cod was harder to catch now than a decade ago with many saying they travelled further offshore to target cod, they hope the catch reductions will help the recover the blue cod biomass.

This testimony reflects a growing concern among the fishing community that nearshore stocks are under pressure, and that offshore areas now represent some of the last remaining healthy blue cod habitats accessible to recreational fishers. These areas are not only ecologically important but also culturally and socially significant to local communities who rely on them for food gathering, recreation, and connection to place.

Members have identified that the last strong blue cod fishing grounds are located in a valley on the northeast boundary of the proposed seabed mining zone, with members suggesting they are feeding

[36] **Fisheries New Zealand.** (2025). *Review of sustainability measures for blue cod (BCO 8) for 2025/26 fishing year* (Fisheries New Zealand Discussion Paper No: 2025/10). Ministry for Primary Industries. https://www.mpi.govt.nz/dmsdocument/70074/direct/
[37] Ministry for Primary Industries. (2025, September 29). Minister for Oceans and Fisheries decision letter: Review of sustainability measures for fisheries – October 2025 round [Decision letter]. https://www.mpi.govt.nz/dmsdocument/70597-Minister-for-Oceans-and-Fisheries-decision-letter-Review-of-sustainability-measures-for-fisheries-October-2025-round

from the benthic worm beds. These habitats are highly sensitive to sedimentation and physical disturbance. Seabed mining risks undermining recovery efforts by degrading spawning grounds, increasing turbidity, and displacing fish from preferred habitats.

Recreational fishers already report declining catch success inshore and are increasingly reliant on offshore areas such as Outer Reefs, Grahams Bank and the Rolling Grounds both of which are adjacent to or within the proposed mining footprint.

We maintain that the BCO 8 decision is a clear signal of ecological stress in the region. Any further disruption to blue cod habitats, particularly those still supporting healthy populations, would be counterproductive to national recovery strategies and detrimental to recreational fishing values.

Therefore, where the proposal directly conflicts with the BCO 8 decision and risks further decline of blue cod, we strongly oppose the application.

We require recognition of:

- ***The BCO 8 (29 September 2025) decision as evidence of localised depletion and habitat vulnerability.***
- ***That remaining productive blue cod habitats near the proposed mining site be protected from sedimentation and physical disturbance.***
- ***That the cumulative effects of seabed mining on blue cod recovery be explicitly assessed and mitigated.***

4.10 Sedimentation & water clarity effects

The proposed seabed mining activity presents significant risks to rocky reef habitats and the broader ecological integrity of the STB. These reef systems many of which remain undocumented in scientific literature are crucial to sustaining local fisheries and supporting recreational activities such as diving, boating, and fishing.

Local fishers and divers have long recognised the ecological importance of these reefs. Although not commercially fished, they play a vital role in maintaining fish populations and biodiversity. Recent research (Smith & Anderson, 2023) has confirmed that the extent of rocky reef habitat in the STB is greater than previously understood, with further areas likely yet to be identified.

Recreational users are particularly concerned about sediment plumes affecting the Pātea inshore reefs, including “the traps,” and are most alarmed about the low-lying reef structures located down-current especially the deeper outer reefs. NIWA’s2015 modelling[38] indicates that tailings discharged in waters 35–70 metres deep could drift up to 20 km from the mining site. Below 30- 40 m, wave action is insufficient to resuspend settled particles, meaning fine silt reaching these reefs may persist and accumulate. **Even a thin layer of sediment can smother filter-feeding organisms and degrade the reef ecosystem.**

[38] Hadfield, M.G. and Macdonald, H.S. (2015). Sediment Plume Modelling, 117 p. https://www.epa.govt.nz/assets/FileAPI/proposal/EEZ000011/Applicants-proposaldocuments/8e6049938f/NIWA-Sediment-Plume-Modelling-Report-Full-version.p

The Applicant's sediment plume modelling shows a reduction in water clarity extending from the site to the south east toward Graham Bank. The Applicant calls the reduction *minor*, but our recreational users disagree. Even slight turbidity increases at depth can significantly affect reef habitats that depend on clear water. Divers report that visibility is essential not only for safety but also for enjoyment, and any decline in clarity would reduce the viability of recreational diving in these areas.

The application lacks sufficient detail regarding sediment deposition thickness and long-term accumulation, making it difficult to assess the risk of habitat smothering and food web disruption.

It is also unclear whether the predictive modelling has adequately considered sensitive or undiscovered reef environments. There has been no specific assessment of sediment plume effects in the specific reef areas most used by recreational visitors.

We note the AES ecological assessment, which stated that "at the local scale close to the site, reductions in benthic primary production would exceed natural variability and there could be localised flow-on effects." This highlights the importance of determining localised impacts of the sediment plume.

Therefore, we require:

- ***Recognition that even minor reductions in water clarity and light penetration at depth can have significant ecological consequences for reef ecosystems and directly impact recreational values.***
- ***Require a comprehensive assessment of sediment plume effects on reef habitats and fishing grounds located down-current of the mining site, particularly outer reef systems and string hold blue cod areas. This assessment should include:***
    - ***Deposition thickness and long-term accumulation;***
    - ***Ecological sensitivity of affected habitats;***
    - ***The potential presence of undiscovered or unmapped reef systems, including those identified through local observational knowledge.***
- ***Expand the sediment monitoring programme to include visibility metrics that are directly relevant to recreational divers and fishers, acknowledging that water clarity is essential for both safety and enjoyment.***
- ***Integrate local observational data sediment plume modelling to improve its accuracy, relevance, and responsiveness to real-world conditions.***
- ***Apply section 59(2)(e) of the EEZ Act to ensure the protection of rare, vulnerable, and potentially undocumented reef ecosystems that may be at risk from sedimentation and reduced water clarity.***

4.11 Exclusion Zones

While the Applicant does not explicitly propose a set recreational fishing exclusion zone, the nature of the operations including vessel movements, sediment discharge, and safety protocols will likely result in a **functional exclusion** of recreational fishers from the mining area and potentially surrounding waters.

Section 5.13.5.2 of the application indicates that the effects of the project on recreation include '*Very Minor effects due to displacement from the exclusion zone around the active mining activity'*

Section 5.13.6.3 of the application indicates that as '*part of the project, TTR intends to apply to MNZ to establish an exclusion zone (buffer zone) around the IMV and other project related vessels when anchored within the extraction lanes to safe guard other ocean users, members of the public and project vessels from harm. The exclusion zone applied for will extend in a circle with a radius of approximately 1 NM from the IMV to extend beyond the extremities of the anchor pattern and cover the area where support vessels are manoeuvring and/or are constrained in their ability to manoeuvre. It is considered that this measure will further ensure that any effects on marine traffic are avoided.*

Any exclusion zone around the project related vessels is unlikely to affect recreational opportunities in the project area. Marico (2015) indicates that the project area is very lightly used by any vessels and, because of the nature of the seabed material, is unlikely to support much marine life which would be of interest to recreational fishers or divers.'

For our recreational users, reduced access to fishing grounds combined with potential ecological stress from sediment plumes, habitat disturbance, and noise poses a direct threat to recreational fishing. These pressures are not isolated; they interact and accumulate, potentially degrading fish abundance, behaviour, and availability. The absence of a cumulative effects assessment overlooks how these combined impacts could undermine long-standing fishing traditions, community wellbeing, and local knowledge systems.

We also note that **Section 4.8.3** of this report discusses the potential for exclusion based on **noise-related human health risks**, which may further restrict access for recreational users. This reinforces the need for a full and transparent assessment of all exclusion-related impacts both physical and perceptual on recreational users.

Therefore, we require the Applicant to:

- ***Clearly define any proposed exclusion zones, including their size, location, and duration over the proposed term of activity.***
- ***Identify which fishing grounds and reef areas will be affected.***
- ***Develop mitigation measures to ensure recreational users are not displaced from valued and productive areas.***

4.12 Recovery and Cumulative Impacts

Running a mining operation 24 hours a day for 7 days a week for multiple decades puts constant pressure on the marine environment. The application suggests that once mining stops in a block, the stress ends but it doesn't explain how long recovery might take, or whether full recovery is even possible with any confidence.

Local fishers know that even short-term disturbances can affect fish behaviour and numbers. A decades-long operation, with no breaks, risks doing lasting damage to the ecosystems we rely on for recreational activity.

Unlike storms, which are short and allow nature to bounce back, seabed mining would be a daily disturbance creating sediment plumes, noise, light, and vibration, all at once, and all the time. This kind of constant stress can overwhelm marine life and stop habitats from recovering properly.

Certain species may be able to handle short bursts of sediment or noise, but this does not mean they can cope with it every day for decades. Without a proper cumulative impact assessment, the long-term risks to fish populations, reefs, and coastal ecosystems remain unaddressed.

Ongoing or concurrent pressures described in this proposal generate uncertainty at the local level regarding the adequacy of adaptive capacity to avoid long-term or permanent change.

Therefore, we require the following:

- ***A comprehensive cumulative effects assessment that encompasses all ecological values, both in the immediate vicinity and in broader surrounding areas.***
- ***Provision of clear modelling of ecosystem recovery timelines, including identification of risks to long-term ecological health.***

4.12.1 Historical Damage from Russian Trawlers in the South Taranaki Bight

The operation of Russian-owned trawlers in the STB and wider west coast of New Zealand, particularly during the 1960's – late 80's and early 2000s, has left a legacy of ecological concern and community frustration. These vessels were contracted by New Zealand companies to target jack mackerel and other commercial fished species. However, due to the deep deployment of their nets (40–60 metres) and small mesh sizes (approximately 75mm), they indiscriminately captured a wide range of non-target species including snapper, john dory, terakihi, barracuda, squid, gurnard, and school sharks.

Of particular relevance to the current seabed mining proposal is the local reported physical damage caused by these trawlers to sensitive benthic habitats. Local fishermen recall that Russian vessels trawled the seafloor using heavy gear, including solid balls, which crushed extensive bryozoan colonies and damaged outer parts of the Outer Reefs and the Rolling Grounds, an area overlapping with the proposed mining zone; it is believed locally that some of these areas have never recovered from the trawling impacts[39].

[39] Whanganui Based, Retired Commercial Fisherman. *Personal Communications*. (September 2025).

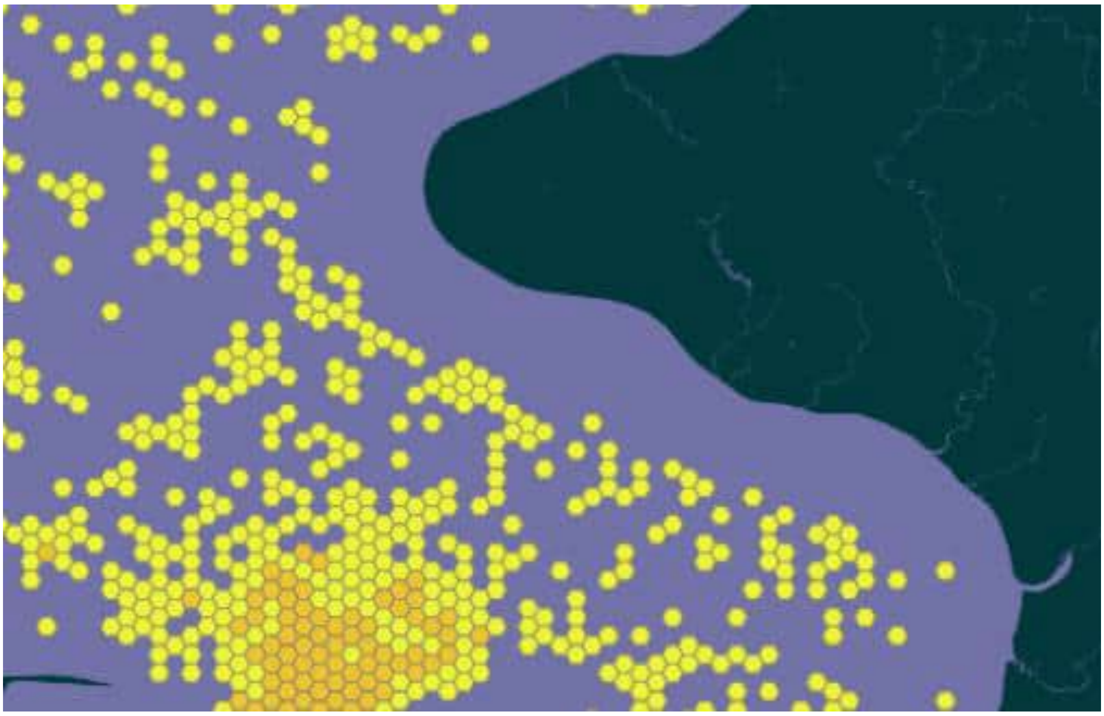

Figure 4-5: Russian Fishery Vessel Trawl Locations in the South Taranaki Bight from 1964 – 1987 (MPI, 2014)[40].

This historical precedent raises serious concerns about the resilience of the STB benthic environment and the potential for long-term or irreversible damage from destructive seabed mining.

Our Recreational Users require:

- ***Documented and anecdotal evidence of benthic habitat destruction from bottom trawling in the South Taranaki Bight, particularly by Russian vessels from the 1960s to early 2000s be considered in the decision-making process.***
- ***Recognition that some areas, such as the Rolling Grounds and outer area of the Outer Reefs, may not have recovered from past trawling impacts.***
- ***Assessment of the cumulative environmental effects of historical trawling alongside the proposed seabed mining activities.***
- ***Account for the potential long-term or irreversible damage to sensitive benthic ecosystems.***

[40] Ministry for Primary Industries (2014). *Soviet Fishery Data (New Zealand Waters) 1964-1987*. Southwestern Pacific OBIS, National Institute of Water and Atmospheric Research (NIWA), Wellington, New Zealand, 111883 records, Online http://nzobisipt.niwa.co.nz/resource.do?r=mbis_soviettrawl released on November 5, 2014. https://doi.org/10.15468/yqk5jg accessed via GBIF.org on 2025-09-29.

4.13 Environmental Monitoring

The environmental monitoring plan presented in the Taranaki VTM fast-track application acknowledges the inherent difficulty in attributing specific ecological changes directly to seabed mining activities. This challenge stems from the complex and dynamic nature of marine ecosystems, where multiple natural and anthropogenic factors interact over time. While this recognition is scientifically valid, it raises significant concerns for our recreational users (fishers, divers, boaters, and coastal observers) who rely on long-term, place-based knowledge and direct observation to understand changes in the marine environment.

Our members have consistently observed and interpreted changes in fish populations, water clarity, and habitat quality through generational experience. The reliance on thresholds and adaptive management frameworks, while useful in theory, may lack the immediacy and transparency required to safeguard recreational interests. Ambiguity in causal links between mining activity and ecological effects risks undermining accountability. If environmental degradation occurs without being formally attributed to mining operations, trust in the monitoring framework may erode, leading to opposition and disengagement from affected recreational user communities.

Key concerns include:

- **Exclusion of recreational users** from formal monitoring and advisory structures.
  - *Consent Condition 60.d.* refers to the integration of community knowledge and mātauranga Māori in monitoring reviews. However, *Point F* excludes recreational users from both the Technical Review Group. This exclusion contradicts the stated intent of incorporating community knowledge and raises serious questions about transparency and inclusivity.
  - *Conditions 81 and 82* refer to community relationships but limit engagement to an advisory capacity, effectively restricting the ability of recreational fishers and divers to contribute meaningful insights or raise concerns.
  - Additionally, Section 5.13.5.3 of the application offers the requirement of a complaint register to record concerns for users in the South Taranaki Bight but there appears no process for how complaints might be considered and dealt with.
- **Disconnect between monitoring data and lived experience.**
  Recreational users may observe changes in fish behaviour, sediment plumes, or reef health that are not reflected in formal monitoring outputs. Without mechanisms to validate or respond to these observations, the monitoring programme risks being perceived as disconnected from on-the-ground realities. As an example of local knowledge being used for monitoring and management we refer to the September 2025 BC08 reduction in Blue Cod catch limits being changed through compelling reporting of the local fishery knowledge where there was uncertainty in stock status to inform management decisions[41].

[41] Ministry for Primary Industries. (2025, September 29). Minister for Oceans and Fisheries decision letter: Review of sustainability measures for fisheries – October 2025 round [Decision letter]. https://www.mpi.govt.nz/dmsdocument/70597-Minister-for-Oceans-and-Fisheries-decision-letter-Review-of-sustainability-measures-for-fisheries-October-2025-round

Our Recreational Users strongly advocate for a monitoring framework that is inclusive, transparent, and responsive to local knowledge. Without meaningful participation from recreational users, the environmental monitoring programme risks failing to detect or respond to the very changes that most directly affect our communities.

Therefore, we require:

- ***Inclusion of recreational users in the Technical Review Group to ensure that community knowledge is genuinely considered in environmental assessments and decision-making.***
- ***Consideration of recreational community led data collection from events such as fishing competitions or the encouragement of voluntary logging fishing trip success and observations and sightings can be useful to monitor for example, trends in effort to catch over time.***
- ***Reef and fish population monitoring be expanded to include high-use recreational sites such as the Outer Reefs and Blue Cod Grounds southeast of the proposed mining area. Monitoring in these locations is essential to accurately detect changes in sedimentation, habitat condition, and fish abundance in areas most valued by local fishers and divers.***

4.14 Safety and response to incident

Coastguard Whanganui has expressed concern regarding the lack of consultation and planning around maritime emergency response in relation to the proposed seabed mining activity.

Please refer to **Coastguard Whanganui Comment** to the Panel presented in **Appendix A**.

4.15 Oil Spill Response Concerns

From a recreational perspective, the risk of oil spills associated with seabed mining operations in the STB is a major concern. Modelling in the application indicates that over 90% of potential oil spill events would result in shoreline impacts, threatening beaches and coastal waters heavily used by fishers, divers, and other recreational users. Typical weather conditions in the region often characterised by strong winds, rough seas, and rapidly changing forecasts can further complicate spill response efforts, potentially delaying containment and increasing the risk of widespread environmental damage.

Given these risks, it is critical that the region and New Zealand is equipped to respond rapidly and effectively to a major spill, particularly under the STB's often severe and unpredictable weather conditions. The coastal marine environment supports a wide range of recreational activities that are highly valued by locals. These values must be protected through robust planning, early preparedness, and genuine engagement with those who use and understand these waters.

Therefore, we require:

- ***Confirmation that New Zealand has sufficient national and regional capacity including equipment, personnel, and coordination systems to respond effectively to a major spill under adverse weather conditions.***

- ***Prioritise protection of recreational values and coastal access in all oil spill response planning and decision making.***
- ***Ensure meaningful engagement with local response teams, including recreational boating and fishing clubs, to incorporate local knowledge and capacity into response planning.***
- ***Require comprehensive oil spill scenario planning that reflects the specific environmental and weather conditions of the South Taranaki Bight.***
- ***Mandate early approval of detailed oil spill contingency plans prior to any seabed mining activity commencing.***

4.16 Precedent and Environmental Standards

The decision on the Taranaki VTM seabed mining application will set a critical precedent for future seabed mining activities in New Zealand. Of particular concern to our recreational users is the potential lowering of environmental standards and the expansion of mining areas beyond the current proposal in the STB.

Granting consent under uncertain ecological conditions, incomplete baseline data, and speculative recovery modelling risks establishing a permissive framework for future applications. This could lead to cumulative degradation of marine ecosystems, reduced protections for sensitive habitats, and diminished consideration of recreational values.

We are concerned that approval of this application may signal to operators/applicants that large-scale seabed disturbance is acceptable, even in areas of high biodiversity and recreational use.

Therefore, we require:

- ***Consideration of the precedent a supportive decision may set for environmental standards and future seabed mining proposals;***
- ***Require that any consent decision uphold the highest level of environmental protection and precaution; and***
- ***Ensure that expansion of mining areas is not permitted without full reassessment and public consultation.***

Overall, we strongly oppose the proposed Taranaki VTM seabed mining application.

Appendix A-Supplementary Submissions

Coastguard Wanganui

29 September 2025

Taranaki VTM Fast-Track Application Team
Environmental Protection Authority
Private Bag 63002
Waterloo Quay
Wellington 6140

Dear Panel,

Whanganui Volunteer Coastguard Incorporated was formed in 1978 when the Marine Search and Rescue Group (formed in 1964) reformed and became the Wanganui Volunteer Coastguard. This followed a number of significant and serious incidents off the Whanganui Coast which identified the need for a managed maritime response to marine search and rescue. Over the years this Unit has grown from a small number of dedicated and enthusiastic volunteers with a very small dedicated vessel to be a very strong and viable Unit, with a large purpose-built rescue facility, servicing and supporting the Whanganui, Taranaki, Rangitikei and Manawatu coastal areas.

On 1 November 2025 this Unit will join with the local communities in welcoming and dedicating the newest Coastguard New Zealand Rescue Vessel (Whanganui Rescue) into Search and Rescue service for this area.

This note does not represent any commentary on the value or merit of the application before you. Other than, that is, to promote to you (and the applicant) the below observations and questions. These come out of a genuine concern for our Coastguard volunteers, their capabilities and capacity for any potential increase to calls for service. Of course, and very much a primary consideration, there is a concern for those that might be involved in aspects of the proposal before you.

Given the very limited time provided in this matter I fear my consideration is somewhat underdone and therefore handicapped in regard my being fully informed and therefore providing you with a fully considered submission in this matter. For that, please forgive me.

So, turning to this matter specifically:

1) Coastguard Whanganui will likely provide primary maritime search and rescue assets to a maritime emergency linked to this application (should an emergency occur).
    a. We have not been consulted or informed as to any assessed potential for having and maintaining a Search and Rescue resource, asset or capacity or capability related to this Resource Consent request.
    b. We are not aware of any assessment of risk, types of risk, or the potential required of this Unit to provision contingencies and assets related to any potential call for service. This raises questions (in my assessment) related to:
        i. Is there any consideration as to how the proposal might impact on this volunteer Unit and what contingencies and resourcing is provided to manage a potential for increased risk and calls for service?
        ii. Are the Rescue assets located locally sufficient and appropriately supported?
        iii. Are there any contingencies and processes proposed and developed that might involve this Unit?

        iv. Should we be involved in that process pre-event?
        v. Should we be involved in that development in the future?
    c. Is there any anticipation for extra resources, education and training required of our Coastguard volunteers?

2) Other assets involved in Maritime Search and Rescue may include NZ Police, Aviation resources, St John Ambulance and Fire and Emergency New Zealand.
    a. The Coordinated Incident Management System provides a framework of principles and characteristics, related to roles, structures and functions should a maritime emergency occur. It requires from all of us to have an overview of potential risk, consideration of that risk and some coordinated contingency planning related to that same risk.
        i. Is there a resource contingency to support the development of inter-agency pre-event planning and ongoing specific training?
        ii. What information, specialist advisors and other resources are to be provided to those Search and Rescue agencies to support them in the pre-planning phase or in an operational phase if required?

3) Where is the contingency and resource to support the volunteer base that may be called upon to ensure lives are saved at sea?

With respect

Steve Turfrey

President - Whanganui Volunteer Coastguard Incorporated
493 Kaikokopu Road
Brunswick
RD 1
Whanganui 4571
Ph:027 241 4983

WANGANUI SEA FISHING CLUB MANAWATU

PATEA & DISTRICTS BOATING CLUB INC.

Progress Castlecliff Incorporated

Incorporated 1994 638475
Reg'd Charity CC4532
NZBN 9429042813613
10 Rangiora Street
Castlecliff 4501
progress@castlecliff.nz

PROGRESS
CASTLECLIFF

Monday 29th September 2025

FTAA-2504-1048 - Progress Castlecliff comment on Taranaki VTM Project

1. Contact Details	
Please ensure that you have authority to comment on the application on behalf of those named on this form.	
Organisation name (if relevant)	Progress Castlecliff Inc
First name	James
Last name	Barron (chair)
Postal address	10 Rangiora Street, Castlecliff, Whanganui
Phone number	0211231750
Email *(a valid email address enables us to communicate efficiently with you)*	chair@castlecliff.nz

2. We will email you draft conditions of consent for your comment			
☒	I can receive emails and my email address is correct	☐	I cannot receive emails and my postal address is correct

3. Please select the effects (positive or negative) that your comments address:			
☐	Economic Effects	☒	Sedimentation and Optical Water Quality Effects
☒	Effects on Coastal Processes	☒	Benthic Ecology and Primary Productivity Effects
☐	Fished Species	☐	Seabirds
☐	Marine Mammals	☐	Noise Effects
☐	Human Health Effects of the Marine Discharge Activities	☐	Visual, Seascape and Natural Character Effects
☐	Air Quality Effects	☐	Effects on Existing Interests
☐	Other Considerations (please specify):		

Incorporated 1994 638475
Reg'd Charity CC4532
NZBN 9429042813613
10 Rangiora Street
Castlecliff 4501
progress@castlecliff.nz

PROGRESS CASTLECLIFF

Progress Castlecliff is a broad based community group and registered charity with 30 years of experience delivering community aspirations for Te Kaihau-o-Kupe / Castlecliff.

Our focus is on Castlecliff's tangata and whenua – the people and built and natural environments with work such as...

- people – creating and running Castlecliff Library and community hub, retaining and growing The Duncan Pavilion as Whanganui's most used venue, and running sport, recreations and community building events and advocacy.
- urban opportunity - rejuvenating the seaside urban heart of Castlecliff (Rangiora Street from abandoned shops to finalist for NZ's best street
- Castlecliff Coast Care - focussing on our unique coastal environment
- recreational renewal (building skate park and basketball facilities, obtaining Kanoa funding for North Mole amenity work & wider infrastructure advocacy.

Tupua te Kawa is the natural law and value system of Te Awa Tupua. Tupua te Kawa is in Progress Castlecliff's written constitution. It's 4 principles guide our comment here...

Ko te Awa te matapuna o te ora.
The River is the source of spiritual and physical sustenance.

E rere kau mai te Awa nui, mai te Kahui Maunga ki Tangaroa
The great River flows from the mountains to the sea.
(Te Awa Tupua is an indivisible and living whole from the mountains to the sea.)

Ko au te Awa, ko te Awa ko au
I am the River and the River is me.

Nga manga iti, nga manga nui e honohono kau ana, ka tupu hei Awa, hei Awa Tupua
The small and large streams that flow into one another form one River.

These principles humble us and remind us our community is intrinsically and indivisibly connected with the awa but also the seas and sands that birthed and define Te Kaihau-o-Kupe Castlecliff. While the moana is not where Progress Castlecliff works it sustains our people both spiritually and physically and is the essence of our coastal community.

Progress Castlecliff views with grave concern the extractive seabed mining proposals being put forward and **Progress Castlecliff supports unreservedly the concerns advanced by Wanganui- Manawatu Sea Fishing Club and allied organisations** drawing on their deep and long experience with Whanganui's seas and fisheries.

James

James Barron
Chair Progress Castlecliff.
This submission is unanimously supported by our full board.

Waitotara Patea Fishing Club

Your Comment on the Taranaki VTM Project

Please include all the contact details listed below with your comments.

1. Contact Details	
Please ensure that you have authority to comment on the application on behalf of those named on this form.	
Organisation name (if relevant)	Waitotara Patea Fishing Club
First name	Bill
Last name	Oliver
Postal address	2 Pingao Place, Waiinu
Phone number	021 269 7263
Email (a valid email address enables us to communicate efficiently with you)	waitotarafishclub@gmail.com

2. We will email you draft conditions of consent for your comment			
	I can receive emails and my email address is correct		I cannot receive emails and my postal address is correct

3. Please select the effects (positive or negative) that your comments address:			
	Economic Effects		Sedimentation and Optical Water Quality Effects
	Effects on Coastal Processes		Benthic Ecology and Primary Productivity Effects
	Fished Species		Seabirds
	Marine Mammals		Noise Effects
	Human Health Effects of the Marine Discharge Activities		Visual, Seascape and Natural Character Effects
	Air Quality Effects		Effects on Existing Interests

	Other Considerations (please specify):

Please provide your comments below, You may include additional pages if needed. If you are emailing this form and attaching any supporting documents, please list the names of those files below to help us ensure all materials are received.

Waitotara Patea Fishing Club was established in 1978 by a local group of land-based fishermen. We are a non for-profit family friendly organisation that continues to grow steadily drawing our membership from the South Taranaki/Whanganui regions. As a club we do not only hold regular local competitions off our local Waiinu beach but also compete as a team with other regional clubs from the Manawatu all around the coast to Waitara.

Our concerns are not solely aimed at the impact that this proposal will have on our recreational coastal activities, but also on the environmental impact it would have on the already fragile sea life, that is at this time being threatened by commercial fishing operations, on this as yet relatively unspoilt coastline.

This coast forms part of a large breeding grounds stretching along to Kapiti for fish such as Snapper, Rig and Kahawai. Our members who have boats have already seen the impact of commercial operations in this area especially on species such as Blue Cod.

We feel as a club that any further unnatural disturbances to the environment, merely for profit, would have a disastrous impact on marine life that may be lost forever and as such spoil the opportunity for future generations to enjoy the activities we are fortunate to have now.

B Oliver.

Bill Oliver, Club Captain.

On behalf of the Waitotara Patea Fishing Club committee and members.

1978

Appendix B- Local Knowledge References

Ministry for Primary Industries
Manatū Ahu Matua

Biogenic habitats on New Zealand's continental shelf. Part I: Local Ecological Knowledge

New Zealand Aquatic Environment and Biodiversity Report No. 174

E.G. Jones
M.A. Morrison
N. Davey
B.W. Hartill
C. Sutton

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New Zealand Government

Growing and Protecting New Zealand

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Jones, E.G.; Morrison, M.A.; Davey, N.; Hartill, B.W.; Sutton, C. (2016). Biogenic habitats on New Zealand's continental shelf. Part I: Local Ecological Knowledge.

***New Zealand Aquatic Environment and Biodiversity Report No. 174.* 95 p.**

Fishers develop detailed knowledge of their fishing grounds, often built up over many years. Known as Local Ecological Knowledge (LEK), this information about the environment and the fish they catch is often different but highly complementary to scientific data about localized marine eco-systems, and in some cases, exceeds it. Fifty trawl fishers around New Zealand were interviewed to record their knowledge of biogenic habitat, with charts being marked by the fishers themselves before being digitised and collated to provide a national map of fisher-drawn areas of possible biogenic habitat. A total of 496 areas were digitized, along with a further 92 observations that were not marked on charts. Many of these sites were memorable for the distinctive habitats/species that were caught as bycatch, sometimes in sufficient amounts to damage gear or make cleaning the net difficult. Of the areas marked on charts, 66% were classed as potential biogenic habitat (327) with a further 15% classed as "Foul" or "Reef". The most commonly mentioned biogenic habitats were corals (likely to include bryozoans), sponges, kelp, horse mussels and bryozoans. Many of the areas marked on charts were overlapping or spatially clustered in certain areas: e.g. Cape Reinga/North Cape/Three Kings; East Cape, offshore North and South Taranaki Bight; Stewart Island / Foveaux Strait / Fiordland and the Oamaru to Dunedin continental shelf. In some areas, temporal and spatial reduction in the habitats/species were noted, usually attributed to fishing activity, e.g. the "*wire-weed*" fields (chaetopterid tubeworms) off the North Canterbury; the "*tarakihi weed*" (also chaetopterid tubeworms) / sponge assemblage of the "*Hay Paddock*" off Oamaru, large beds of sea-pens off the west coast South Island, and an unidentified organism called "*spongeweed*" in the South Taranaki Bight.

The inherent uncertainty and bias in these data are acknowledged. The non-random approach of selecting interviewees potentially created a bias in the expert pool interviewed, and despite using multiple starting points in our expert selection, the knowledge-base for some regions was possibly under-represented. However, with the aim being to collect very specialized and location-specific knowledge, potentially only possessed by a few individuals, the purposive and "snowball" sampling methods were believed to be the best way to overcome the difficulties of engaging an expert group (commercial fishers), where a significant number were unsurprisingly wary, or unwilling to divulge the information being sought. Steps to increase the confidence in certainty of the observations collected included defining "Key Sites" as those being repeatedly and consistently described by multiple fishers, and / or consistent with scientific information if available. When all fisher-drawn areas were overlaid together, a total of 65 sites were identified around the country where multiple fishers (up to 9) described the same or similar habitats at overlapping locations, or in close proximity. For nearly half of these sites (30), scientific information was identified (varying from large-scale surveys to isolated stations or samples) that provided some level of corroborative evidence. From the 65 sites, 47 were suggested as "Key Sites" for consideration for future empirical sampling. These included areas where scientific surveys have already characterized biogenic habitats, (e.g. Separation Point, Otago Shelf and Foveaux Strait bryozoan assemblages, and sponge gardens of North Cape), sites where more limited scientific data corroborates fisher information, but the spatial extent and / or the biological communities remain unquantified, (e.g. Canterbury tube worm fields, Ranfurly Bank) and sites where no scientific information was identified (e.g. west coast North Island canyons, "*Coral Patch*", Hauraki Gulf).

With the aforementioned caveats in mind, the maps and site descriptions presented here represent a valuable, but in many places, unverified indication of where biogenic habitats might exist on the New Zealand continental shelf, and are intended only to inform the design of future field sampling.

INTRODUCTION

1.1 Overview

A central theme to emerge from the move towards Ecosystem Based Fishery Management (EBFM) is the role of habitat in supporting sustainable fishery production (Armstrong & Falk-Petersen 2008, Caddy 2014). Different habitat types vary in their complexity, represented by the heterogeneity in physical structure, which may be geological, or of biological form. Evidence from a wide range of studies on different marine system components indicates that as habitat complexity increases (at multiple scales), so does a given unit of area's value for biodiversity (species richness, abundance, age / length composition, provision of settlement surfaces, juvenile survivorship / growth, bentho-pelagic coupling, and base trophic production) (e.g. Heck & Wetstone 1977, Connell 1978, Luckhurst & Luckhurst 1978, Dean & Connell 1987, Connell & Jones 1991, Tupper & Boutilier 1995, Klitgaard 1995, Rooker at al. 1998, Charton & Ruzafa 1998, Lindholm et al. 1999, Cummings et al. 2001, Norkko et al. 2001, Buhl-Mortensen et al. 2010, Beazley et al. 2013, Caddy & Defeo 2003, Rogers et al. 2014). Biogenic habitats are defined as those formed by living species that create emergent three-dimensional structure, have been shown to be especially important to many fish species (e.g. Luckhurst & Luckhurst, 1978, Bell & Galzin 1984, Ebeling & Laur 1985, Roberts & Ormond 1987, Carr 1989, Connell & Jones 1991, Rooker et al. 1998, Heifetz 2002, Gratwike & Speight 2005, Abookire et al. 2007, Pérez-Matus & Shima 2010, Rabaut et al. 2010, Humphries et al. 2011, Baillon et al. 2012, Laman et al. 2015). In the context of marine ecosystem management, more diverse assemblages are likely to be more productive, sustainable, and / or more resilient (Millennium Ecosystem Assessment 2005, Worm et al. 2006, Sala & Knowlton 2006, Palumbi et al. 2008). Unfortunately much of this understanding has come from studies assessing the impact of habitat loss on species diversity. Structurally complex habitats are becoming rarer in many parts of the world (Airoldi et al. 2008). For example, less than 15% of the coastline in Europe is considered to remain in good condition, with near elimination of many productive and diverse coastal habitats (Airoldi & Beck 2007). Similarly, a comparison of 12 estuarine and coastal ecosystems in North America, Europe, and Australia found human impacts to have depleted 90% of formerly important species (including many habitat-builders), destroyed 65% of seagrass and wetland habitat, degraded water quality, and accelerated species invasions (Lotze et al. 2006).

In New Zealand, biogenic habitats include coral and bryozoan reefs, sponge-dominated habitats, horse mussel, oyster, scallop and dog cockle beds, kelp forests, rhodoliths beds, sea grass meadows, and tube worm fields (for a review see Morrison et al. 2014a). Key studies characterizing some of these habitats on the continental shelf (about 5–250 m water depth) include the epifaunal biodiversity hotspot of Spirits Bay (Cryer et al. 2000, Tuck & Hewitt 2011); the "sponge garden" off Goat Island, Cape Rodney to Cape Okakari Marine Reserve (Battershill 1987); bryozoans off Separation Point (Tasman/Golden Bay) (Grange et al. 2003), the South Taranaki Bight (Gillespie & Nelson 1996), Otago Peninsula (Probert at al. 1979, Batson & Probert 2000, Wood & Probert 2013), and Foveaux Strait (Cranfield et al. 1999, 2003, 2004); rhodolith beds of northern New Zealand (Nelson et al. 2012, Neill et al. 2015); macroalgal communities (Shiel 1990, Shiel & Hickford 2001, Shears & Babcock, 2007). Similar to other parts of the world, the close proximity to land renders these habitats highly vulnerable to the effects of fishing, land-derived sedimentation, sediment dumping and spoil dispersal, pollution, invasive species and other human impacts (Morrison et al. 2009, 2014a). Currently, our understanding of the extent and magnitude of biogenic habitats on the shelf is highly limited in the context of scientific studies, e.g., high biodiversity areas of Spirits Bay were only discovered in the 1990s (Cryer et al. 2000). It is difficult to manage threats to important biodiversity resources without having fundamental information on their identity and spatial locations (Diaz et al. 2004).

1.2 Value of Local Ecological Knowledge (LEK)

While scientific information on coastal shelf biogenic habitats is limited, there is a nation-wide pool of information on where different habitats are (and were) to be found, currently extending back in time about fifty years; that of fishers, especially retired commercial fishers, who, as resource users, necessarily develop detailed knowledge of their fishing grounds. Known as Local Ecological Knowledge (LEK), this information about the environment and the fish that are caught is often different, but highly complementary to scientific data, and in some cases, exceeds it. Compared to scientific information such as fishery-independent surveys, LEK generally concerns smaller spatial scales, but derives from a potentially larger observational base and usually over wider time frames (Dawe & Schneider 2014). It is generally non-standardized, largely anecdotal and may be biased by selective or limited memory. However, such knowledge can provide unique, fine-scale historical information through the recollections of different generations, and can be used to complement scientific information or provide information in its own right.

An increasing number of researchers have recognized this, and studies have demonstrated the value of LEK in terms of: improved understanding of local fish stock structure and migration (Neis et al. 1996, Murray et al. 2008); perception of environmental and population change (Sáenz-Arroyo et al. 2005a, Rochet et al. 2008, Parsons et al. 2009, Taylor et al. 2011, Morrison et al. 2014b, Thurstan et al. 2016); mapping resource use by fishers including their ‘home patches’ (Martin 2008, Hall et al. 2009); and broad scale habitats and ‘seascapes’ mapping for better marine spatial planning (Pederson & Hall-Arber 1999, Bax & Williams 2001, Bergmann et al. 2004, Gass & Willison 2005, Williams & Bax 2006). As an example, LEK was used to reconstruct 2800 km^2 of historical cod spawning grounds in the Gulf of Maine that are now fished out (Ames 2007) and in their simple but eloquent paper, Sáenz-Arroyo et al. (2005b) illustrated rapid inter-generational changes in the perception of the state of Mexico’s Gulf of California. By interviewing three generations of fishers they found young fishers were largely unaware that the large species such as Gulf of Mexico grouper, had ever been common (older fishers caught up to 25 times more on their best days fishing), or that near shore sites were ever productive. Fisher’s knowledge has also been used within New Zealand in a number of contexts; e.g., to document the development of the trawl fishery and Wairoa Hard closure in Hawke’s Bay (Tai Perspectives 1996), to map the activity of the Bluff oyster fishery (Hall et al. 2009), to examine the recreational exploitation history of snapper, *Pagrus auratus* (Parsons et al. 2009), and to assess fisheries and environmental change in the Kaipara Harbour (Morrison et al. 2014b).

Gaining access to hard-won information about the location of good fishing grounds and habitat can be more difficult to achieve than more general recollections of ‘best ever catches’. This is often due to a mistrust of scientists and managers by fishers, and understandable feelings that it is proprietary information upon which an individual’s competitive advantage lies, or that such information will lead to negative management outcomes such as closed areas and other restrictions that will impact on livelihoods (Pederson & Hall-Arber 1999). However, in a number of instances, LEK has been used with success to increase understanding of seabed habitats. Gass & Willison (2005) combined scientific and local knowledge to assess the distribution of deep-sea corals in Atlantic Canada. The scientific sources were opportunistic presence data from survey trawl and observer databases and this was supplemented with 26 interviews with fishermen, some of whom had memories as early as the late 1940s and early 1950s. Using photographs and specimens, location information by species was achieved over a wide geographic range. The authors found that the three data sources provided both unique and overlapping information, with each method enhancing the combined knowledge. Slacum et al. (2008) used information from two experienced commercial fishers (40 years fishing combined) to learn about areas of varying productivity within their fishing grounds, and help identify geographic strata for a trawl survey designed to assess the relationship between summer flounder abundance and specific habitat features, and identify Essential Fish Habitat (EFH). Bergmann et al. (2004) asked fishers to describe the location of grounds and key habitat features they thought were important for gadoids in the Irish Sea, and compared this with standard ground fish surveys from the region. Not all fishers participating in that study were willing to mark locations on charts, but those that did identified a wide range of habitats that were broadly compatible with scientific survey data. Although fishers were not always aware of the species’ names of non-target invertebrates, and were sometimes cautious about offering information that might prove incorrect, the interviews revealed valuable biological information that was consistently cross-referenced by different individuals. For example, a number of fishers noted the association of one gadoid species, haddock with ‘*wigs*’ (identified as brittle star beds by the authors), suggesting the fish used the beds to "*clean themselves*". The authors reported that haddock are known to feed on brittle stars post spawning. Similarly, in south-east Australia, LEK was used to inform a process of mapping the structure, ecology, and use of the sea-scape by fishers (Williams & Bax 2006). The authors built up relationships over a period of five years through port visits, commercial fishing operations and management meetings; resulting in fishers supporting the project as a means to have an input into the spatial management and regional marine planning and any potential area closures. Detailed information on distribution, productivity, seabed biology and geology, and oceanography effectively provided a course-scale habitat map, with 'fishing grounds' as units and a mixture of information on geomorphological features such as sediment plains, rocky banks, and substrate patches dominated by a particular species / community.

1.3 Objectives

The overall objectives of the project were to characterise and map the occurrence of significant areas of biogenic habitat forming hotspots and associated biodiversity in New Zealand's near-shore coastal zone (about 5–150 m). There were four specific objectives:

1. To collect and integrate existing knowledge on biogenic habitat-formers in the <5–150 m depth zone of New Zealand's continental shelf, from sources including structured fisher interviews, primary and grey literature, and other sources as available.
2. Using the findings of Objective 1, design and deploy a series of sampling voyages to selected locations, to map and characterise locations of significant biogenic structure (either still existing, or historical), and collect relevant biological samples (both through visual census, and physical collection).
3. Process and analyse the samples collected in Objective 2, to provide a hierarchical, quantitative description of the biogenic habitats and associated species encountered.
4. Using the findings from Objective 1–3, assess the present status, likely extent, ecological role, and threats to, biogenic habitat formers in the <5–150 m depth zone. This should include a spatial modelling and risk assessment framework. Integrate (as appropriate) with other information sources and/or approaches that may exist by the year 2010/11.

This report covers Specific Objective 1, with a companion report, "Biogenic habitats on New Zealand's continental shelf. Part II: National field survey and analysis." (Jones et al., in review) covering Objectives 2–4.

2. METHODS

In order to map and characterise the occurrence of significant areas of biogenic habitat forming hotspots, we required information on their location. A mixed-method sequential exploratory strategy (Creswell, 2009) was employed, where qualitative data from nationwide fisher interviews (Specific Objective 1) were collected and used in combination with available scientific data to select appropriate target sites for further study (Specific Objectives 2-4).

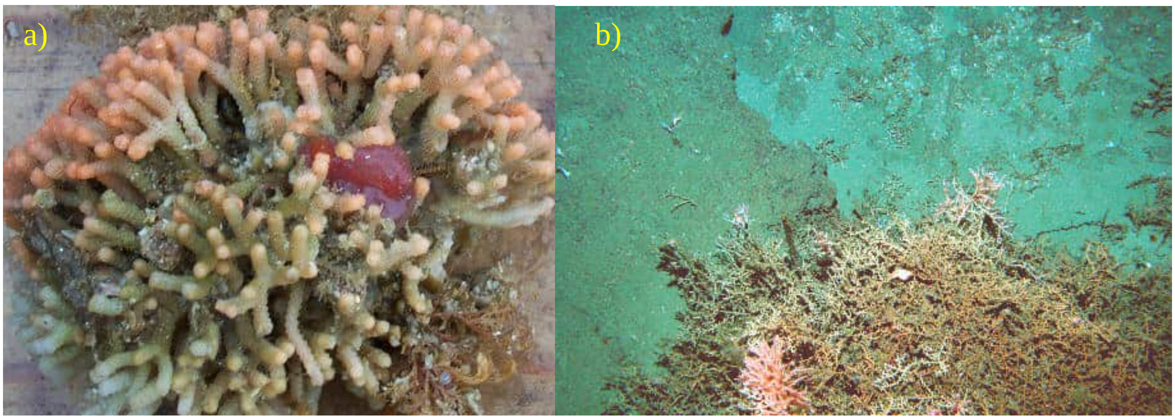
2.1 Interview approach

The issue of eliciting, evaluating and applying expert knowledge has received some attention in the LEK and Traditional Ecological Knowledge, (TEK) literature, as well as more broadly around the use of scientific experts in forums (e.g., Huntington 2000, Davis & Wagner 2003, Drew 2004, Davis & Ruddle 2010, Drescher et al. 2013). Drescher et al. (2013) addresses the rigorous use of expert knowledge in ecological studies in detail (note: their use of the word "expert" is not confined to those with formal science training); while Davis & Wagner (2003) offer robust critiques of the LEK field in general (largely focussed on terrestrial examples). Drescher et al. (2013) discuss the sampling bias that can occur when experts included in the elicitation process are not fully representative of the entire population, due to some or all individuals being difficult to access. If a large enough expert pool was accessible, then random or stratified random strategies could be used, but non-random sampling methods such as 'Chain referral sampling' (snowball sampling) were noted as being commonly used where the expert pool may be less visible; an initial expert was selected, with that person nominating further suitable experts. Multiple independent starting points (i.e. selecting initial experts from different places or groups) was seen as one way to maximise representative selection from the overall pool. Correctly identifying experts is a challenge (Huntington 2000, Drew 2004). Davis & Wagner (2003) suggest that the best approach is through systematically gathered peer recommendations, using a structured sampling technique, where experts were rank-ordered depending on their peer's views of them (see also Davis & Ruddle 2010). However, Drescher et al. (2013) observed that peer selection could potentially lead to selection bias or 'underestimated knowledge variance' due to the nominating of 'like-minded people' (population clustering). These authors also highlighted the issue of participants being polarized by social or political debates central to their expert contributions, particularly where the topic involved resource allocation.

Despite these drawbacks, researchers in social science research have argued the advantages of non-random selection techniques. Non-random, or purposive sampling is widely used in qualitative research to identify and select individuals or groups of individuals that are especially knowledgeable or experienced with the phenomenon of interest (Bernard 2002, Patton 2002). Support for these techniques focuses on being able to select the right participants to achieve a depth of understanding or detail about the phenomenon of interest, rather than a breadth of knowledge that allows generalization of the results (i.e. a representative sample). As noted by Drescher et al. (2013), where exceptionally local knowledge is required, only very few individuals may possess this knowledge and sample size may be irrelevant as long as one knowledgeable expert is involved (e.g. Bart 2010: "*finding effective knowledge is not the same as finding commonly held knowledge*"). Davis & Wagner (2003) however, note that such knowledge can only be classed as anecdotal and cannot be seen as representative of the knowledge system as a whole, stressing the requirement for understanding the nature of the information collected, and limitations of its use, unless verification can take place.

For this project, the primary knowledge being sought was location-specific presence (current and / or past) of what would most likely be unusual habitats in the context of the largely "flat", soft sediment fishing grounds familiar to most fishers. This knowledge may be held by a few or just one individual, come from a one off encounter rather than repeat observations, and might depend on an individual's propensity to fish in uncharted territory, and / or a longer fishing history that encompassed a previous era of explorative and expanding fisheries. Such information would fall within the "specific knowledge" end of the continuum of knowledge contextualization described by Drescher et al. (2013) with "synoptic knowledge" representing the other end of a spectrum of increasing integration and value assessment of individual knowledge pieces. The purpose of collecting these data was to contribute to hypotheses of potential biodiversity hotspots, and to inform an empirical data collection strategy to validate these observations, rather than to generate conclusions about biogenic habitats themselves. Given the nature of the knowledge sought, and these aims, it was felt that a combination of 'purposive' and 'snowball' sampling techniques were the most appropriate; the former where individuals were selected because they are believed to be capable of contributing the most comprehensive or reliable information; the latter where initial participants were asked for recommendations of further knowledgeable participants. Initial potential participants were identified through professional networks of multiple colleagues, supplemented with personal contacts, and contacts obtained from approaching professional fishermen's associations. Trawl fishers were targeted as the main focus group, as this fishing method was believed more likely to retain substantial by-catch of biogenic habitat type fauna compared to other methods. The fisher interview survey was conducted at the national scale, resulting in a range of independent contact approaches through multiple channels. As already mentioned, such methods run the risk of creating a bias in the pool of expertize elicited, but it was hoped that using multiple starting points would minimize this bias, by maximising our chances of reaching as many experts as possible. However, some regions proved to have fewer potential interviewees than others, and / or required a greater effort to secure participants, whilst other areas, with a larger pool, were undoubtedly under-sampled due to limited resources.

An initial phone call to introduce and outline the project and its purpose, ascertain the spatial and temporal scope of the individuals experience and willingness to participate, was followed up with an information pamphlet (see Appendix 1) sent to those who were positive about being involved, before being contacted again to arrange a full interview. The initial phone call identified some individuals who were perceived as being unable to meet the criterion of offering reliable or useful information. It is also recognized that those individuals who were unwilling to participate may represent a valuable pool of knowledge that we were unable to tap into.. All interviews were carried out by two NIWA staff, who travelled to Auckland, Tauranga, Napier, Gisborne, Wellington, Wanganui, New Plymouth, Nelson, Lyttelton, Westport, Oamaru, Timaru, Port Chalmers and Bluff. The questionnaire used was based on a literature review of wider LEK interview approaches (e.g. for other objectives such as fisheries catch and size trends), but specifically focused on seafloor habitats, ranging from well-known fishing grounds to one-off memories or 'unusual places or catches'. The questionnaire was semi-structured to elicit a wider range of possible answers, and a greater level of detail and context; as compared to more restrictive yes/no, or multiple choice options. While the level of detail may vary between respondents and the results can be more difficult to quantify, this process allows for potentially unanticipated findings (Neuman 2005). Questions were divided into three parts; the first concerning individuals' history in the industry, the second (and main) section concerning the location and characteristics of biogenic and other habitats (effectively a free-listing process), and the third finishing with any other comments about changes they had observed in the environment and memorable catches. A selection of visual aids (photographs, and specimens of some calcareous groups) were used to familiarize or remind the fishermen of the kinds of 'habitats of interest' (e.g., Figure 1). Regionally relevant nautical charts were provided and used as the framework for the interview. Following a brief summary of the individuals fishing history, the fishers were asked to go through all the areas that they had fished recently or in the past, and to outline areas of 'unusual' habitats. Memories were encouraged by looking at the photos and asking fishers to think of times when they had picked up large volumes of material in the trawl, or they had damaged, snagged, or even lost a net. Where an area was identified, we encouraged them to mark this area on the chart and then asked specific questions about that area; the species they would have been targeting, when they last fished it, whether they remembered catching undersized fish, the occurrence of unusual water temperatures or currents in the area. In some instances these sites were relatively large and well known to the individual, in other cases they were one-off tows. Along with the markings on the chart, one of the two interviewers recorded notes during the interview, relating the information to the various marked areas. Where permitted, interviews were also recorded for the purposes of making sure all details were captured and later transcribed. The logistics of arranging multiple interviews in a day, and in some cases, interviewee "fatigue", limited most interviews to around one hour. In many cases, the final section of the interview concerning historical changes in environments was not covered, as the main part of the interview took up the time available.



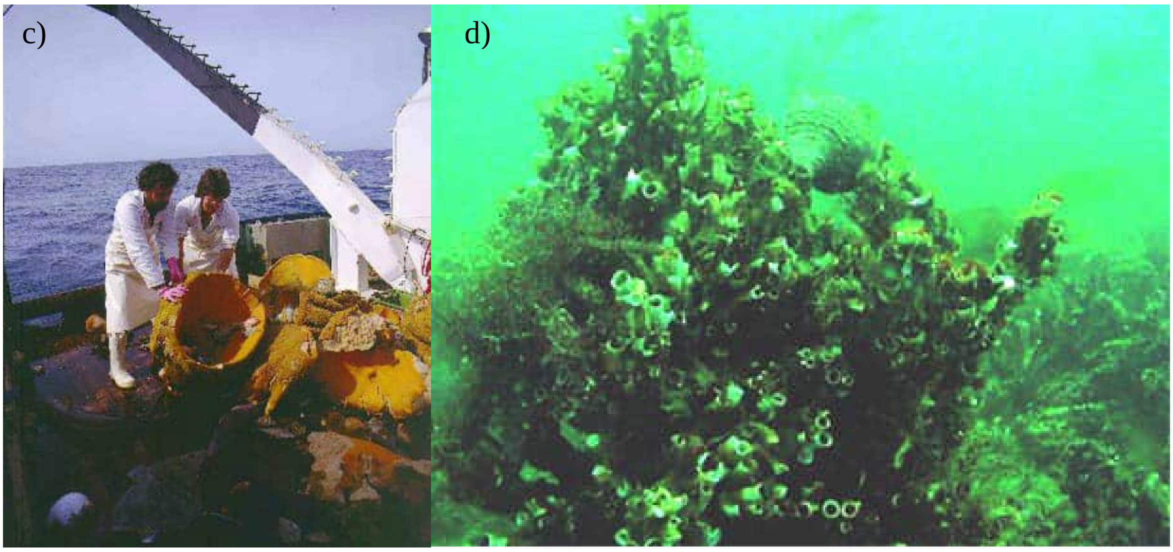


Figure 1: Examples of visual aids used: a) the bryozoan *Cinctipora elegans*; b) deep-water coral *Solenosmilia variabilis*; c) sponge by-catch from a research trawl, 1980s, Cape Reinga region; d) tubeworm mound, *Galeolaria hystrix* (Source: R. Davidson, Davidson Environmental Ltd).

2.2 Data digitization and organization

Following the interviews, the data were digitized into two formats (Figure 2). The areas marked by fishers on the chart were scanned as high quality JPEG images, including the nearby coastline. These scanned charts were then added as layers to a GIS database. The charts were geo-referenced by aligning the coastline from the nautical chart to the relevant sections of an independent national GIS coastline shape file as closely as possible, using up to eight geo-reference points. This was considered to be the best way of digitising the data, as fishermen had drawn their areas by relating chart features to terrestrial landscape features that they remembered from trips (NB: many of the data collected pre-dated the arrival of GPS; radar and visual sightings were the main means of position-fixing).

Once scanned, charts were geo-referenced, and polygons were traced over the areas drawn by fishers. Within the attributes table, each polygon was assigned the relevant fisher identification tag and a habitat type, or other category (e.g. fishing, spawning or nursery ground) were assigned. Assigning these categories was sometimes a straightforward selection from an existing list of known habitat categories (e.g. "Kelp forest", "Sponges" or "Coral"), whilst other categories were generated during the synthesis of the interview data, some with a known scientific classification (e.g. "Wireweed" was assigned to "Tubeworms"), while others remained unidentified (e.g. "Spongeweed" and "Cauliflowers"). In this way a series of fisher layers were built containing the scanned jpegs and different habitat areas located on the chart. Where no areas were drawn, but site or general location was mentioned, these were added as points. The conversion of areas marked on nautical charts into a GIS database also required re-projection from a chart's non-linear geographic co-ordinate system (Datum: D_WGS_1984) to a planar projection (World Mercator). This was done when the individual fisher layers were merged to create a data master-layer with all polygons included and all the data merged into one dbf file (shape-file). At the same time, the written notes and audio files from the interviews were transcribed into an excel spreadsheet, as much of the information associated with each polygon, including lengthy descriptions, was considered too cumbersome for input into GIS tables. These additional data are linkable to the GIS database through the fisher and polygon unique ID identifiers.

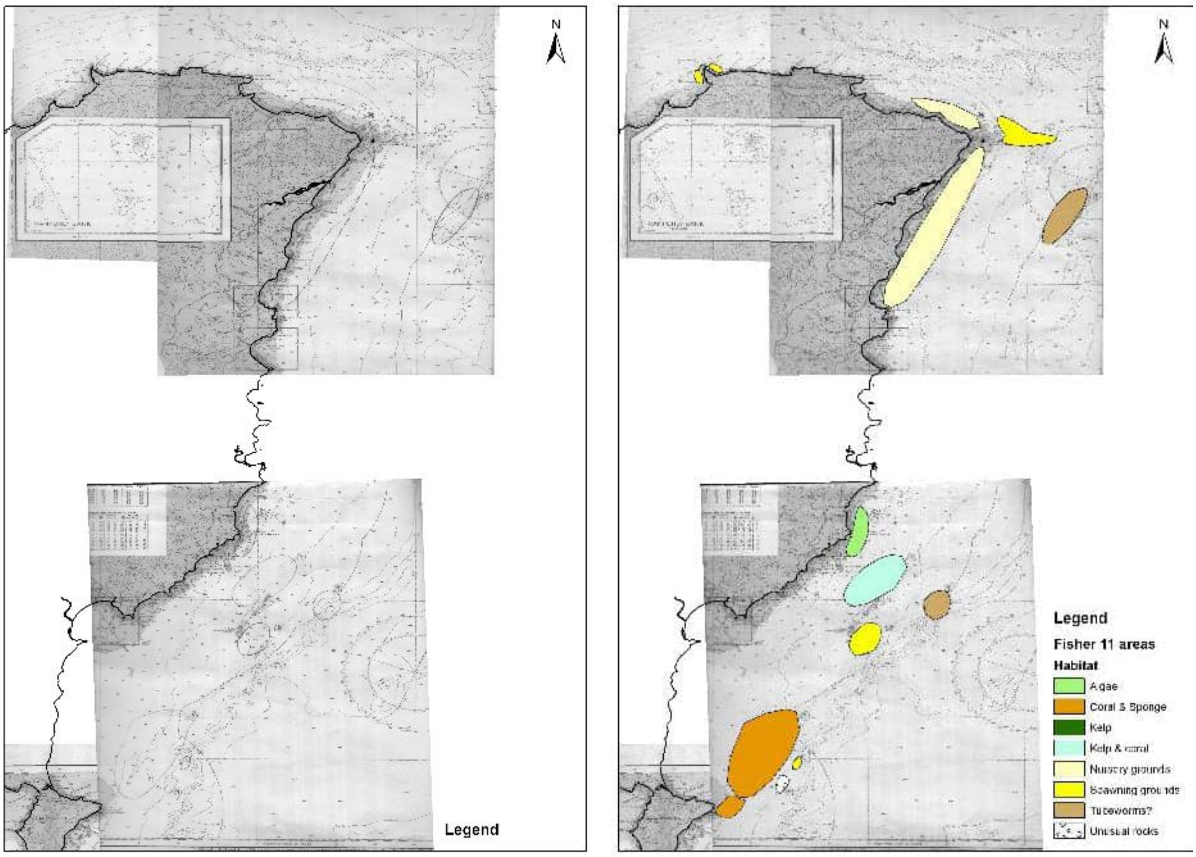


Figure 2: left) Charts marked up with LEK scanned to coastline; right) polygons created by tracing over the fisher-drawn areas, and assigning habitat type ID and other information in the GIS database.

2.3 Supporting scientific data sources

To assist in interpretation of fisher's descriptions, scientific literature was reviewed where available, and some selected data sources were collated. The published science literature for New Zealand on biogenic habitats and fisheries species linkages has been recently reviewed (Morrison et al. 2014a), and was used to provide science based information. In addition to fishers, several scientists were also interviewed in areas known to be the focus of active scientific research; in particular Foveaux Strait/Stewart Island, and Otago Peninsula. Total commercial catch data for relevant species (supplied by MPI), were summed into 5 km squares, and plotted to identify catch hot-spots for selected species such as tarakihi and golden snapper (not given in this report due to spatial catch data resolution restrictions). Selected invertebrate/by-catch records from the 'AllBioSea' and 'Specify' databases were also plotted. These by-catch and other records were very variable in terms of regions covered, whether by-catch was recorded, and the level of taxonomic resolution used; and were used as a qualitative indication of species presence only (see Baird et al. (2015) for a detailed discussion of such data's limits). Included in these extracts, were records from two *Tangaroa* voyages that were carried out following the interviews as part of this project, which targeted some of the sites identified by fishers. For a full description of these voyages, see Jones et al. (in review). Maps of areas of predicted rocky reef habitat (less than 50 m) developed by the Department of Conservation, based on expert knowledge and analysis of hydrographic faring sheets, were also compared with fisher records of 'Foul" and other bycatch likely to be associated with hard substrate.

2.4 Regional descriptions and Key site selection

Once digitized, composite maps were generated for nineteen regions around New Zealand (Figure 3 regions A–S), with all polygons for a given region overlaid. This process revealed areas drawn by different fishers that were in the same geographic locality, or overlapped. Where these area descriptors were the same, similar, or at least not inconsistent (e.g., one described as "Foul", or "unusual rock", and another described as “Coral”), sites were given a greater weighting in terms of likely validity, and suitability for further exploration. Some areas were mentioned by up to nine individuals (including verbal comments that were not specifically geolocated), although this number was dependant on how many fishers had knowledge of that particular region, which varied between regions. At some sites, the validity of fisher’s knowledge, was further strengthened by existence of converging scientific data, but absence of this criterion did not necessarily lessen potential validity. Through this process, a subset of sites were identified; defined as being repeatedly and consistently described by multiple fishers, and / or consistent with scientific information if available, or considered especially unusual and interesting (as arbitrarily defined by the report authors). We chose not include any criteria relating to minimum size of fisher-drawn areas, recognizing the relatively coarse scale at which information was provided, the variation in how individuals recorded their information, and the potential for mismatch to actual habitat coverage. These were called “key sites”, and provided the basis for planning two sampling voyages on board R.V. *Tangaroa*, with the aim of mapping and characterizing locations of significant biogenic structure, which are described further in Jones et al. (in revision). In addition to maps of regional LEK-derived biogenic habitat diversity, national scale maps were also generated for particular habitat types.

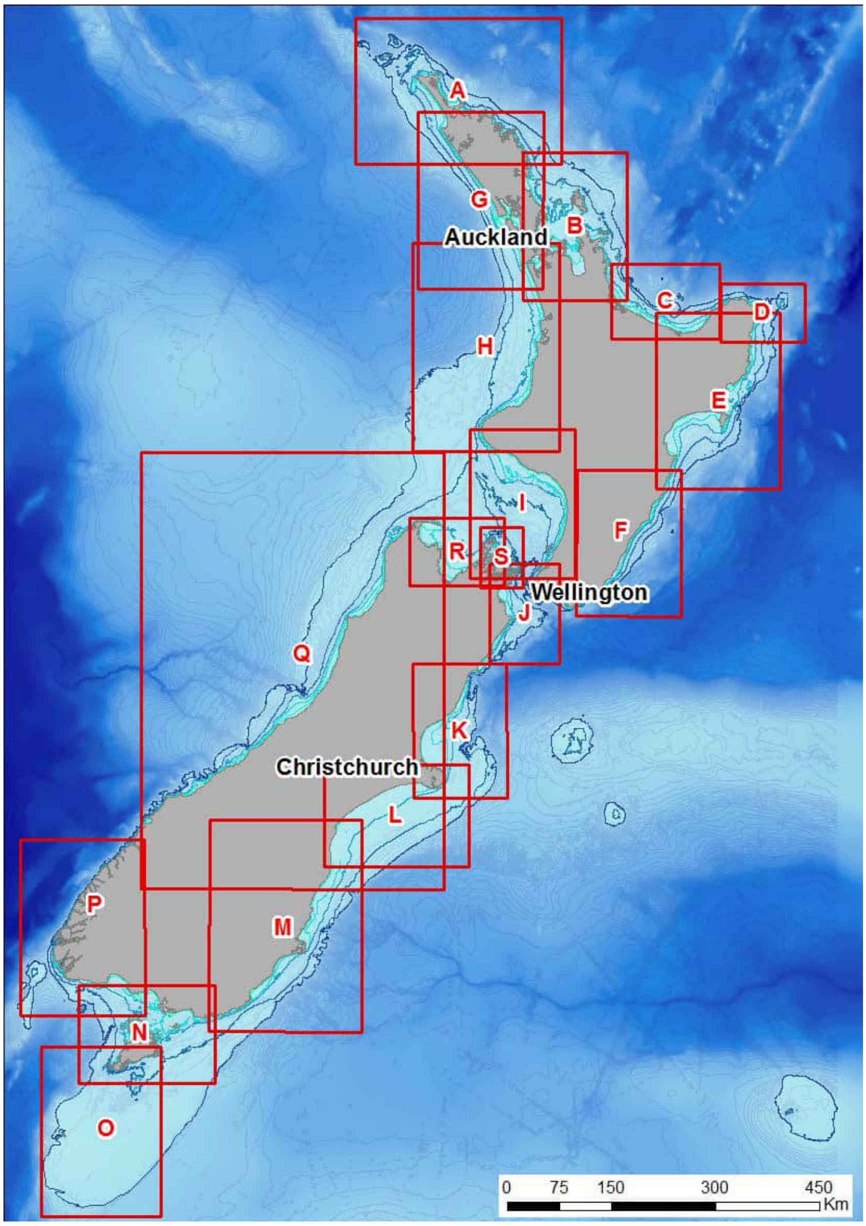


Figure 3: Master map of the LEK descriptions by region.

3. RESULTS

3.1 Fisher demographics

A total of 70 commercial fishers were contacted for interview. Sixty-three percent (44) were retired or semi-retired (i.e., still had some involvement in the industry). All were male, most operated demersal trawls, with some also fishing with or having previously fished with Danish seine, long-line, dahn line, and set net (north-east North Island); and/or rock lobster pot and oyster/scallop dredge (South Island). Of those contacted, ten individuals either declined to be contacted further, or declined when contacted a second time to arrange an interview. Of the remaining 60 fishers that indicated a willingness to be interviewed; 55 were contacted a second time and of these, 5 interviews did not proceed for various reasons; leaving a total of 50 individuals interviewed in full (71%). The final age composition of the interviewees is given in Table 1.

Table 1: Age composition of fishers interviewed.

Age group (years)	<50	50s	60s	70 +	Total
Fishing	5	4	7		16
Retired / ex-fishers		2	18	14	34
Total	5	6	25	14	50

3.2 Overall summary of LEK information collected

In total, fishers outlined 496 areas on charts all around New Zealand, and made a further 92 observations about locations that they recalled, but were unsure of the extent, or exact location, and did not mark on the charts. In only one interview, were no valid geo-located observations recorded, with nearly 85% of interviews providing between 5 and 38 observations, and 60% providing over 10 observations. The geographic range of information from any one interview was varied, with some individuals having fished many different regions, whilst the fishing history of others was more localized. For ease of presentation, the LEK information is split into nineteen regions. These vary considerably in area of continental shelf they include, but the spread of information between them indicates some areas that were likely to have been under-sampled in terms of fisher knowledge. In most regions, between 5 and 10 fishers provided some knowledge of habitats, recording between 10 – 52 observations. In some, up to 14 fishers provided information (Foveaux Strait and Stewart Island, South Taranaki Bight, Timaru to Foveaux Strait), whilst in two regions, the number of interviewees who had knowledge was less; 4 fishers for the Canterbury Bight, and only 1 for the Traps and Snares region.

The range of information gathered varied from single locations to mega-habitat features corresponding to fishing grounds. The biogenic habitat fishers were asked to think about were often what they thought of as undesirable "*rubbish*" that would have to be shovelled overboard or cut from the net. Observations were based on recollections of bycatch that was frequent or unusual or substantial enough to be memorable; for instance, many fishers recalled nets being damaged by large catches of coral and / sponges, or the difficulty of removing large volumes of kelp and "*tarakihi weed*" (chaetopterid tubeworms) from meshes. A large array of fisher descriptions were recorded along with local nicknames that originated from the colour, size, shape, texture of the organisms such as "*plumb duffs*" (large sponges), "*elephants ears*" (sponges, possibly referring to shape rather than colour), "*white straw*' (most likely tube worms), "*cow-pads*" (juvenile rays) "*sea apples*" (sea tulips), "*snapper biscuits*" (sand dollars), "*bulls wool*" (bleached *Ulva*?), "*cauliflowers*" (ascidians/sponges/sea cucumbers?), and '*corn-flakes*' (bryozoans). Nearly 66% of the areas marked on the charts were classed as potential biogenic habitat, (63% of the observations overall). The top five most frequently mentioned categories were Corals, Sponges, Horse mussels, Kelp and Bryozoans. The combined observations of corals, bryozoans and sponges represented around 30% of all observations (170). These were not necessarily at different locations; in many instances, multiple fishers identified the same areas as the same, or similar, habitat.

Other biogenic categories described by fishers included shellfish beds (e.g. dog cockles, scallops, oysters), sea tulips (kāeo), sea pens, eelgrass, rhodoliths and tubeworms (identified as chaetopterid tubeworms). Fishers also noted large numbers of other species such as kina, sea cucumbers and bristle worms. In addition, 70 observations of "*Reef*" or "*Foul*" areas were located, where the fishers knew the area was untrawlable and might contain epifauna of some sort. There were also observations of picking up unusual rock formations, "*petrified wood*", thermal vents and areas of shell hash and rubble. Some fishers outlined particular fishing grounds as well as areas they believed to be important nursery and spawning sites for species such as flatfish, tarakihi, and snapper. These were also included in the report as appropriate, as a step towards better understanding fish (fisheries) habitat inter-relationships (Morrison et al. 2014c).

Not all interviewees were willing to mark all the places they had knowledge of on a chart due to the perception that such information might lead to 'negative' management outcomes, such as the designation of Marine Protected Areas (MPAs). This concern was shared by almost all individuals interviewed, whether still fishing or retired.

4. DESCRIPTIONS BY REGION

In this section, the LEK information from the nineteen regions shown in Figure 3 is presented in more detail. For each region, a map of the fisher-drawn areas is provided, along with a table summarising the main areas and habitat types described, evidence of fishing impacts where noted, and the number of fishers who reported each feature, (either with or without drawing on the charts). For more literal information, the reader is referred to the narrative sections given in the Appendices. As described in Section 2.4, key sites were defined as locations (of any size), that were repeatedly and consistently described by multiple fishers, and / or consistent with scientific information if available, or considered especially unusual and interesting (as arbitrarily defined by the report authors). These sites are highlighted in bold in the regional tables. These key sites are suggested as higher priority for any subsequent empirical sampling programme. They are also shown as named features on the regional maps, using the fisher/s feature name where possible. At the end of each regional section, scientific information that provided species or other context relevant to the fishers LEK is summarised.

4.1 Three Kings Islands to East Northland.

Twenty nine LEK areas were marked by seven fishers in this northern New Zealand region. A further five sites were mentioned verbally by survey participants, but not marked on the charts (Table 2, Figure 4). The most commonly mentioned biogenic bycatch categories in these areas were corals (including black corals) and sponges, with some being able to recall distinctive colour, shape and / or texture of what are likely to be species of glass sponge (fibre-glass texture, sticking to hands), *Stelleta* ("*nest-like*"), and *Ancorina* sponges ("*elephant ears*"), as well as gorgonians ("*skeleton corals*").

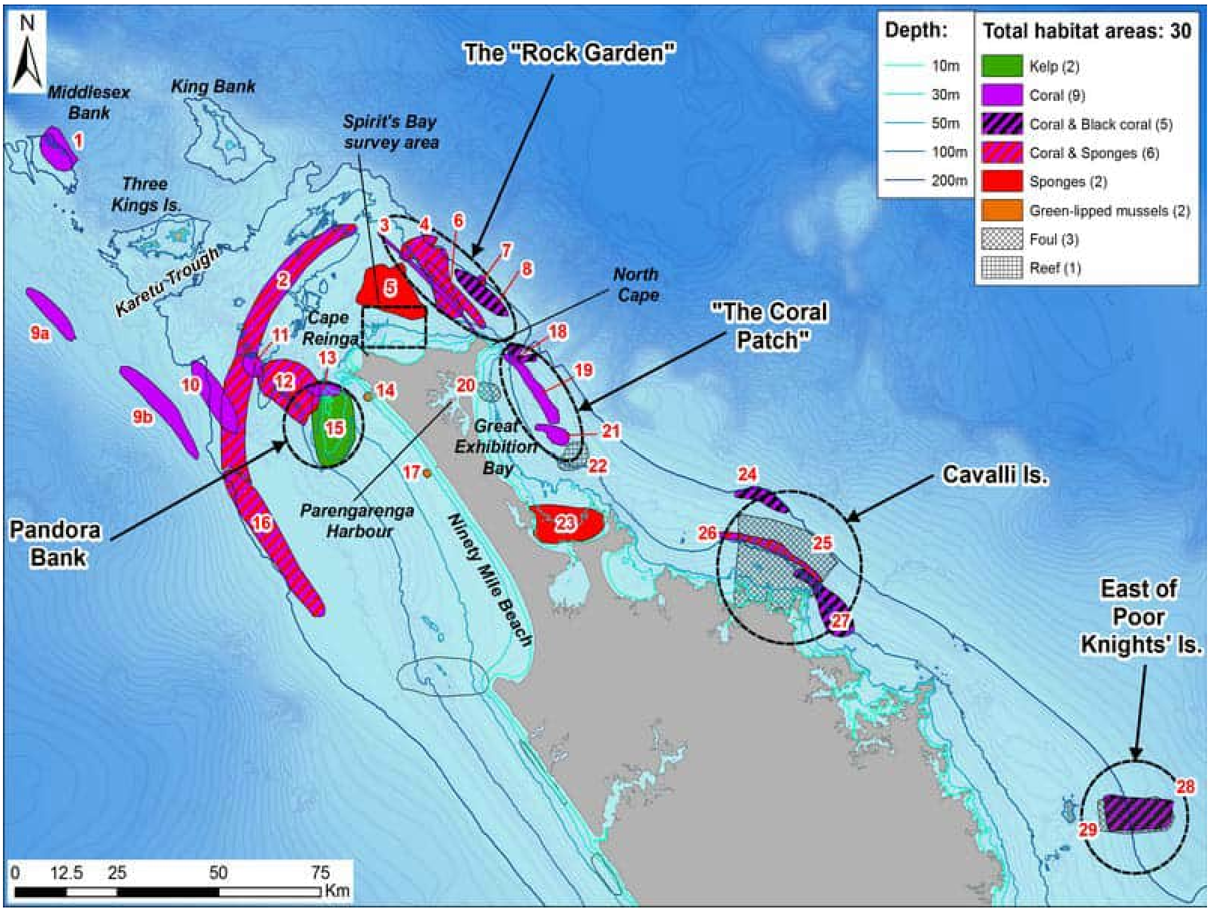


Figure 4: North Cape region LEK map (Region A of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section (in red). Some key sites are circled and labelled as black text on white background.

The areas around the North Cape, (called the "*Rock garden*"), the Cavalli Islands and Pandora's Bank were most frequently talked about in relation to snagging or losing gear, and bringing up corals, sponges and other bycatch. Table 2 summarises these and the other key sites described. In several areas, such as Middlesex Bank and The Rock Garden, fishers made comments about a decline in occurrence of these types of bycatch, or that they were aware that early fishing activities had resulted in the destruction of these habitats.

Table 2: Summary table of sites described by fishers in the North Cape region with the area identification numbers, brief description, fishing impacts where mentioned, and the number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	Area ID no.	Description	Fishing Impacts observed?	Frequency of ID
Middlesex Bank	1	Targeted packhorse lobsters and hapuka in the 1970s. Brought up orange, red and pink coral, some "*fern-shaped*". Believed coral habitat had declined	yes	1
"The Rock Garden"	3,4,5,6, 7,8	A trawlable strip subject to strong tides and surrounded by rich coral and sponge habitat. Bright yellow *Stelleta*-like and grey sponges identified as well as "*lacey*" glass sponges.	yes	5
Offshore Cape Reinga	2, 9, 10, 11, 16	Sponges and gorgonians found offshore from Cape Reinga in waters deeper than 100 m; yellowy-white fibre-glass textured (glass sponges), grey "*elephant ears*", orange "*nest-like*", and tall "*skeleton*" and "*staghorn corals"* of multiple colours.		4
Pandora's Bank	12, 13, 15	Sandy bottom, swept by strong tides with patches of foul (coral and sponges mentioned), as well as seasonal algal occurrences likely to be *Caulerpa* and *Durvillea* spp.		4
"Coral Patch"	18, 19, 21, 22	Offshore reefs in Great Exhibition Bay (70 – 150 m), still fished today. Pick up sponges ("*shiny yellow balls*") and black coral described as having 5–7 cm trunk diameters		3
Ranganu Bay	23	Sponges, algae and fan-corals found in 10 – 40 m when fished in the 1950s and 60s	yes	2
Cavalli Islands	24, 25, 25, 27	An area of strong tides and rocky ground with canyons and peaks where gear had been lost. Corals and sponges were found here.	yes	5
East of Poor Knights	28, 29	An area of rugged terrain and strong tides where corals and sponges were found.		2

Scientific data sources

The Three Kings Plateau (including The Three Kings Islands, Pandora Bank, and the area between Cape Maria van Diemen and North Cape) has been described as a hotspot of bryozoan biodiversity, particularly Spirits Bay (Rowden et al. 2004), with the complex biogenic sediments in this region identified as an important factor in this high diversity. A study of the composition and origin of carbonate sediments of the South Maria Ridge found these to be largely composed of clean skeletal carbonate gravels and sand with over 80% (generally over 90%) calcium carbonate ($CaCO_3$), mainly calcite (one of several forms $CaCO_3$ can take) (Nelson & Hancock 1984). This dominance was attributed to very low levels of terrigenous (land-derived) sediments, the presence of rocky substrates for dense epifaunal assemblages, and strong upwelling of nutrient rich waters. Analysis of the superficial sediments found them to be composed of species-diverse bryozoan colonies (10–74% volume), with lesser amounts of mainly infaunal bivalves (2–20%), gastropods (2–10%), ahermatypic corals (0–18%), calcareous red algae (1–16%), and benthic foraminifers (3–15%), along with small contributions from serpulid worms, barnacles, echinoids, brachiopods, sponges, and pteropods (Nelson & Hancock 1984). Based on the appearance of material (fresh/relic) they concluded that modern material (*i.e*., present day $CaCO_3$ production) occurs down to 150 m water depth, around the Three King Islands and Middlesex Bank (and likely also King Bank), but is less important at the same depths on the adjacent, more coastally influenced Reinga Shelf.

At Spirits Bay, an unusual and very diverse invertebrate assemblage was 'discovered' during a scallop stock assessment dredging survey. Examination of the specimens collected during this and a subsequent survey in 1997, found the fauna of this area to be highly unusual, with a very high proportion of new and/or endemic species. In response to this, a targeted biodiversity and mapping survey of the area was carried out in 1999 (Cryer et al. 2000), followed by the closure of some of the area to commercial fishing. The area of the survey is marked in Figure 4 (‘Spirits Bay survey area’), and is located inshore of the areas marked by fishers. Cryer et al. (2000) used a combination of acoustic, photographic, and dredge sampling to assess the Reinga Cape–North Cape area, recording over 300 bryozoan species, and over 200 sponge species, as well as a range of other groups, including two gorgonian and two coral species in the deeper part of the study area (65–100 m), and black coral. The highest species richness was found at 30–80 m water depth. Six stations each recorded more than 100 bryozoan species (station average 61, range 0–140). Of these, the largest and dominant frame-building species was *Celloporaria agglutinans*, found at 33% of the stations sampled, although these colonies were smaller and less common that seen in Tasman Bay, where they are seen as important juvenile fish habitats. A further ten frame-building species were also present. The specific area sampled by Cryer et al. (2000) supported high biomass scallop harvests for several years following its discovery, but by the time of sampling in January 1999, few adult scallops were found, and no scallop spat.

Two inshore trawl surveys were carried out along the east Northland coast in the early 1990s but no by-catch records were found in the TRAWL database. The 2009 Bay Of Islands OS2020 survey also surveyed the shelf between North Cape and the Poor Knights Islands, in 50 to 200 m water depths with a number of stations falling within the fisher polygon sites such as the “Rock Garden”, the northern end of the “Coral patch” and the Cavalli Islands region. An overview of the surveys and initial analysis of data was undertaken as part of the OS2020 project (Bowden et al. 2010). Biogenic substrates such as shell hash and coral rubble were found around North Cape, with muddy substrates dominating the shelf further south, interspersed with areas of exposed bedrock and other hard substrates, e.g. offshore of Whangaroa harbour and the Cavalli Islands. Diversity (number of taxa present in DTIS transects, and how evenly distributed relative abundances are) was highest around North Cape and to the south of Whangaroa with lower diversity observed between North Cape and Doubtless Bay. A variety of sessile fauna including sponges, bryozoans and anthozoans (corals, anemones and sea pens grouped) were recorded in the more heterogeneous areas. A trawl survey was also completed, which found that the soft sediment fish communities were largely similar to those reported by the previous trawl surveys. Diversity and relative abundance of fish communities sampled by towed and baited video were also reported with some preliminary analysis of patterns of fish communities associated with different substrate and habitat types, including reef habitats (Jones et al. 2010).

Along the east Northland coast there have been a number of smaller scale habitat surveys of inshore areas such as Doubtless Bay and Mimiwhangata, which have documented subtidal reefs, kelp forests and sponge and gorgonian-dominated deep reefs (Kerr & Grace 2005; Grace & Kerr 2005). A broadscale habitat map from Ahipara on the west coast to Mangawhai on the east coast, covering the intertidal out 12 nautical miles has been produced for the Department of Conservation using multibeam data from various sources. Fine and “undefined” sediments made up nearly 80% of the total area, with reefs (from shallow intertidal to deep reefs) making up around 14% (Kerr 2009). The rocky reef habitats and fish populations of the Poor Knights Islands Marine Reserve have also been documented (e.g. Ayling & Shiel 2003; Taylor et al. 2011, NIWA, unpublished data).

There is overlap of LEK with scientific research in this region, with the data from surveys carried out in Spirits Bay, North Cape and the coast of east Northland broadly matching fisher-identified descriptions of biogenic habitat sites such as the “Rock Garden”, the “Coral Patch”, and around the Cavalli Islands. Areas of predicted rocky reef habitat (less than 50 m), based on expert knowledge and analysis of hydrographic faring sheets, also indicate reef in the Cavalli Island area, and west of Cape Reinga and Pandora’s Bank (DoC, unpublished). The latter area is also known from taxonomic records to support abundant lithistid and other sponges (M. Kelly, pers comm.). In some areas, fisher information extends further offshore than scientific information, such as the marked areas offshore of Cape Reinga, Ninety Mile beach and the Poor Knights. There was a lack of fisher information between the Cavalli Island region and the Poor Knights, which coincides with potentially extensive areas of deep reef (Bowden et al. 2010, Kerr 2009). The lack of fisher-drawn areas along this stretch of coast possibly reflects a gap in coverage, i.e. the fishers we interviewed did not have detailed fishing experience of this coast.

4.2 Greater Hauraki Gulf and Coromandel Peninsula

Twenty-nine LEK areas were marked on charts, along with six unmarked sites (mentioned verbally, but not located on the chart), by seven fishers (Table 3, Figure 5). A wide variety of biogenic habitats were mentioned, including sponges and corals, tubeworms, bivalve beds, and both green and red algae.

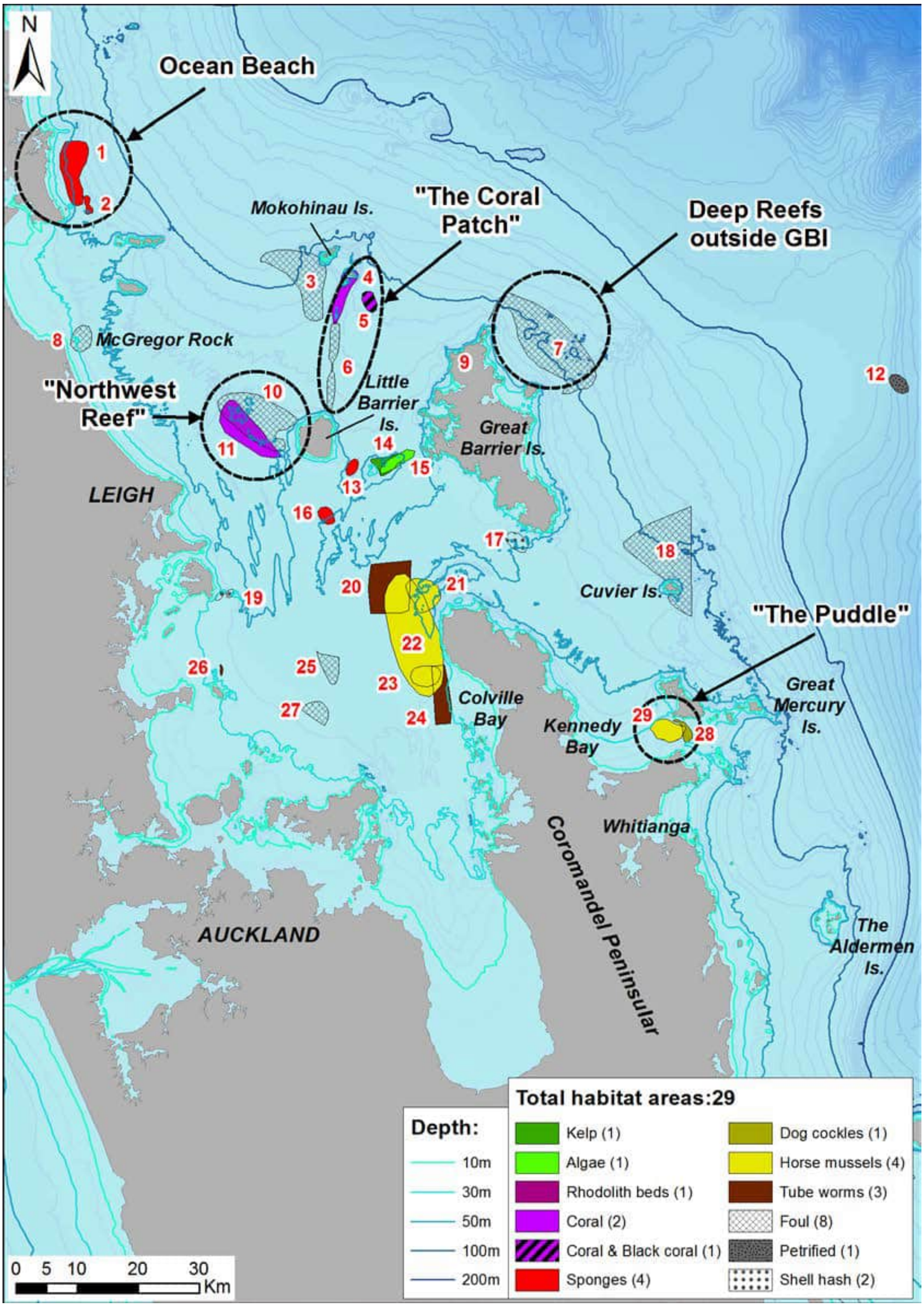


Figure 5: Greater Hauraki Gulf LEK map (Region B of Figure 3). Each fisher-drawn area has a unique number, specific to this regional section (red). Key sites are circled and labelled as black text on white background.

The most commonly mentioned habitat was "foul"; areas that were untrawlable due to the rugged terrain, such as rock pinnacles and rocky reefs. Large areas of foul ground were located in the outer Hauraki Gulf, along the 100m contour off the Mokohinaus Islands, Great Barrier and Cuvier Island, as well as around Little Barrier Island and some smaller patches further inshore (see Figure 5 and Table 3). Fishers had known tow paths that passed as close to these areas as possible, most commonly targeting snapper, but also noted the occurrence of "*small*" (undersized) and "*rubbish*" (non-target) fish in some of these areas. Some foul patches were associated with characteristic bycatch such as sponges and corals, e.g. the area off Ocean Beach and around Little Barrier Island. Several fishers described the sponges as orange and black "*pumpkins*" (possibly *Stelleta* and *Ancorina* spp) and "*cauliflowers*" (no known likely identification). One fisher described catching coral that was "*black and spikey*", another as brown/black and "*fern-like*" (likely gorgonian coral). Others recognized pictures of deepsea stony corals and gorgonians. Horse mussel beds were described by several fishers off the Coromandel Peninsula and Great Mercury Island, and small patches of shell hash to the east of Kawau (19) and south of Great Barrier Island (17) were noted as being made up of mainly horse mussel shells. Tubeworm beds were marked in shallower depths off Tiri tiri Matangi (26) and Coromandel Peninsula (20, 24). One fisher described them as "*soft and rubbery, found in little patches*" (probably a chaetopterid worm). Off Miners head, Great Barrier Island, one fisher described what he believed to be a rhodolith bed (9), but had not visited this site for 20 years.

Table 3: Summary table of sites described by fishers in the Hauraki Gulf region with the area identification numbers, brief description, fishing impacts where mentioned, and the number of fishers who described verbally or identified overlapping or very close areas. Key sites in bold.

Sites	**Area ID no.**	**Description**	**Fishing Impacts observed**	**Frequency of ID**
Ocean Beach	1, 2	Rugged terrain with perceived high fish abundance, that was avoided due to the bycatch of "*pumpkin and cauliflower sponges*"		2
"*The Coral Patch*" (south of Mokohinau Islands, Simpson Rock and north of Little Barrier.)	3,4,5, 6	A narrow strip from south of the Mokohinau Islands, to north of Little Barrier, including around the pinnacle "Simpson Rock" (4 and 6); a series of mounds sitting 6 m above surrounding seabed. High snapper catches, presence of small fish noted, and a bycatch of coral. Patches of foul, coral and black coral also reported either side of this strip (3, 5)		3
Deep reefs, **Great Barrier** and Cuvier Island	7, 18	Large areas of foul northeast of Great Barrier Island and north of Cuvier Island in 100 m + of water. Some clear tows closer inshore targeting snapper, hapuka, gemfish and bluenose. No bycatch described. G.B.I. foul known of by 2 fishers but not marked.		GBI (3), Cuvier (1)
The "Petrified Forest" and other deep water environments off G.B.I.	12	Located about 60 miles east of Great Barrier Island, in 400 m depth a "Petrified Forest" with shell and rock embedded together in unusual formations was described. The site was targeted for hapuka. "Pinnacles" in depths of 250–300 m where "black spikey corals and orange sponges" were snagged were also mentioned in this area, and patches of "*slimies*" (pink-coloured sea pens), "*slimey*" soft corals and sponges on muddy grounds also mentioned (neither marked on the chart).		2 (Petrified forest)
North-west Reef (west of Little Barrier Island)	10, 11	Described as "Foul", "Reef" and with corals resembling deep-water stony corals. Targeted		3

Sites	Area ID no.	Description	Fishing Impacts observed	Frequency of ID
		mainly for snapper, associated with catches of small fish.		
Craddock Channel, "The Pumpkin patch" and Horn Rock.	13, 14, 15, 16	An area of sponge on the edge of the Craddock channel (13) and a pinnacle further south (16) were both close to trawl tows targeting snapper, with a bycatch of "*pumpkin sponges*" / "*black pumpkin sponges*" reported. On the eastern side, tows close to these areas (14 and 15) targeting spawning snapper could come up clogged with kelp.		4
Inshore Reefs	8, 25,27	McGregor's Rock off Bream Tail had been heavily fished for snapper, but was previously an area where "sponges and weed" were caught as a bycatch. Several other patches of "Foul" were located by a second fisher in under 50 m depth.	yes	1
North-west coast of Coromandel Peninsula	20,21,22, 23,24	Horse mussel beds and tubeworm patches along the Coromandel coast from Colville Bay north. Described as "workable" when inshore trawling was permitted, being targeted for snapper, but had been "*fished down*". A current fisher mentioned only tube worms in two distinct patches to the north and south of the horse mussel area.	yes	5
"The Puddle", Mercury Islands	28, 29	Overlapping areas, one described as horse mussels with undersized snapper, the other as dog cockles with sponges growing on them. Kennedy Bay and the Aldermen Islands were also mentioned as fish nursery grounds, but not marked.		2

Scientific data sources

There have been a large number of trawl surveys of the greater Hauraki Gulf (e.g., Morrison et al. 2002b), but by-catch was not recorded in these; direct observations during the last two surveys in 1996 and 1999 surveys found very low by-catch volumes (MM, pers. obs.). Some limited reef fish survey work has been undertaken in approximately 50 m water depth within the North-West reef area, which falls inside the Hauraki Gulf Cable Protection Zone (Shears & Usmar 2003). Fish assemblages were assessed by Baited Underwater Video (BUV) on patch reefs to the west of Great Barrier Island, and in a shallower soft sediment area south of Whangaparoa Peninsula. Diving on the shallowest part of the reef system (about 33 m), a diverse encrusting invertebrate assemblage was reported, including the sponge species *Ancorina elata*, *Stelletta crater*, *Dendrilla rosea*, *Raspailia* sp. and *Aaptos aaptos*. Soft corals (*Alcyonium aurantiacum*) and hydroids (e.g. *Solanderia ericopsis*) were also present. The deep reef systems (50–120 m water depth) off Arid and Great Barrier Island have been surveyed, and a range of sponge species, as well as some black coral reported (Morrison et al. 2001a, Sivaguru & Grace 2002). More recent video camera surveys in the proposed marine reserve area off Great Barrier Island have produced a baseline seabed habitat map, with a "rocky-seaweed" biotope found in the shallow subtidal to 40 m zone, and large areas of boulders and hard substrate in deeper waters, which were characterized by a diverse fauna of sponges and bryozoans (Lee et al. 2015). Limited drop camera work by DOC also identified areas of broken foul off the eastern end of Coromandel Peninsula (DOC, unpublished), which matches broader multibeam records of the general area. Higham (2014) digitized some historic records of bycatch from trawl surveys carried out in the Hauraki Gulf in the early 1900s (Ayson, 1901; 1908), which suggested the historical presence of patches of low lying reef and shell hash in the outer Gulf, with notes of "bottom coral and shell" collected from trawls to the south of Little Barrier and Great Barrier Islands, and horse mussels, sponges and "rough bottom" noted from tows to the west of the tip of Coromandel Peninsula. This latter area was also the location of a scallop survey where bycatch records indicate the presence of sponge in many samples, and horse mussels in some (MPI data presented in Higham 2014). To the west of the Coromandel, and around Great Mercury Island the same scallop surveys have recorded the widespread occurrence of kelp and sponges, and more restricted presence of horse mussels and dog cockles. In the inner parts of the Gulf, Battershill (1987) has described the "*Sponge Garden*" in the Leigh Marine reserve (further south than the one described by fishers), and also commented on at least 20 other shallow water reef sites around the wider Hauraki Gulf with similar habitat. The previous widespread occurrence of historical green-lipped mussel beds (about 500 km^2) in the inner Hauraki Gulf and Firth of Thames has been mapped, but were fished to extinction by the 1960s (Greenway 1969, Reid 1969), and were not found during targeted acoustic and video surveys in the early 2000s (Morrison et al. 2002a, 2003). Horse mussel beds of varying densities are widespread in the inner Hauraki Gulf (Compton et al. 2012), including around Kawau island (Backhurst & Cole 2000), Martin's Bay and Mahurangi harbour (Cummings et al. 1998). However, their distribution has not been systematically mapped. Recent studies of the communities associated with dog cockle shell and rhodolith beds found around Otata island (The Noises), Rakino and Motuihe Islands in the inner Hauraki Gulf have documented a rich small-body invertebrate fauna dominated by amphipoods, oligochaetes and nemerteans (Dewas, 2008; Dewas & O'Shea, 2012).

There has generally been a lack of broadscale scientific sampling of the benthic communities in the deeper parts of the Hauraki Gulf (more than 50 m), with the exception of the targeted sampling of the North-west Reef and Great Barrier Island deep reef systems, and bycatch records from scallop surveys. These studies overlap with the fisher areas and corroborate their descriptions in these sites, except for the areas of tubeworms to the west of the Coromandel. Recent multibeam mapping of the area between the Mokohinau Islands, Little Barrier Island and west/south-west of Great Barrier Island has further confirmed the fisher descriptions of "foul" and patch reefs in these areas (NIWA unpublished) . There was less fisher knowledge in the inner Hauraki Gulf, where trawling has been banned since the 1930s, and therefore no overlap with documented biogenic habitats such as the historical greenlip mussel beds, dog cockle beds, seagrass and other inshore habitats, such as rocky reefs, which have been relatively more studied, particularly within diver depths.

4.3 Bay of Plenty

Eighteen LEK areas, were marked on charts, along with three unmarked sites (mentioned verbally, but not drawn on the chart), by six fishers (Table 4, Figure 6). A number of offshore sites between 100–200 m, several described as "*drop-offs*" and "*canyons*", were places where the fishers had brought up sponges, corals, unusual types of rock, "*riverstones*" (smooth round stones) and an unidentified organism described as "*cauliflowers*" (see Table 4). In these areas, fishers had known clear tows targeting mainly tarakihi. Further inshore on the western side of the bay, several areas of "*hard brown sponges*" were described (no known identification). Inshore habitats noted by fishers in this region included beds of red algae, kelp and horse mussels, as well as patches of foul and greenlip mussels. Both fish spawning (snapper and blue moki) and nursery (tarakihi and snapper) grounds were also mentioned.

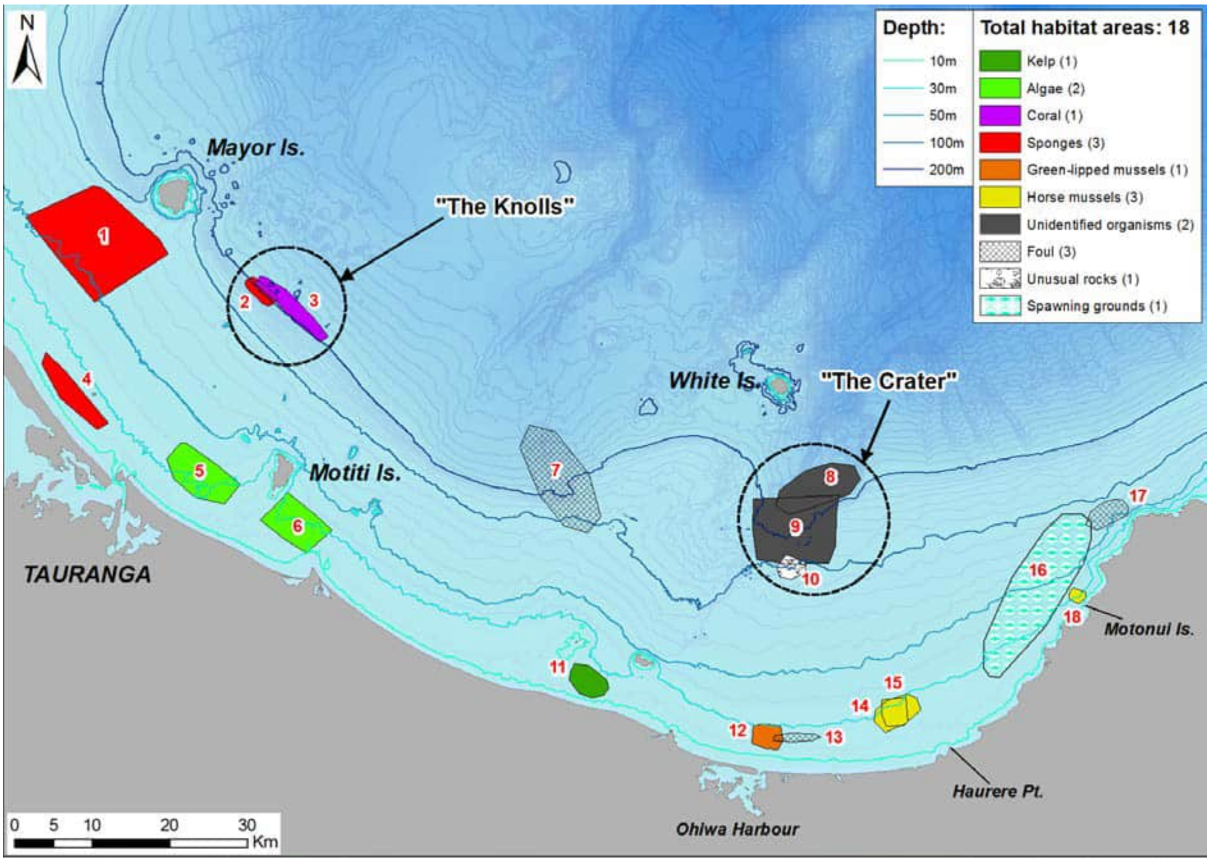


Figure 6: Bay of Plenty LEK map (Region C of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section. Key sites are circled and labelled as black text on white background.

Table 4: Summary table of sites described by fishers in the Bay of Plenty region with area identification number, description, note of fishing impacts where mentioned and the number of fishers who identified overlapping or very close areas. Key sites in bold.

Sites	Area ID no.	Description	Fishing Impacts observed?	Frequency of ID
The "Knolls", south-east of Mayor Island	2,3	Low density sponge or coral bycatch, where juvenile tarakihi were caught. Coral described as "*finger-fat, hollow, yellowy white coral with veins*".		2
south-west of Mayor Island	1 ,4	Sponge bycatch; "*small, hard, brown sponges*" picked up when targeting snapper and trevally.		1
Inshore algal beds	5, 6, 11	Red algae and papa rock in about 25 to 35 m water depth (5, 6) and further east an area where		1

Sites	Area ID no.	Description	Fishing Impacts observed?	Frequency of ID
		detached kelp was picked up after westerly storms (11), associated with small snapper.		
Offshore drop-offs: "The Crater"	7,8,9,10	One area described as a steep-sided canyon with shaley rock and course sand and strong currents where tarakihi were abundant (7). "The Crater" (8,9,10); another canyon feature with large pumice-like rocks. Two overlapping areas noted for bycatch of "*cauliflower-shaped*" organisms that were white in colour, soft, and which, when squashed oozed an "*acid-like*" liquid that stung. Two other fishers verbally mentioned this as an area that was currently fished, with patches of foul and a "coral" bycatch.		4 (The Crater)
Horse mussel beds	14,15, 18	Horse mussel beds on muddy grounds off Haurere Point and Motonui Island. These were fished for flounder and snapper.		2
Inshore reefs / foul	12,13,17	Foul offshore of Ohiwa harbour (13), described as low relief (only 0.5 m off the bottom), but known to snag trawl gear. Greenlip mussel beds also indicated (12). A small patch of "foul" off Waikawa Point was thought to be a potential snapper spawning ground.		2
Spawning grounds	16	A large area off the eastern Bay of Plenty coast noted as a spawning ground for Blue moki.		1

Scientific data sources

A series of trawl surveys was completed in the Bay of Plenty in the 1980s and 1990s (Morrison et al. 2001b), but by-catch records were only collected in the 1999 survey, and were very modest (Morrison & Parkinson 2000). Surveys of intertidal and shallow subtidal rocky reef sites have been carried out around Mayor (Tuhua) Island, White Island and Volkner Rocks, and along the eastern coastline as part of regional and national scale surveys of subtidal reef communities and reef fish (e.g. Smith et al. 2013; Shears & Babcock 2007; Roberts & Stewart 2006; Smith, 2004). The sessile invertebrate fauna of White Island and Volkner Rocks was found to be highly diverse, dominated by sponges, bryozoans, hydroids and ascidians (Smith 2004). Reefs north of Opotiki were described as dominated by grey bracket sponges (*Ancorina* sp.) and red turfing algae (Mead et al. 2005). A classification of the coastal environment of the Bay of Plenty region, from Tauranga to Cape Runaway compiled a variety of data sources including surveys of seagrass, rocky reefs, and interpretation of sediment maps, (Haggitt et al. 2008), with areas of biodiversity interest subsequently identified (Haggitt et al. 2009). In depths less than 30 m, the authors reported that sandy substrate was the dominant habitat, interspersed with rocky reefs and gravel habitats, which were particularly prevalent offshore from Tauranga, around Motiti Island, and formed an almost continuous band along the coastline east of Opotiki out to Cape Runaway. These habitats overlap with areas described by fishers as sites of sponge and kelp bycatch (4, 5, 6, and 11) and marked as foul (17). In depths below 30 m, sand was again described as the dominant habitat by Haggitt et al. (2008), but with areas of deep reef noted around offshore islands and outcrops, which overlapped fisher-drawn areas such as 2 and 3, and patches of gravel, which overlapped fisher areas 1, 7 and 10. Since the grounding of the MV *Rena* in 2011, extensive surveys of subtidal rocky reefs in the vicinity of the Astrolabe Reef and Motiti Island have also been carried out (Battershill et al. 2013). The shallow hydrothermal vents that occur around Moutohora (Whale) Island, White Island and an area in between these sites, known as the Calypso Zone, have also been the subject of targeted studies (Kamenev et al. 1993). In the outer Bay of Plenty, the biodiversity of deepwater habitats along the southern Kermadec Ridge have recently been explored (NIWA, unpublished data). Most of the detailed studies in this region are either shallower or deeper than the fisher knowledge, with minimal overlap between scientific data on biogenic habitats and the fisher knowledge.

4.4 East Cape

Seventeen LEK areas were marked on the charts around East Cape, along with three unmarked sites (mentioned verbally, but not drawn on the chart), by eight fishers (Table 5, Figure 7). This region was dominated by the large areas of foul ground, sponge and coral bycatch, mainly on and around Ranfurly Bank. Soft mud sediments characterized the rest of the area, with fishers commenting that nets were liable to become bogged down in the mud in deeper areas. A series of tarakihi spawning and snapper and tarakihi nursery areas were also marked along the coast of East Cape and Cape Runaway. To the south of Ranfurly Bank, a bycatch of tubeworms and sea pens on the softer mud were described.

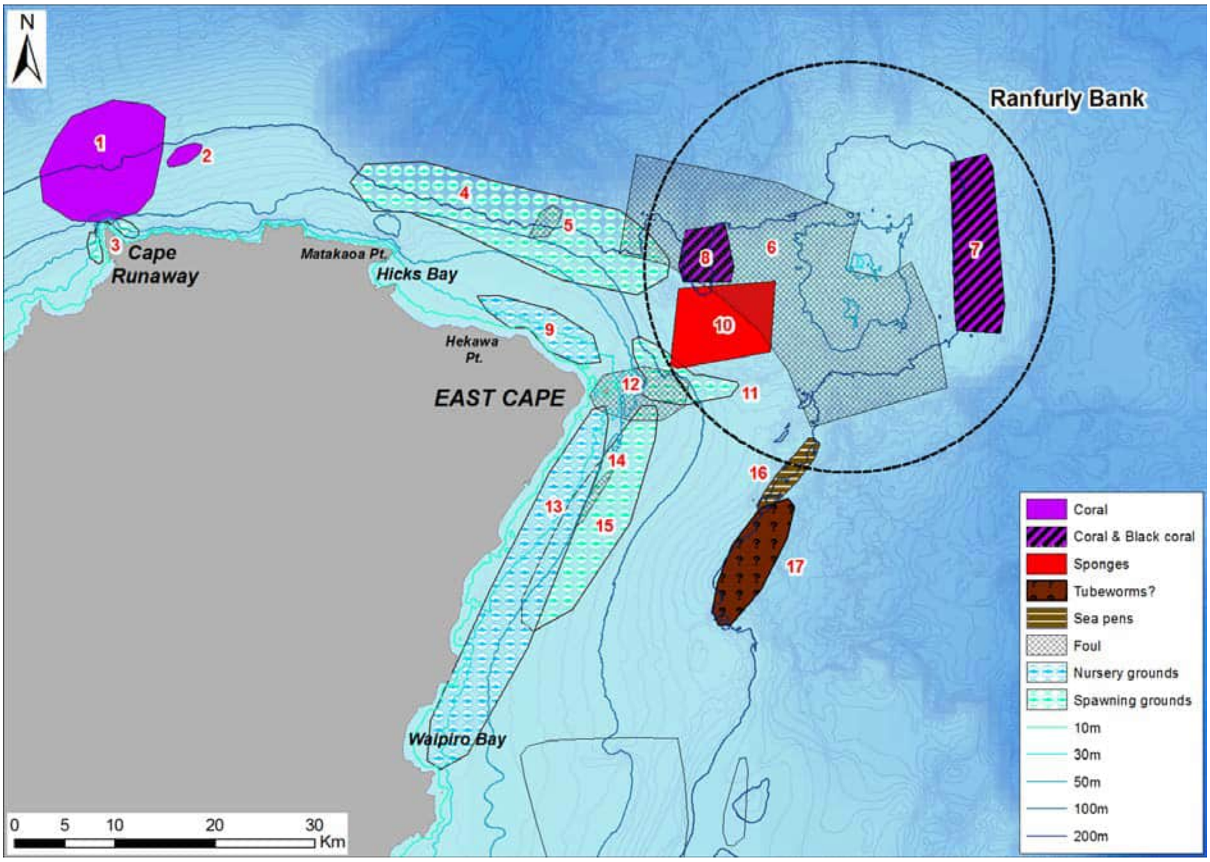


Figure 7: East Cape LEK map (Region D of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section (red). Key sites are circled and labelled as black text on white background.

Table 5: Summary table of sites described by fishers in the East Cape region with area identification number, description, note of fishing impacts where mentioned and the number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	Area ID no.	Description	Fishing Impacts observed	Frequency of ID
Cape Runaway	1, 2	A large area from 50 m+ depth, described as "*a hole with coral in it*" (1). Another fisher described the deep "valley contour marks" as untrawlable, but marked a smaller site to the east inside the 200 m contour where coral and "*lace coral*" (bryozoans) were picked up.		2
Ranfurly Bank	5, 6, 8, 10, 7	Avoided by the retired fishers and marked only as "Foul". Is being "*opened up*" by current fishers, who reported a bycatch of yellow sponges, coral and black coral on the deeper slopes of the bank	yes	4

Sites	Area ID no.	Description	Fishing Impacts observed	Frequency of ID
		where they targeted tarakihi (7, 8, and 10). To the west of the main bank, an isolated patch described as a "*big rock*" surrounded by soft mud was also avoided (5)		
East Cape	12, 14	Inshore of Ranfurly Bank, tows passing along the 100 m contour were clear, but inside of this was described as "*all foul*". Further south off Whakariki Point was another bank of low-lying foul was targeted with handliners for grouper and tarakihi.		1
East Cape Spawning grounds	3, 4, 11, 15	Tarakihi spawning grounds in 50 – 200 m+, historically heavily targeted by trawlers (4, 11, 15). Blue moki spawning grounds (August – September) were marked either side of Cape Runaway (3).	yes	1
East Cape nursery grounds	9, 13	Inshore of the spawning grounds, areas where large numbers of "juvenile" tarakihi and snapper were caught around June were described.		1
Soft sediment habitats	16, 17	Fishing grounds with a bycatch of what were thought to be sea pens (16); "*glowed green in the dark*". Further south (17), what was believed to be tubeworms were caught as a bycatch, coming up in clumps, described as "*white straw, yellowy-white in colour, about 1–2 feet long, solid, but bendy and slimy".*		1

Scientific data sources

This region has received very little scientific research in relation to habitat mapping, although it is known to be an important biogeographic feature influencing the distributions of many taxa (Roberts & Stewart 2006 and references therein). The fish communities of inshore reefs along the coastline were sampled by Roberts & Stewart (2006), who described the reefs as hard sandstone and softer mudstone (papa), supporting a variety of macroalgae, sponges and bryozoan clumps, although some areas were noted to be heavily sedimented. Cole et al (2003), sampled four sites for reef-fish fauna on either side of Cape Runaway as part of a wider survey of the Bay of Plenty, and greater sediment loads on the western side, along with a lack of *Lessonia variegata*. A bathymetry and drop-camera survey mapping the reef habitats down to 40 m has also been carried out, with particular focus on sponge communities found there (Mead et al. 2003). Offshore, Ranfurly Bank was highlighted by the WWF Spotlight Report (Arnold 2004) as an area of unusual / unexpected occurrence of some species, such as endemic red algae (Phillips 2002). The fisher observations of foul along the East Cape coastline (e.g. 12 and 14) overlap predicted reef presence (DOC, unpublished), and the descriptions of coral found in deepwater off Cape Runaway (1 and 2), fit with the known occurrence of deep reef habitat in this area. The fisher observations of juvenile tarakihi agree with data discussed by Vooren (1975), although fisher knowledge suggests that the nursery grounds here may be more significant than previously thought. Similarly, fisher observations of spawning tarakihi match those of Robertson (1978), and observations of blue moki spawning match the general conclusions of Francis (1981).

4.5 Gisborne and Hawke's Bay coast

Nine fishers marked a total of forty-nine areas, along with three unmarked sites mentioned verbally (Figure 8, Table 6). The most commonly mentioned categories were kelp, "corals", and foul. A series of offshore areas of foul were described as banks or pinnacles where "coral" and sponges were picked up in the nets. Many of these areas were sites that had been targeted by gillnetters for blue moki. Fishers variously described coral as "*bushes*", "*fern-like*" and "*twisted and very fragile*", often being retrieved attached to flat papa rock, and recognized images of a variety of corals, including black corals (*Leiopathes* spp), stony branching and cup corals, and gorgonians. Soft yellow sponges, and pale yellow finger-like sponges with a stalk and large grey sponges "*like elephants feet"* were also described. The most frequently mentioned locations were Ariel Bank, "*The Cabbage Patch*", and the "*Wairoa Hard*" and "*Clive Hard*" in shallower depths in Hawke Bay. These inshore reefs, along with others further north, were characterized mainly by the presence of sometimes dense kelp, along with patches of greenlip mussels and scallops. One fisher did not mark the chart but described being able to collect greenlip mussels with a pitchfork from a reef at the entrance to Napier harbour. See Table **6** for more details.

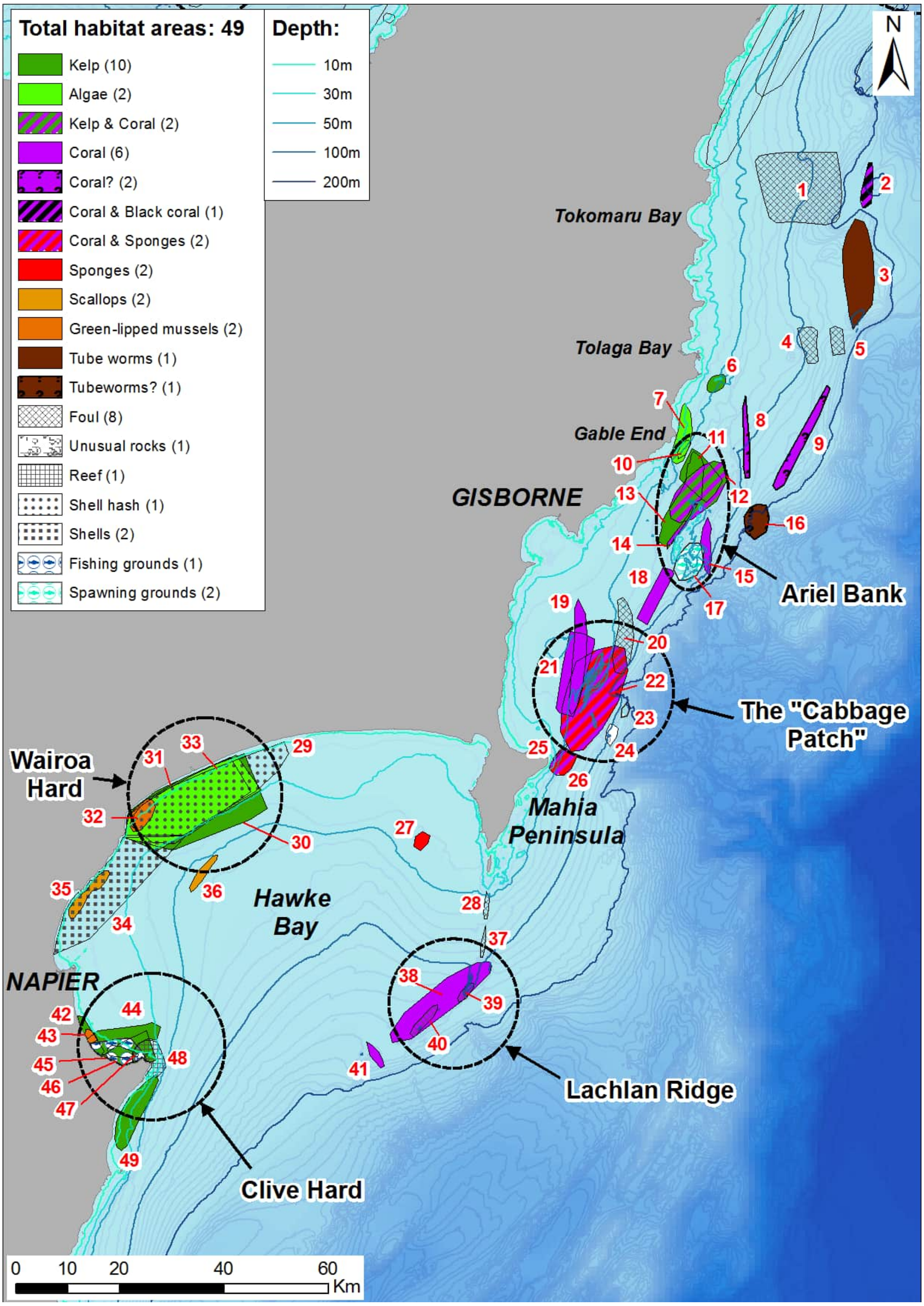


Figure 8: Hawkes Bay/Gisborne region LEK polygon features map (Region E of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section (red). Key sites are circled and labelled as black text on white background.

Table 6: Summary table of sites described by fishers in the Gisborne and Hawke's Bay region, with area identification number, short description, note of fishing impacts where mentioned and the number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	Area ID no.	Description	Fishing Impacts observed	Frequency of ID
East Cape Reefs/ Banks	1,2, 4,5,8,9	Banks, pinnacles and untrawlable ground off Tokomaru Bay, Tolaga Bay and Gable End, mostly in 100+m depth. Coral was mentioned as a bycatch from these areas that were targeted by gill netters for blue moki.	yes	1
Tubeworms	3, 16	Areas where "white straw" was picked up, believed to be either tube worms or sea pens.		1
Inshore reefs	6, 7	In shallower depths (< 50 m) where seaweed including kelp was picked up in trawls.		1
Ariel Bank	11, 12, 13, 14, 15, 17, 18	Ariel Bank itself was noted as a moki spawning site that had been "*hammered*" by gill-netters. Adjacent to the bank were trawlable areas where "*coral*", sometimes attached to slabs of rock and kelp were brought up in the nets.	yes	4
The "Cabbage Patch"	19, 20, 21, 22	There were known tows through or inside this feature, others avoided altogether. Grey sponges "*like elephant feet*" were described, and fishers identified pictures of stony corals, bryozoans and gorgonian fans. Further offshore, two small areas were also marked as moki spawning grounds (23) and a site where pumice-like "*barrels*" were picked up (24).		4
Table Cape / Mahia Peninsula	25, 26	One fisher described this area as being similar to the Cabbage Patch, another described only a "drop off" where tun shells were abundant.		1
Lachlan Ridge	28, 37, 38, 39, 40, 41	Hard ground surrounded by muddy substrate that was fished, occasionally picking up "*coral*".		2
Wairoa Hard	29, 30, 31, 32, 33	A well-known area of hard ground, closed to fishing since 1981. Several fishers described dense kelp forests that clogged the net, others noting the presence of greenlip mussels and shell hash, all commenting on the wide variety of species caught and its importance as a nursery ground for snapper, trevally and blue moki.	yes	5
Clive Hard and Cape Kidnappers	42, 43, 44, 45, 46, 47, 48, 49	Another well-known fishing ground for snapper, flounder, rig and moki, many describing kelp, also red algae, some noting the presence of greenlip mussels. Off Cape Kidnappers, one fisher noted a reef where he had caught a large amount of crayfish (48), and another area of reef and kelp just outside Hawke Bay to the south.	yes	4

Scientific data sources

A number of studies have been made of the seafloor ecology of Hawke Bay focusing on the soft sediment communities (e.g. McKnight 1969; Knox & Fenwick 1978), and shallow subtidal rocky reefs (Duffy 1992). A history of the coastal fisheries of the area documented fisher descriptions of the Wairoa Hard (Tai Perspectives, 1996), mapping areas of low ridges of cobbles and pebbles, and some areas of larger boulders. This report also documented the removal of kelp forests from the Wairoa Hard through the 1960s and 70s. Some limited ROV and side-scan surveys of the Wairoa and Clive Hard found areas of muddy sands and sandy muds, mega-rippled areas of cobbles and gravel, with some brown macroalgae, patches of horse mussels and sponges, but in general little epifauna was present (Thrush et al. 1997). Horse mussels may have been historically more widespread within the bay; Hay (1990), noted that "*vast beds of horse mussels were exposed when the west shore of the Ahuriri Lagoon was uplifted 0.5–1 metre*" after the 1931 earthquake. The Clive Hard was found to be largely muddy sediment, with areas of cobble rubble and bedrock found towards Cape Kidnappers (Thrush et al. 1997). Trawl surveys in the region in the 1960s and 1970s found sufficient juvenile snapper (less than 25 cm) in inshore areas, particularly Hawke Bay and East Cape, for them to be defined as nursery grounds (Paul & Tarring 1980). This suggests the presence of biogenic habitat such as seagrass, horse mussels and shallow reefs, which snapper are known to associate with (Parsons et al. 2014), at least historically, although these surveys, and more recent ones along the east coast (Stevenson, 1996), did not record bycatch. Battershill (1993) reported on observations of the area after Cyclone Bola, with a huge volume of mud being washed into the bay, and associated implications for the loss of biogenic and other seafloor habitats.

The coastline either side of Hawke's Bay was noted in the WWF Spotlight Report for its extensive intertidal rock platforms and seagrass beds (Arnold 2004), and both inshore and offshore subtidal reefs are believed to be widespread. A national scale map of predicted subtidal reefs less than 50 m depth has been produced by the Department of Conservation from hydrographic faring sheets, and this indicates the presence of reefs along much of the coastline north of Hawke's Bay, and also offshore at sites such as Ariel Bank, the Tokomaru Bay foul, the Cabbage Patch, and along the Lachlan Ridge (DOC, unpublished data). Broadscale surveys of shallow subtidal reef communities across New Zealand sampled a number of inshore reefs along this coastline, noting the highly exposed nature of locations such as Mahia peninsula and Gisborne (Makarori, Baldy and Pouawa reefs) (Shears & Babcock, 2007). Overall, these sites had the highest mean biomass of *Carpophyllum* spp and "dense forests" of *Ecklonia radiata* were noted. Other sampling of inshore reefs has focused on the fish communities, including those at Te Tapuwae o Rongokako Marine Reserve, 16 km north of Gisborne (Freeman 2005), and inshore of Ariel Bank, around the Mahia peninsula and Clive Hard (Smith 2008; Smith et al. 2013. Acoustic mapping has been undertaken off Table Cape and other sites around the Mahia peninsula, along with some towed video surveys targeting Te Māhia rohe sites between 16 and 100 m depth (NIWA, unpublished data). The video surveys revealed patch reefs with sponge-covered boulders, as well as evidence of sedimentation (Miller & Ormond, 2007).

A qualitative comparison of the existing scientific information and fisher knowledge in this area corroborates the existence of the reefs indicated by fishers off Tokomaru and Tolaga Bay, the Cabbage Patch, Ariel Bank, Mahia peninsula, Lachlan Ridge and Cape Kidnappers and the existence of patches of hard substrate within the Clive and Wairoa Hard sites. At much greater depths, the region (including the Wairarapa coast) is known to support convergent margin cold seep fauna (Arnold, 2004), but between the shallow subtidal and these deep-sea habitats, there is no known significant scientific information on biogenic habitats.

4.6 Wairarapa Coast

Along the Wairarapa coast, thirteen LEK areas were drawn, along with seven unmarked sites described verbally, by five fishers (Table 7, Figure 9). Biogenic habitats were concentrated along the narrow continental shelf south of Castle Point, where foul ground, shell hash, kelp (*Ecklonia)*, sponges and oyster beds were located by various fishers between Uruti Point and Kahau Rocks. Another *Ecklonia* reef and possible rhodolith bed were noted further south (12, 13), and some rocky outcrops where a coral bycatch was recalled were located in deeper waters (10, 11). North of Uruti Point was mainly described as soft muddy fishing grounds for red gurnard and tarakihi; "Cooks Teeth", north of Cape Turnagain (described as "cleaned out") and another between Uruti and Castle Point. The only area of potential biogenic habitat, was a patch of horse mussels (1) that a fisher associated with good tarakihi catches, noting that smaller "juveniles" were caught to the north. Two further fishing grounds were mentioned, but not marked on charts to the south off Pahaoa River and Te Kaukau Point.

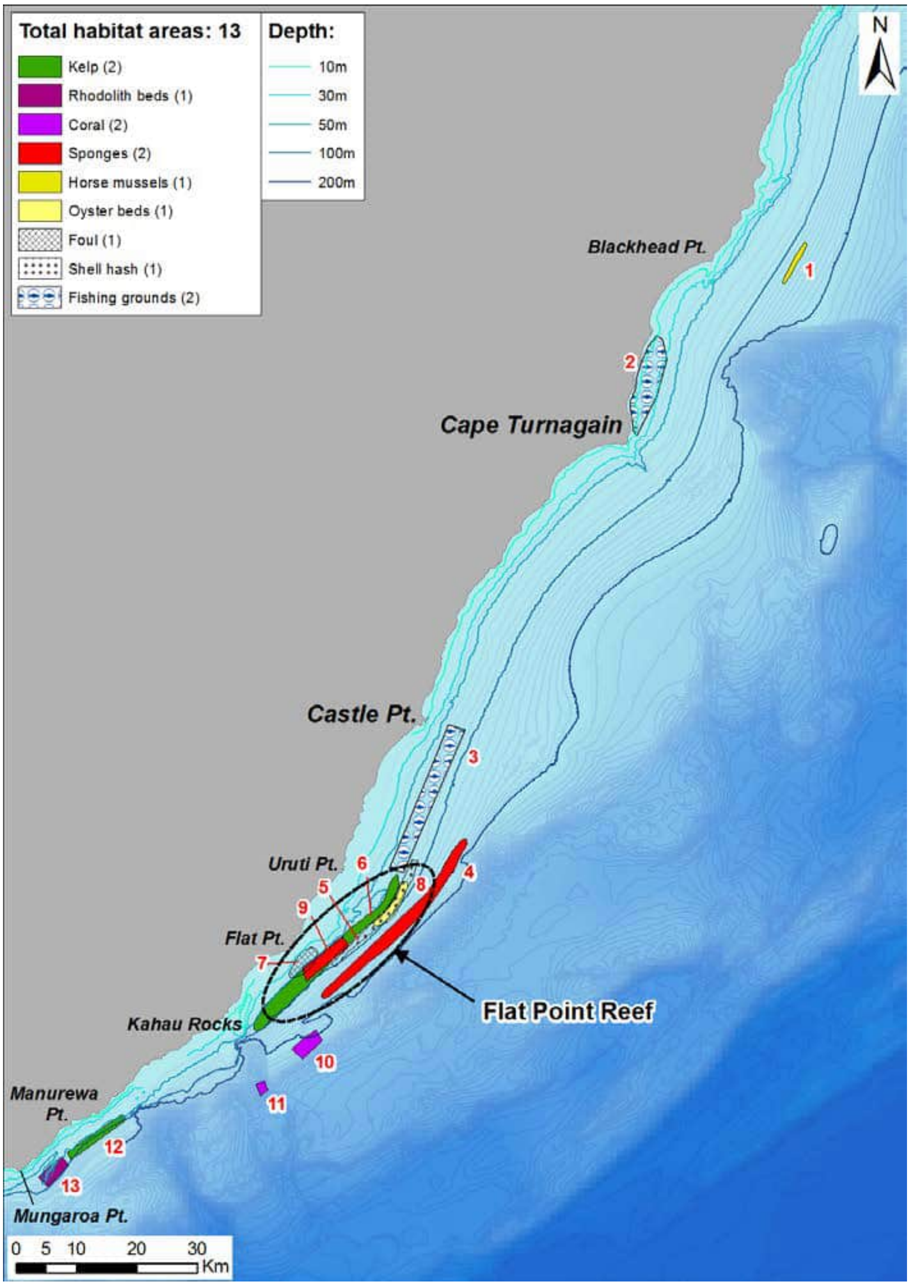


Figure 9: Wairarapa coast LEK map (Region F of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section (red). Key sites are circled and labelled as black text on white background.

Table 7: Summary table of sites described by fishers along the Wairarapa coast, with the area identification numbers, brief description, fishing impacts where mentioned, and number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	Area ID no.	Description	Fishing Impacts observed	Frequency of ID
Flat Point Reef	6, 7, 9	Described as low-lying foul that was not fishable (7). Offshore of this area, an extensive and partially overlapping area classed as rocky reef with *Ecklonia* beds (6), and another site where what were possibly sponges were picked up in the trawl; black on the outside, buff on the inside, with fine, sharp spines and a distinctive smell (9).	yes	3
Shell hash / oyster beds	5,8	An area of shell hash and oysters, partially overlapping the *Ecklonia* reefs of Flat Point.		2
Offshore of Flat Point	4	Occasional white finger sponges caught in small amounts		1
Rock outcrops with ”coral”	10, 11	Occasional pink and white coral snagged when lining for grouper (gorgonians?)		1
Te Kaukau Reef and rhodolith beds	12, 13	One fisher indicated a reef where he sets pots along (13), and believed he found “coral rubble” similar to images shown of rhodoliths. Another marked an area (12) where large amounts of kelp got snagged in his trawl net after a southerly.		2

Scientific data sources

In general, scientific information is sparse along this coast, and where it exists it is focused on shallower intertidal / subtidal rocky reefs, and in the deepwater habitats outside the experience of the fishers we interviewed (although some had spent time fishing for orange roughy along this coast and mentioned the deepwater banks that were targeted). Subtidal rocky reefs and kelp beds, including *Ecklonia radiata*, *Lessonia variegate* and *Durvillaea* spp, are known to occur along this coast, particularly around the major headlands (MacDiarmid et al. 2012). The subtidal habitats between Blackhead and Tuingara Points, including the Te Angiangi marine reserve, have been mapped, and identified multiple areas of reef, comprising mixed algal beds in the shallowest depths (< 20 m), *Ecklonia* forests (10 – 20 m depth), and encrusting invertebrate and sponge flats further offshore (15 – 50 m) (Funnell et al. 2005). This region has been impacted by sedimentation from a recent coastal landslide (Macpherson 2013). An inshore bottom trawl survey was carried out along the east coast of the North Island in the 1990s, but bycatch data were not recorded (Stevenson, 1996). At greater depths along this coast (more than 700 m), cold seep communities have been located and characterized. Along with typical, symbiont-bearing taxa such as siboglinid (tube) worms, vesicomyid clams and bathymodiolin mussels, the presence of coldwater corals was noted around the periphery of seeps, and a new species of encrusting sponge that harboured a diverse macrofaunal epibiont community (Baco et al. 2010). Overlap between scientific data and the LEK areas was found for the fisher-drawn areas between Flat Point and Kahau Rock, which coincide with predicted rocky reef distributions along this coast (DOC, unpublished data), and the occurrence of coral bycatch in deeper waters are located around the edge of one of a series of shelf edge canyons which have been mapped during recent *Tangaroa* voyages (NIWA unpublished data).

4.7 North Island West Coast

Seventeen LEK areas were identified along this coast, by seven fishers (Table 8, Figure 10). The most frequently mentioned area was the "*Petrified Forest*", where fishers described picking up "*black petrified wood*" or "*lignite*". Offshore of the "forest", fishers marked the heads of a number of canyons, which were targeted for tarakihi and were known for unusual rocks and encrusting sponges and corals.

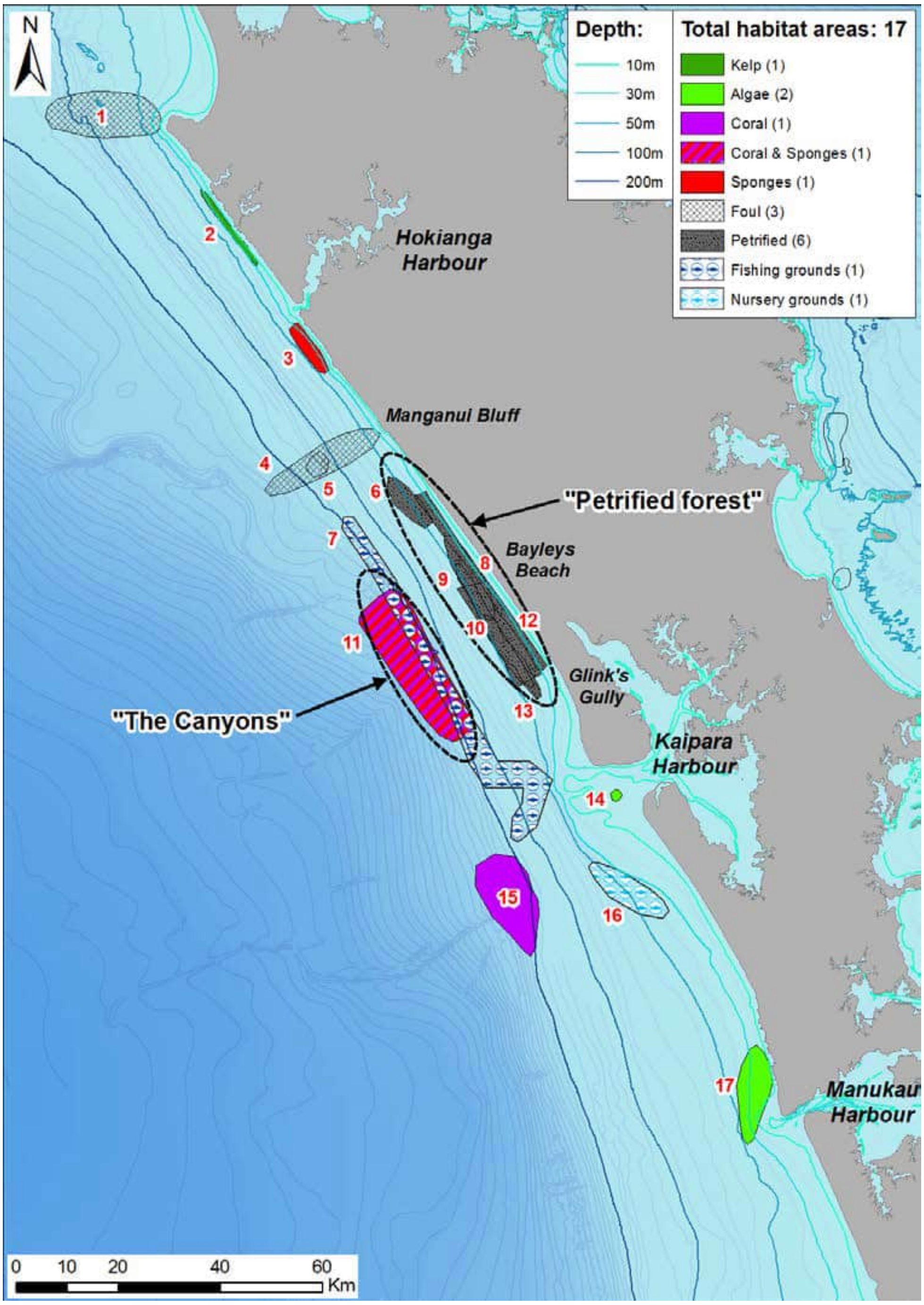


Figure 10: West Coast North Island LEK map (Region G of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section (red). Key sites are circled and labelled as black text on white background.

Table 8: Summary table of sites described by fishers along the West coast, North Island, with the area identification numbers, brief description, fishing impacts where mentioned, and number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	Area ID no.	Description	Fishing Impacts observed	Frequency of ID
The “Petrified Forest”.	6, 8, 9, 10, 12, 13	Between Manganui Bluff and Glinks Gully, fishers picked up what was described as “*black petrified wood*” “black like coal”, in an area that was characterized by an abundance of small snapper (less than 10 cm or 6”) and trevally.		5
Algal beds	2, 14, 17	Outside of west coast harbours, algae (kelp and Caulerpa recognized), sometimes in high volumes, was caught in the trawls.		1
Reef Point and Manganui Bluff	1, 4, 5	Foul ground. The Manganui Bluff foul described as pinnacles.		2
“The Canyons” / “The Trenches”	7, 11, 15	Canyons dropping from around 100 to 200–300 m depth, targeted for large tarakihi. A bycatch of light black pumice that could be encrusted with organisms such as small sparse feathery trees less than 10 cm high, possibly bryozoans, corals and “*elephants ear*” sponges 2–3 ft in size. Another similar feature, called the “*Kaipara trench* offshore of the Kaipara harbour where “coral” was found.		3

Scientific data sources

A series of trawl surveys have been carried out along the west coast, but only the more recent one in 1999 recorded by-catch (Morrison & Parkinson. 2001). Volumes were very modest; the only catch of note was clumps of small green-lipped mussels in close to shore south of Hokianga Harbour, most of which were associated with large branches, and a small tree trunk. A sampling stratum with relatively high numbers of smaller sized snapper (2–3 year old fish) is located on the northern side of the Kaipara Harbour coastline, but trawls did not extend up into the ‘Petrified Forest’ area. Whilst the habitats of the Kaipara and Manukau harbour have been studied in some detail (e.g. Morrison et al. 2014b, d), there is little known information for continental shelf habitats along this coastline. The only known convergence between LEK and scientific information was the overlap of several of the fisher-drawn areas marked as foul / sponge habitat (1, 3, 4, 5) with predicted subtidal reefs (DOC unpublished data).

4.8 North Taranaki Bight

Twenty-one LEK areas were marked on charts, and five sites mentioned verbally, identified by seven fishers along this part of the coast (Table 9, Figure 11). The most commonly mentioned categories were "*Coral*" (could also include bryozoans) along with sponges and foul. Sites marked by fishers were clustered along the edge of the continental shelf; they had noted areas of distinctive rock formations at the shelf break where they picked up coral and sponges. The shelf itself was described as mainly featureless sand although some areas where sea pens, tube worms and "gatherer shells" were common were noted. Another cluster of sites described as hard ground occurred between 50 – 100 m, just to the north of New Plymouth, and inshore reefs were marked along the coastline around and to the north of Cape Egmont.

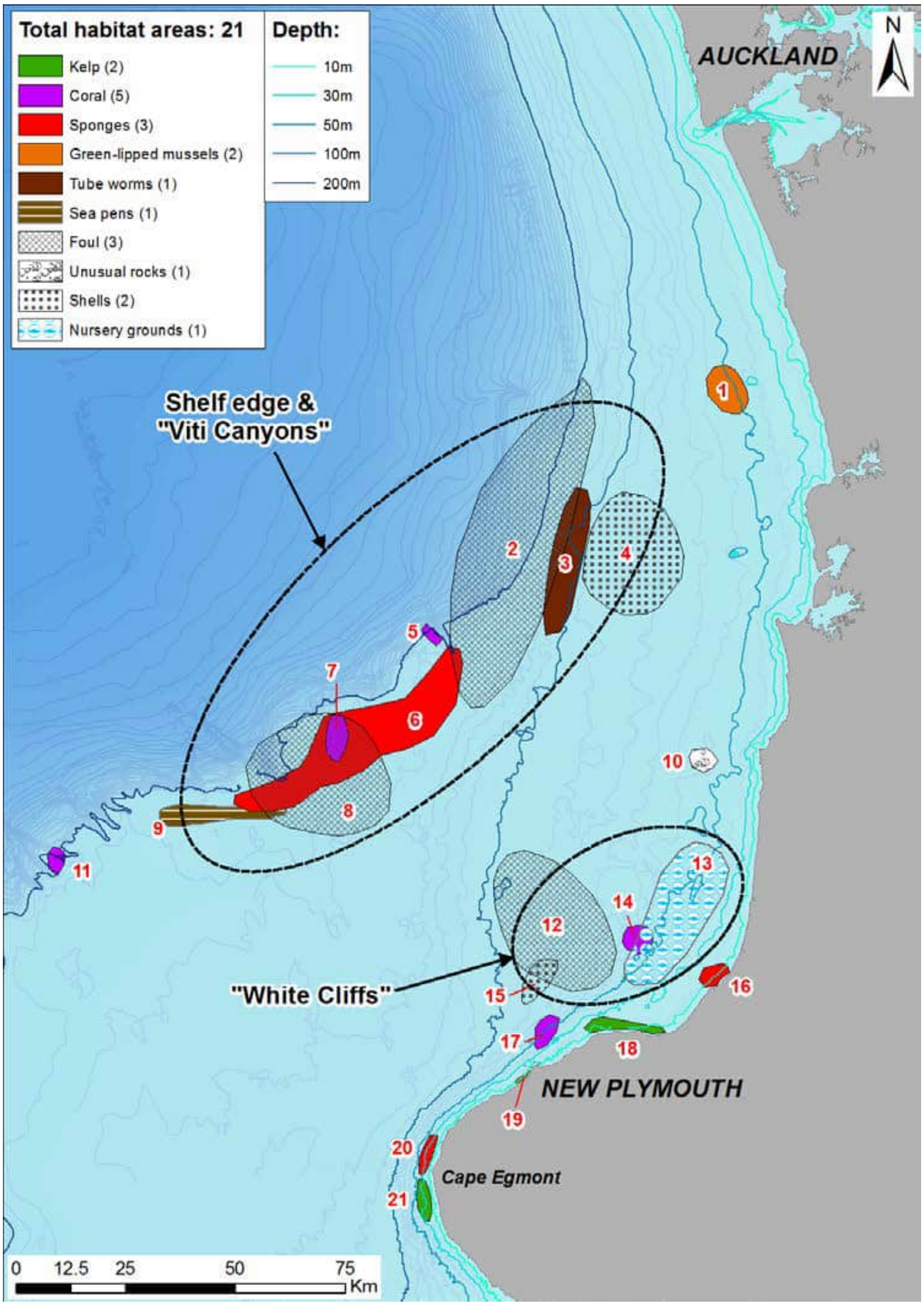


Figure 11: North Taranaki Bight LEK map (Region H of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section (red). Key sites are circled and labelled as black text on white background.

Table 9: Summary table of sites described by fishers in the North Taranaki Bight region, with the area identification numbers, brief description, fishing impacts where mentioned, and number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	IDs	Description	Fishing Impacts observed	Freq. of ID
Shelf edge canyons	2, 5, 6, 7, 8, 11	Series of areas along the shelf break between 100–250 m described as pinnacles and foul ground around canyon heads. Distinctive rock formations were mentioned; "*concrete-like pillars, up to 1.5 m long by 12–15 cm diameter, that break off in square-shaped pieces.*.", and "*papa-like rocks that were like swiss cheese with holes all in same direction*". Bycatch also included grey elephants ear sponges, yellow sponges, "*weed*", "*big trees of coral*" and "*lacey coral*". These foul grounds were targeted by long liners for hapuka, school shark and blue nose. Trawlers targeting snapper, tarakihi and trevally on nearby fishing grounds caught splendid and butterfly perch close to the foul areas.		5
Tubeworm / seapen areas	3, 9	On soft substrate fishers mentioned both sea pens (described as "*pencil thickness*", white in colour, widening out at one end and slimey) and tubeworms.		
"White Cliffs" and other subtidal reefs	10, 17, 15, 12, 14, 13	Areas of hard ground offshore of New Plymouth; "*White Cliffs*" an area of limestone rock ledges believed to be a snapper nursery ground, previously heavily fished (13). The "*Motonui bricks*" an area of boulders and gravel where "*coral*" was picked up (14), "*One way Foul*" consisted of "*swiss cheese*" rock that could only be fished in one direction (10), and "The Acre", known for frilly, razor sharp "*coral*" that tore nets (17). Another large area of foul (12) that was associated with catches of small fish was also located between 50 – 100 m in this area.	yes	2
Inshore reefs	16, 18, 19, 20, 21	Inshore reefs noted as areas of kelp and sponge, and some patches of greenlip mussels		1

Scientific data sources

Little information is available for this coastline, outside of surveys undertaken at the Sugarloaf Islands Marine Protected Area, offshore of the Port Taranaki breakwater, New Plymouth. The work there has focused on shallow rocky reef fish assemblages, and the effects of marine protection. The habitats inside the reserve include steep rock faces, caves and crevices, pinnacles and boulder fields. Habitat-forming species mentioned by such surveys include the brown kelps *Ecklonia radiata* (down to greater than 15 m water depth) and *Carpophyllum maschalocarpum* (to about 6 m water depth), and 'abundant sponges' at one site (Miller et al. 2005). Located on the North Taranaki coastline, the Parininihi Marine Reserve (overlapping the fisher-drawn area 16) is noted for its dense and diverse sponge assemblage on Pariokariwa reef, (Battershill & Page, 1996). The authors described a shallow (10–15 m) boulder and rock outcrop sponge garden characterized by "remarkable densities" of *Polymastia crassa* (occupying up to 70% of the available surface), *Ecklonia* forests, and "Axinellid gardens" in 10 – 20 m depth, where dense (up to 10 per m^2) communities of finger sponges (*Raspailia* and *Axinella* spp.) and *Ancorina alata* were found. Many of the inshore reefs located by fishers (16, 18, 19, 20, 21) were also identified as sites predicted to be rocky subtidal reefs (DOC unpublished data).

4.9 South Taranaki Bight and Kapiti Island

Thirty-nine LEK areas were marked on charts, along with nine unmarked observations (mentioned verbally only) by 14 fishers in the South Taranaki Bight (Table 10, Figure 12). Fishers described a wide range of habitats dominated by descriptions of "*coral*" (likely to include bryozoans), large sponges, and live and dead dog cockles found across large areas of the inner shelf. Further south, horse mussel beds and areas of kelp forest were also outlined. Several fishers talked about "*spongeweed*", described as orange or brown in colour, one believed it to be an algae, but the areas described included depths of up to about 100 m depth. It was thought to be previously much more widespread than present day, due to heavy fishing.

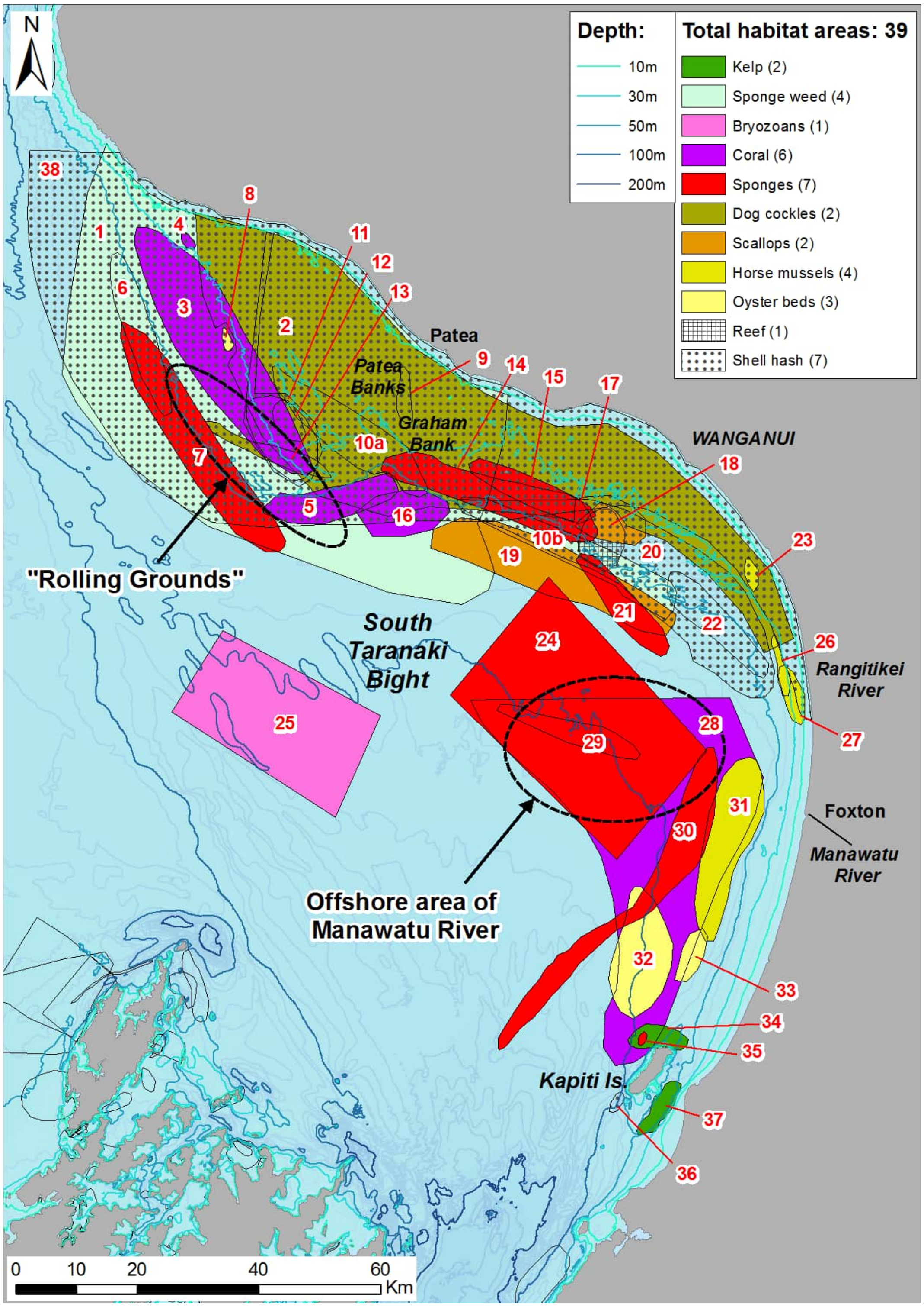


Figure 12**: South Taranaki Bight and Kapiti Island LEK map (Region I of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section (red). Some key sites are circled and labelled as black text on white background.**

Table 10**: Summary Table of sites described by fishers in the South Taranaki Bight and Kapiti Island region, with the area identification numbers, brief description, fishing impacts where mentioned, and number of fishers who verbally described, or identified overlapping or very close areas. Key sites in bold.**

Sites	Area ID no.	Description	Fishing Impacts observed	Freq. of ID
Inshore of Rolling grounds / Patea Shoals	1, 2, 4, 6, 9, 38	One retired fisher marked a very large area encompassing a wide depth range of what he described as "*sponge weed*" (1); brown spongey weed growing on shells, with little tubes about the thickness of a pencil, like a coral, but spongey and smelling strongly of iodine. Trawl gear brought up so much of the weed it needed to be cut from the sweeps with a machete and "*gave your hands hell*". Heavy fishing had removed this weed. A current fisher marked a small area (6) where large volumes of orange "sponge weed" could damage the net. In shallower water, a large area was described as untrawlable, with dog cockles, scallops, patches of bare rock, rock lobster, kina (2). A small area of rock / gravel in about 30 m was located where "coral" was found (4), and patch where shell hash (dog cockle and scallop shells) accumulated in undulations (9).	yes	3
Patea Shoals/ The "Rolling grounds"	3, 5, 7, 10, 11, 12, 13, 38	This area was marked by multiple fishers, many noting it as a large area of shell hash (10, 12), including dog cockles (13), also some patches of hard ground (11), and coral described as hard, white / cream coloured and "*lumpy*" (3, 5), another recognizing pictures of bryozoans (16). In deeper water, the trawl net could pick up very large (1–2 ft across) grey / brown sponges, called "*plumb duffs*", which had a lot of "growth" on them.	yes	9
Wanganui shelf – North and South Traps and Graham Bank	14, 15, 17, 18, 19, 20, 21, 22	Fishers marked a variety of habitats on this part of the shelf, including an area where large sponges were found, sometimes in great abundance (14, 15); a current fisher noted that droppers were used on the net to avoid picking them up. Further south, another area was described as sand hills with grey or cream coloured finger sponges ("*like trees*") being picked up (21). Overlapping areas of reef, shell hash, scallop beds, "*sponge weed*" and "*lacey corals*" were also noted.		3
Bryozoan patch	25	Thought to be bryozoans, associated with leatherjacket catches.		1
Offshore sponge and coral	24, 28 29, 30	This area was noted by three fishers for a high bycatch of both large grey / black sponges, called "*puddings*" and "*coral*" that was described as "*thin, grey clumps…gets quite large*". Nets could get badly damaged in this area.		3
Shellfish beds	23, 26, 27, 31, 32, 33	Two adjacent areas of oyster beds on "hard packed sand" were described by two fishers, one recalling getting 8–9 sacks per tow. Further north substrate was muddier and several areas of horse mussels was drawn along the coast.		1
Kapiti Island Reefs	34, 35, 36, 37	Around Kapiti Island, two areas of Ecklonia beds to the north and in the Rauoterangi Channel were described (34, 37); these reefs were the start of the "*kelpy areas*" which extended south along the coast, where good catches of John Dory were noted. A small area to the south west of the island was thought to be a spawning ground for spotted dogfish (36) and to the northwest of Kapiti another fisher mentioned picking up brown finger sponges in deeper water (35)		2

Scientific data sources

In their study of the sediment facies of the Wanganui Shelf, Gillespie & Nelson (1996) defined three groups of skeletal components found in the shelf sediments. The areas described by fishers as shell hash, dog cockle beds and scallop beds roughly coincided with their "*Assemblage C*" (*Glycymeris*, *Scalpomactra*, *Tucetona*), whereas the sponge and coral areas tend to overlay "*Assemblage A*" (bryozoan, *Talochlamys, Tucetona*). Gillespie & Nelson further described five surficial sediment facies, of which Facies 2 was high-carbonate dominated by skeletal-carbonate material, the bulk of which was described as being fresh and originating from bryozoans and bivalves. In their assessment of bryozoan biodiversity in New Zealand, Rowden et al. (2004) highlighted this region as an area with samples displaying a wide range of biodiversity values from high to low. In a baseline environmental report, MacDiarmid et al. (2010) summarized previous benthic surveys in the region and describe a rugged, high energy environment, with a seabed dominated by sandy substrate, being generally species poor. Surveys in the Kupe South development area, to the west of Wanganui found inshore subtidal reefs, boulder and cobbled habitat supporting encrusting and turfing algae, bryozoan and sponge communities (Haggitt et al. 2004). Further offshore, extensive areas of low-relief hard reef, and exposed mudstone, with encrusting red algae, turfing red and brown algae and sponges was recorded (McComb et al. 2005). In a report on the South Taranaki-Whanganui marine area, Rush (2006) reviewed published information and gathered knowledge from the community through workshops, interviews and mailed questionnaires to boat and dive clubs. The report describes offshore reefs, of "*rubble strewn platforms…supporting corals, sponges and bryozoans*" and the North and South Traps are noted by divers as important features supporting stands of *Ecklonia*, corals and increasing numbers of unidentified tropical fish. The DOC Wanganui Conservancy Strategy (1997) describes some relevant offshore habitat features in the region, which, whilst not based on known quantitative surveys, match many of the fisher-drawn areas; *"A large reef known as the North and South Traps, offshore south of Patea, are of particular interest because of the abundant marine life and tall underwater pinnacles. At a depth of 100 m, the seabed between Foxton and Wanganui supports extensive sponges and numerous characteristic finger-like growths of striking pink and white coralline alga. Several new or previously rare crustacea have also been found in depths of 40–60 m off Manawatu, rubble platforms with a low elevation (25–30 cm above the surrounding bottom) occur. These are a few hundred metres to several kilometres in width. A gravel boulder accumulation with a low elevation is located about 12 km off Wanganui and is well-known to recreational users. Geological survey confirms that these gravels are also found in the Nelson area and on the gravel plain just south of the Waitotara River. Rich fauna of branching corals, bryozoans, sponges, ascidians, crustacea, mollusca, polychaetes and small demersal fish are frequently associated with this type of bottom.*

Recent, extensive surveys have been carried out in the Patea Shoals / Rolling Grounds region as part of environmental assessments for iron sand mining (Beaumont et al. 2013). Video observations identified seven habitat types. Rippled sand was common across the inner to mid-shelf areas out to 50 m depth, with some sand-wave bedforms and isolated low relief rocky outcrops. Wormfields characterized by patches of high density sabellid tubeworms (*Euchone* sp) were found in the northern mid-shelf and deeper areas, with the authors noting the association of a characteristic orange Catenicellid bryozoan with these wormfields (possibly known to fishers as "spongeweed"). In deeper areas (more than 45 m), live dog cockle beds and dead shell rubble were found, with bryozoans (along with sponges, ascidians and other sessile invertebrates) colonizing the shell rubble below 60 m (Beaumont et al. 2013). These descriptions broadly match fisher descriptions of the habitats, particularly if what fishers described as coral could also include bryozoans.

Further south around Kapiti Island, there have been a number of surveys documenting the subtidal reef assemblages (e.g. Shears & Babcock 2007, Battershill et al. 1993), which are also known to occur along much of this coastline (MacDiarmid et al. 2012). Rhodolith beds in 20–25 m depth to the east of the island are believed to be the largest aggregation anywhere in the country (Battershill et al. 1993).

4.10 Cook Strait

Eighteen LEK areas were marked on charts, and five sites described verbally, by seven fishers (Table 11, Figure 13). The Canyon itself was one of the main fishing grounds in the area, with fishing focusing around the edge of the canyon and sponge and "coral" bycatch if tows went too deep. The unusual rocks retrieved by some fishers indicate the presence of hydrothermal vents in this canyon. In shallower depths along the coast of the South Island, horse mussel beds were a memorable feature of certain grounds for retired fishers, although not all were believed to be still in existence, whilst the upper part of the South Island east coast was noted for extensive areas of hard ground and "foul" with clear tows described, targeting tarakihi and stargazers.

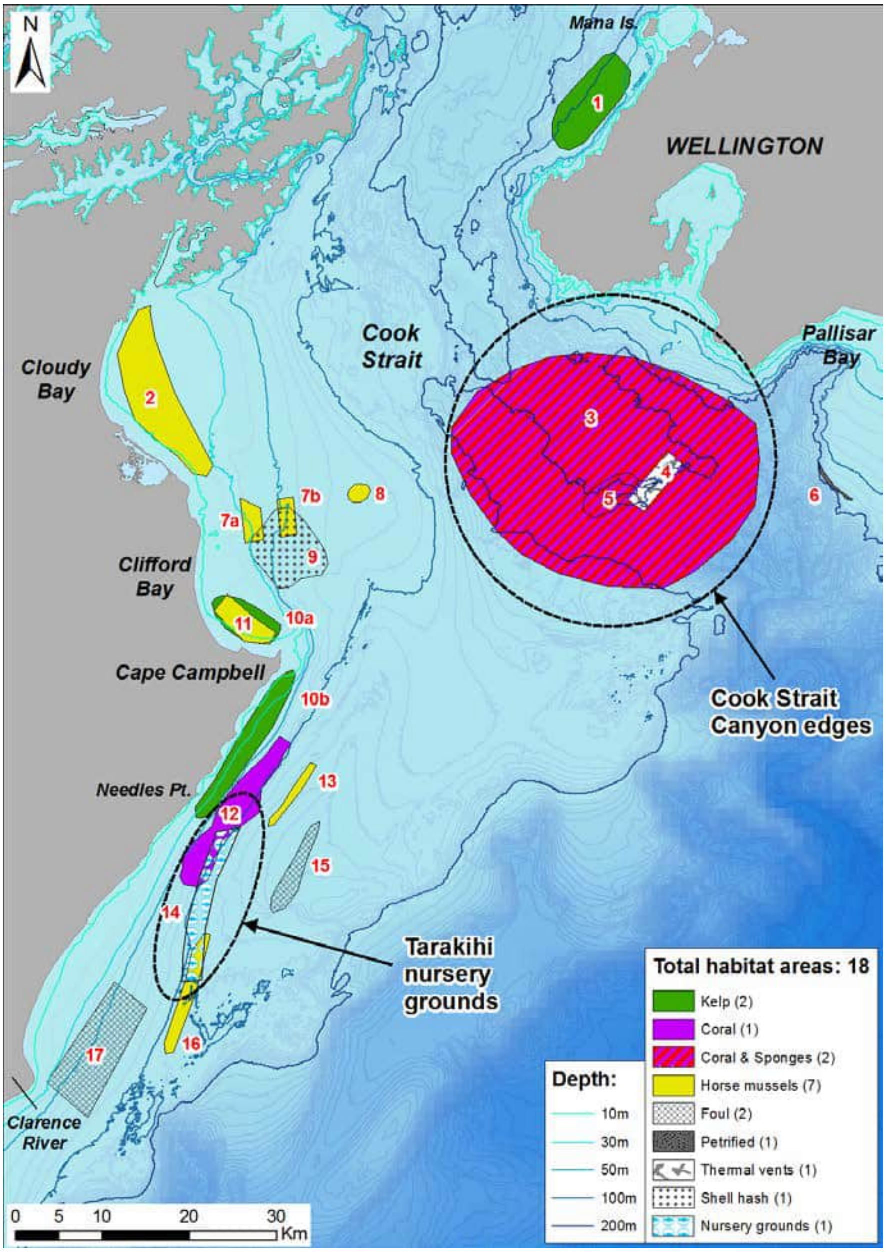


Figure 13: Greater Cook Strait region LEK map (Region J of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section (red). Key sites are circled and labelled as black text on white background.

Table 11: Summary table of sites described by fishers in the Cook Strait and Cape Campbell region with the area identification numbers, brief description, fishing impacts where mentioned, and the number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	IDs	Description	Fishing Impacts observed	Freq. of ID
Kapiti Coast rocky reef	1	The coastline south of Kapiti Island was described as "*kelpy*" with many reefs where John dory catches were good. Kelp was reported in nets to 60 fathoms (110 m) (NB: this might have been drift algae).		1
Cook Strait Canyon	3, 4, 5, 6	The edges of the canyon were productive fishing grounds for tarakihi and warehou, with "*coral*" and sponge bycatch when fishing deeper. Certain areas (4, 6) known for "*petrified wood*"; hollow, tubular rock likely to be thermal vents.		2
Horse mussel beds, S. Island east coast, Clifford and Cloudy Bay	2, 7, 8, 11, 13, 16	Previously dense horse mussel beds that damaged trawl gear, but were not thought to exist now (2, 7 and 11). Small warehou (6–8") were associated with the mussels in Clifford Bay. A smaller patch in deeper water (8) was a present day occurrence. Historical beds along the east coast were associated with tarakihi and warehou when fished more than 30 years ago.	yes	1
Cape Campbell and east coast South Island – Tarakihi nursery grounds	10, 12, 15, 17	This coast was described as having lots of foul / hard ground, with two patches noted on the chart (15, 17). Fishing in the area targeted tarakihi and stargazer, with known clear tows through the extensive foul. A possible tarakihi nursery ground to the south of Needles Point (14), where fish under 6" were sometimes caught. Inshore, kelp was picked up when gillnetting for blue moki (10) and "*coral rubbish*" caught in tows further offshore (12).		1

Scientific Data Sources

The occurrence of various algal habitats along the Wellington region coastline has been reviewed by MacDiarmid et al. (2012), noting subtidal reefs and beds of various kelp species occur throughout the region(Adams 1972; Shears & Babcock 2007,Smith 2008), and *Adamsiella* algal meadows inside Wellington harbour (discovered during Biosecurity surveys). In the offshore regions, the existing biological knowledge of the Cook Strait canyon system has been summarized by Lamarche et al. (2012), who described the faunal assemblages associated with different geomorphic habitats. The occurrence of sponges, scleractinian corals, bryozoans and ascidians from exposed hard substrates on the canyon walls, gullies and bank crests was described, as well as the presence of cold seeps. Both the presence of kelp beds along the Kapiti coast, and the bycatch described by fishers from the Cook Strait canyon are corroborated by the scientific information available. Information available for the Cape Campbell region was limited. An assessment of sites of ecological significance in Clifford Bay noted subtidal reefs in the lee of Cape Campbell, scattered patches of giant kelp, and further offshore, shellfish beds and bryozoans are noted (Davidson et al. 2011). South of Cape Campbell, offshore giant kelp beds were mentioned, although it was acknowledged that little information exists about habitats beyond the intertidal in this region (Davidson et al. 2011). This information broadly matches fisher-drawn areas.

4.11 Kaikoura to Banks Peninsula

Twenty-nine LEK areas were identified by five fishers; with four additional habitat polygons identified around Kaikoura by Scientist 3 (Table 12, Figure 14). Along this coastline, areas of tubeworms were the most commonly mentioned habitat, occurring between 50 and 200 m depth, with some areas of sponges and corals indicated to the north around the Conway Trough and Ridge. Papa rock with coral and sponges attached, scallops and foul were also noted along the edge of the shelf in this region. Inshore patch reefs were marked as foul between Point Gibson and Double Corner, with a large area of bryozoans located offshore of this. Otherwise, the bay was described as soft mud with several patches of horse mussels between 10 and 50 m depth. The tube worms were believed by all fishers to be an algae, described as "*weed*" and "*grass like*", clogging the meshes of the net so that they sometimes filled up with mud. One current fisher described the wireweed as *"6 - 8 inches long, fine, like grass with a smooth, non slimey texture, pale white to brown in colour and about 2mm diameter"*.

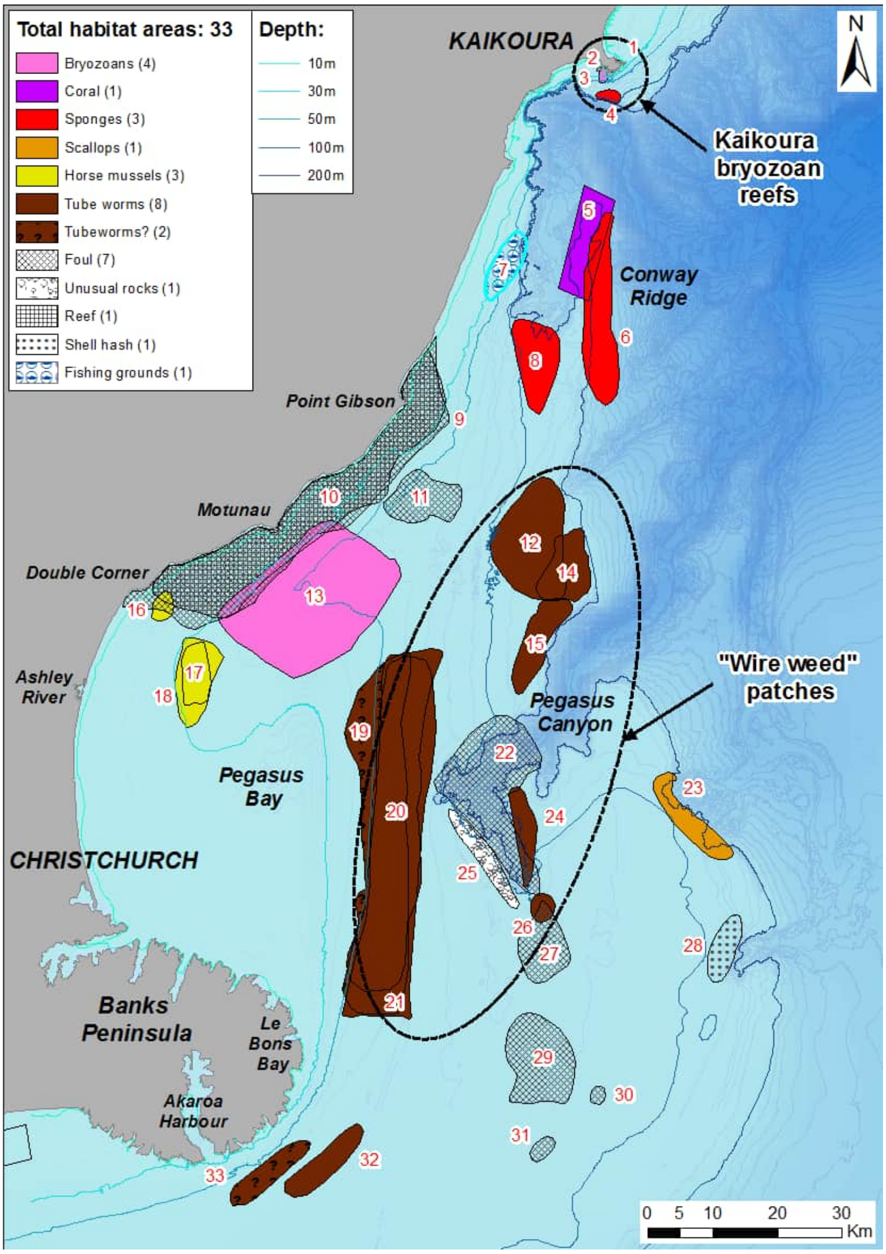


Figure 14: Kaikoura to Banks Peninsula LEK map (Region K of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section (red). Key sites are circled and labelled as black text on white background.

Table 12: Summary table of sites described by fishers in the Kaikoura to Banks Peninsula region with the area identification numbers, brief description, fishing impacts where mentioned, and the number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	IDs	Description	Fishing Impacts observed	Freq. of ID
Conway Ridge	5, 6, 7, 8	Areas marked around the edge of the shelf break as being papa rock that could only be fished in one direction, with sponges and corals caught attached to rock fragments brought up in the net; described orange sponges that were cylinder or cup-shaped, and large branched corals on occasion. This area was infrequently fished, but tarakihi were targeted on certain phases of the moon and bellowsfish also caught (identified by photo).		3
"Wireweed": Tubeworm beds	12, 14, 15, 19, 20, 21, 24, 26, 32, 33	A series of areas marked by 4 fishers along the coast from Banks Peninsula to just south of Point Gibson, described as "*wireweed*"; all believed this to be an algae, "*like grass*". The largest area is in the outer part of Pegasus Bay. Retired fishers who marked this area "*just clipped the edges*" of the habitat to avoid clogging up their nets with the "weed" and soft mud; nets had been lost here. They believed more recent fishing activity using bobbin rigs had probably destroyed much of this habitat; one estimated just 30% remained. Another overlapping area to the north had been fished by them less often, and smaller areas also marked around Pegasus Canyon and off Banks Peninsula. These areas were mainly targeted for tarakihi, and thought to be important for juvenile tarakihi, red cod, warehou, stargazer and barracoutta. Sea cucumbers were also associated with the wireweed, coming up in the nets "*hanging onto the weed*".	yes	3
Pegasus Canyon and offshore foul	22, 25, 27, 29, 30, 31	Rocky outcrops / papa rock were described around the edges of Pegasus Canyon, although no associated bycatch noted. (Areas of "wireweed" were also indicated on the shelf.)		3
Inshore reefs	9, 10, 11, 13	Inshore patch reefs with kelp surrounded by hard packed sand were described along the coast between Double Rocks and Shag Rock, with small patches of shell hash and oyster beds that "come and go". Offshore of these reefs, another fisher described an area of "cornflakes" identified as bryozoans. He described dragging bobbins through the area to break up the cornflakes.	yes	3
Pegasus Bay horse mussel beds	16, 17, 18	Two areas of horse mussels were marked in 20 – 40 m of water in Pegasus Bay. These beds were thought to "come and go", but the offshore area was thought to have been quite extensive. The shells tore the nets, so to avoid damage one fisher towed an old net through the bed before returning the next day to fish for elephantfish.	yes	2

Scientific data sources

Aside from an extensive body of research on the intertidal and nearshore subtidal rocky reefs and kelp beds in this region, particularly around Kaikoura (e.g. Schiel & Hickford, 2001, Shears & Babcock, 2007), little scientific data on habitats (biogenic or otherwise) could be found for this part of the shelf. None of the commercial fishers interviewed gave information about Kaikoura Peninsula, although the area is thought to be fished by both commercial and recreational fishers for sea perch. Benthic habitats have been mapped using sidescan and single-beam sonar supplemented with sediment samples, between Kaikoura Peninsula and Haumuri Bluff (Carter et al. 2004). Extensive areas of subtidal reef and boulder rock aprons were mapped around the peninsula, as well as along the coast south of Pinnacle Rock. These areas of reef were interspersed with areas of both fine and course rippled sand, and muds. The muddy sediments occupying the deeper shelf and slope produced a speckled acoustical signal, which was attributed by the authors to beds of horse mussels. The reefs around the peninsula have been documented by Schiel & Hickford (2001), who described fucalean algae as the dominant canopy forming species at shallower depths, giving way to genticulate coralline algae below 15 m. Sponges and bryozoans were found to make up to 15 and 10% of the cover at all depths (down to 20 m) respectively. Coarse shelly sand with a mixture of coralline algae, bryozoans, and molluscs are known to occur out to 50m depth (1, 2, 3) (Mike Page, NIWA, pers. comm.). On the shelf to the southeast of the peninsula, Carter et al. (2004) identified large areas of pebble gravel pavement. A previous survey in this area used ROVs and dredges to sample the benthic community (4) (Page et al. 1993). Across a depth range of 70 – 100 m, substrate varied from areas of shell (including oyster shells), and cobbles, to boulders of up to 0.75 m, with a benthic community dominated by sponges including *Lissodendoryx* and *Iophon* sp.

Between 1978 and 1980 a continual trawl survey from Cape Campbell to Nugget Point was carried out by the Fisheries Management Division vessel *W.J. Scott* (Fenaughty & Bagley, 1981). Invertebrate bycatch was not formerly reported, but the authors noted that tarakihi catches were best off Point Gibson and the Conway Ridge area where "*The seafloor in much of this region is covered in huge tracts of polychaetes referred to by some fishermen as "tarakihi weed*". The original scanned charts show tow positions in many of the areas outlined by fishers as "wireweed", and the presence of "mud", "weed" and "rough" are frequently noted. Rough ground is also noted on the Conway Ridge and around Pegasus Canyon. Vooren (1975) also referred to a single station from this survey between Christchurch and Kaikoura (station J07/032/72, 45 m water depth), citing the comment "*Included 120 kg of molluscs (Atrina*) [horse mussels] *and 45 kg of starfish".* Subsequent geological surveys in this area have also noted the presence of tubeworms; Carter & Carter (1985) mapped a 255 km^2 area of ridges and gullies on the mid to outer shelf off Canterbury which closely overlaps the northern cluster of fisher-drawn areas. They attributed the topography to mass failure along an unconsolidated sand horizon beneath, which compressed the mud layer into ridges and gullies. These have been eroded by currents, except in areas "*as a consequence of biological stabilization by dense colonies of chaetopterid worm tubes or associated biota*". This area was sampled by van Veen and box Core, and two samples were reported as "dominated by the polychaete *Phyllochaetopterus socialis* Claparede." (Probert & Anderson 1986).

What the fishers described as "wireweed" in the interviews was assumed to be tubeworms, based on the *WJ Scott* observations, and discussions with a scientist who was formerly a fisher in this region; he described what he knew as "*tarakihi weed*" to be "*many interwoven noodles, approx. 25 – 30cm long, probably a polychaete of some description*". The fishers' description of inshore reefs between Double Rocks and Shag Rock match the predicted occurrence of subtidal rocky reefs, as mapped by DOC, (DOC, unpublished data).

4.12 The Canterbury Bight

Nine LEK areas were identified by four fishers in the Canterbury Bight (Table 13, Figure 15), described as being mainly flat, hard-packed sand. The main habitat feature were the “kāeo” (sea tulip) beds, noted by three fishers in the shallow waters of the Bight. To the north of the kāeo beds, an elephantfish spawning ground was described, and in deeper water a patch of horse mussels were recalled by one retired fisher. Beyond 50 m several foul areas were drawn; one reef (“Top Rocks”) within a larger fishing ground where tarakihi are targeted; the fisher described using a larger mesh to avoid catching the undersized fish caught in this area.

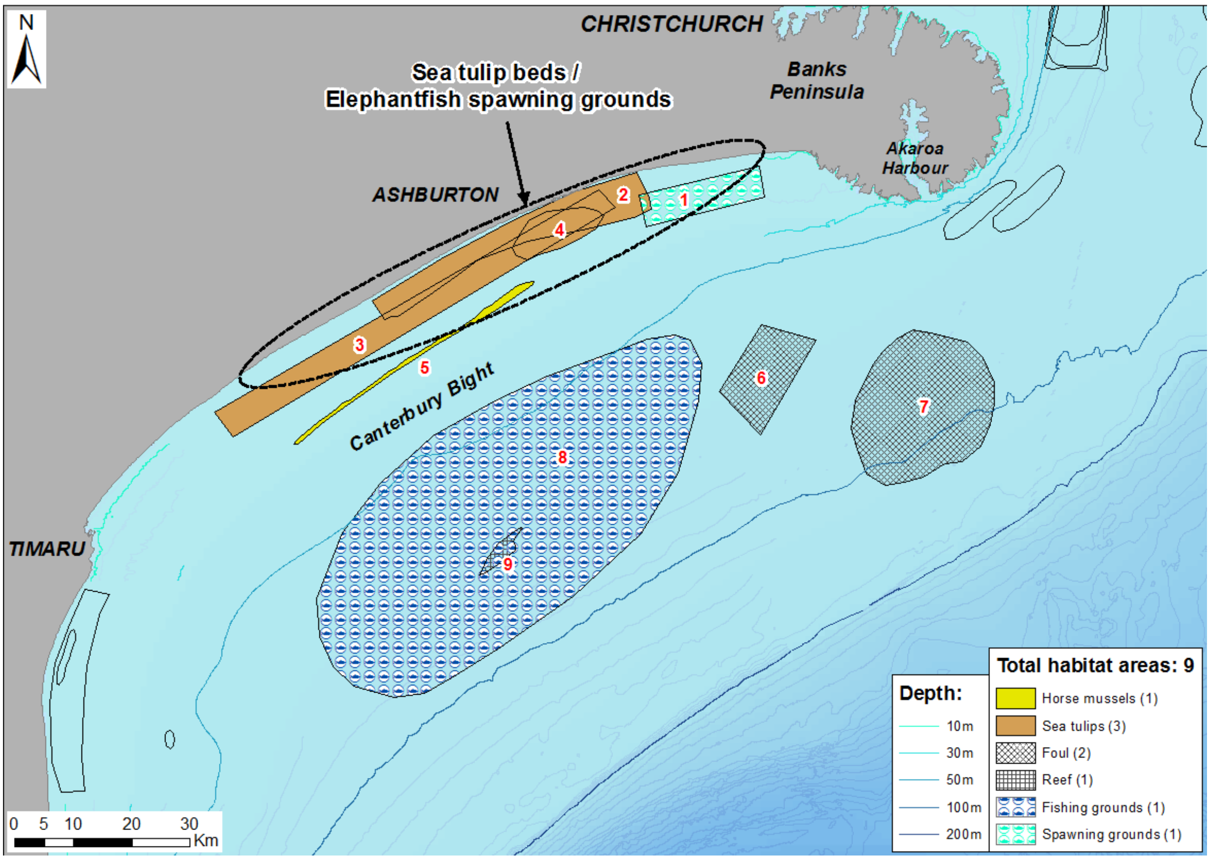


Figure 15: South Canterbury Bight LEK map (Region L of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section (red). Key sites are circled and labelled as black text on white background.

Table 13: Summary table of sites described by fishers in the Canterbury Bight region with the area identification numbers, brief description, fishing impacts where mentioned, and the number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	IDs	Description	Fishing Impacts observed	Freq. of ID
Sea Tulip beds	2, 3, 4	Beds of sea tulips found on coarse gravel / boulder substrate, more dense further south		3
Offshore foul	6, 7, 9	Untrawlable ground between 50 – 100 m; sea perch are caught nearby and one area (9) associated with undersized tarakihi.		1
Horse mussels	5	Many patches were previously present along the coast from Timaru north, but not believed to be there now	yes	1

Scientific data sources

No information on biogenic habitats was found for this area. The original *WJ Scott* charts indicate "rocks" and "foul" in approximately the same areas as noted by the fishers (Fenaughty & Bagley, 1981). Elephant fish are a particular target of the East Coast South Island trawl survey, with 41% of the recorded biomass caught in the 2014 survey from the shallow (10 – 30 m) strata that overlap the sea tulip beds indicated by fishers (Beentjes et al. 2015). The trawl survey has also recorded the presence of the sea tulip *Pyura pachydermatina* in its catches (see Figure 25).

4.13 Timaru to Foveaux Strait

Fifty-two LEK areas were identified, along with thirteen verbal descriptions, by fourteen fishers in this region (Table 14, Figure 16). There were many distinctive habitats described by the fishers, including the kāeo beds (sea tulips) found off Oamaru and Dunedin, the "*Hay paddock*" (tubeworm beds), offshore of Oamaru, and the Otago bryozoan thickets that retired fishers avoided due to the damage they caused their nets. Horse mussels were found in 40 – 60 m between Taieri Head and "North Reef" (Karitane Canyon) and scallops in patches out in deeper water (more than 100 m). Closer inshore a number of reefs were noted, fishers describing dense stands of giant kelp (*Macrocystis pyrifera)* in some places, and beds of blue mussels (Blueskin and Molyneaux Bays).

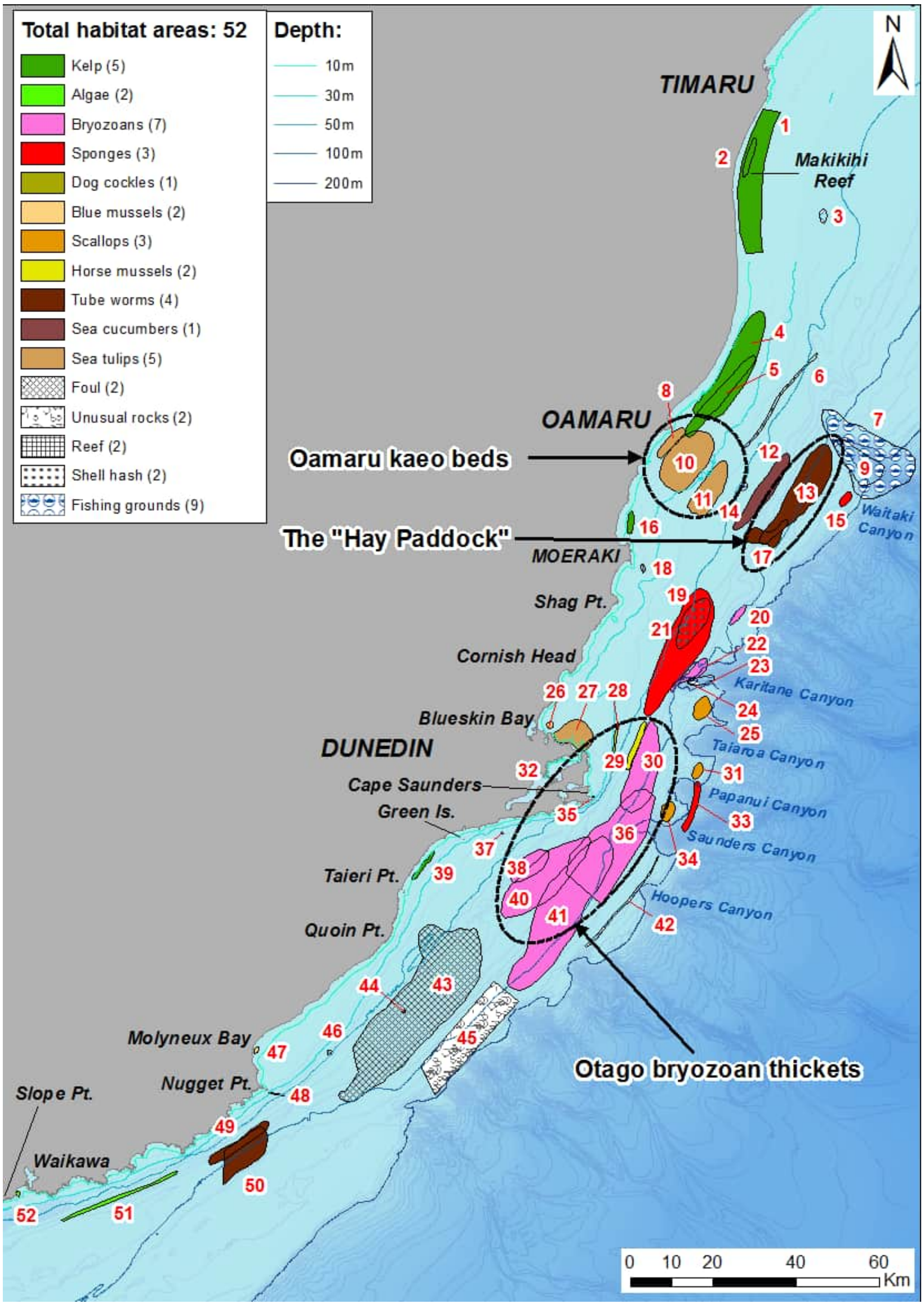


Figure 16**: Timaru to Foveaux Strait LEK map (Region M of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section (red). Some key sites are circled and labelled as black text on white background.**

Table 14: Summary table of sites described by fishers in the Timaru to Foveaux Strait region with the area identification numbers, brief description, fishing impacts where mentioned, and the number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	IDs	Description	Fishing Impacts observed	Freq. of ID
Inshore Reefs, kelp beds and mulloch	1, 2, 4, 5, 16, 39	Makikihi Reef (1, 2) from which drift kelp can accumulate after a swell. Mulloch beds were also believed to exist here (around "*North Rocks*", Timaru), but the charts were not marked. Further south, very dense, untrawlable stands of giant kelp on gravelly substrates were thought to "come and go" (4, 5 16, 37). Noted as a nursery area for tarakihi.		2
Oamaru and Dunedin kāeo beds	8, 10, 11, 27, 32	The "kāeo patch" off Oamaru; the sea tulips come up attached to pebbles / rock. Deeper area marked (11) was not thought to be present anymore. Also found inside Dunedin harbour (32) and Blueskin Bay (27).		3
"The Hay Paddock"	12, 13, 17	An area of dense "*tarakihi weed*" or the "*hay*", described as being pale yellow, with kinks, straw-like, and coming up in clumps. Another noted "*like straw, thickness was less than a drinking straw*". Was believed to still exist, but not so extensive, with pockets of "weed" in deeper water also. Tarakihi were associated with this habitat. This site was also mentioned verbally by several others, one describing "*spongey rubbish and shell hash between 60 – 100m*".	yes	4
Otago Shelf canyons	7, 9, 15, 19, 21, 22, 23, 24, 33	Waitaki Canyon, known locally as "*The crack*", was targeted for bluenose, ling and squid (7, 9). Large temperature gradients here, and a bycatch of grey-green "*fingery sponges*" described. Further south, the shelf around Karitane canyon was a targeted fishing ground (23, 24), where tarakihi were "*just of size*" or undersized; called "*North Reef*" by one, another describing a "*cornflake patch*" along the northern edge (22). Inshore of the canyon, a large area where brown sponges were commonly brought up was noted, also marked as an area of shell hash (19, 21).		2
The "*Cornflakes*"; Otago bryozoan thickets	20, 22, 30, 36, 38, 40, 41	Bryozoan patches were noted by fishers from as far north as Shag Point (20) to Quoin Point in the south (41). Patches north of the Otago peninsula were smaller and in more than 100 m depth, with a more extensive area outlined by multiple fishers in 60 – 120 m offshore of the peninsula. Retired fishers commented that the cornflake patches were avoided or fished infrequently (for tarakihi) due to the damage they caused to nets, but were targeted by set netters. Other bycatch associated with the bryozoan included finger sponges, horse mussels, scallops and shell hash.	yes	5
Shellfish patches	25, 28, 29, 31, 34, 35	Inshore of the bryozoan thickets, horse mussel shells were commonly caught (28, 29), and patches of queen scallops indicated offshore of the bryozoan thickets towards the shelf edge (25, 31, 34). A small dog cockle bed was also marked just north of Cape Saunders (35).		1
Areas of foul / papa rock and crayfish spots	43, 44, 45, 46	Between Quoin Point and Nugget Point, some large areas of foul / papa rock were marked (43, 45) & mentioned verbally, along with several small patches of reef / pinnacles noted as good spots for crayfish (44, 46).		2
"Corally tubeworms"	49, 50	South of Nugget Point, areas of shelly bottom and foul where blue cod are more common were described verbally, but not marked. Two areas were marked as areas of shell hash, "*corally broken material*" and different tubeworms. Soft ones were described as '*tubes of sand*" that came up in		2

Sites	IDs	Description	Fishing Impacts observed	Freq. of ID
		the net after a blow. Harder cases were described as "*corally stuff*", not in clumps.		

Scientific data sources

The marine habitats along this coastline have been relatively well studied, both historically and in the present day. Graham (1962) described the Oamaru region and divided the area into different zones; in 'Zone 2', from 9–55 m, he described kelp dominating down to 27 m water depth, apart from one small strip immediately north of Oamaru Harbour. Sediments were composed of coarse brown gravel and then muddy shell-sand, with a lot of sponge, barnacle and polyzoan-encrusted shells, as well as colonies of mytilids (mussels) infested with polychaetes and stalked ascidians (kāeo). Beyond 55 m was the "*Hay Paddock*", "*...a vast meadow of so-called "tarakihi weed" and numerous other species… bobbins must be used otherwise the net will fill with debris*". Graham identified the worms as *Phyllochaetopterus socialis* (NB: this species assignment has never been confirmed by a taxonomist). At greater depths, small orange finger sponges were mentioned at the south end, but apart from that "*it is excellent for trawling*". Graham also quoted a Timaru trawler man who said that 30 years earlier, they got "*large quantities of shells in their nets, but seldom now find a specimen of erstwhile common species*". In Vooren's description of tarakihi nursery grounds (Vooren 1975), the Hay Paddock is also described; "*… concentrations of young tarakihi there tend to be associated with areas of a rich invertebrate benthic epifauna containing a variety of sponges, worms, echinoderms, and molluscs. The area around Stn J08/041/69, off Oamaru, for example, is locally infamous for the great quantities of sponge usually brought up by trawl nets and. is therefore known among the fishermen as the "Hay Paddock*". In Vooren's appendices, station J08/041/69, in 65 m of water, had a tarakihi catch rate of 1445 fish per hour, with the catch notes describing the by-catch as an "*immense quantity of sponge, with many starfish, molluscs, worms, etc*". The areas drawn by the fishers at the Hay paddock overlapped the station(s) mentioned in Vooren (1975), but are deeper than the area described in Graham (1962). Graham's description of Zone 2, out to 55 m includes sea tulips, corroborating the kāeo beds described by fishers

The Otago Peninsula bryozoan beds have been well studied by researchers and students of Otago University, with two of the fishers interviewed having had spells skippering the University research boat, with their knowledge influenced by this. Informal interviews were also carried out with three scientists from Otago University, who gave general descriptions of the key areas. Probert et al. (1979), Batson (2000), Batson & Probert (2000), Wood (2005) and Jones (2006) have sampled, mapped and described the species composition of these patchy "thickets". Up to 16 different species of bryozoan have been recorded, with the main habitat-formers including *Cinctipora elegans, Hornera robusta, Hornera foliacea*, *Hippomenella vellicata, Celleporina grandis, Celleporaria agglutinans, Cellaria immersa, and Adeonellopsis spp.* Two assemblages have been described on the mid- to outer-shelf between 45 and 130 m, with a rich associated fauna including ascidians, sponges, polychaetes, anemones, brittle stars and asteroids. The bryozoan dominated habitat is thought to be limited to being roughly parallel with Otago Peninsula, (Wood & Probert 2013), with Batson & Probert (2000) reporting that scallop fishers occasionally caught significant quantities of bryozoans south of Hoopers Canyon. The fisher-drawn areas from this survey overlap the scientific maps, but imply bryozoans may extend, or have previously extended further south than this (areas 40 and 41). Some sampling has been carried out at the shelf edge and in the network of canyons in this region; Probert et al. (1979) defined three major epibenthic macrofaunal groupings, and recorded a number of bryozoan species and a chaetopterid worm identified as *Phyllochaetopterus socialis* in the "Upper canyon" assemblage.

4.14 Foveaux Strait and Stewart Island

Twenty-nine LEK polygons were identified, along with thirteen areas described verbally, by twelve fishers (Table 15, Figure 17). Due to the extensive existing scientific knowledge of this region, sensitive fisheries politics, and previous interviews already carried out (e.g., Hall et al. 2009, and unpublished), only three fishers with some oyster dredging experience in the Foveaux Strait itself were interviewed. One of these declined to mark areas on the charts, referring us to the historical maps from Stead (1971). We also interviewed a NIWA research scientist familiar with the area, and four general habitat areas have been included (Keith Michaels, pers comm.).

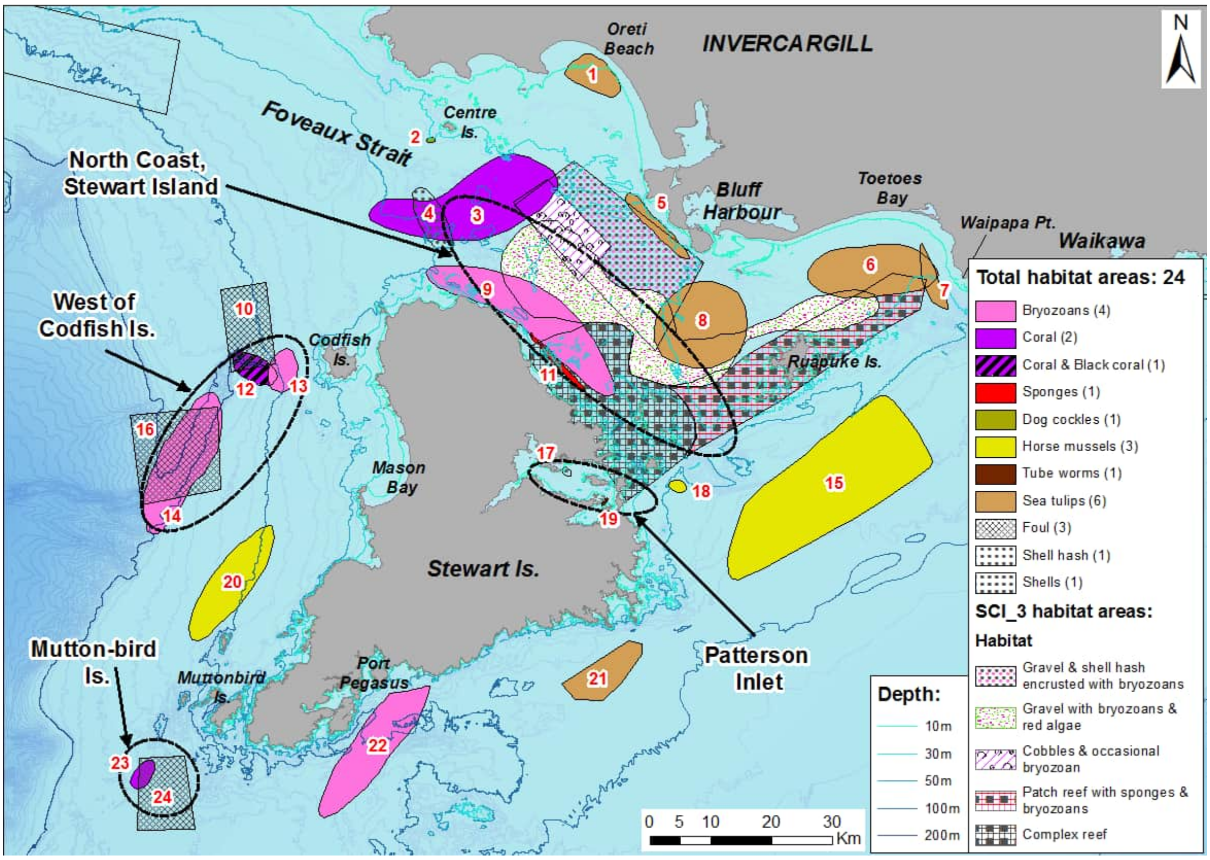


Figure 17: Foveaux Strait and Stewart Island LEK map (Region N of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section (red). Some key sites are circled and labelled as black text on white background.

Table 15: Summary table of sites described by fishers in the Foveaux Strait and Stewart Island region with the area identification numbers, brief description, fishing impacts where mentioned, and the number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	IDs	Description	Fishing Impacts observed	Freq. of ID
Kāeo patches	1, 7, 9, 10, 12, 26	Sea tulips (kāeo) were mentioned by many fishers, mainly in inshore regions of the mainland; Oreti beach (1), outside Bluff Harbour (7), Toetoes Bay / Waipapa Pt (9, 10), and the central eastern Foveaux Strait (12). A verbal reference to "sea apples" found south of Waipapa Pt, along with coral and sponges. Occurred over cobble / shingle seabed, but seemed to "*come and go*", associated with elephant fish and flatfish.		3
Foveaux Strait bryozoans and oyster beds	3, 5, 13 and 16	A large area off the northern coast of Stewart Island was noted as rich in bryozoans with large amounts of dead oyster shells (13). A smaller overlapping site (16) was noted for grey/brown sponges. Further west into the Strait, other fishers marked areas of oyster shell debris (5) and "coral" that was believed to refer to encrusting bryozoans (3).	yes	2
Horse mussel beds	20, 23, 25	East of Stewart Island, patches just outside Paterson Inlet and further east off Ruapuke Island were described as shelly seabed, the fishers picking up horse mussels, sponges, and oyster shells.		1
Paterson Inlet	22, 24	One fisher described towing here before restrictions and being unable to bring the net aboard is was so full of "*mussels, horse mussels, shells, scallops, cockles, starfish and other stuff*". The large tubeworm mounds in the entrance of Glory Bay were mentioned (not from fishing them), and another recalled picking up sponges attached to scallop shells off Port Adventure		1
Mutton-bird Islands (southern chain)	28, 29	Described as an untrawlable patch of reef by one, another had fished and brought up red and black coral.		2
West of Codfish Island; Mason Canyon and Mason Bay	14, 17, 18, 19, 21	A steep-sided canyon "*full of bryozoans and cows horns*" (no known id for the latter), with one fisher describing once trawling up a black coral "*the size of an apple tree*" (14, 17, 18) Further south another area of foul and bryozoans was identified (19, 21). The western coast of Stewart island, particularly Mason Shallows, was mentioned verbally; reefs, "coral" patches (bryozoans?) and sponges.	yes	3

Scientific data sources

There is a relatively rich science literature for this area. In Foveaux Strait, the bryozoan reefs, known locally as "mulloch", and their associated Bluff oyster and blue cod fisheries have been extensively researched, yielding a good understanding of the different habitat distributions in this area (e.g., Fleming 1952, Stead, 1971, Jiang & Carbines 2002, Carbines & McKenzie 2004, Carbines & Cole 2009, Cranfield et al. 1999, 2001, 2003, 2004, Jiang & Carbines 2002; but see Michael 2007). An approximate representation of those habitats was supplied for this project (areas 4, 6, 8, 11, 15). In the main channel, area 8 contained prolific red algae, stalked ascidians, (*Pyura pachydermatina*), *Evechinus chloroticus* encrusting bryozoans, and small patches of sponge (*Crella incrustans and C. chondropsis*). To the north, area 4 was described as gravel and shell encrusted with a thin layer of bryozoans, occasional sea squirts and sponge patches at southern boundary, though not prolific. In the north-western corner, there were occasional patches of hard encrusting *Celloporaria* sp. The eastern end of the Strait was characterized by complex reef and patch reef, heavily encrusted with ascidians, sponges and bryozoans, and interspersed with sand and gravel (Areas 11 and 15).

Around Stewart Island, a number of sites have been surveyed by the University of Otago; mulloch beds were still present off Chew Tobacco Point and Port Pegasus on the eastern side of the island; a variety of sponges and bryozoans were recorded around the Mutton Bird islands to the south; mussels and bryozoans north of Codfish Island, with a lower bryozoan diversity recorded at stations in the vicinity of Mason Canyon (A. Smith, unpublished data). Paterson Inlet (Figure 17) holds a diversity of biogenic habitats, including fields of tube-worm mounds (*Galeolaria hystrix*) (see Smith et al. 2005); red algal meadows of *Adamsiella chauvinii* (formerly *Lenormandia chauvinii*) and similar algal species, bryozoans (especially *Cintopora elegans*) forming large thickets, bivalves (*Chlamys gemmulata*), and abundant and diverse brachiopod 'pavements' (Willan 1981). Hard bottom habitats also include lush forests of giant kelp (*Macrocystis pyrifera*), particularly abundant around Ulva Island (Grange & McKnight 1987). The authors reported that unpublished data collected from Port Pegasus and Port Adventure suggested that similar habitats, particularly the brachiopod and bivalve communities on soft sediment, were present in these inlets also (Grange & McKnight 1987). Fisher descriptions of bryozoan beds and areas of sponge along the northern coast of Stewart Island overlapped with the scientific area descriptions, although fishers also marked areas further west that were not covered by the habitat maps. The available scientific information also corroborated the areas around the Muttonbird Islands.

4.15 The Traps, south of Stewart Island, and the Snares Plateau

South of Stewart Island, the only information available was anecdotal descriptions of bycatch and designated foul areas from *Tangaroa* trawl surveys (Figure 18). An area of unusual sponge habitat (1) was identified south of South Trap (raised rocky reef feature) in 100–400 m. Large areas east and south of the Snares Island were described as unknown foul (flat but foul, possibly rock formations) (2, 4) and a smaller area was thought to have coral (3). A commercial fisher with potting experience in this region talked about The Snares being an area with a lot of coral. They sometimes recovered lost pots from previous years which had coral growing on them. This didn't occur at The Traps, which the fisher believed had no coral and few sponges

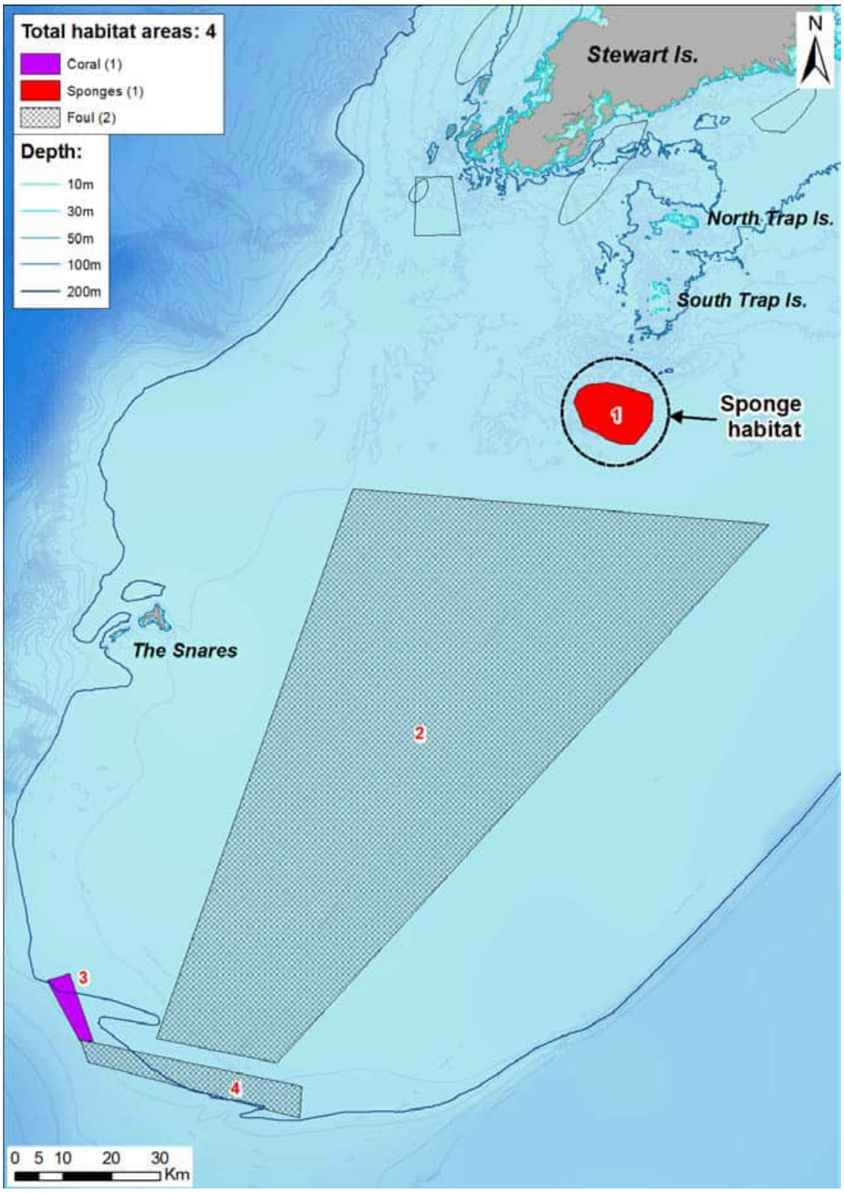


Figure 18**: The Traps, south of Stewart Island and the Snares Plateau LEK map (Region O of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section. Key sites are circled and labelled as black text on white background.**

Scientific data sources

Aside from the anecdotal information of known foul areas and bycatch records, little biogenic habitat information is available for this region. At Hoho Bay, Snares Islands, schools of juvenile tarakihi have been filmed in 10–20 m water depth (April 2008), in association with a thick layer of leaf litter washed off the island making the fish ‘very well disguised’ (Debbie Freeman, DOC, pers. comm.; figure 45a in Morrison et al. 2014a). In addition to leaf litter, large *Lessonia adamsiae* ‘trees’ (endemic to the Snares) were present as the main canopy plant, along with lower height patches of *Caulerpa brownie* (a green algae). Some benthic sampling has been carried out by the University of Otago on the Snares platform, which was described as full of biogenic areas with diverse mulloch beds found in 120–160 m depth (A. Smith, unpublished material). The presence of habitat-forming corals has been recorded at a small number of sites between around 200–300 m across this area and the wider Campbell plateau region, including the recently mapped “Squires Coral Coppice” to the east of the Auckland Islands (Tracey et al. 2011; Mackay et al. 2014).

4.16 Fiordland Region

Of the fishers interviewed that were based in Port Chalmers and Bluff, many had some previous experience of fishing or rock lobster potting in Fiordland. Sixteen LEK areas were drawn, with a further 12 sites described verbally, by seven fishers (Figure 19, Table 16). Certain inlets were described as clean sandy bottom that could be trawled for red gurnard, rig, and skate, – e.g., Milford Sound, Poison Bay (mentioned by two fishers), Looking Glass Bay, Breaksea Sound (one fisher would trawl half way up this sound, although did not mention which arm), and Coal River. Other inlets were avoided; Bligh Sound was described as too muddy, others were too rugged, targeted by cray potters, and known for their coral bycatch (see Table 16). One fisher described "*sea trees*" as having round trunks, like a tree, but like coal, very hard with leaves that were pink and slimey (likely a species of black coral). Offshore of the coast between Puyseger Point and Te Waewae Bay was generally avoided due to the known foul, but no bycatch was mentioned.

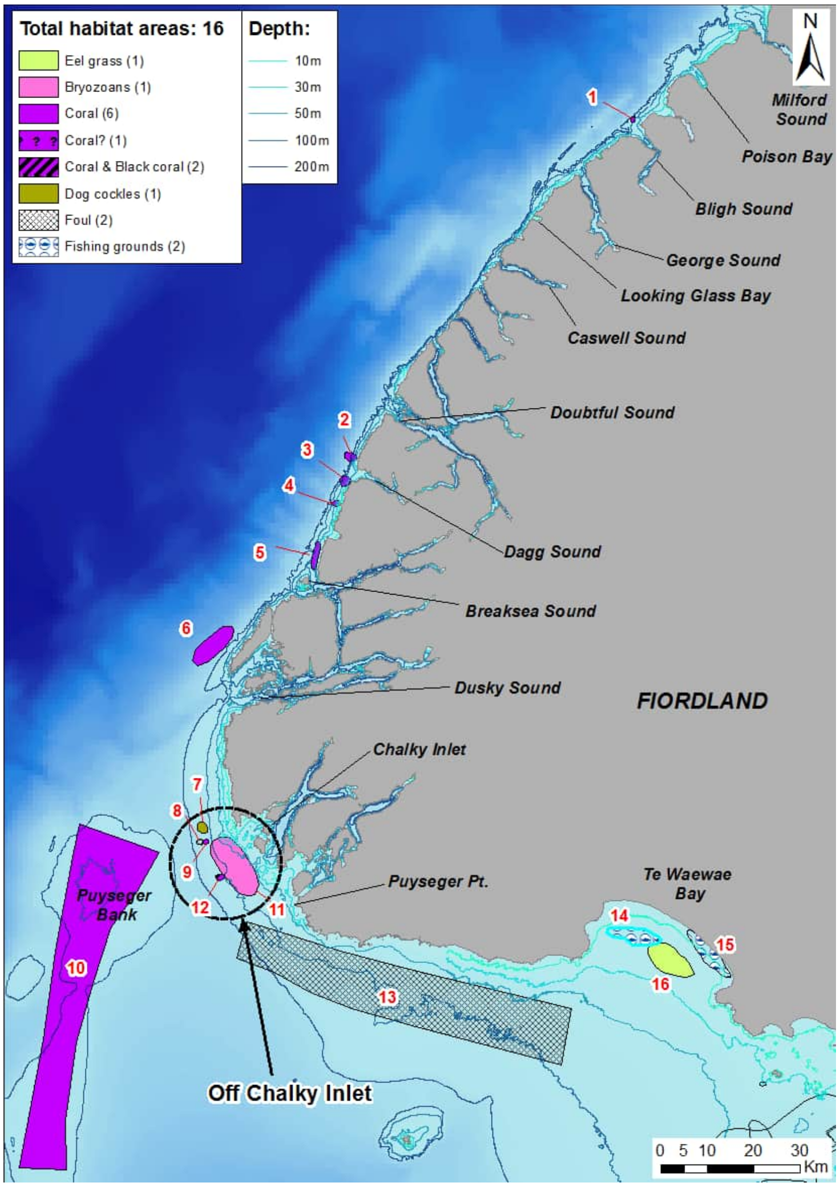


Figure 19: Fiordland region LEK map (Region P of Figure 3). Each fisher-drawn polygon has been assigned a unique number, specific to this regional section. Key sites are circled and labelled as black text on white background.

Table 16: Summary table of sites described by fishers in the Fiordland region with the area identification numbers, brief description, fishing impacts where mentioned, and the number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	IDs	Description	Fishing Impacts observed	Freq. of ID
George and Caswell Sound		Targeted by crayfish potters; the sides of the fiords were steep and fishers aimed for the ledges. Black coral trees were frequently snagged on the lines.	Yes	1
Doubtful Sound		Was targeted with pots for crayfish. A shallow sill in Crooked Arm was noted as having abundant corals, and a 10 ft black coral tree was once pulled up with a cray pot from this inlet.	Yes	2
Breaksea – Dusky Sound coast	2, 3, 4, 5, 6	Along the coast outside these fiords (about 50 m depth), were areas of hard ground, where broken pieces of coral are picked up in cray pots. In some areas, the fishers believe they can pick up large trees of coral on the sounder (or could also be pinnacles).	Yes	1
Offshore of Chalky Inlet	7, 8, 9, 11, 12	Outside Chalky Inlet, a large area (about 13 km long by 6 km wide) was described as having “plate corals” (11), which might be large coralline algae plates (e.g. Freeman et al. 2011), or rock encrusted with bryozoans and other species. Just offshore of this, a smaller site was noted for its rugged terrain (12), where pots had been lost; the fisher believed he could see the large trees of coral on the sounder. To the north, another smaller spot, “*The Porky patch*” was also described as rugged, with 6–8 m high rock ridges and “coral rubble”. (8, 9). A small patch of dog cockles and shell hash was marked nearby (7).	Yes	3
Puyseger Point to Te Waewae Bay	13	Much of the coastline described as very rugged and avoided by trawlers; one fisher had fished for rock lobster a few seasons, and believed the area to be different to the west coast fiords. No specific bycatch mentioned.		2
Te Waewae Bay	14, 15, 16	A sandy bay targeted for flats and elephant fish, known for its abundance of sand dollars. One fisher also marked an area he thought was seagrass.		2

Scientific data sources

A large amount of science research has been undertaken inside the Sounds, initially focusing on the intertidal communities and soft sediment bottoms, which were regarded as being similar to those found elsewhere on the New Zealand continental Shelf (Grange 1990). In 1978, diving surveys discovered the unique communities found on the fiord walls (Grange 1990), and subsequent research has focused on black coral (Grange & Singleton 1981, Grange 1985), red corals (Miller & Mundy 1999), algal diversity (Nelson et al. 2002), blue cod (e.g., Carbines & McKenzie 2004, Rodgers & Wing 2008, Beer et al. 2011), sea perch (Francis & Ling 1985, Lawton et al. 2010), development of habitat maps (Wing et al. 2005), and the “China Shops”, discrete areas where epifaunal diversity is thought to be extremely high (Willis et al. 2010). The fiords recalled by fishers as places with memorable coral bycatch (George, Caswell and Doubtful Sounds), have also been sampled in a number of studies and the presence of coral communities confirmed at certain sites (Grange 1985, Miller & Mundy 1999), with 10 “China Shop” sites found within Doubtful Sound (Willis et al. 2010). Milford and Breaksea Sounds were described as having “clean” fishing tows and Bligh Sound as too muddy to trawl, although all three are known to contain coral communities on the walls at certain locations, with Grange (1985) reporting that Breaksea Sound had a significantly greater density of black coral colonies than all other fiords sampled. Unlike the fiords themselves, no scientific information was readily available for the areas identified by fishers outside on the coast. Further south, Puyseger Bank has been identified by scientists as a known coral and sponge region (10), and inshore of the bank, live and dead bryozoans have been collected in dredge samples which overlap the fisher-drawn areas outside Chalky Inlet (A. Smith, unpublished material).

4.17 West coast, South Island

Twenty-seven LEK areas were identified, and four sites described verbally, by seven fishers (Table 17, Figure 20). Along the narrow shelf, areas of clean hard packed sand were interspersed with known foul grounds, such as the "*Kahurangi Shoals*" to the north and patches of sponge and coral bycatch between Big Bay and Jackson bay, which was known as a good crayfishing area. Between Abbey Rocks and Greymouth, a number of areas were drawn by two fishers and verbally mentioned by another as "*tarakihi weed*". The descriptions and photos of this "weed" identified it as a sea pen, possibly *Acanthoptilum longifolium*. Historically, these beds, which were fished for tarakihi, were particularly dense at the shelf edge, especially around the edges of Hokitika and Cooks Canyons, but one fisher described them as having disappeared.

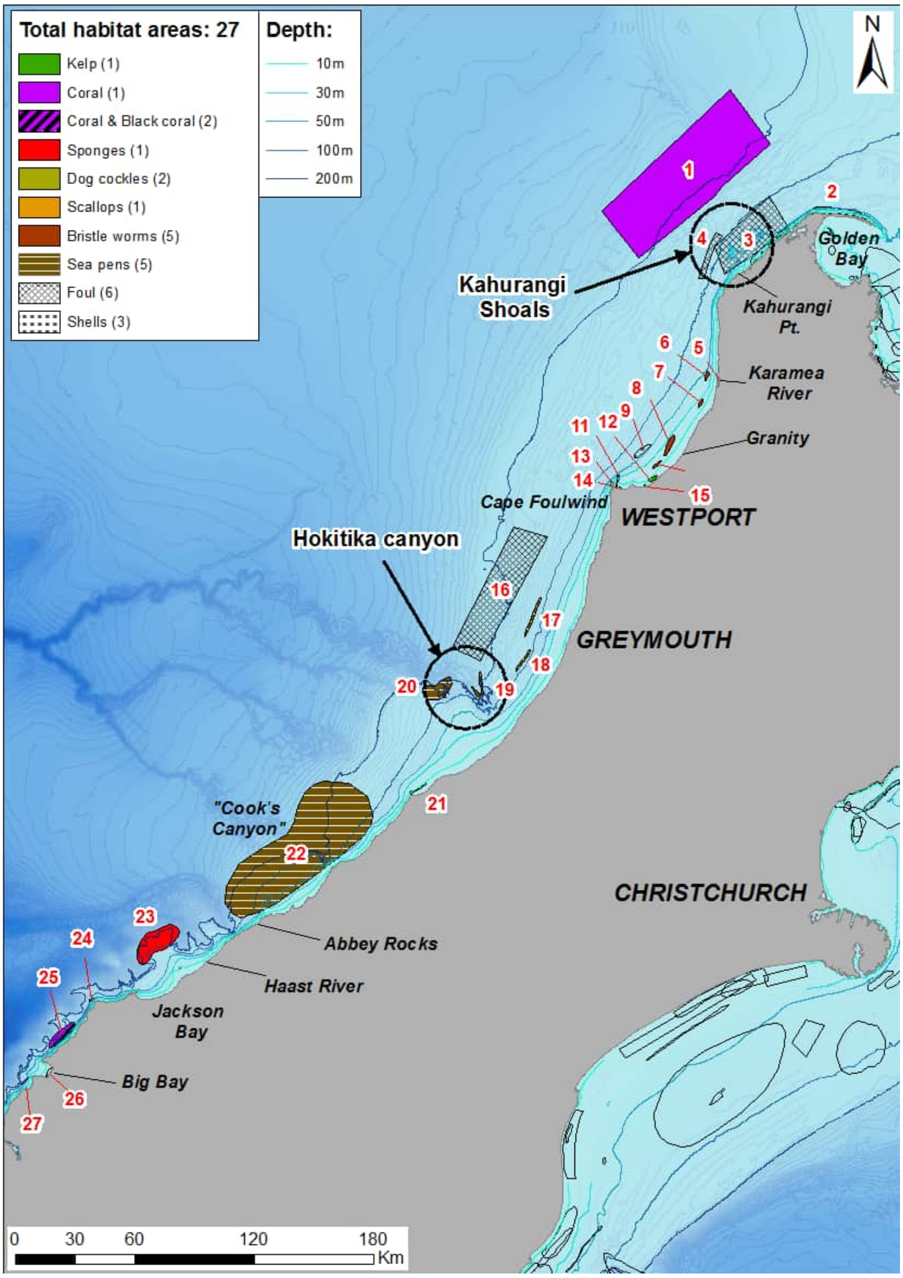


Figure 20: West coast South Island LEK map (Region Q of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section. Key sites are circled and labelled as black text on white background.

Table 17: Summary table of sites described by fishers in the West coast South Island region with the area identification numbers, brief description, fishing impacts where mentioned, and the number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	IDs	Description	Fishing Impacts observed	Freq. of ID
Kahurangi Shoals and "*Heaphy Valleys*"	1, 3, 4	Areas marked as foul, with the offshore area known for coral bycatch (1). Have been targeted by longliners for grouper. John dory also associated with these areas.		1
Cape Foulwind and north	5, 6, 7, 8, 10, 11, 12, 13, 14, 15	Small patches of foul, kelp (11, 12, 13), and dog cockles (14, 15) around Cape Foulwind. Clear mud/sand to the north, fished for flatfish, with dense patches of bristleworms mentioned (5, 6, 7, 8, 10).		1
"Tarakihi weed" / sea pen patches of Hokitika and Cooks Canyon	17, 18, 19, 20, 22	Beds of sea pens associated with hard packed sand in depths of 80–160 m, but around the edges of canyons and drop-offs this "*tarakihi weed*" tended to be denser and associated with rougher terrain and boulders. Offshore was thought to be a large area of untrawlable foul. The weed in this case was described as "*beige coloured, slimey, like a quill, thicker at the base*", and "*several feet long, snotty, with nodules thicker at the base and getting thinner towards the tip*".	yes	2
Foul / Coral / Sponges	23, 25, 27	Offshore areas of reef or foul ground where red finger sponges associated with *Ecklonia* (23) were found, or coral / black coral fragments (25, 27).		2

Scientific data sources

Intertidal and shallow subtidal reefs and their fish communities have been studied at some locations along the coast (e.g. Shears & Babcock 2007, Neale & Nelson 1998, Roberts et al. 2005), but information on biogenic habitats in greater depths was not found. The continental shelf along this coast is characterized by high rates of sedimentation (Carter 1975) and largely dominated by soft sediment habitats, becoming finer and more uniform in texture to the south (Probert & Swanson 1985). A regular inshore trawl survey is carried out along this coast, with some large areas of untrawlable grounds defined as part of the survey strata, particularly south of Cape Foulwind (Stevenson & MacGibbon 2015). Many of these areas are associated with the heads of the many canyons that intersect the continental shelf along this coast, as well as the gravel beds of the Kahurangi Shoals further north. Apart from this mapped information, which overlaps in places with fisher-drawn areas, virtually nothing is known of these habitats. No scientific information on the tarakihi weed described from this coast was found, apart from anecdotal observations of a scientist who had worked in this area; "*Years ago when fishing 60–80 fathom (always outside of 60) between Hokitika and Greymouth, used to catch lots of 'Tarakihi weed', looks like barley, about 2 foot long stalks, khaki colour, very slimy. Has a grain-like head on stalk and long leaves, like marron grass. The beds were extensive, the net coming in 'saturated' from wings to bag, but hasn't seen a stalk since 1975–1980. The reason it was called tarakihi weed is because it was a good spot to get good hauls of TAR.*" (D. Robertson, pers. comm. to MM) (NB: possibly Long-leaf sea pen, *Acanthoptilum longifolium*).

4.18 Tasman Bay and Separation Point

Thirty-two areas and one unmarked site were described by eight fishers (Table 18, Figure 21). Overlapping areas were marked at two main locations where fishers described picking up "coral", which was likely to refer to bryozoans; the bryozoan reefs of Separation Point, and an area to the west of D'Urville Island, where sponge bycatch was also mentioned. In shallower water, a variety of shellfish beds (mainly horse mussels), and areas of shell hash were marked, particularly in Tasman Bay. In the deeper part of the bay, a fishing ground notable for high catches of leatherjackets was marked (8).

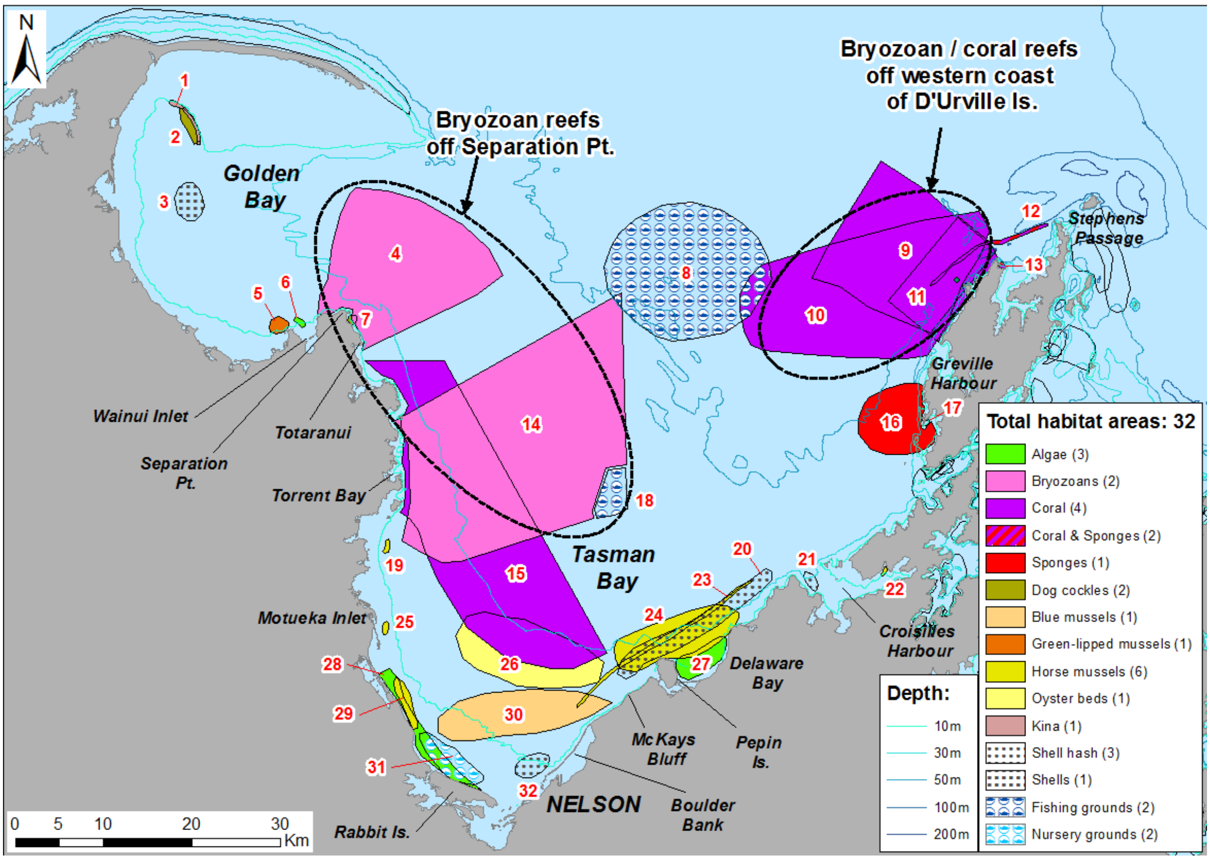


Figure 21: Tasman Bay and Separation Point LEK map (Region R of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this regional section Key sites are circled and labelled as black text on white background.

Table 18: **Summary table of sites described by fishers in the Tasman and Golden Bay region with the area identification numbers, brief description, fishing impacts where mentioned, and the number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.**

Sites	IDs	Description	Fishing Impacts observed	Freq. of ID
Golden Bay	1, 2, 3, 5, 6, 7	Mainly described as sandy / shelly with small patches of shell hash and shellfish noted in places.		1
Bryozoan reefs of Separation Point	4, 14, 15	A large area (4) outlined from Wainui Bay in an arc through to Totaranui, extending out for 12 nautical miles. There was a "*natural corridor*" between this and another area (14, 15), where the "*coral beds*" were more rubble compared to the bryozoan clumps in the closed area of Separation Point. The corridor and a small area called Harvey's Bight (outer corner as shown) were "*clean*" and fishable for snapper, John dory, trevally, and tarakihi before closure in 1980.	yes	2
Shellfish beds, inner Tasman Bay	19, 20, 21, 22, 23, 24, 25, 26, 29, 30, 31, 32.	Fishers indicated various shellfish beds and areas of shell hash in the shallow inshore Tasman Bay, including horse mussels in under 10 m, blue mussels and a historic oyster bed that was "*long gone*". Adjacent to one horse mussel patch (29) a snapper nursery that was avoided by fishers was marked (31), with another overlapping area marked by a third fisher as an area of dense seasonal lettuce weed (28).	yes	3
Bryozoan / coral reefs off D'Urville Island	9, 10, 11, 12,	A large area off the western coast of D'Urville Island marked by three fishers as "coral" (likely to be bryozoans), and described was "*hard to tow over*". A fourth fisher drew a narrow overlapping strip (12), where he believed he had been the first trawler to "*break in*" this area; he recalled sandy coloured finger sponges and corals. It was noted for abundance of leatherjacket as well as "*charity*" tarakihi (25–30 cm)	yes	4
D'Urville Island sponge patches	13, 16, 17	A small patch of abundant sponge and "coral" was indicated at the northern end of D'Urville Island (13), another larger area at the SW end was noted for large, round orange sponges called "*pumpkins*" (16). A tiny area was marked as an area of high numbers of juvenile leatherjacket (17).		1

Scientific data sources

Separation Point and its bryozoans have been the focus of several studies/reports (Saxton 1980a, b, Bradstock & Gordon 1983), with Grange et al. (2003) using side-scan sonar to map the extent of the bryozoan beds, along with some limited ROV drops to ground-truth the different seafloor types. The area currently closed to fishing, where Grange et al. (2003) estimated bryozoan communities (main species *Celleporaria agglutinans*) covered of around 55km^2 overlaps with area 4. The bryozoan beds were more widespread historically (Saxton 1980a & b), extending south to Torrent Bay, which overlaps the fisher-drawn areas 14 and 15. These beds were described as less dense than the Separation Point beds, probably composed of the more fragile *Hippomenella vellicata* (Grange et al. 2003). They were largely destroyed by fishing (Saxton 1980b), although subsequent surveys have recorded scattered small mounds inside the Tonga Island Marine Reserve (Grange et al. 2003). Bradstock & Gordon (1983) also provide a species list of 94 bryozoan species collected at a single station, 75 m depth, located within the areas marked by fishers in north eastern Tasman Bay off D'Urville Island.

4.19 Marlborough Sounds

Forty-five LEK habitat areas and one unmarked site (mentioned verbally, but not drawn on the charts) were described by six fishers (Table 19, Figure 22). This area was rich in biogenic habitats. The most commonly mentioned bycatch types were sponge and "*coral*". The latter most likely to be the hard bryozoan species found in Tasman Bay. Multiple areas of both sponges and corals were noted along the coat of D'Urville Island, and areas of sponge were also mentioned along the inner Pelorus and Queen Charlotte Sound (39). Horse mussel beds were also frequently noted. Some areas were mentioned by multiple fishers, such as the east and southern coast of D'Urville Island, but these were recollections from 20–30 years ago, and some comments were made about areas being discovered and "*cleaned out*". Another fisher thought that sponge habitat in the inner Pelorus Sound may have been impacted by mussel farms.

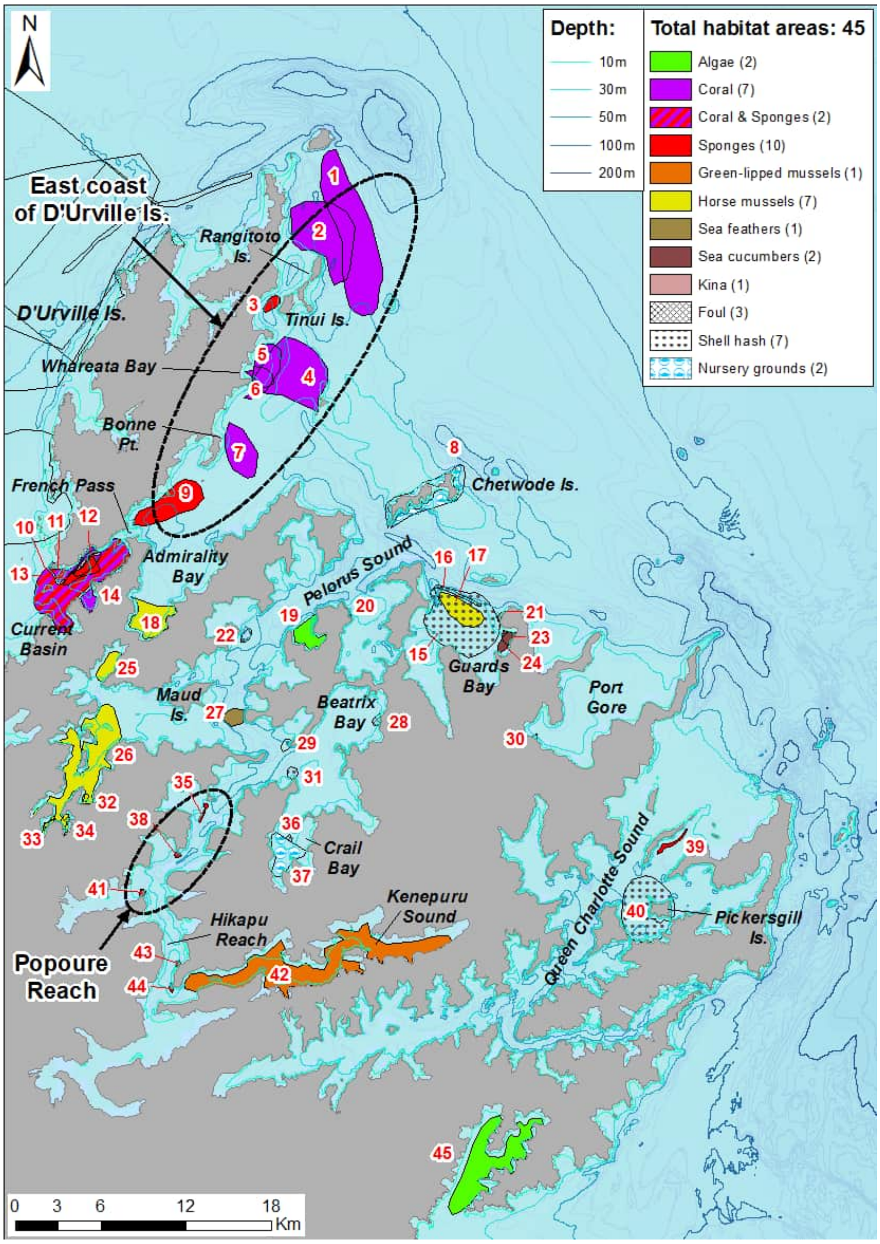


Figure 22: Marlborough Sounds LEK map (Region S of Figure 3). Each fisher-drawn area has been assigned a unique number, specific to this region section. Some key sites are circled and labelled as black text on white background.

Table 19: Summary table of sites described by fishers in the Marlborough Sounds region with the area identification numbers, brief description, fishing impacts where mentioned, and the number of fishers who described verbally, or identified overlapping or very close areas. Key sites in bold.

Sites	IDs	Description	Fishing Impacts observed	Freq. of ID
East coast D'Urville Island	1, 2, 3, 4, 5, 6, 7	Multiple fishers marked areas along the eastern coast of D'Urville Island, as "*coral rubble*", one noting its similarity to Separation Point (probably the bryozoan *Celleporaria agglutinans*). These were based on recollections from 20 to more than 30 years ago, with several noting that the areas were hard to fish, due to net damage, and were associated with large catches of juvenile blue cod on occasion.	yes	3
French Pass	9, 10, 11, 12, 13, 14,	The channel south of French Pass was noted as an area of hard ground covered in sponges and '*corals*", with the densest sponge cover in shallow water along the D'Urville Island coast (11), and Waikawa Bay (14) known more for *"corals"*. One fisher noted that this area had been "*cleaned out*" since it was first fished in the 1960s. To the north of French Pass, another fisher marked an area where soft, yellow, dinner plate sized sponges (8–9 inches high) were found, called "*spongey cheeses*".	yes	3
Horse mussel beds; Admiralty Bay and Tennyson Innlet	18, 25, 26, 32, 33, 34	Areas of horse mussels on sand / mud substrate. Beds may not be so extensive now.		2
Inner Pelorus Sound - Popoure Reach	35, 38, 41, 43, 44	Multiple areas within Popure Reach where "*sponge material*" was found. This was an area targeted for scallops.		1
Pelorus Sound, Crail Bay and Beatrix Bay	19, 20, 22, 27, 28, 29, 31 , 36, 37	Small areas of shell hash (22, 29, 31), rock pinnacles / untrawlable areas (28, 36), sea feathers and starfish (*Coscinasterias muricata*) (27) and red algae and scallops (19), with a snapper nursery area also noted in Crail Bay (37)		1
Greenlip mussel beds – Kenepuru Sound	42	Found along the entire coastline of this area. Not known if beds are still this extensive	?	1
Chetwood Island	8	Noted as a blue cod nursery grounds		1
Guards Bay / Alligator Head	15, 16, 17, 21, 23, 24	Large overlapping areas of shell hash and horse mussels (15, 16, 17). Closer to shore, a kina bed (21) and an area nicknamed "*sea cucumber alley*" was described; fish catches were good, but high numbers of sea cucumbers and kelp were also brought up in the nets.		3
Queen Charlotte Sound	39, 40	Small area of sponge and larger area of shell hash associated with large numbers of brittle stars		1

Scientific data sources

Detailed work on the biogenic habitats of the Marlborough Sounds, across a range of habitat type and sites (including maps) has been carried out by Davidson et al. (2010), with sites of ecological significance described (Davidson et al. 2011). Habitats identified included horse mussels, rhodoliths, mound or mat-forming tubeworm species, red algae, dog cockles, bryozoans, and sponges. Bryozoan sites included an area of *Celleporaria. agglutinans* and *Galeopsis pocellanicus* growing on isolated rocky outcrops in the passage between D'Urville and Rangitoto Islands (surveyed using spot dives), which overlaps fisher-drawn areas 3 and part of 2, and Davidson et al. (2011) describe "*compact, tightly* *branching colonies [of Galeopsis porcellanicus] that can cover almost the entire substratum"* in French Pass, where multiple fishers noted sponges and coral. Patches of mixed biogenic assemblages including bryozoans, sponges, horse mussels and ascidians were found to the east and west of the Trio Islands (overlap with fisher-drawn area 4), and around Chetwode Island, which was thought to be a blue cod nursery ground (8). In Tawhitinui Reach, sponges and hydroids were recorded on patches of cobbles, boulders, bedrock and adjacent soft sediments in discrete areas, one of which overlapped with the fisher-drawn area 27, recalled for its abundance of sea feathers and *Coscinasterias muricata*. Horse mussel beds identified by Davidson et al. (2010) included Waitui Bay, Port Gore (not mentioned by fishers), and Crail Bay, thought by one fisher to be a snapper nursery (27). The fisher-drawn horse mussel bed in Guards Bay (17) was mentioned by Davidson et al. (2011), but recent surveys have failed to locate them. Davidson et al. (2010) also described areas of bryozoan mounds that were not located by fishers in this study, and the presence of areas of large tube-worm (*Galeolaria hystrix*) mounds in Port Underwood (see figure 41 in Morrison et al. 2014a), with recent sampling by dropped underwater video showing blue cod of all sizes to be strongly associated with these habitats in Port Underwood (G. Carbines, Stock Monitoring Services, pers. comm.).

5. HABITATS IDENTIFIED AT THE NATIONAL SCALE

In this section, some national-scale information is presented, by combining regional section material for key species/groups. Selected species records from taxonomic databases (Specify, AllSeaBio) are plotted alongside the fisher-drawn areas as appropriate for reference. Some of the more common records are given at a species, or species group taxonomic level, with others grouped as "other species". Included in these data, were the records collected from two *Tangaroa* voyages carried out as part of this project, which targeted areas identified by the fishers. Records from these voyages are numbered to identify them from the historical records. For full details of the voyages, please refer to Jones et al (in review).

5.1 Coral

Coral was identified by many fishers (Figure 23), including in a number of cases, the selection of particular images as provided in the interview. Black coral was specifically mentioned by many, and is thought to be distinctive enough to be a correct identification (however, note that there are 18 different New Zealand species). In some instances, given existing science knowledge, it seems that bryozoan colonies were also almost certainly described as corals, e.g., in the South Taranaki Bight (Gillespie & Nelson 1996), Tasman Bay (Saxton 1980a, b), D'Urville Island (Mace 1981), and Foveaux Strait (Cranfield et al. 1999, 2003). In many cases, fishers identified corals as part of a biogenic habitat mixture e.g. 'Coral & sponge'; these were left as described by fishers. Figure 23 shows where fishers reported coral areas, alongside coral presence records collated from multiple scientific sources (lower depth cut-off of 250 m). The main distribution pattern of 'cold-water' corals in New Zealand is off the continental shelf, in depths greater than 200 m (Tracey et al. 2011). Most of the potential coral habitat areas reported by fishers were deeper than 100 m, with many of them falling on the edge of the shelf. Many of the seafloor types which coral species grow on are composed of rougher rock terrain, not vulnerable to trawl, and a number of the LEK areas presented here came from fishers using other fishing methods such as rock lobster potting, and long-lining/drop-lining.

5.2 Sponges

Sponges were present across all regions of New Zealand (Figure 24). In a number of areas they were reported as part of biogenic habitat mixture, including coral/black coral, and bryozoans. There were too many potential habitat-forming species to plot taxonomic records for. Large sponge habitat areas were reported off North Cape, Rangaunu Bay, the Poor Knights Islands, Mayor Island, East Cape, Mahia Peninsula, Kaipara Harbour, the North and South Taranaki Bights, Wellington, Otago, Foveaux Strait, and north of Jackson's Bay, west coast South Island. Many species are likely to have contributed to these areas, based on the fisher's accounts, with different species assemblages in different geographic regions.

5.3 Tube worms

Tubeworms were reported as patches from around most regions of New Zealand (Figure 25), although the species involved almost certainly varied between regions, based on descriptions. As with sponges, there are too many potential habitat-forming species to plot. Fisher-drawn areas were identified off the North Taranaki Bight, the area south of East Cape, and in the inshore Karamea Bight (north-west South Island). The largest tube-worm habitat extents were described off the North Canterbury Bight, and Timaru). The terms “*Tarakihi-weed*” and “*Wire-weed*” were used by a number of fishermen to describe these areas. Off Oamaru, two fishers marked overlapping areas known locally as “*The Hay Paddock*”. The “*tarakihi weed*” here was described as “*pale yellow colour, with kinks, straw-like, came up in clumps*.” “*It may grow on humps of substrate*” and “*like straw, thickness was less than a drinking straw*”. The Hay Paddock was also mentioned verbally by one other fisher but as he wasn’t navigating, he wouldn’t say where exactly. He described the “*hay*” as gritty with shellfish attached.

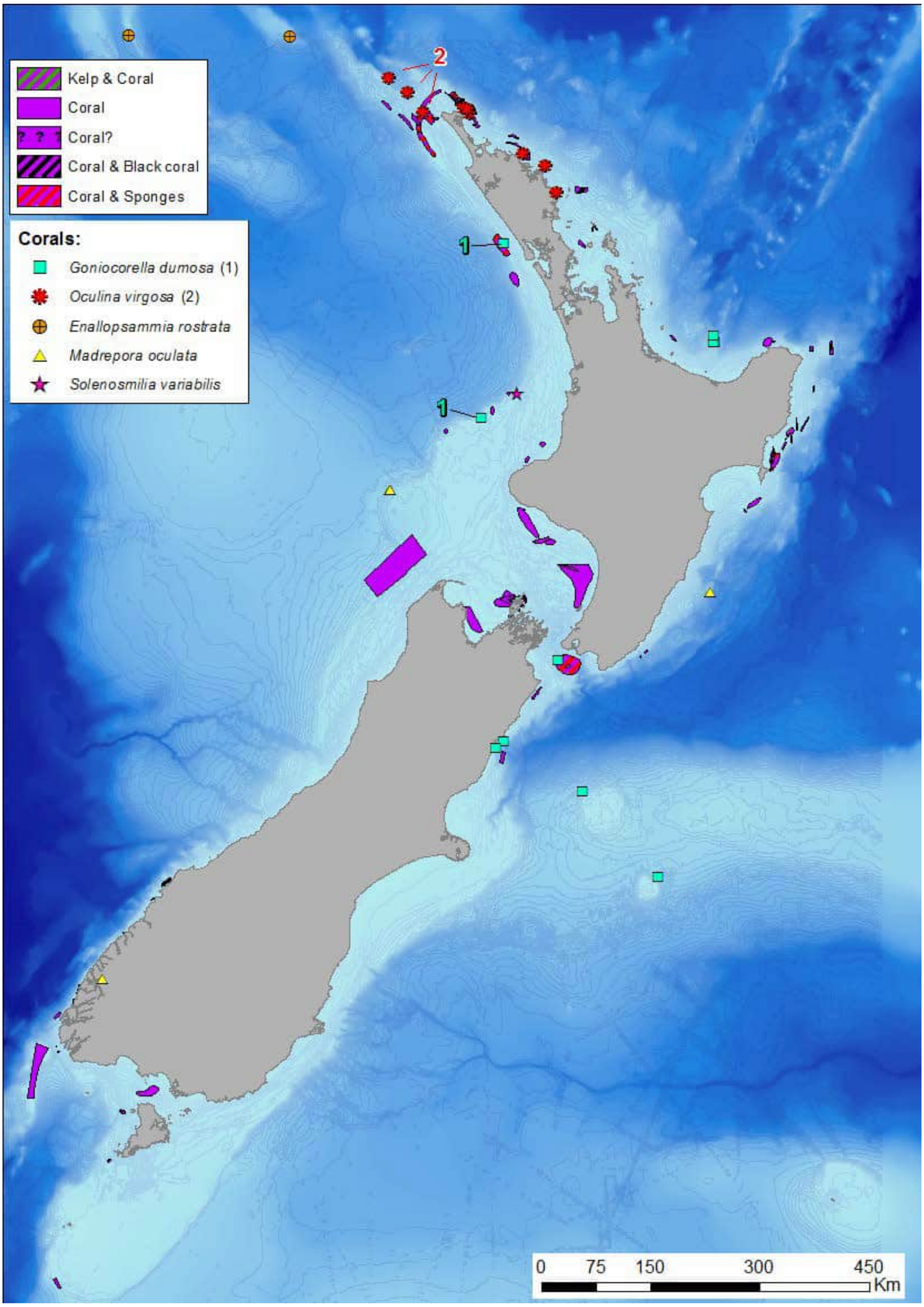


Figure 23: LEK coral habitats at the national scale (NB: some habitats identified as corals are actually bryozoans; South Taranaki Bight, Tasman Bay, Foveaux Strait). Note that the Chatham Rise shallower areas (e.g. Mernoo Bank) were not included in the LEK interviews. Taxonomic records for selected coral species likely to be found on the shelf (< 250 m) are also plotted, with records numbered where they were sampled as part of this project.

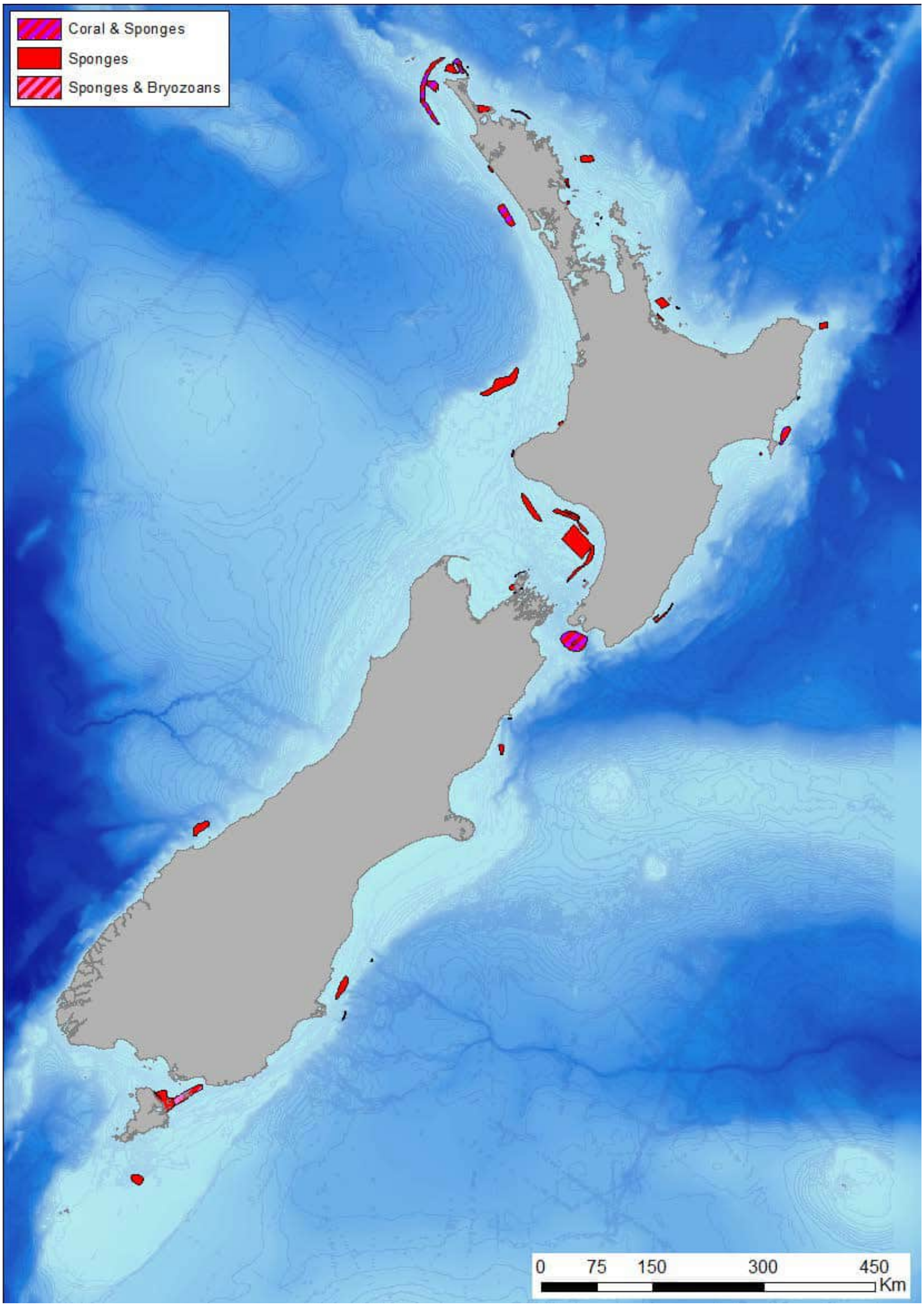


Figure 24: LEK map for sponges at the national scale. Note that the Chatham Rise shallower areas (e.g. Mernoo Bank) were not included in the LEK interviews.

Off Banks Peninsula, local fishers marked patches of what they called "*wire weed*". One believed it to be "*a grass product*" but described it as "*clumpy, hard, with a sandy feel*". He marked four discrete areas (see region section). A second local fisher believed the worms to be different at different sites. A third fisher marked an approximate site close by, but shallower (80–100 m), that he described as a place where you get "*tarakihi weed*" but was not sure of extent. He described it as "*6–8 inches long, fine, like grass with a smooth, non-slimey texture, pale white-brown in colour and about 2 mm diameter*." He believed there were similar areas off Cape Campbell and near Wellington although he could not mark areas. Another fisher also believed this habitat to occur up at Kaikoura, south of Cape Campbell, but no definite areas were marked on the charts. These fishing grounds were described as being very muddy and that the trawl net could easily become very bogged down with the weed clogging the meshes and the net filling up with mud. In some cases fishers had lost their nets.

A second form of "*tarakihi weed*" was described by one fisher from an area off Waikawa Harbour, Southland (fisher-drawn area 52, Figure **16**), as a pink weed that appeared sporadically and could get so thick it would bog down the trawls. He described it as "*wee low bushes, very fine and pretty*". It was not very long and not like a whip and was not slimy. It didn't occur shallower than 30 fathoms. This was probably an algae or bryozoan species. A third habitat also called "*tarakihi weed*" was sea pen fields off the west coast, South Island (see below).

5.4 Sea feathers, sea pens, and sea tulips (kāeo)

Sea feathers were identified by one fisher from the Marlborough Sounds, in about 70 m water depth, associated with the large starfish *Coscinasterias muricata*. There are about 20 species that have been reported as present in less than 250 m water depths in New Zealand. In Figure 25, records of *Argyrometra mortenseni*, *Cenolia novaezealandiae,* two high level groups, and all other species combined are plotted.

Sea pens were identified by five different fishers. In the North Island, sea pens were reported from north of Great Barrier Island (Hauraki Gulf), where they were known as "*slimies*", and described as pinkish in colour with a slimy membrane that could be peeled back. They occurred in 100 fathoms (about 180 m), along with soft corals and sponges, on mud substrates. South of Ranfurly Bank, the catching of "*stalks only*" animals (possibly a whip-like species) was reported from depths of 150–200 m, on soft muds; with these animals glowing green when seen in the dark. In the North Taranaki Bight, animals were described as being pencil-thickness, white in colour, widening out at one end, and slimy. They were caught along the edge of the shelf in 150–160 m water depth, and seemed to be caught on a certain tide.

On the west coast of the South Island, sea pens were reported from Cook Canyon, Hokitika trench and Kumara Junction, where they are known locally as "*Tarakihi Weed*" (confirmed by a photo). This species covered the flat areas, and was thickest on the edge of drop-offs. It was abundant in the 1970s, but greatly reduced by the 1980s according to anecdotal observations (D. Robertson, pers. comm.)

As sea pens can be feather-like, club-like, radiating or even whip-like in form, it is quite likely that there may be misidentifications with some tube worm and other species groups, outside of the descriptions above. Figure 25 shows taxonomic records for two species (*Acanthoptilum longifolium*, *Anthoptilum grandiflorum*) and a higher taxonomic group, sampled during the two subsequent *Tangaroa* voyages, as well as all other species combined. With some exceptions (Marlborough Sounds, Banks Peninsula, Fiordland) most were reported from the outer shelf.

Sea tulips (kāeo) are solitary ascidians, with long wrinkly, purple bodies attached to a long tough stalk, with large animals growing to a metre long. Known as kāeo (*Boltenia pachydermatina*), they are filter feeders, and occur in coastal waters where they can form extensive beds, with the greatest depth they occur in being about 80 m. Fourteen fishers identified kāeo areas, all from the South Island: including the Canterbury Bight, Oamaru, Dunedin Harbour, Bluff and Foveaux Strait. Most records were from shallower waters, down to around 30 m water depth. A number of fishers said that there were not usually many fish associated with them, and that they tended to avoid these patches (apart from those targeting elephant fish off the South Canterbury coast). Many also commented that the beds seemed to come and go, and that they were often associated with gravel and rubble, coming up attached to stones and rocks. They were not common in the taxonomic data records (Figure 25), thought to be more a lack of collecting in shallower southern coastal waters than being rare (taxonomic records averaged 18 m water depth, range 8 to 32 m).

5.5 Kelp and algae

Kelp and other macroalgae were reported by fishers from a range of locations (Figure 26), although the main distributions of algae on shallow rocky reef areas or deeper rugged bottom areas are less available to trawling (*Ecklonia radiata* is now known to grow down to more than 70 m water depth where water clarity permits, e.g. Ranfurly Bank, Jones et al., in review). Kelp forests are probably generally avoided by trawlers, though there are clear accounts of their removal historically in some areas as part of ‘conditioning’ fishing grounds. Large kelp areas were reported from Pandora Bank, two areas inshore of Mayor Island, the Wairoa and Clive Hards’, and around Timaru and Oamaru, as well as smaller polygons scattered around the lower North Island (Figure 26).

Red (and green) algae growing on soft sediment seafloors was reported from a number of regions, and is probably a more common and widespread habitat on coastal soft sediment seafloors than currently acknowledged, especially in regions with higher water clarity. This included the South Taranaki Bight, where two forms of “*Sponge-weed*” were reported, of which one appears to be an algal species.

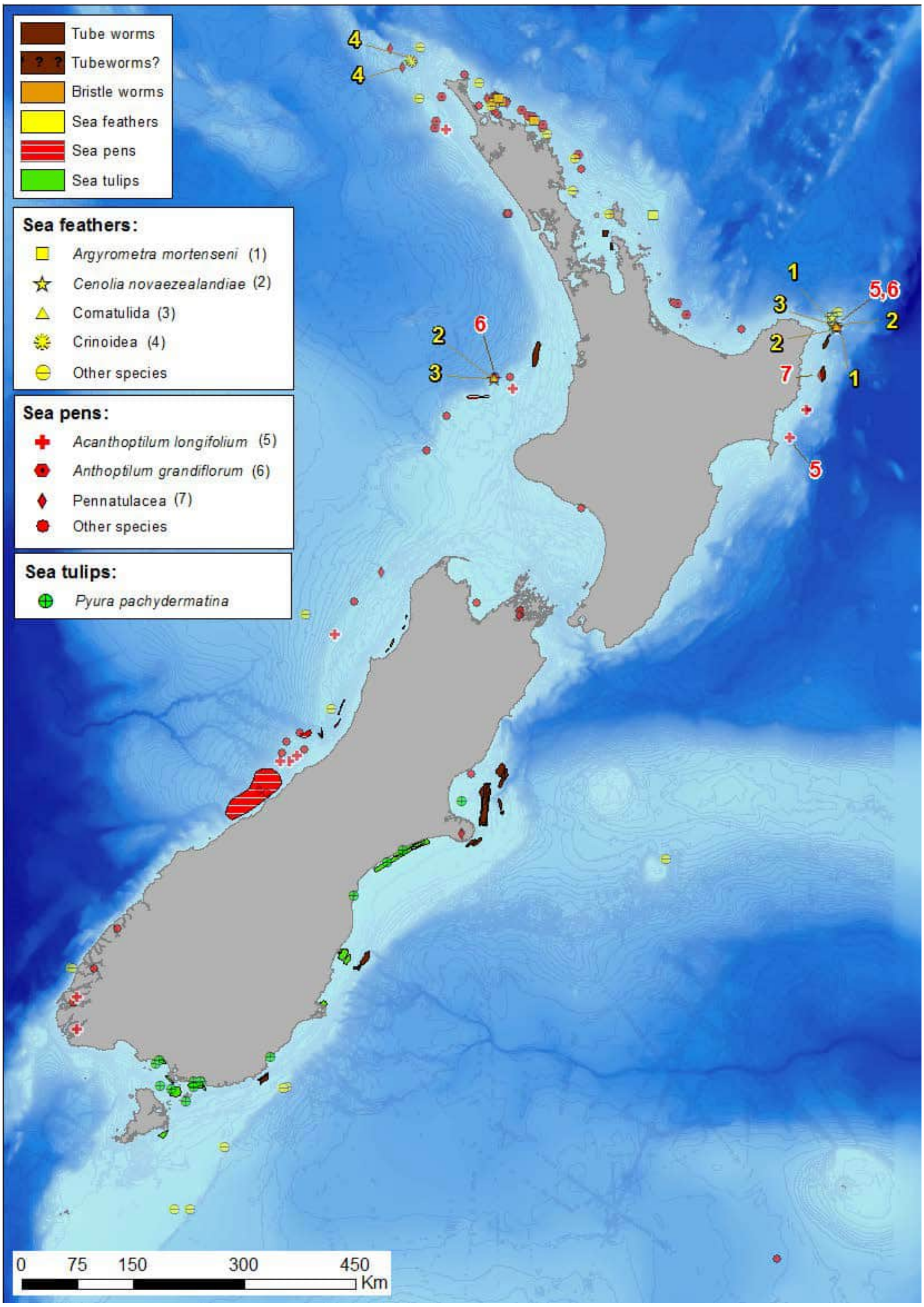


Figure 25: LEK map at the national scale, for tube-worms, bristle-worms, sea pens, sea feathers, and sea tulips. Note that the Chatham Rise shallower areas (e.g. Mernoo Bank) were not included in the LEK interviews. Taxonomic records for selected species of sea feathers, sea pens, and sea tulips are also plotted, with those records collected as part of this project numbered.

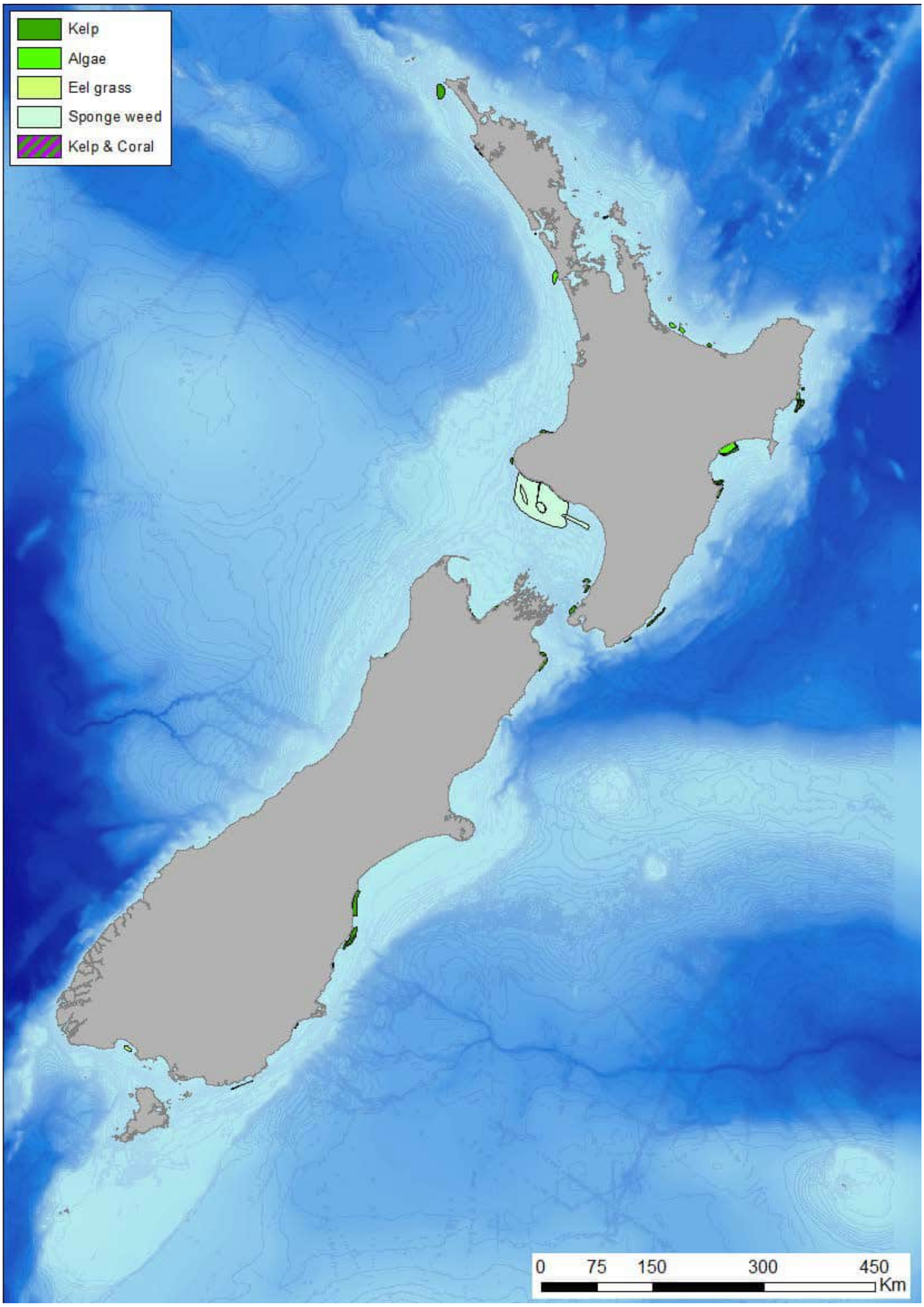


Figure 26: LEK map of kelp and algal habitats at the national scale. Note that the Chatham Rise shallower areas (e.g. Mernoo Bank) were not included in the LEK interviews.

5.6 Bivalves: horse mussels, dog cockles, scallops, mussels

Bivalves were reported as by-catch, although we did not interview fisheries from shellfish dredge fisheries (e.g. scallops and oysters), apart from several fishers in Foveaux Strait. Horse mussels were reported from around much of the New Zealand coast out to at least 80 metres water depth (Figure 27).

Taxonomic records also showed them to be present around the country, with some notable gaps between the Manukau Harbour and Ninety Mile Beach, along almost the entire east coast of the North Island, and from Fiordland to Farewell Spit. While the last area mentioned may be due to heavy natural sediment erosion inputs from the Southern Alps, the other gaps are likely to simply represent a lack of taxonomic collection, with for instance numerous horse mussel beds known to exist in the Greater Hauraki Gulf and East Northland regions (e.g., M. Morrison, pers. obs.; Morrison et al. 2014a). Dog cockles were reported by fishers at a number of places, including both small discrete areas (e.g. off Fiordland), and as large extensive areas (e.g., the Rolling Grounds, South Taranaki Bight). Taxonomic records were widespread, from the Three Kings Island region to East Cape, South Taranaki Bight and Marlborough Sounds, and the lower South Island (both coasts), as well as from shallower areas of the Chatham Rise. However, they were not reported from the west coast North Island (New Plymouth to Ninety Mile Beach), Mahia Peninsula to north of Otago, and the entire west coast of the South Island, excepting Fiordland. *Tawera spissa*, a small infaunal bivalve species that can form extensive very high density beds along with associated dead shell cover (Taylor & Morrison 2008), was distributed around the New Zealand coastline, including some records from the Mernoo Bank area, Chatham Rise (Figure 27). Scallops (several species) and mussels (blue and green-lipped) were occasionally reported as low levels of by-catch, with some relatively small patches of green-lipped mussels observed (very small, compared to historical distributions in the inner Hauraki Gulf, and Marlborough Sounds, e.g., Greenway 1969, Reid 1969).

5.7 Foul and/or unusual rock

Foul ground was reported from most regions (Figure 28), although it was much more common in some regions (e.g. Cape Reinga to Three Kings Islands, East Northland, Stewart Island region) than others (e.g. Tasman and Golden Bays; South Canterbury Bight). It is likely that some of these foul areas hold abundant coral / sponges, but others may be just unfishable rock formations or rocky reefs with low biogenic habitat cover. A number of reports of unusual rocks and other features may also be of value for geological purposes, including: several "*petrified forests*" (possibly geological formations) reported off northern New Zealand; very heavy, smooth polished possible river stones (inshore of White Island, Bay of Plenty); "*gun barrels*" (brown-coloured, pumice-like barrels, hollow, with nothing growing on them) off Mahia Peninsula; Swiss cheese rock (e.g. outer shelf edge of North Taranaki Bight), and rock chimneys (off Wellington). A national scale map of subtidal reefs less than 50 m depth has been produced by the Department of Conservation, predicted from expert knowledge combined with interpretation of hydrographic faring sheets (DOC, unpublished data), and these data are included in Figure 28. Two areas are highlighted; Ariel bank, offshore of Gisborne, and the coastline between Christchurch and Kaikoura, where LEK areas (foul or other categories such as "Sponges", "Coral" etc) overlapped with predicted subtidal reefs.

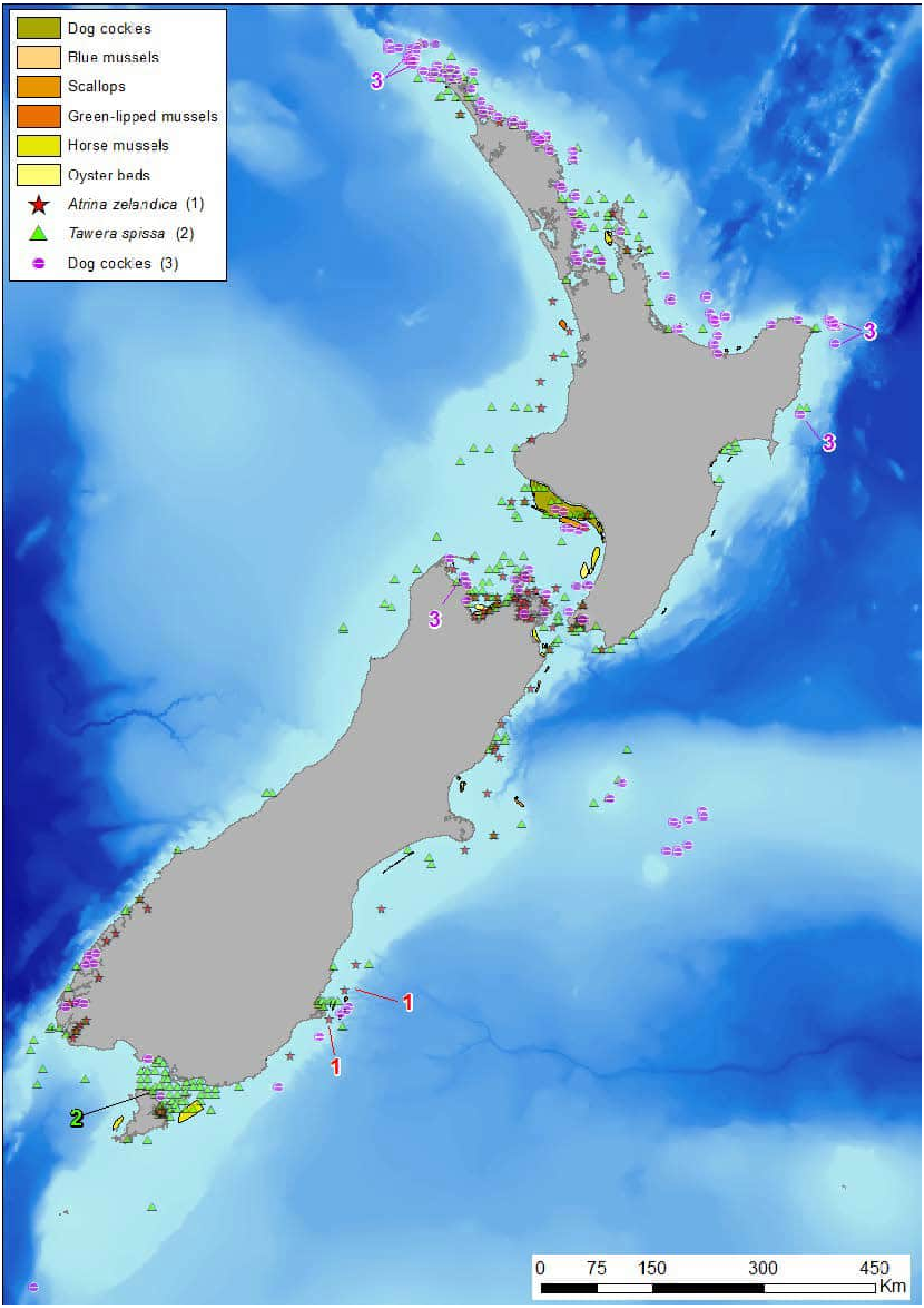


Figure 27: LEK map at the national scale for selected bivalve habitats. Note that the Chatham Rise shallower areas (e.g. Mernoo Bank) were not included in the LEK interviews. Taxonomic records for horse mussels (*Atrina zelandica*), morning star shells (*Tawera spissa*) and dog cockles (*Tucetona laticostata*) are also plotted, and numbered where collected on voyages as part of this project. Dog cockle records include material collated from Te Papa collections.

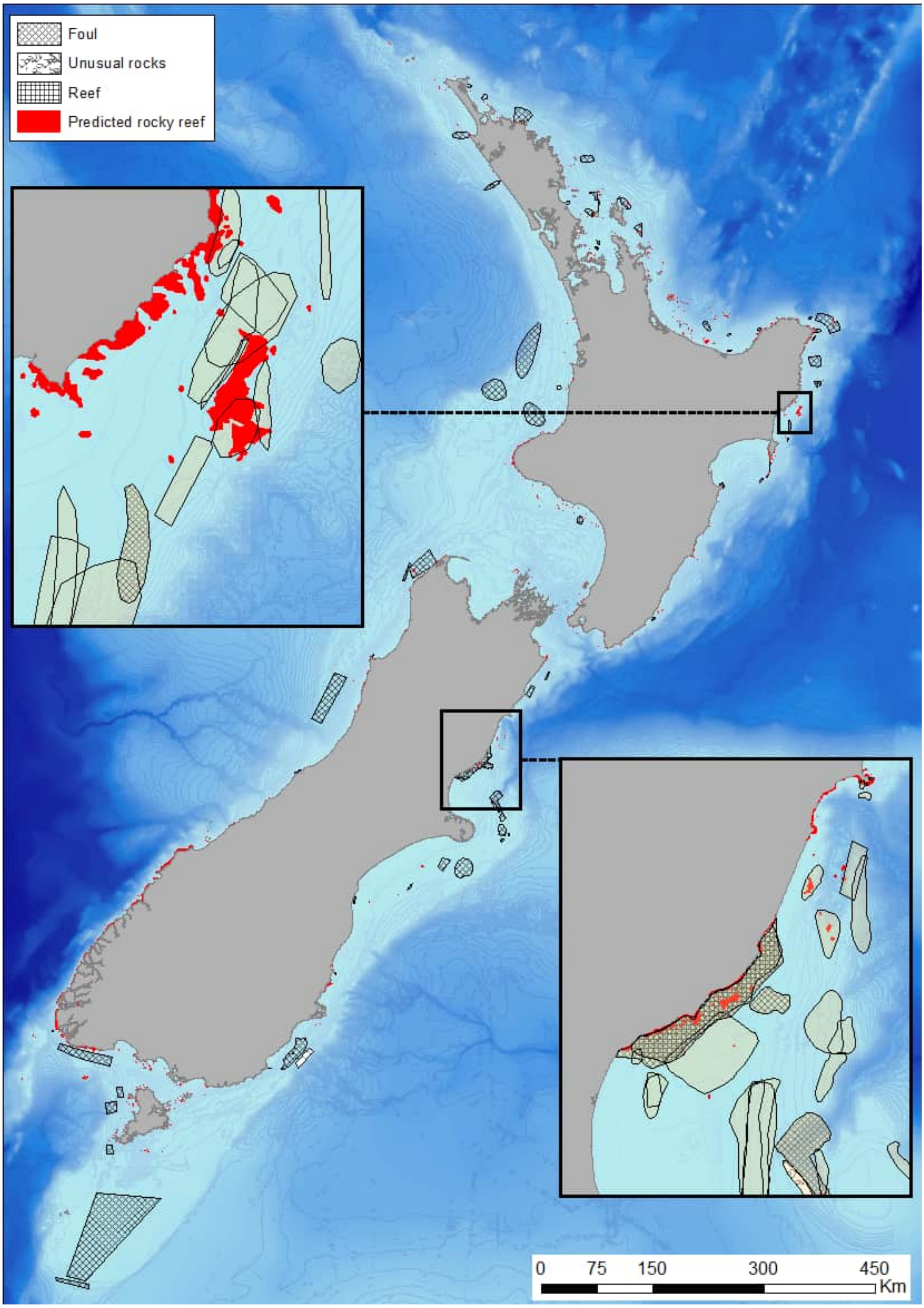


Figure 28: LEK map at the national scale for foul, reef, and unusual rock polygons. Note that the Chatham Rise shallower areas (e.g. Mernoo Bank) were not included in the LEK interviews. Areas of subtidal reefs in less than 50 m water depth, predicted from interpretation of hydrographic faring sheets and expert knowledge are also shows (DOC, unpublished).

6. CONCLUSIONS

A total of 588 observations were recorded from the 50 fishers interviewed, with 496 of those accompanied by areas drawn on nautical charts. Around 66% of the observations were classified as potential biogenic habitat, with a further 15% described as "Foul" or "Reef". The most commonly mentioned biogenic habitats were corals (likely to include bryozoans), sponges, bryozoans, kelp and horse mussels. When combined and overlaid together, these data could be summarized into 109 locations or groups of habitat types, which have been summarized in the regional tables of this report. A total of 65 of these locations were identified by multiple fishers, (i.e. more than one individual), with up to nine individuals (The Rolling grounds, South Taranaki Bight) describing the same or similar habitats that overlapped, or were in close proximity. Of these, 47 were suggested as "Key Sites", as defined in Section 2.4, for consideration for empirical sampling as part of Specific Objective 2, and these are listed in Table 20. There were noticeable clusters of biogenic habitat in certain areas: Cape Reinga/North Cape/Three Kings; East Cape, offshore North and South Taranaki Bight; Stewart Island / Foveaux Strait / Fiordland and the Oamaru to Dunedin continental shelf. In many areas (34 sites overall, 19 key sites), dramatic temporal and spatial reduction in some habitats/species were mentioned, usually attributed to fishing activity (see Table 20): the "*wire-weed*" fields (chaetopterid tubeworms) off the North Canterbury Bight; the "*wire-weed*" / sponge assemblage of the "*Hay Paddock*" off Oamaru; large area/s of big sea-pens off the west coast South Island; and '*sponge-weed'* (a term thought to potentially include sponge, catenicellid bryozoan and /or algal species/s, variously reported under the same generic name) off the South Taranaki Bight.

The inherent uncertainty and bias in these data is acknowledged. Increased confidence in our certainty of the observations was sought by consulting the available scientific literature. In over half of the key sites (30), some scientific information was found (see Table 20). The level of detail available was highly variable; in some places targeted surveys have been published, e.g. studies documenting the extensive dog cockle beds of the South Taranaki Bight (Gillespie & Nelson 1996), the bryozoan assemblages of the Otago Shelf (Wood & Probert 2013) and Foveaux Strait (Michael et al. 2007), the sponge gardens of North Cape and Spirits Bay (Cryer et al. 2000, Bowden et al. 2010). In other places, single station observations or trawl survey bycatch records provided less substantial, but corroborative information, e.g the single station bryozoan sample from west of D'Urville Island (Bradstock & Gordon, 1983), and the comments on presence of chaetopterid worms on the Canterbury shelf (Fenaughty & Bagley, 1981, Carter & Carter 1985, Probert & Anderson 1986). For the remaining areas, minimal, or no scientific information was readily available; e.g. sponge and coral areas off Cape Reinga, and the canyons off the west coast of the North Island, Ariel Bank and the "*Cabbage Patch*" off the Gisborne coast, and "*The Coral Patch"* in Hauraki Gulf. In several regions, scientific information was more readily found for shallow depths (less than 30 m), and / or in deep water beyond the continental slope, than for the shelf itself, e.g. the Bay of Plenty and east coast of the North Island.

Biases in the data collected, due to the interviewee pool sampled are likely. Our sample represented a small (under 5%) proportion of the estimated current number of inshore vessel skippers (estimated at about 1300 in 2007) and an unknown proportion of retired fishers. The process by which LEK was gathered in this study undoubtedly falls foul of many of the issues raised by Drescher et al. (2013) and others in their discussion of the potential pitfalls and bias in using "expert knowledge" (see Section 2.1 of this report). Our interviewee selection technique is likely to have been biased by the non-random methods used to make contact with prominent individuals, and industry organizations, and we did not undertake a formal process of ranking participants beyond the initial phone call, where individuals that did not appear to be able, or willing to offer useful information were noted, and not contacted further. However, using multiple independent starting points should have alleviated bias to some extent, and the process of requesting geo-located information inevitably discouraged individuals from providing information for sites they were less familiar with. Despite its potential drawbacks, this non-random approach was felt to be the best way to overcome the difficulties of engaging an expert group (commercial fishers), where a significant number were unsurprisingly wary, or unwilling to divulge the very localized and specific knowledge being sought, and maximize the chances of collecting information within the constraints of the resources available. In many areas, a substantial amount of information, covering a large area of the shelf was recorded, e.g. South Taranaki Bight and Otago Shelf. In other areas, the number of fishers found with knowledge was fewer, and the information was less extensive. Gaps in coverage of the shelf in these areas may reflect a lack of interviewees with appropriate knowledge instead of a lack of biogenic habitat, e.g. east Northland, Fiordland and Bay of Plenty.

Table 20: List of "Key" sites identified from fisher's surveys of potential biogenic habitat around New Zealand, summarizing the habitat categories allocated, the number of fishers who made observations, whether fishing impacts were commented on, and listing known scientific data where overlapping or close by.

Key Sites	Fishing Impacts observed?	Frequency of ID by fishers	Habitats	Science info	References
"*The Rock Garden*", North Cape	●	5	Sponge / Coral	●	Rowden et al. 2004, Cryer et al. 2000
offshore Cape Reinga		3	Sponge / Coral		
Pandora's Bank, Cape Reinga		4	Sponge / Coral / Kelp		
"*Coral Patch*", Great Exhibition Bay		3	Sponge / Coral	●	Bowden et al. 2010
Cavalli Islands, East Northland	●	5	Foul / Sponge / Coral	●	Bowden et al. 2010
East of Poor Knights Islands		2	Sponge / Foul	●	Ayling & Shiel 2003, Taylor et al. 2011- from Poor Knights Islands
Ocean Beach, Hauraki Gulf		2	Sponge		
"*The Coral Patch*" (south of Mokohinau Islands, Simpson Rock and north of Little Barrier.)		3	Coral / Black coral / Foul		
Deep reefs, Great Barrier Island		3	Foul	●	Morrison et al. 2001a, Sivaguru & Grace 2002, Lee et al. 2015
"*North-west Reef*", west of Little Barrier Island.		3	Coral / Foul	●	Shears & Usmar 2003
"*The Puddle*", Mercury Islands		2	Horse mussels / Dog cockles		
The "Knolls", south-east of Mayor Island, Bay of Plenty		2	Sponge / Coral		
Offshore drop-offs: "The Crater", Bay of Plenty		4	"Cauliflowers"		
Ranfurly Bank, East Cape	●	4	Coral / Black coral / sponge / Foul	●	Phillips 2002
Ariel Bank, Gisborne coast	●	4	Coral / Kelp	●	DOC predicted reef layer (unpublished), Smith et al. 20013
The "*Cabbage Patch*", Gisborne coast		4	Coral / Sponge / Bryozoans / Foul	●	DOC unpublished reef layer (unpublished), Smith et al. 20013
Lachlan Ridge, outer Hawke Bay		2	Coral		

Key Sites	Fishing Impacts observed?	Frequency of ID by fishers	Habitats	Science info	References
Wairoa Hard, Hawke Bay	●	5	Kelp / Greenlip mussels	●	Thrush et al. 1997
Clive Hard and Cape Kidnappers, Hawke Bay	●	4	Kelp / Greenlip mussels	●	Thrush et al. 1997
Flat Point Reef, Wairarapa coast	●	3	Sponges / Kelp / Foul	●	DOC unpublished predicted reef layer
The “*Petrified Forest*”, West coast, North Island		5	Petrified wood		
“*The Canyons*” / “*The Trenches*”, West coast, North Island		3	Sponges / coral		
Shelf edge canyons, North Taranaki Bight		5	Sponges / coral / Foul		
“White Cliffs” and other subtidal reefs, North Taranaki Bight	●	2	Foul / Coral		
Patea Shoals/ The “*Rolling grounds*”, South Taranaki Bight	●	9	Dog cockles / Foul / coral / sponges	●	Gillespie & Nelson 1996, Rowden et al. 2004, Beaumont et al. 2013
North and South Traps and Graham Bank, South Taranaki Bight		3	Sponges / sponge weed / lace coral / shell hash	●	DOC unpublished data
Offshore sponge and coral, South Taranaki Bight		3	Sponges		
Cook Strait Canyon		2	Coral / Sponge	●	Lamarche et al. 2012
Cape Campbell and east coast South Island		1	Foul / kelp	●	Davidson et al. 2011
“*Wireweed"* tubeworm beds, Pegasus Bay and North Canterbury shelf	●	3	Tubeworms	●	Fenaughty & Bagley, 1981, Carter & Carter 1985, Probert & Anderson 1986
Sea Tulip (kāeo) beds, South Canterbury Bight		3	Sea tulips	●	occurrence in TRAWL database
Oamaru and Dunedin kāeo beds		3	Sea tulips	●	Graham 1962
“*The Hay Paddock*”, Oamaru	●	4	Tubeworms / sponges	●	Graham 1962
Otago Shelf canyons		2	Foul / sponges / bryozoans	●	Probert et al. 1979
The “*Cornflakes*”; Otago shelf bryozoan thickets		5	Bryozoans	●	Probert et al. 1979, Batson, 2000, Batson & Probert 2000 etc.
Kāeo patches, Foveaux Strait		3	Sea tulips	●	occurrence in TRAWL database

Key Sites	Fishing Impacts observed?	Frequency of ID by fishers	Habitats	Science info	References
Bryozoans and oyster beds, Foveaux Strait	●	2	Bryozoans / shell hash / sponges	●	Fleming 1952, Stead, 1971, Carbines & McKenzie 2004, Carbines & Cole 2009, Cranfield et al. 1999, 2001, 2003, 2004, Jiang & Carbines 2002, Michael 2007
Mutton-bird Islands (southern chain), Stewart Island		2	Foul / coral	●	Otago Uni (unpublished)
West of Codfish Island; Mason Canyon	●	3	Bryozoans / coral /Foul		
Offshore of Chalky Inlet, Fiordland	●	3	Bryozoans / coral /Foul	●	Otago Uni unpublished
Kahurangi Shoals and “*Heaphy Valleys*”, West coast, South Island		1	Foul / Coral		
“Tarakihi weed” / sea pen patches of Hokitika and Cooks Canyon	●	2	Sea pens / boulders		
Bryozoan reefs of Separation Point, Tasman / Golden Bay	●	2	Bryozoans	●	Saxton 1980a, b, Bradstock & Gordon 1983, Grange et al. 2003
Bryozoan reefs off D’Urville Island, Tasman Bay	●	4	Bryozoans / sponges	●	Bradstock & Gordon 1983
East coast D’Urville Island, Malborough Sounds	●	3	Bryozoans	●	Davidson et al. 2010
French Pass, Malborough Sounds	●	3	Bryozoans / sponges	●	Davidson et al. 2011
Inner Pelorus Sound - Popoure Reach, Malborough Sounds		1	Sponges		
Other Sites where science information was found					
Middlesex Bank	●	1	Coral	●	bryozoan samples, Rowden et al. 2004, sediment composition, Nelson & Hancock 1984
Table Cape, Mahia Penninsula		1	Sponge / Coral	●	NIWA unpublished, Shears & Babcock, 2007, Smith et al. 20013
Inshore reefs, North Taranaki Bight		1	Sponges / kelp / Reef	●	Battershill & Page, 1996 - Parininihi Marine Reserve. Miller et al. 2005 - the Sugarloaf Islands Marine Protected Area

Key Sites	Fishing Impacts observed?	Frequency of ID by fishers	Habitats	Science info	References
Kapiti Island Reefs		2	Reef / Kelp	●	Shears & Babcock 2007, Battershill et al. 1993
Paterson Inlet, Stewart Island		1	Mixed shellfish	●	Otago Uni (unpublished)
George & Caswell Sound, Fiordland	●	1	Coral / Black coral	●	Grange & Singleton 1981, Grange 1985, Nelson et al. 2002, Willis et al. 2010
Doubtful Sound, Fiordland	●	2	Coral / Black coral	●	Grange & Singleton 1981, Grange 1985, Nelson et al. 2002, Willis et al. 2010

Maurstad (2002) has highlighted the intellectual property rights and confidentiality of information provided by fishers; it is of paramount importance that thoughtful decisions are made about how and what to present to protect individuals and the collective group, to ensure continued cooperation/collaboration in the future. A theme running through almost all interviews was a general mistrust and concern for how the data would eventually be used, with fishers naturally concerned about future restrictions accessing fishing grounds. Although protection of vulnerable biogenic habitat sites is likely to be a key target, where such habitats are identified and mapped, it is possible to involve the fishing industry in such a process to ensure the outcome is workable for all parties. As an example, recent cooperation between scientists and the fishing industry in Europe led to careful area closures to protect areas where cold water corals remained undamaged, minimize impacts on the industry, whilst making sure that any changes in fleet fishing patterns did not impact elsewhere on the environment (Hall-Spencer et al. 2009). A similar engagement and collaboration process would be beneficial in New Zealand, so that fishers are informed and empowered along with other groups in any decision-making process, with the objectives being to ensure protection of key habitats, balanced with minimizing impacts on the fishing industry, and potentially even increasing fisheries production. Working closely with the fishing industry into the future would also be of particular benefit given the amount of undocumented habitat knowledge that undoubtedly still exists for some areas. In addition, fishers unsurprisingly revealed extensive knowledge of fish movements and behaviours on occasion (not reported here), and we suggest further research targeting the capture of knowledge on fish population dynamics, spatial and temporal habitat use patterns, and how the associated fisheries operate would be a valuable exercise.

With the above caveats in mind, the maps and site descriptions presented here represent a valuable, but in many places, unverified indication of where biogenic habitats might exist on the New Zealand continental shelf, and as such are intended only as a starting point to inform the design of future field sampling (consistent with the Specific Objective) and are not analysed further. Many fisher-drawn areas were drawn on maps at a relatively coarse resolution, and in some instances may include a large proportion of non-biogenic habitat. Alternatively, the biogenic habitat may well extend beyond the boundaries of the area indicated by an individual, or may no longer be present due to historical changes. The true identity of species, and extent of the habitats described, in most cases can only be guessed at until samples can be collected and identified, and the habitats properly mapped.

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9. APPENDIX 1

NIWA
Taihoro Nukurangi

Biogenic habitats and their value to New Zealand fisheries

Fishermen have a long-term and deep understanding of the marine systems that they have fished over the years, the result of spending more time and effort on the water than scientists are able to. This experience includes seeing many things that may be quite uncommon, such as areas of unusual habitat, or species doing things that are unexpected.

We would like to learn from such knowledge, so that we can better understand how marine systems work. One of the things that we are especially interested in is the distribution and ecological role of biogenic habitats on the continental shelf – from the shore to 200 metres water depth, including their potential function as fish nurseries.

What are biogenic habitats?

Biogenic habitats are 'living' habitats created by the physical structure of the plants or animals themselves. Examples include sponge gardens, corals, bryozoans, tube-worm mounds, and seaweeds. Fish depend on healthy habitats to survive, feed and reproduce. Different species are supported by different habitats and for any one species, certain habitats may be more important at different stages in their life. For example a recent study has demonstrated the critical importance of seagrass beds and other habitats in the Kaipara Harbour as a nursery for snapper from the entire west coast of the North Island (see attached article). These studies show that productive commercial and recreational fisheries are inextricably linked to healthy marine habitats which help support fishing communities both now, and for generations to come.

Can you help us?

To identify the most important sites, we want to learn from the extensive and long-term knowledge of fishermen. Such local knowledge is hugely valuable, built up from years of fishing experience, effectively sampling a much wider area of the seabed far more frequently than scientists are ever able to.

We would like to interview experienced fishermen from different areas who would be willing to help us identify locations where they have observed benthic organisms (such as sponges and corals), at abundances high enough to form 'biogenic reefs'. These may be places you know by nicknames that relate to the unusual things you catch there (e.g. "The Coral Patch", or "The Hay Paddock"). They could also be places where you once fished and found unusual things, or places you think are important for juvenile fish because of certain features. These will not necessarily be places where the most adult fish are caught.

Can we interview you?

We would like to conduct face-to-face interviews that will last around an hour, using nautical charts, and a variety of pictures and specimens, to help identify where such places occur, and what is found in them. You can remain anonymous if you wish.

We are especially interested in the role biogenic reefs and habitats may play as juvenile fish nurseries. As a result of our interviews, we hope to be able to identify sites around New Zealand that support different types of biogenic reefs/habitat, from which we will select a sub-sample for scientific study. This will involve mapping sites with high resolution multi-beam sonar, and the use of night-time flown video cameras to count and measure fish sleeping on the seafloor and quantify their associations with the biogenic habitats themselves. We will also collect biological samples and information on the environmental conditions in these places, to help us understand why biogenic habitats are found in certain places and not others. Ultimately, we want to know what their role is in ecosystem functioning, including as juvenile fish nurseries, and which habitats are the most valuable in terms of supporting ongoing fisheries production.

Please ring or email any one of the following if you are prepared to be interviewed or want to know more:

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10. APPENDIX 2 - Narrative summary by area of fisher recollections

The content of this Appendix has been removed to protect informant confidentiality. A version of this AEBR with Appendix 2 in its complete form is stored by MPI Wellington (contact Science.Officer@mpi.govt.nz).

Netting Coastal Knowledge

A report into what is known about the South Taranaki-Whanganui marine area

JULY 2006

Department of Conservation
Te Papa Atawhai

Netting Coastal Knowledge:

A report into what is known about the South Taranaki-Whanganui marine area

JULY 2006

Based on a draft report prepared for the Project Team by
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- Ngati Ruanui
- Ohawe Boating and Angling Club
- Patea and Districts Boating Club
- Taranaki Regional Council and
- Wanganui-Manawatu Sea Fishing Club

Cover photo: View from Castlecliff north.
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TABLE OF CONTENTS

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Summary

WHAT'S IT ALL ABOUT ?

What is known about the South Taranaki coast, between Manaia and Wanganui? What information is contained in published reports? And, perhaps more interestingly, what information is lurking in the heads of those members of the community who have lived, worked and played in this area for many years?

This project set out to engage with the community to learn more about the South Taranaki coast.

The report is divided into two parts: The first part sets out the method and results of gathering information from the South Taranaki coastal community. Through workshops, face-to-face interviews and written questionnaires people who were familiar with the coast (the majority had used it for over 20 years) were asked for information on where they were fishing/diving/gathering kaimoana/seeing marine mammals etc, what species they saw and what changes they had noticed. They were asked what they valued about the area, what their desires for its future were, and what ideas they had for management.

The research project highlighted the significance of the area for the people who use it. People value the area for its naturalness and remoteness, and also for the diversity and abundance of fish caught. There have been some clear and noticeable changes to the fishery over the last 20 or so years. These were apparent to the majority of people interviewed. In particular, the explosion in the spiky dogfish and paddle crab populations suggested to many interviewed that there was some sort of ecological imbalance. Furthermore, changes have been noticed in the numbers of people using the area and the fishing technology available.

There was certainly a desire from those interviewed for some sort of change in the management of the area, especially if that was what it would take to keep things the same. This came from even those who said that the fishing was the same as it had ever had been. In particular there was a desire for more say at the local level in how the fishery was managed. There were concerns about certain types of commercial fishing – which may have been genuine, or may have just reflected a lack of understanding of how commercial fishing operates.

The second part of this report summarises all available technical information on such topics as the physical features of the ocean, the geology that shapes the area and what is known about the biology. Background material was unearthed on the recreational and commercial fishery and monitoring into the state of the coastal environment. Management of the coastal marine area is complicated, and Part II of the report concludes with a summary of the current management situation and an outline of management tools available.

The final chapter of this report looks at what information gaps the research has identified and what options there are available for progressing changes to management.

Part I Information on the South Taranaki - Whanganui coast obtained from the community through interviews, workshops and questionnaires.

Photo credit: L. Douglas

1 GATHERING INFORMATION FROM THE COMMUNITY

Introduction

In April 2005, a community based project team was formed to research more about the marine environment along the South Taranaki coast.

This came about after a public meeting was held that discussed a recent inventory that had been conducted of existing information[1], and how to address the apparent lack of information for the South Taranaki–Whanganui coast. The feeling of the meeting was that whilst there appeared to be few written reports about this area of coast, information was held in the heads of the people of the community, and it was this information that should be accessed to provide a baseline of information for future research.

Throughout this report the word **Whanganui** which is literally translated as "big bay", has been used to refer to the river, bay, coastline and general area. The word **Wanganui** has been used for the city name, organisations which bear the city's name and in instances where the city or settlement have been used as a point of reference.

The project team that was formed to oversee the research comprised the following organisations:

- Department of Conservation,
- Go Deep Scuba,
- Horizons Regional Council,
- Ministry of Fisheries,
- Nga Rauru,
- Ngati Ruanui,
- Ohawe Boating and Angling Club,
- Patea and Districts Boating Club,
- Taranaki Regional Council, and
- Wanganui-Manawatu Sea Fishing Club.

Other organisations and individuals also took part in one or more project team meetings.

The chapter concludes with listing the information which people in workshops wanted to see included in this project. While not everything that people were interested in could be covered in this project, the list of things that people did want to see included not only highlights where there is a lack of technical information, but also where there are education gaps. For example, there were clearly misunderstandings between the commercial and recreational fishing sectors that might need addressing with better information sharing.

In this chapter

This chapter provides the background for the social research that forms Part I of this report. It outlines the purpose and objectives of the research and how the research was conducted.

The research purpose

The project team identified that the purpose for the research was to:

- establish information about the coast and its history;
- build relationships and networks among all those with an interest in the marine environment through the process of doing the research; and
- produce a report that will assist in future management decisions about the sustainability of the area.

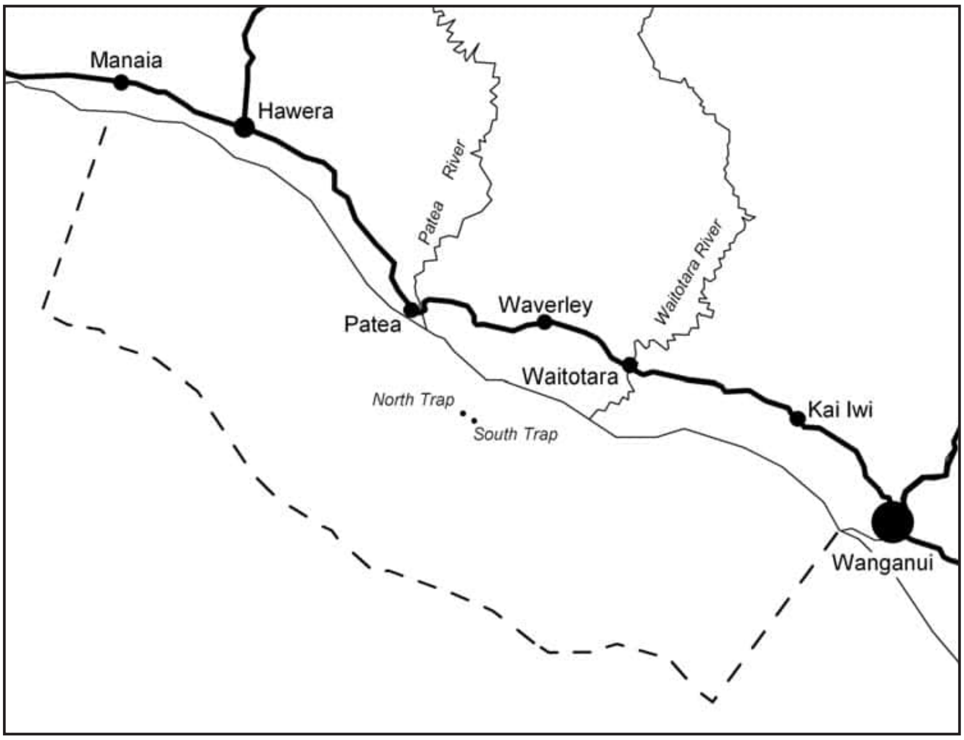


FIGURE 1: THE FOCUS OF THIS RESEARCH IS THE 115 KM LENGTH OF COAST AND MARINE ENVIRONMENT BETWEEN MANAIA AND CASTLECLIFF OUT TO THE 12 NAUTICAL MILE LIMIT.

The research objectives

Within the broad research purpose, the project team identified some specific objectives:

- to build a picture of the marine environment as it is today using existing published information, anecdotes, stories and other information held by locals;
- to document what we know about the environment and its resources in the past and what has changed;
- to build an understanding of what is important to the groups and individuals with an interest in the area, and what they wish to see in the future;
- to identify information gaps and make recommendations for future research; and
- to increase awareness of management issues for the area.

How the research was conducted

A researcher was appointed by the Department of Conservation to coordinate the research effort, with direction from the project team.

The key steps were:

RESEARCH STEPS	EXPLANATION
Literature review	Published information about the South Taranaki Bight was reviewed and summarised.
Workshops with local organisations	Seven workshops were held with clubs and other local organisations. At these workshops a presentation was given outlining the purpose of the research. Then the groups taking part in the workshops were asked: • what information they were interested in seeing included in the report; • what areas (on a map) they knew something about, or used for fishing, diving etc.; • what things were important to them about the area; • what changes they had noticed; and • what they wanted for future management. Approximately 100 people were involved.
Face-to-face interviews	79 face-to-face interviews were conducted. Questions asked in the interviews are included in Appendix 1. Total numbers taking part were approximately 85.
Mail out of a 'post-back' written survey	A written survey was mailed out with boat and dive clubs newsletters. Four clubs mailed the survey out to their members. A survey was also placed as an advertisement in local newspapers. 55 people returned completed written surveys.
Preliminary findings presented	Preliminary findings were presented to the project team to seek feedback before confirming the shape of the final report.
Draft report circulated for peer review	Circulation of the draft report to the project team and other key individuals for formal peer review.
Report published	Publication of this report.

Key areas to research

The project team felt that information needed to be gathered from both existing literature and from the community in order to describe:

- the marine environment as it is today;
- what is being monitored and what it tells us;
- what is important about the coast to locals;
- what locals want the coast to be like in the future;
- what appears to be at risk; and
- information gaps and how those gaps might be addressed by future research.

What people wanted the research to find out

In the workshops and face-to-face interviews, people were asked what information they would find interesting. This was to guide the project team so that information of most interest to the people of the coast could be included as far as possible.

Biology, geology, ocean and climate

People were interested in the biology of the area – how it was changing and whether things were getting better or worse, and if the use of the area was sustainable.

The erosion of the cliffs along the area and the location of reefs were issues of interest, along with finding out more about what is on the seabed. There were locally relevant questions raised about changes to the Castlecliff Beach in terms of sand movement and swimming off Patea.

Other people were interested in the ocean currents – the strength, speed and changes. One of the younger respondents was curious as to why the water was blue. People were interested in how the weather affected the fishery – particularly seasonal changes such as El Nino.

Recreational fishing

People were interested in trends in fish numbers, and changes in shellfish. They were particularly interested in reasons behind some of the changes that they had observed, for example, why there are more spiky dogfish and paddlecrabs and what impact these species have on other species. There was a range of specific fish-related issues that concerned people: Is the spiky dogfish a NZ wide problem? Why are paua so small? What are the lifecycles of blue cod, cray and snapper? How long do fish take to grow to legal size? Where are fish spawning? etc.

Given the strong recreational fishing background of the majority of respondents, there was a keen interest in finding out who was using the resource, how the technology had changed and what increase in recreational fishing pressure there was. Practically everyone was curious to know where the good fishing spots were!

Commercial fishing

People were interested in finding out more about commercial fishing, particularly about trawling – whether the voluntary trawl ban was enforced, what the frequency of trawlers was, how close trawlers came to shore, and if trawling impacted on the breeding stock or on the environment generally. People wanted information on what was happening with the fish stocks, particularly species like kawahai. There were a number of people wanting general information on how the commercial fishery worked – how the quota management system worked, what happened to bycatch or fish caught without quota etc.

State of environment

There was much interest in finding out about changes in the environment, particularly in terms of weather patterns, water quality, temperature and the impact of land management (such as use of fertilisers, dairy farm run off) and specific industries such as the dam on the Patea River; Fonterra, the oil industry – seismic testing and explosives, and the Wanganui wastewater discharge.

People's views

People were interested in finding out what other people thought about various issues such as commercial fishing, marine reserves/protection options and management options. The relationship between the recreational and commercial fisheries was one that people wanted to see explored.

Management

Finally, there was interest in exploring ideas for effecting management change – for both recreational and commercial fishing, but also for managing erosion and exploring improvements to coastal access and the idea of an artificial reef.

2 THE PEOPLE OF THIS COAST AND WHO WAS INVOLVED IN THE PROJECT

Introduction:

This chapter describes the settlements, population, ethnicity, and income characteristics of the communities along the South Taranaki coast. This is to provide a social background to the area.

It then describes the people who were involved in the research – the numbers of people involved in workshops, face-to-face interviews and written surveys. It discusses how long those who took part in the research had used the coast, and what they used it for.

Settlements

Settlements along the study area include the city of Wanganui and the towns of Waverley, Patea, Hawera and Manaia. A number of smaller coastal settlements also fringe the study area including Ohawe, Waiinu, and Mowhanau.

Surrounding the towns is considerable pastoral farming, some horticulture and also forestry. The area's most significant rural industry is dairying. The milk processing plant at Whareroa, near Hawera that is operated by Fonterra is the largest single plant of its kind in Australasia.

Population

As at the 2001 census (more recent census data was unavailable at the time of printing), the population of the South Taranaki district was 27 537 and the Whanganui district was 43 266. The populations of settlements in the study area were:

TABLE 1: SOUTH TARANAKI POPULATION

SETTLEMENT	POPULATION AT 2001
Wanganui	39, 423
Waverley	906
Patea	1302
Hawera	10,944
Manaia	951

Source: Statistics New Zealand.[2]

Age statistics showed that in 2001[3] there were greater numbers of young people (0-14 years), greater numbers of older people (64 years +) and proportionately fewer people in the 15-64 age bracket than the New Zealand average.

Ethnicity

The people of the area are predominantly of European and Maori extraction, with small numbers of other ethnicities including Pacific Island and Asian. At the 2001 census, 84% of people in the Whanganui district and 87% in the South Taranaki district identified as European (compared to 80% average across New Zealand). 21% of people in the Whanganui district and 20% in the South Taranaki district identified as Maori (compared to 15% across New Zealand and 47% from Patea).

Income

Income levels vary with most localities ranking under the national median income of $18,500 per annum. Exceptions to this include Hawera, with its median income sitting just above the national median at $19,100 per annum, and Patea, with its median income of $12,000 per annum, well below the national median as well as below other localities in the district.

Who was involved in the research?

As the research purpose was to obtain information from people familiar with the coast, the method of selecting participants was not representative of the general population (a consequence of the 'snow-ball' methodology of selecting people to interview). The following section discusses the types of people involved in the research. It is clear from this analysis that recreational fishermen dominated the group of respondents, with commercial fishermen, iwi, divers, environmentalists and agency representatives making up the remainder of the group.

As a consequence, the results should not be used as an indicator of the views of the whole population of South Taranaki and Whanganui, but rather as an indication of the views of coast and marine area users.

Workshops

Four fishing based clubs took part in workshops – two from the Patea end of the study area (Patea and Districts Boating Club and Ohawe Boating and Angling Club) and two from the Wanganui end of the study area (the fishing adjuncts of the Wanganui Cosmopolitan Club and the Wanganui East Club). The Wanganui-Manawatu Seafishing Club was unable to fit in a workshop in the time available, however, a presentation of the draft research findings was also given to this club and useful feedback was obtained.

The other groups that took part in workshops included the Wanganui Underwater Club, the Castlecliff Linking Group (a group that includes representatives from a number of Castlecliff based community groups) and a group of students (self-selected) from the Patea Area School. Members of the South Taranaki Dive Club were also involved in the Ohawe Boating and Angling Club workshop

Face-to-face interviews

79 face-to-face interviews were conducted. A number of interviews were conducted with pairs of respondents; the total number of people taking part in interviews was approximately 85. Participants came from throughout the study area.

Written surveys

A written questionnaire was sent out with the newsletters of the Ohawe Boating and Angling Club, Patea and Districts Boating Club, Wanganui-Manawatu Seafishing Club and Wanganui Dive Club. An advertisement, with the written questionnaire, was taken out in the Hawera Star and the Wanganui Chronicle.

Fifty-five people returned the questionnaire.

Recreational fishers

70% of respondents (again, both those interviewed and those that returned written surveys) used the coast for recreational fishing. This reflects the fact that the method for selecting participants in this research was not random (i.e. the survey respondents were selected on the basis of having knowledge of the coast). They therefore are not representative of the entire population, but do represent the recreational fishing community. This approach is consistent with the purpose of this research, being to seek information from those familiar with the coast, and therefore it was appropriate to target this group.

Other uses of the coast

Many of those that were included in the research also indicated that they used the coast for boat fishing, surfcasting and beachwalking. There are many other uses, including 4WD biking, surfing, whitebaiting, painting and spiritual revitalisation.

Many years on the coast

68% of respondents had used the coast for more than 20 years with many of them having used the coast for over 40 years. Collectively, therefore, the respondents had many years of experience on the coast. Thus the observations from these people, whilst only ‘anecdotal’, provide valuable, previously unpublished information on changes that have occurred through time.

Customary fishing

Only about 10% of the respondents indicated that they gathered kaimoana from the coast. Nga Rauru and Ngati Ruanui were both represented on the project team and therefore provided information to the project. To ensure that all tangata whenua had an opportunity to input to the project, a draft of the report was circulated to representatives from Nga Ruahine iwi and Te Runanga Tupoho.

Nga Ruahine was reluctant to get involved in the project when they were not on the project team. Information on Nga Ruahine's relationship with the coast is therefore limited to that obtained from existing literature, and information obtained from Maraekura Horsfall of Manaia.

Commercial fishing

Only about 10% of the respondents indicated that they used the area for commercial fishing. Indeed, a number of these identified themselves as ex-commercial fishers. To address the lower numbers involved from the commercial sector in either the project team or the respondents interviewed, the draft report was peer reviewed by a representative of the Taranaki Commercial Fisherman's Association.

3 WHAT PEOPLE VALUE ABOUT THIS COAST

Introduction

This study revealed that the South Taranaki – Whanganui coastal area is a special area for many reasons and is a well kept secret! Locals value the area for its remoteness and naturalness as well as the ability to catch a wide range of fish species.

In this chapter

Quotes in *italics* throughout this report were made by participants in the workshops or face-to-face interviews.

This chapter summarises the responses that people gave when asked what was important to them about this coast. Answers were grouped into the following themes:

- the naturalness of the coast;
- recreation, including fishing, diving, walking, swimming and surfing;
- access; and
- the weather.

Naturalness of the coast

A number of respondents said the naturalness of the coast was important to them. The ruggedness, uniqueness, beauty and unspoilt nature were mentioned.

"It's a fantastic wild area." – Recreational fisher.

"There are beautiful views of Mt Taranaki and Ruapehu as both are visible on a fine day."- Local resident.

Photo credit – A. Cox

The peaceful and remote nature of the coast was valued, and the fact that it was not overpopulated.

"We don't want it to look like Surfer's Paradise." - Local resident.

"It's important that I can go fishing, [but] irrelevant whether I catch fish or not. It is magic to see the sun come up." – Recreational fisher.

"It's an absolutely beautiful place to be," - Local resident.

In a similar vein, a few people said "Keeping it secret" was important.

"[I] want to see it protected. Not publicised. We don't want more people." - Recreational fisher and diver.

The need to preserve the coast's important natural features and environmental quality, particularly water quality, was important to a number of public agency respondents.

The relative absence of pollution was also mentioned. One respondent commented that there was no sewerage, and another said there was not much rubbish on the beach. Another person mentioned the absence of oil drilling as important.

Five respondents specifically mentioned geological features as important. These included the fossils in the cliffs, blowholes, preserved forest at Waitotara, ventifacts, fault lines and the North and South Traps.

"A lot of fault lines. Fascinating."- Local resident.

"It has a great history and a unique geology with rare fossils of various types, including our famous ventifacts." -Former commercial fisher.

Even the sand rated a mention!

"The black sand keeps you warm."- School student.

The rocky bottom was seen as important as it helped protect the fishery.

"The rocky bottom which keeps the trawlers out."- Recreational fisher.

Fishing

Over thirty respondents valued the coast for fishing and gathering kaimoana.

"It is our food resource. Our pataka." –Tangata whenua.

"Fish is a part of our diet."- Local resident.

The uniqueness of the fishery was mentioned by a number of respondents.

Photo credit – S.Hornby

"There is no other place like it." - Former commercial fisher.

"It balances the catch we get from the North Taranaki Bight and some species (i.e. trevally) are larger and more productive in the southern area."- Commercial fisher.

"Recreational fishing is very important for a coastal community." - Local resident.

"This particular fishery is quite unique. My colleague, formerly from East Coast, is amazed at the size of the fish and the fish being caught, e.g. large snapper, blue cod, and shark. Fish stocks are healthy as a result of weather patterns protecting it." - Ministry of Fisheries officer.

A feature valued as important by a full third of those mentioning fishing as important, was the ability to catch enough for a feed. One person rated the fishing as better than off New Plymouth in this respect, and other people commented on the fact that the area was not over-fished. "You can catch a fish" was a typical comment.

Photo credit – S.Sammons

A small number of respondents thought it was important that protection measures didn't inhibit use, with one person saying that ensuring there is no reduction in catch limits was important.

The variety of species was important, with some people mentioning the diversity of fish available, and the diversity of reef systems as well.

"The ability of my customers to get out and enjoy themselves and show the kids what fishing is all about." – Charter operator.

Some fishing areas were singled out for mentions of their importance:

"The [Patea] mudflats are important for pupus (snails etc)." – Tangata whenua.

"The groper hole, and underwater mountain." – Recreational fisher.

"The Waitotara River is a major whitebait breeding ground." –Local resident.

Diving

Diving was important to a small but significant number of respondents (12). Of these, five people said it was some of the best diving to be had. Features mentioned as important included the North and South Traps and reefs beyond the Traps. Some respondents mentioned coral and increasing numbers of unidentified tropical fish.

Photo credit – J.O'Leary

"Here if I am diving and find a unique spot, I feel like I am the first person to ever see it." – Diver.

"The reef areas can be as good as that found at the Poor Knights. It needs conserving before it's too late." – Diver.

Walking

A small number of respondents (4) named the walking opportunities the coast provided as important.

Photo credit
– R.Miller, DOC.

"You can walk for miles." -Local resident.

Younger respondents also mentioned sand dune sliding (on boogie boards) and sliding down mud banks along the beach as important. Fossicking on the beach and picking up objects such as rocks was also important to younger respondents.

Swimming

The water heating up in summer, and the pleasure of swimming at the Patea moles at full tide, and jumping off the wall was mentioned by a few respondents.

Castlecliff, circa 1915

Photo credit – Whanganui Regional Museum.

Access

Accessibility was of great importance (14), particularly that the coast was accessible to everyone. The available vehicle access, car parking and maintenance of launching facilities including structures such as the walls at Patea were valued.

The proximity of the coast for locals and easy access for children, and the benefits of this for family time and relaxation were important.

"I just love it. Born and bred here. A feed of fish is a bonus."- Local resident.

"It's our home coast. We need to look after it." - Recreational fisher.

"The coast is one of the reasons I am here." - Recreational fisher.

The reserves and the facilities provided were also mentioned, e.g. BBQ areas and tables. The land reclaimed by the moles at Castlecliff was also valued for its amenity.

The reality that a lot of the coast was not accessible was also seen as important. Two main aspects were mentioned - the rugged, inaccessible nature of many parts of the coastline itself and the limitations of getting out to sea on such an open exposed coast.

The weather

The weather itself rated a mention.

"Only the hardy fishermen go out. The fishing is an adventure here." – Recreational fisher.

"Stormy conditions make the view interesting" –Local resident.

The role of the weather and the exposed coast in limiting how often people could go fishing was seen as important by quite a number of respondents (14).

"Recreational fishers would never be able to over-fish this coast." – Recreational fisher.

Photo credit- A.Cox

"It's good on a good day." - Local resident.

Rough waves featured in many people's accounts of some of their worst days off this coast:

"I got swept out to sea off South Beach... somehow I managed to swim back in." - Recreational fisher.

"We got caught in a storm in a 20 ft trailer boat with way too much fish on board. We were nearly sinking. There were huge waves breaking over us. It's a bad day when you're out there and it's rough and you lose gear." - Former commercial fisher.

"We took three waves one day coming over the Patea bar. We took it too lightly that day." - Recreational fisher.

"I lost the Pandora on the Whanganui bar with 1400lb of flounder aboard. We were pooped by the south wall and I lost the boat and the catch." - Former commercial fisher.

A Holiday Adventure...

"Through the 1960s and early 1970s we spent the summer holidays camping at Kai Iwi beach. Instead of going to the Mowhanau camping ground we set up our tent at the old Waitotara County Council Reserve, enjoying the privacy (there was a tap, long drop and rubbish collection). Mr Gay of Manaia brought his 5 donkeys down each year to give donkey rides, and these donkeys shared our paddock.

One night a gale force southerly blew up, with torrents of rain. The donkeys, wise beasts, took shelter in the lee of our tent. Suddenly a violent blast lifted the tent off the centre pole and down it fell, leaving 2 adults, 4 children and 3 donkeys struggling to get out of wet, flapping canvas. Pandemonium reigned for a while, but no-one was hurt, and it was a great adventure for the kids to look back on."

- Local resident

4 FISHING AND DIVING

Introduction

This project has highlighted that the South Taranaki to Whanganui coast is considered highly valuable for the fishing and diving opportunities it provides – even if the weather is not always that obliging!

Recreational fishing is an important pastime for local people. The South Taranaki fishery is recognised by those interviewed as unique: at a time where many fisheries around New Zealand are under considerable pressure, many believe that this fishery has inclement weather as its built-in protector.

During the workshops, people gathered around a nautical chart, and identified broad areas where they went fishing, or areas they knew something about. In the face-to-face interviews, people were asked to identify on the chart which areas were important to them (for fishing, diving, gathering kaimoana, marine mammal watching etc). People who completed the written surveys were also asked to indicate areas where they fished or dived.

Specific GPS points of people's favourite fishing spot were not sought, rather, people indicated general areas.

People were also asked what species of fish were most often seen or caught, and what species were rare to catch.

In this chapter

This chapter summarises the results from asking people what areas were important to them for fishing and diving, what fish species they were catching or seeing and what the seabed is like from a diver's perspective.

This study did not attempt to gauge catch levels at all. The aim was simply to identify the range of species targeted, and to get a sense of their perceived abundance and location.

What areas are important for fishing?

To identify which areas were important for fishing, the nautical chart was divided into large grids, and people were asked in the workshops and face-to-face interviews to identify which squares were important for fishing. The project team specifically agreed not to attempt to seek specific GPS points from fishers due to the sensitivity of such information.

A tally was made of the frequency each grid was mentioned. This provided an approximation of areas that were more frequently mentioned during this research than others (see Figure 2).

FIGURE 2: AREAS IDENTIFIED THROUGH WORKSHOPS AND INTERVIEWS AS BEING IMPORTANT FOR FISHING.

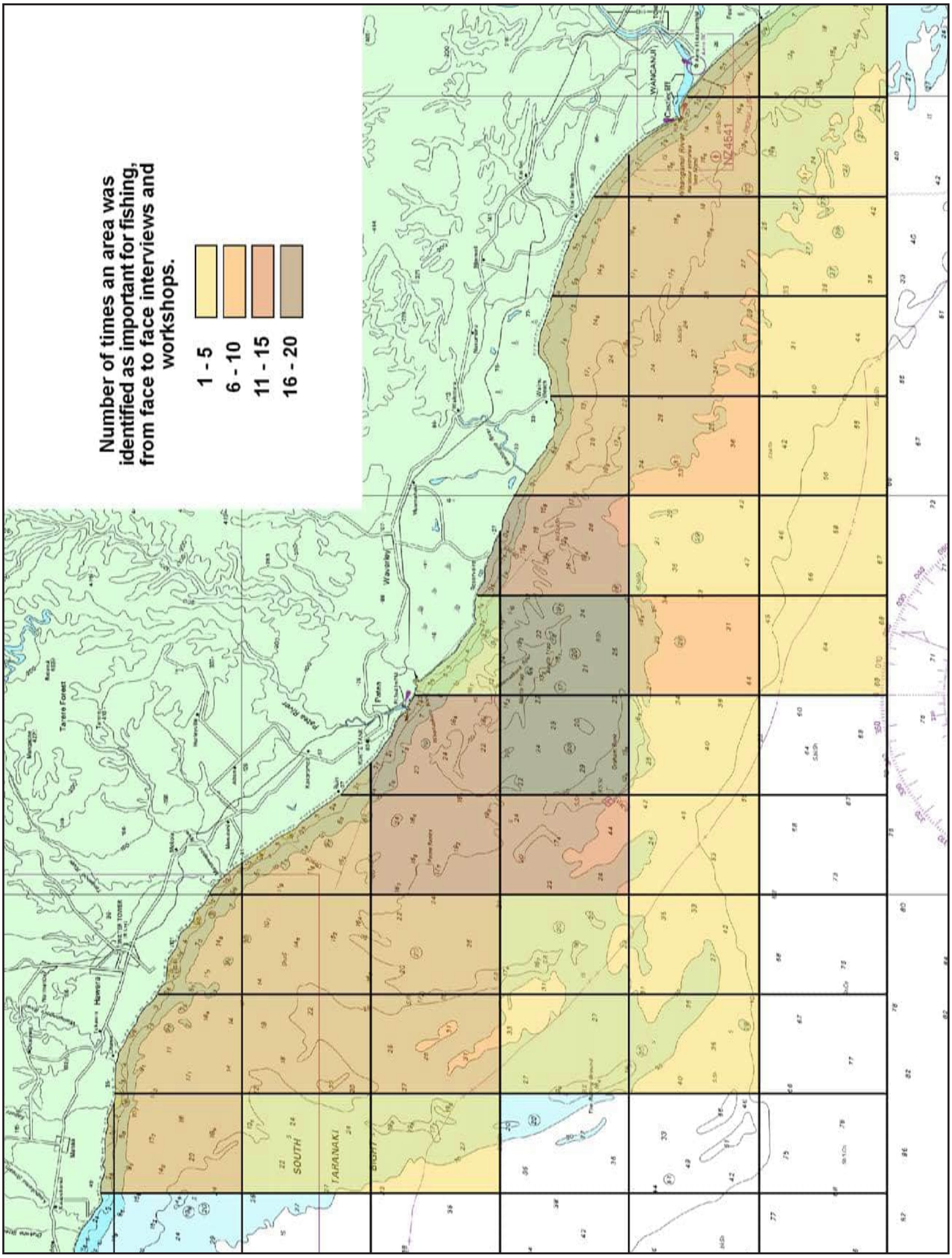
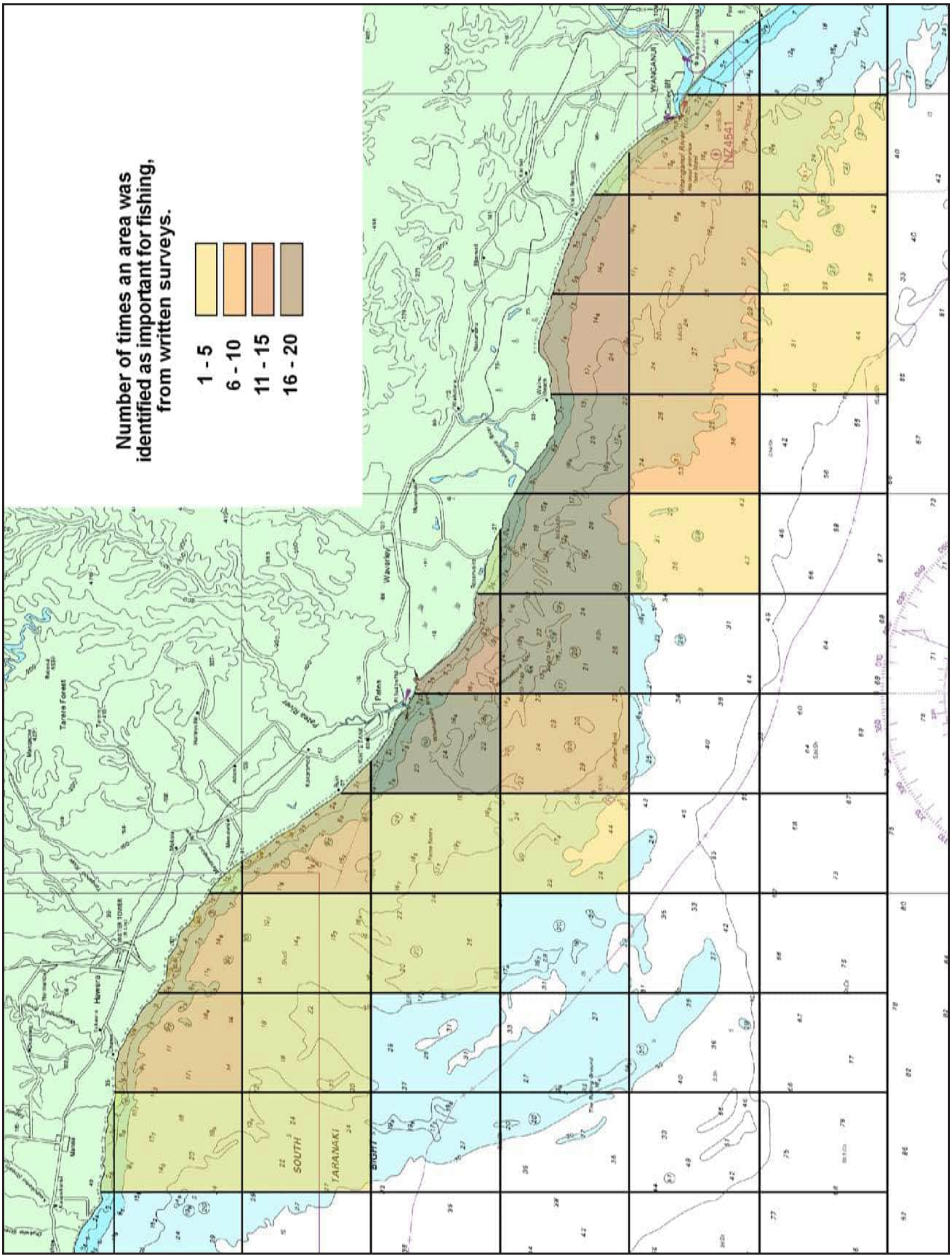


FIGURE 2A: AREAS IDENTIFIED AS IMPORTANT FOR FISHING FROM THE WRITTEN QUESTIONNAIRES.



A similar tally was made of the information from the written questionnaires (Figure 2a). Information from the written questionnaire was kept separate from the face-to-face interviews and the workshops because of the smaller map provided for people to fill in. The fishing map for the written surveys was less detailed – the scale of map respondents used was smaller, and estimates had to be made of what people meant by 'off Waitotara' etc.

The results from the written questionnaire were consistent with the other results confirming fishing 'hot spot' areas off Patea, off the North and South Traps, off Waitotara and Waverley and down along the coastal strip towards Wanganui.

'We fish at the Graham Bank and the rolling ground. Get the fish anywhere. To trawl here (off Castlecliff) have to go out to 4 miles and tow south. Too many rocks closer in. Have to go out 27-30 fathoms.'- Former commercial fisher.

People indicated that they varied where they fished according to the weather, but would generally fish into the wind so that there was a tail wind for the return trip home. In addition, people varied their fishing spot according to the season.

Fishermen were aware of the seabed they fished over, and recreational fishers tended to target reef or foul ground. Blue cod in particular are targeted over foul ground. One area directly off Kai Iwi (the 24-27m line on the chart) is known by Whanganui fishers as the cod bank.

"[I] used to be able to land on my favourite cod spot 50% of the time, now with GPS, can land on it 100% of the time. I managed to fish out a favourite spot by returning to it repeatedly, and then all of a sudden the fish were under size. It took over 2 years for the fish at that spot to build up again. GPS haven't helped fish stocks, especially blue cod which need foul ground.' – Recreational fisher.

Seabed used by commercial fishers varied according to species targeted or fishing method used.

"Grey mud when we were trawling – or reef and foulground for longlining or set netting." – Former commercial fisher.

Fish species caught

The most common fin fish caught are blue cod and snapper. Kahawai and gurnard were common but to a lesser degree.

Other species caught included tarakihi, barracouta, john dory, and trevally. Fish species considered rare to catch by respondents included groper and kingfish.

Spiky dogfish were the most common shark reported by respondents.

Other species reported

Other species mentioned by two or more respondents included blue wharehou, flounder/sole, squid, conger eels, elephant fish and herring.

Other species mentioned by respondents included blue moki, butterfly perch, blue mao mao, yellow eyed mullet, jock stewart, slender roughy, grey mullet, blue mackerel, trumpeter, monk fish, butterfish and ling.

"I saw a huge basking shark once. It was longer than a 40 foot boat. It had its huge mouth wide open." - Former commercial fisher.

"Someone got a video of a marlin jumping off Waverley." - Recreational fisher.

Some respondents mentioned encounters with great white sharks.

"My worst day [out on the coast] was when a 4m white pointer came up following a hooked kahawai to breach beside the boat... a very impressive specimen!" - Recreational fisher and diver.

"Once a flying fish flew onto the [boat] deck. We took it to the museum because we didn't know what it was!" - Former commercial fisher.

Table 1 lists fish species mentioned by respondents. The number given in the column 'reported abundance' is the total number of mentions made, and whether the respondent stated it was 'common' to catch, 'rare' or 'other'. For some species, respondents did not specify whether the species mentioned was 'common', 'other' or 'rare' to catch, and for these species, the numbers given are for the number of times the species was mentioned.

TABLE 1: REPORTED FISH SPECIES AND ABUNDANCE

COMMON NAME	MAORI NAME	SCIENTIFIC NAME	REPORTED ABUNDANCE		
			COMMON	OTHER	RARE
Barracouta		Thyrsites atun	5	26	
Blue Cod	Pakirikiri, Rawaru	Parapercis colias	96	7	
Frostfish		Lepidopus caudatus	2	2	2
Groper / Hapuku	Hapuku	Polyprion oxygeneios	4	8	26
Gurnard	Kumukumu	Chelidonichthys kumu	44	36	4
Jack mackerel	Hauture	Trachurus novaezelandiae	5	7	2
John dory	Kuparu	Zeus faber	6	19	23
Kahawai	Kahawai	Arripis trutta	55	27	7
Kingfish	Haku	Seriola lalandi	9	21	32
Leather jacket	Kokiri	Parika scaber	9	10	3
Marlin		Makaira nigricans	4	10	8
Moki			6	2	4

TABLE 1: REPORTED FISH SPECIES AND ABUNDANCE... CONTINUED...

COMMON NAME	MAORI NAME	SCIENTIFIC NAME	REPORTED ABUNDANCE COMMON	OTHER	RARE
Parrot fish			3	10	3
Red cod	Hoka	Pseudophycis bachus	17	17	23
Shark (rig, grey, gummy, sand)		Mustelus lenticulatus		13	
Shark (grey / school)				1	
Shark (spiky dogfish, spiny dogfish)		Squalus acanthias		33	
Shark (spotted smooth hound, lemonfish, spotty), rig		Mustelus lenticulatus		10	
Shark (unspecified dogfish)				3	
Shark (carpet)		Cephaloscyllium isabella		4	
Shark, mako	Mako	Isurus oxyrinchus		1	
Shark blue		Prionace glauca		1	
Shark, thresher		Alopias vulpinus		1	
Shark, white-pointer		Carcharodon carcharias		1	
Snapper	Tamure	Pagrus auratus	85	19	3
Stargazer	Kourepoua	Genyagnus monopterygius		5	4
Spanish mackerel		Family Scombridae		4	3
Stingray	Whai	Family Dasyatidae		8	1
Tarakihi		Nemadactylus macropterus	13	36	15
Trevally	Arara	Pseudocaranx dentex		23	12
Tuna		Family Scombridae		1	7

The abundance results given in Table 1 should be used as indicative only given the limitations of the research. These results relied upon those interviewed subjectively stating whether a species was commonly caught, other, or rare to catch. Note that information on shark abundance was not gathered by the interview team.

Who else is using the area?

People interviewed face-to-face were asked who else they noticed using the coast. People fishing in the area were mainly described as locals. Where 'outsiders' were using the area, they were generally believed to be coming from the Manawatu or to a lesser extent, from New Plymouth, particularly during competitions. There were occasional mentions of people from other areas.

What areas are important for diving?

North and South Traps

The areas most frequently mentioned by respondents as important for diving were the North and South Traps off Patea.

Fish species seen regularly here included terakihi, red moki, cod, snapper, rock lobster, Spanish lobsters and packhorse crayfish, kingfish, blue moki, big eye, leather jacket and other smaller reef fish (Wanganui Underwater Club workshop).

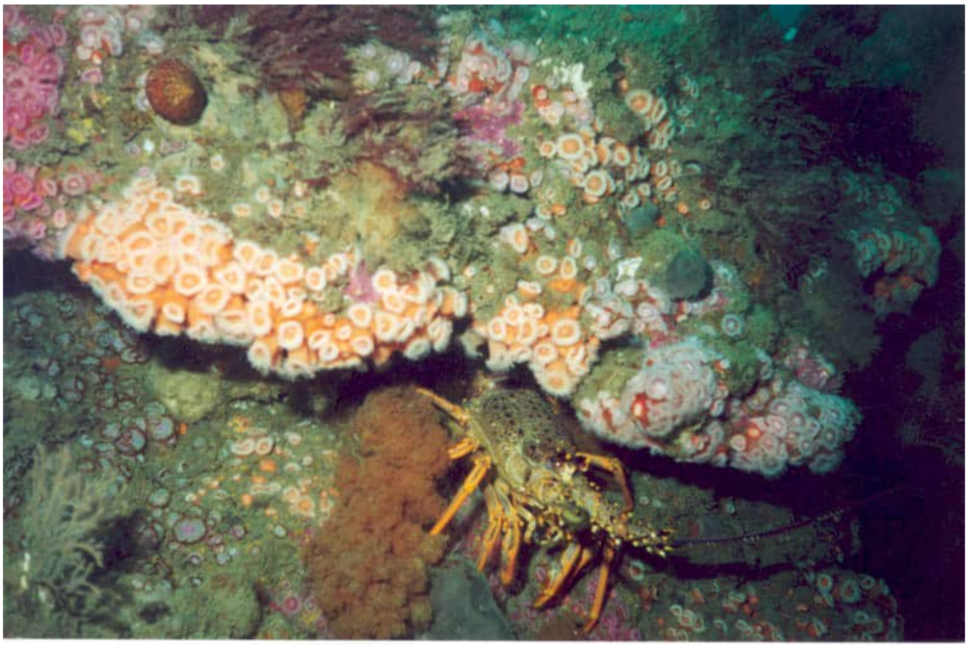


Photo credit – J. O'Leary

"The traps provide some of the best diving in New Zealand because the weather protects them, they haven't been over harvested, they have huge drop offs and fantastic colours on the walls." – Diver.

Photo credit – J. O'Leary

"You find conger eels, large patches of kina, large crabs, scattered patches of kelp. Papa and rock. Rock walls are covered with anemones, nudibranchs (the Jason Clown species), colourful algae, corallina paint – pink and purple etc." – Diver.

"Pretty with a torch – different algae, sponges, get elephant sponge shallower than you should – probably because of a lack of clarity. There is more weed at the South Trap because the water is clearer. There are kina in patches. Also see conger eels, banded wrasse, parrotfish, triplefin and nudibranch. A little bit of kelp on the South Trap." – Diver.

Other diving spots

Divers also mentioned diving off Patea, Waverley and Waitotara. They described rock 'mounds' sitting on the sand which were papa rocks with shell layers, about knee high, in water 8-10m deep. They also described the following papa rock structures running out from the coast like fault lines or a papa uplift:

"Off Waverley and north of Waitotara there are papa rock ledges and gutters running about 0.5 km long on a 45 degree angle to the sea floor, perpendicular to the coast. Rock lobster hide there (clinging under the roof of the rock formation). It's in water from 8m-20m deep."- Diver.

Other divers described areas off the coast of Patea and further around the coast:

'…papa ridges - scattered - long ridges of reef with bits broken off and cracks once off ring plain area.' – Diver.

Further out, some divers talked about the Graham Bank:

"On the edge of the Graham Bank there's a steep drop off with a ridge of papa. Good visibility." – Diver.

"Graham Bank is pure sand. There is nothing on it." – Diver.

5 CHANGES IN FISHING

Introduction

Fishing has been important for local people in South Taranaki since it was first settled. In recent years, improvements in technology and the advent of more affordable boats, has seen increased numbers of people enjoying this pastime.

Participants in the research were asked to identify what changes they had noticed in the area generally. Many of their replies were related to changes observed in fishing. People were also asked if fishing was harder, the same or easier and why.

While the results discussed in this chapter are generally only based on anecdotal information obtained through the interviews, written questionnaires or workshops, it is worth keeping in mind that the huge majority of participants in the interviews had used the coast for over 20 years, and many of those had used the coast for much longer than that.

Harder or easier?

More than 50% of all survey respondents believed that fishing had got harder in recent years.

Less than 25% of survey respondents thought it was about the same, perhaps with some species by species variation and the remainder of respondents (also just under 25%) thought fishing was easier.

A perception held by a significant proportion of respondents, probably around about half, is that there are fewer fish. A number of these respondents also mentioned an increase in poor quality (meaning less desirable) fish species.

Why?

After people were asked if fishing was harder, easier or the same as it had been in the past, they were asked to identify why. Table 2 summarises those responses.

"Boats are bigger, faster, and able to go out further."- Recreational fisher.

"We used to use long lines and set nets before GPS." - Recreational fisher.

"[There] used to be 50 boats maximum on the weekend. Now you'll see 100 boats on a week day."- Recreational fisher.

TABLE 2: REASONS WHY PEOPLE BELIEVED FISHING IS HARDER, EASIER OR THE SAME

HARDER	EASIER	THE SAME
Improved technology – resulting in over fishing certain areas	Improved technology	Improved technology – so can travel further
Quota management	Quota management	Weather
Trawlers – too close, too many	Voluntary trawl agreement	
More fishers		
Over abundance of spiky dogfish		
Commercial fishing in the past – Japanese longliners and pair trawlers		
Erosion, sand covering reefs, pollution		

Other information available

A number of people interviewed indicated that they had kept records (informal or regular) and the majority of these indicated that they would be happy to make this information available for future research. Such information included fishing logs or diaries (maintained by 14 people), dive logs (maintained by 3 people) and club or competition records (maintained by 3 people). Detailed data from commercial fishing off Wanganui in the 1970s is held by Audrey Cox. This additional data was not analysed through this study, but has the potential to contain valuable information, at the local scale, that could be analysed in the future.

Summary of changes observed

Changes in the shore fishery – particularly from surfcasters and shellfish gathers were reported. Species for which fishing was perceived to have changed were snapper, kahawai, blue cod and rig. Other changes included significant increases in spiky dogfish and paddlecrabs. There was a perception that numbers of recreational fishers had increased, and that people were able to get out more thanks to improved boats and equipment. There was a perception that there were more trawlers operating.

Changes in the shore fishery

Quite a few respondents believed that there had been a decrease in shoreline fish stocks:

"When Dad used to surf cast he could get 2-3 snapper an hour. At Pihana, you could see snapper tails as they were feeding on mussels." – Recreational fisher.

"As a child I used to fish off the rocks with a handline and would always catch things. But I seldom do now." – Recreational fisher.

"The inshore fishery is totally over fished. Species have disappeared,

e.g. Patiki (flounder). As a child, 6-8 of us could go down to the beach at low tide in February-March with a spear and get a good feed of flounder for the whole family. Not now. Although there has been a small improvement in the last 2 years." - Tangata whenua.

This was echoed by another respondent.

"As a kid we used to catch flounder from the beach and sometimes tread on them when swimming. Now very occasionally people catch them in streams." - Recreational fisher.

One respondent put forward a possible reason for this:

"In the 1960s there was a trawler in the flounder season that ran between Castlecliff and Kai Iwi. Must have done a lot of damage." - Tangata whenua.

"I used to do a lot of floundering in the late 1950s and 60s. I often caught 100 flounder or sole. Once I caught several sackfuls and took them up to the Grand Hotel and sold them for thruppence each."- Local resident.

"There has been a noticeable decline in fish caught over the last 10 years." –Recreational surfcaster.

Data was provided from the Patea Surfcasting Club (Table 3). This appears to illustrate a decline in fish caught by surfcasting. This may be indicative of an actual decline, or it may merely reflect a reduction in fishing effort through there being fewer club members.

TABLE 3: NUMBERS OF FISH CAUGHT SURFCASTING BY THE PATEA SURFCASTING CLUB

SEASON	NUMBER OF FISH CAUGHT
1995	219
1996	239
1997	206
1998	180
1999	162
2000	134
2001	68
2002	39
2003	28
2004	33

Source: Patea Surfcasting Club annual competition records (edible species),
Fred Petterson pers com.

"You used to be able to catch snapper in the river off the wharf. They used to sell for 2'6. Now you just get enough for a feed." - Recreational fisher.

Changes to fish size

A few people mentioned that fish were generally smaller than they were 5-10 years ago, with one suggesting they were smaller out to 3-4 miles off shore. Several respondents commented that it was necessary to go further out to catch fish, with a few suggesting larger cod and snapper can be scarce.

However, some respondents believed that there had been some improvement in reef fish able to be caught from the shoreline.

"We landed bigger fish in the competitions last year (off Wanganui) than we got when I was long lining in the 1940s and 1950s." – Former commercial fisher.

Changes in shellfish

A number of respondents commented that there were fewer shellfish available on the shoreline.

"There are fewer shellfish between Wanganui and Waitotara. I don't think the bed is there anymore. We used to dig up pipis to use for bait. You don't see whole shells on the beach like you used to. Just small bits… it could be a natural thing such as sand shift or disease." - Former commercial fisher.

Another respondent echoed this, and added that tuatua had also gone from the Waitotara River mouth area. A third respondent mentioned cockles as less plentiful.

One respondent observed that they used to get mussels off Ototoka Beach.

"Even 6-8 years ago you could get a feed – now you can't. This is due to over harvesting." – Local resident.

Another respondent observed that in the 1970s the mussels in the rock pools were a very good size, but by 1985 were much smaller.

Yet another respondent could remember paua being taken from Waitotara Beach.

"In the last 10 years, tuangi (surf clams) were washed up dead in very large amounts. A huge heap of them along the coast, perhaps half a metre thick to 2 metres wide. All the way between Patea and Otaki. A natural phenomenon, but I have never seen this again in all my 67 years." - Tangata whenua.

"There was a shell fish die off along the coast about 6 years ago. Big bi-valve shells washed up – could this have affected inshore fishing?" – Local resident.

"Also, gastropod, volute shells are much less common than when I was a boy – you can still find them down at Waikanae." – Local resident.

"The rock pools past Snapper Rock had lots more and larger mussels – everything of eatable size is gone, there are seeding mussels only on the Waiinu side." - Local resident and naturalist.

"There are now more blue bottles than in the past." - Recreational fisher.

Increases in paddlecrabs

Several respondents mentioned increases in the size and number of paddle crabs, and one put this down to a decline in the rig fishery:

"I believe that rig is now fished out. They used to travel up and down the coast in vast quantities. [Rig] used to feed on paddlecrabs. In the 1960s they were very small perhaps one inch (20mm) across near Wanganui. Because rig was hit so hard commercially it has upset the structure that was going on. We did not have big paddlecrabs there. Now if you go fishing you catch heaps of them. I believe that the decline of rig and snapper has allowed the paddlecrab population to increase. It was the mid-1980s that suddenly we had very big paddlecrabs. They bite your feet surfcasting and come on the line." - Former commercial fisher.

"One of the banes of the beach at the moment is a population explosion in the paddlecrab numbers, caused, we think, by large scale set netting of the shark population." -Commercial fisher.

Although a couple of beach walking respondents believed that there were fewer crabs.

"There are fewer dead paddlecrabs."- Local resident.

Changes in kahawai

Kahawai is another fish popular with recreational fishers that appears to have declined in recent years. Certainly, a significant number of respondents felt that there were fewer kahawai in the area.

"We live in sight of the sea and don't see the schools of kahawai we used to." - Local resident.

"When I was growing up I lived next to the Whanganui River. I can remember hearing kahawai at night, a huge noise like a waterfall of fish on the river. Back in the 1960s you would get 150 kahawai in a 30 m net in the river. There was also mullet in the river." - Former commercial fisher.

"In the 1960s I remember seeing kahawai drive shoals of sprat up the [Whanganui] River. Also Te One Kahawai too. I last saw this happen about ten years ago. It would cause small fish to jump out of the water onto the shore." - Tangata whenua.

However, at least one respondent felt that kahawai were still plentiful:

"Kahawai are still OK off the river mouth."- Recreational fisher.

Increase in spiky dogfish

Many respondents reported an increase in spiky dogfish and complained of it being a pest to fishers:

"Spiky dogfish have increased to plague proportions. The possum of the sea." - Recreational fisher.

"It was the mid-1980s that…spotty spiky shark also started becoming more common." - Former commercial fisher.

Decrease in sharks

Fewer sharks, particularly 'good sharks' were reported by several respondents. Some wondered if this was because of a change in the food chain, or perhaps the current flow.

One respondent put the decrease in rig down to females being 'hammered when in pup.'

Changes in rock lobster or crayfish

A few respondents mentioned an increase in the number of juvenile crayfish:

"Crayfish have got smaller. You never used to see the little ones."- Diver.

An increase in the number of softshells was also reported. However, at least one respondent felt that this increase (in seeing juvenile crayfish) was evidence of an improvement in crayfish numbers. A commercial fisher noted that crayfish have generally increased in numbers on the west coast of the North Island with major increases in small rock lobsters being noticed and good catches of larger fish.

Decrease in whitebait

A few respondents reported fewer whitebait and herrings. One suggestion for this was changes in the seasons affecting fish cycles.

Photo credit: A.Cox.

"If we went whitebaiting at Kai Iwi in the 1970s and 1980s, you could get enough for a meal for 4-5 people. I remember learning how to make whitebait fritters." - Local resident

Decrease in groper

"In 1963 and 1964 I went out with Bill Cox and set 100 hooks we went to the groper spot off Kai Iwi that is now long gone. We filled the boat up with groper in under an hour. We worried and hoped there were not too many fish on the long line because we knew we

might sink the boat. We came back grossly overloaded... This was normal." - Former commercial fisher.

Changes in blue cod

A common response on blue cod was that you had to go further out to get them, and that they were harder to catch. A few respondents commented that they were not as widespread, and that the reason was spiky sharks driving them out.

However, at least one respondent felt that there had been an increase in the size of cod.

Increasing numbers of recreational fishers

Increased numbers of recreational fishers was mentioned frequently. Members at one fishing club estimated that their numbers had at least doubled in the last decade.

A few respondents felt that there were more people coming from outside the region, e.g. Taihape, Foxton and Palmerston North.

One suggestion as to why this was occurring was the increased reliability of boats and the ability to obtain a boat at a more reasonable price in relative terms than in the past.

A number of respondents observed that there had been an increase in divers, possibly because of diving courses being made available locally.

An increase in numbers of charter boat operators was also observed.

Increased shore fishing was also commented on, and increased numbers gathering kaimoana.

Improvements to fishing technology

Improvements in technology were mentioned by a large number of respondents. This included better boats and increased quality of, and use of fish finders and hand held GPS.

"Now everyone has a fish finder and depth sounder on their boat and a GPS in their pocket." - Ministry of Fisheries officer.

A few respondents felt this had meant a decrease in the use of long lines and nets.

"We used to use long lines and set nets before GPS." - Recreational fisher.

"Boats are better, faster, and able to go out further." – Recreational fisher.

"There are lots more 14-20 ft boats." – Former commercial fisher.

"Motorbikes on beaches – give greater range for trailers with nets." - Recreational fisher.

Some people see this increase in technology as having its down side in a number of ways:

"GPS enables fishermen to go back to the same spot and hammer it." - Recreational fisher.

"GPS marks which previously were good spots are now either barren or have a much smaller amount of fish on them." - Recreational fisher.

"GPS means people aren't plucking (taking luck to find a good spot) and also are relying on the information, therefore increasing safety risks if there is a failure." – Former commercial fisher.

"You don't see people setting a net, or using one off the beach – mainly because now they get vandalised. Nor do you see people netting in the surf like we used to – people are too lazy now with their flash boats." - Local resident.

However, a few respondents observed that the mainstay of much recreational fishing – the rod and line – remained pretty much as it had always been, notwithstanding improvements in reels, hooks, lures and line invisibility.

One respondent believed that there had been an increase in recreational people using gill nets.

However, a significant group of respondents (12) believed that fishing was about the same, despite a number of these respondents acknowledging that there were more boats and better equipment available to fishers.

"There is no great fishing pressure in South Taranaki." - Recreational fisher.

Of those that believed fishing was easier than in the past, a significant number (4) said that improved technology was the reason for fishing being easier. GPS, sounders, fish finders were the key technological advances mentioned.

"I keep a diary and fishing does seem to be getting better although we now have bigger boats and travel further afield." - Recreational fisher.

Increase in petrol costs

An increase in petrol costs meant that some people were not going out as often.

"I don't go out as far now due to petrol costs." - Recreational fisher.

Changing attitudes

A change in attitude by recreational fishers was commented on by a couple of respondents. Some felt attitudes were more responsible:

"Getting the limit isn't as important as just being out there and catching a feed." - Recreational fisher.

People are more responsible than in the past." - Recreational fisher.

Others didn't think much had changed however:

"I do think we take the beaches and coastal areas for granted." -

Recreational fisher.

"People are not protecting the area as they once did." - Commercial fisher.

Changes in commercial fishing

"My father was one of the first fishermen 60-70 years ago. Had a clinker boat. Fished using hand lines. Brought back sacks full of snapper." - Recreational fisher and diver.

"[Commercial fishing] started in the 1960s when trawlers found out what was here. Before then, in the 1950s, Bill Cox and I would go out in runabouts and never used to see anyone. We could get 15-20 dozen snapper in an afternoon. The weather won't let you do it all the time here. I used to do Bill Cox's long lines. Get them ready for the next day. The set lines would come up with 100 hooks and a fish on every hook." - Former commercial fisher.

"I started out during my school holidays in 1966, trawling on the Oceania. We were fishing snapper and used to sweep everything else back over the side – tarakihi, flounder, john dory… it's always been a good longline fishery… before the big trawlers started." - Former commercial fisher.

"By the early 1970's the Port of Wanganui had the reputation as the best snapper long line fishery in the country."- Former commercial fisher.

People noted that there were less local commercial fishers using Wanganui and Patea, and recalled being able to buy fish directly off the wharf, but not anymore.

"During the 1950s, four or five boats under 15 feet long fished off Kai Iwi beach for snapper…. They used to bring the snapper in by the coal sack and sell them from the boat, in the driveway, for half a crown each… people would queue all the way down the road." - Former commercial fisher.

Some respondents described a decrease in commercial fishing in general, especially gill netting, which they used to use for rig and grey shark, also that there are now fewer squid boats than in the 1970s. Where there used to be a lot of smaller boats doing long lining, there were now more trawlers.

"There used to be a lot of smaller boats doing long lining. Now there are more trawlers." - Former commercial fisher.

"There are fewer squid boats fishing than in the 1970s." - Recreational fisher.

Japanese long liners operated here in the 1960s and 1970s. They were so close in, you could see the top of the mast over the cliff. They set lines in a box formation – took a lot of fish. The snapper fisheries disappeared about then." - Recreational fisher and diver.

"Things got tough for small commercial boats because of regulations

from MAF… the mercury ban on grey shark put many fishermen out of business." - Former commercial fisher.

"In 1975 most commercial long lining was for snapper. There were also gill nets for dogfish and wharehou… the most hooks I would set would be 6000 in a day. That was on my own. This was more than you could do in other parts of New Zealand. There were a couple of years where if I didn't have 3000 hooks, I wouldn't go fishing. Most of this was done at Patea." - Former commercial fisher.

Others felt that there was more commercial fishing happening, in particular from large out of town boats.

A number of those reporting that fishing was either easier or the same credited changes in management of commercial fishing with their observations of the recreational fishery:

"Snapper have come back because big scale trawling has stopped. Perhaps this is because of the quota system – it has worked to an extent, e.g. Snapper 8 – they can fish anywhere in there." – Recreational fisher.

"Generally fishing off the beach seems harder than 50 years ago, but in the last 2 years I have seen people getting good snapper off the beach – maybe because the trawlers are not coming in so close?" – Recreational fisher.

One thought the reason fishing was still the same was that there were fewer locally based commercial boats working the area than in the past.

A group of respondents (9) believed that fishing was easier now than in the past. Of these, the greatest number said that this was because of the quota management system.

One respondent thought fishing was easier because the voluntary 'no trawl' agreement had been upheld.

"To a certain degree, the no trawl zone is respected…" – Recreational fisher.

"Since the mid 1980s and early 1990s fishing has improved. Snapper have returned and size increased. This is possibly due to no pair trawling, commercial set netting being reduced, set lining reduced, amateur quotas, bigger, faster boats going further and reducing local pressure." – Recreational fisher.

The role of the weather

Most of the people who said they believed the fishing was about the same felt that the weather was its best protector.

"The weather on this coast has the most constant swell lines and onshore winds with N-S current of approximately 7 knots. In other words, the weather is atrocious." – Recreational fisher.

"Blue cod grow quick – 1-2 years and there are huge areas there. Because of the weather limiting fishing, they won't be fished out." - Former commercial fisher.

6 MARINE MAMMALS

Introduction

Three quarters of those interviewed had seen marine mammals in the area. The most common species mentioned were the NZ fur seal, followed by dolphins, orca and whales. People also indicated where they had witnessed whales that had been washed up onto the beach. These included some of the rare beaked whales.

What marine mammals are present in the area?

Table 4 sets out all the species mentioned by respondents as present in the area. The number in the 'number of mentions' indicates the number of respondents who mentioned seeing these marine mammals. Where people indicated that they were rare to see, this has been indicated.

TABLE 4: REPORTED MARINE MAMMALS IN SOUTH TARANAKI

GENERA	SPECIES	NUMBER OF MENTIONS
Seals	(species not specified)	37 * 1 said rare
	NZ Fur seal	1
Dolphins	(species not specified)	30 * 2 said rare
	Hector's dolphins	1
	Dusky dolphins	1
	Bottlenose dolphins	2
Orca	Pilot whale, black fish	28 * 6 said rare
Whales	(species not specified)	11
	Humpback Whale	5
	Southern Right Whale	2
	Sperm Whale	2 (1 stranded)
	Cuvier's Beaked Whale	1 (stranded)
	Scamperdown Whale	1 (stranded)
	Pygmy Sperm Whale	1 (stranded)
	Toothed Whale	1
	Minke Whale	1

Seals

People reported seeing seals frequently using the area to haul out (this is when seals come on shore to rest on the beach).

Seals off Patea

Photo credit – S.Hornby

"We didn't used to have seals here. Now they use the area as a haul out. They didn't breed in North Taranaki in the past, but now they are, on the islands." Local resident and naturalist.

"Lots more haul out. Apparently 600 counted between Wanganui and Hawera. Maybe that's why there are less fish. They are known to play with fish, i.e. play with more than they eat." - Recreational fisher.

"I've seen seals sunbathing at Waverley beach."- Recreational fisher.

"I caught a small seal in a gill net up the Patea River last winter." - Recreational fisher.

Orca

A number of people reported seeking orca travelling through the area. Those that were able to indicate on a map where they had seen them highlighted inshore areas off Waitotara, Waverley and Patea.

"I once saw an orca and calf heading down the coast just off Waverley Beach." – Recreational fisher.

"Orca feed on red cod in winter." - Diver.

"Orca come in close – I've seen them at wharves and river mouths. I think they come up in February to feed on stingrays. It seems to be the same family. Orca Watch have suggested it's the same group having a beat that they do." - Former commercial fisher.

Whales

"In 1995 I saw a humpback whale and calf at Ohawe." - Recreational fisher.

While the research was going on, a southern right whale and its calf travelled through the area. Department of Conservation staff were able to take a small skin sample for genetic analysis for research into southern right whale populations. The research, carried out by Auckland University, aims to clarify whether the New Zealand population of southern right whales is distinct from the population around Antarctica.

Southern right whale and calf seen off Castlecliff Beach, Wanganui, July 2005

Photo credit: Wanganui Surf Rescue

Have marine mammal numbers changed?

Respondents were in two minds as to whether marine mammals had increased or not in South Taranaki.

"There's not as many as there was." - Former commercial fisher.

"The mussel reefs have been depleted at Waiinu and now the seals have gone. This is the result of people taking too many shellfish." - Commercial fisher.

"You used to see black fish [orca] twice a year 20 years ago. Now I haven't seen one for a long time. It would be 8 years at least since I last saw one." - Recreational fisher and diver.

A few survey respondents thought dolphin numbers had declined.

"2-3 years ago dolphins were abundant. Not now." - Recreational fisher.

This same respondent thought this was because they were getting caught in nets.

However, a few respondents thought there were more dolphins than in the past:

"There are more now than there have been for quite a while. In the 1950s and 1960s you used to see a lot (but equally I spent a lot more time on the beach then). They seem to be back more frequently now. But maybe it's because we're more conscious of them now." - Local resident.

Comments made about particular species were inconsistent, with some people arguing fewer of a species, but others arguing that there were more.

7 BIRDS

Introduction

Bird diversity and abundance appears fairly low throughout the South Taranaki – Whanganui coastal marine area.

"The Hawera coast is not very rewarding for bird watchers. Many more species are seen on the coastal lakes and sewage ponds where spoonbills, for instance, are to be seen, but I have never seen them on the beach." - Local resident and environmentalist.

Artic Skua off Tangahoe River mouth

Photo credit – S.Hornby

The coast itself has only a few places bound to excite a bird watcher. These areas tend to be at the estuaries of rivers such as Waitotara and Whenuakura, which provide important 'stop-over' points for migratory birds.

Only a few areas, such as Nukumaru, provide breeding grounds for shore birds, although there are significant black-backed gull rookeries scattered around the coast and particularly along the cliffs.

Quite significant numbers of seabirds are sighted by fishers when out at sea, suggesting that the South Taranaki Bight may provide an important feeding ground.

"Arctic skua will hang around tern colonies. Chase the tern and grab fish from them before they hit the sea. They can be seen off the Patea stacks." - Local resident and naturalist.

What bird species did people report seeing in this area?

Respondents mentioned the following birds as ones they had sighted at sea or on the coast in South Taranaki (Table 5). The number in the 'number of mentions' indicates the number of respondents who mentioned seeing these bird species. Where people indicated that they were rare to see, this has been indicated.

The five birds most frequently mentioned by respondents were gulls (including black-backed and red-billed), gannets, albatross, penguins and terns.

TABLE 5: REPORTED BIRD SPECIES

FAMILY	SPECIES	NUMBER OF MENTIONS
Gulls	(type not specified)	42
	Black backed gulls, Karoro	13 * 1 said rare
	Red billed gulls, Tarapunga	6

TABLE 5: REPORTED BIRD SPECIES ... CONTINUED...

FAMILY	SPECIES	NUMBER OF MENTIONS
Gannet		33 * 8 said rare
Albatross/ Mollymawk	(type not specified)	39 * 15 said rare
	Shy (white-capped) mollymawk	1
	Black-browed mollymawk	1
	Grey headed mollymawk	1 * 1 said rare
	Salvin's albatross	1 * 1 said rare
Penguins	Little blue penguin, Korora	19 * 2 said rare
Terns	(type not specified)	18
	Black-fronted Tern, Tara	1
	Caspian Tern, Taranui	2
	White-fronted Tern, (Black Cap)	1
Shearwaters	(type not specified)	3 * 1 said rare
	Sooty shearwater, Mutton bird, titi	10* 1 said rare
	Fluttering shearwater	1
Oyster catchers	(type not specified)	11
	Variable oyster catcher	1
Shags	(type not specified)	9 * 1 said rare
	Black, Kawau	2
	Pied, Karuhiruhi	2
	Little, Kawaupaka	2
	Spotted, Parekareka	2
Petrels	(type not specified)	8
	Cape Pigeon	6
	Storm Petrel	1
Herons	Reef heron	2
	White heron, Kotuku	1
	White-faced heron	5
Stilts	(type not specified)	5 * 1 said rare
Prions	Fairy Prion, Titiwainui	5
Duck		5

TABLE 5: REPORTED BIRD SPECIES ... CONTINUED...

FAMILY	SPECIES	NUMBER OF MENTIONS
Swan		4
Kingfisher		3
Dotterels		2
	Banded dotterel	2
Godwit		2
Plovers	Spur-winged Plover	4
Skua	(type not specified)	3* 1 said rare
	Arctic skua	1
Royal spoonbill		3
Swallow		3
Skylark		2
Magpie		2
Starlings		1
Sparrow		1
Egrets	White egret	1
Pipit	NZ Pipit, Pihoihoi	1

Have bird numbers changed?

There was a perception by a significant group of respondents that there were fewer birds around than in previous years. Some mentioned this period as being previous decades, but one person said fewer than 2-3 years ago.

'Nothing like you used to [see]." –Former commercial fisher.

Gulls

Black-backed gulls are the only birds noted as having colonies on the cliffs, although people interviewed for this project also mentioned starlings nesting in the cliffs, particularly off the Hawera coast. Black-backed gull rookeries were mentioned as being found along cliff tops and sometimes on stacks off the coast.

"There are quite a few areas where you can see black back gulls

Photo credit: DOC image library

nesting on the cliffs or at the bottom." - Local resident and naturalist.

Red-billed gulls are known to be relatively uncommon in the area.

"South of Cape Egmont you don't see many red billed gulls. In winter, however, you do get an influx around Ooanui... probably they come from Kaikoura in the winter and go back again for breeding in the summer." - Local resident and naturalist.

Gulls – more or less?

Some respondents reported more gulls, but a few respondents reported a perceived drop in the number of gulls.

"I think seagulls could be increasing. I've seen thousands." - Commercial fisher.

"Black backs are increasing around New Zealand, especially near rubbish tips. Red bills are also increasing. There has been an increase in breeding numbers around the coast." - Local resident and naturalist.

"Seagulls are conspicuous by their absence at Waverley. They would follow the kahawai up the beach. They would be a nuisance when you were fishing, trying to get the bait."- Recreational fisher.

A variety of ideas were put forward as to why gull numbers might be decreasing. Two respondents suggested it might be because of the Wanganui rubbish dump closing, meaning that there was less food. One blamed changes in wind and sea currents, and another thought the reason was low breeding success of black-backed gulls.

"In [my] younger days there were heaps of seagulls. Today you just do not see so many. I think it has to do with the [Patea meat] works closing down." - Recreational fisher.

Gannets

"The nearest breeding colonies are at Kawhia and Farewell Spit. They are seasonal. There are more of them in summer. This may be related to food or possibly water turbidity. In winter, the water in the inshore area can be pretty dirty."- Local resident and naturalist.

"I don't remember seeing gannets before. But this year they were working on kahawai off Waitotara." - Former commercial fisher.

Albatross (Mollymawks)

These large ocean going birds are occasionally seen here.

"Albatross in the summer are rare, but you often see them in winter."- Charter boat operator.

A group of respondents felt that there were fewer albatross.

"Albatross didn't used to be rare. Where the kahawai went, the albatross went as well." - Recreational fisher.

A reason put forward for this by several survey respondents was fewer fish, therefore less food available for the birds.

"It is because kahawai stocks have been reduced by purse seining." - Recreational fisher.

Little Blue Penguin

Penguins were seen well out in the ocean by boat fishers.

"It has to be calm to see them out at sea." - Recreational fisher.

The presence of penguin nests on the shoreline appears unknown.

"There is no sign of blue penguins coming ashore for breeding – even under Taupata which is good habitat. They could be breeding in Cook Strait, for example, on Stevens Island." - Local resident and naturalist.

Terns

"You see the terns chasing kahawai that are chasing whitebait up the Patea River." Recreational fisher.

"76 pairs used to breed on a stack just north of Patea. Now the black-backed gulls have taken over. There was one pair of black-backed gulls one year with the terns. They predate on terns. Then there were more. I assume that the terns have found another stack to be on, but I don't know where this is."- Local resident and naturalist.

Gulls and Terns

Photo credit – L.Douglas

Prions and mutton birds in large numbers

Several participants talked about seeing large numbers of small black and white birds. These were most probably prions. Several other respondents mentioned seeing 100s of 'little grey birds' that could possibly be mutton birds.

"I've seen thousands of little black and white birds on the water." - Recreational fisher.

Fewer pipits

One respondent mentioned seeing fewer pipits, but greater numbers of spur-winged plovers.

"Pipits are less visible now, but there are huge mobs of spur-winged plovers…Pipits may predate on the edge of a seagull colony, but there is not enough food for both pipits and spur-winged plovers."- Local resident and naturalist.

8 CUSTOMARY FISHING PAST AND PRESENT

Introduction

Fishing and the gathering of other kaimoana was a fundamental part of early Maori settlement of the South Taranaki coast. As a result, Maori hold a very strong relationship with the sea, and traditional management approaches exhibit a high level of knowledge about the resource, and how and when to access it.

There are four iwi, including many individual hapu, holding an association with the South Taranaki coast. Customary management has had to adapt to new circumstances, and whilst there has been a loss of adherence to traditional management practices, there is evidence that this may well return with the efforts of local iwi.

This chapter draws on information provided through interviews, from representatives on the project team and from published literature where it was available, particularly on one project carried out by the Taranaki Catchment Commission in the 1980s.

This project did not include hui to discuss, or draw together information, which would have been a more traditional approach, and perhaps one that might have gathered more information. It became clear in adopting the approach that we did, that much customary related information is considered too sacred to be shared easily. This has been respected. Therefore, this chapter does not comprehensively cover all the customary fishing information for this coast.

In this chapter

The following topics are explored in this chapter:

- iwi of the South Taranaki coast;
- early Maori settlement;
- how resources were traditionally managed;
- customary resources today; and
- how resources are managed now.

Iwi of the South Taranaki coast

There are four iwi with important associations to the South Taranaki coast between Manaia and Castlecliff. These are:

- Te Atihaunui-a-Paparangi
- Nga Rauru Kiitahi
- Ngati Ruanui
- Nga Ruahine-Rangi.

Te Atihaunui-a-Paparangi

The Whanganui iwi are strongly river (the Awa) people. The Whanganui Estuary and coastal regions are important to the Whanganui iwi as well. Runanga Tupuho in particular has a strong relationship with the coast.

Spiritual as well as physical sustenance has always come from a strong association of the iwi with the river and the coast.

"There used to be huge pipi/tuatua beds at the Whanganui River mouth – on the island and on the sand bar. These have died from pollution. As the river is being cleaned up, mullet are returning back." – Tangata whenua.

"People used to go north in waka for kaimoana. When setting hinaki for eels, sharks used to come in and take them. People would catch shark in February-April, full of eel."- Tangata whenua.

"We had an understanding with northern iwi to fish in their area" – Whanganui tangata whenua.

Nga Rauru Kiitahi

Nga Rauru Kiitahi holds a cultural, spiritual, historic and traditional association with the coastal marine area from the Patea River to the mouth of the Whanganui River.[4]

Within the coastal area between Rangitaawhi and Wai-o-Turi Marae is 'Te Kiri o Rauru', the skin of Rauru. Te Kiri o Rauru is an important life force that has contributed to the physical and spiritual wellbeing of Nga Rauru Kiitahi.[5]

Nga Rauru Kiitahi used the entire coastal area from the Patea River (known to them as Te Awanui o Taikehu) to the mouth of the Whanganui River and inland for food gathering, and as a means of transport. The coastal area was a rich source of all kaimoana. Nga Rauru Kiitahi exercised the values of Nga Raurutanga in both harvesting and conserving kaimoana.[6]

"... around the 1880s... Maori would herd the kahawai that would come into the [Whanganui] River mouth with boats into the shallows and club them." - Local resident and environmentalist.

Important sites

There are many sites of cultural, historical and spiritual significance to Nga Rauru Kiitahi along the coastal area from Patea River mouth of the Whanganui River.

"Waikaramihi was an ancient camp. The fish were used by people for many generations." - Tangata whenua.

Tapuarau Conservation Area

Tapuarau is the name given to the area at the mouth of the Waitotara River. Nga Rauru Kiitahi has used Tapuarau as a seasonal campsite from where it has gathered mahinga kai in accordance with the values of Nga Raurutanga. This area remains a significant mahinga kai source today.

Tapuarau extends from the mouth of the Waitotara River to Pukeone and includes several small lagoons, including Tapuarau Lagoon, which are the source of tuna (eels), flounder, mullet, whitebait and inanga. During flooding, Nga Rauru Kiitahi was able to take tuna as it attempted to migrate from the nearby lagoons to the river mouth. The old marae named Hauriri was also situated in this area.[7]

Association with the rivers in the area

The Patea, Whenuakura and Waitotara rivers are the life forces that sustain Nga Rauru Kiitahi.

Nga Rauru Kiitahi knows the Patea River by the name of Te Awanui o Taikehu. The Whenukura River is known as Te Aarei o Rauru. The area along the Whenuakura River is known to Nga Rauru Kiitahi as Paamatangi.

All these rivers are the life force that sustained whanau and hapu along their lengths.

Nga Rauru Kiitahi used the rivers for food gathering. Sources of food included kakahi (fresh water mussels), tuna, whitebait, smelt, flounder, and sole.

Each of these rivers remain sacred to Nga Rauru Kiitahi as a mahinga kai source from which the physical wellbeing of Nga Rauru Kiitahi is sustained, and the spiritual wellbeing nourished.[8] Historically rivers were also used as a means of transport.[9]

Nga Rauru Kiitahi gains management role

As a result of the passage of the Nga Rauru Kiitahi Claims Settlement Act (27 June 2005), four sites adjacent to the coastal marine area will be transferred to Nga Rauru Kiitahi. These are:

- Okehu Stream Conservation Area;
- Waiinu Beach Conservation Area;
- Puau Conservation Area; and
- Approximately 100 ha of Nukumaru Recreation Reserve.

Rehu Village conservation area will be transferred to an entity jointly agreed by Nga Rauru Kiitahi and Ngati Ruanui.

Ukaipo, or temporary camping entitlements will be established. These will be to enable gathering of kaimoana and other natural resources. These include Hawken's Lagoon conservation area (to be renamed Tapuarau conservation area), and Waipipi Marginal Strip.[10]

Ngati Ruanui

Ngati Ruanui holds a cultural, spiritual, historic and traditional association with the coastal marine area from an area just before the Whenuakura River in the south, to an area well outside the study area boundary at Manaia to the north.

Ngati Ruanui comprise a number of sub-tribes including Nga Ruahine-Rangi, Tangahoe and Ngati Hine.[11]

Important sites

For the strip of the coast in the territory of the Ngati-Hine and Tangahoe hapu (subtribes) (between Denby Road, near Hawera, and a small stream at Waverley), individual reefs have been identified and marked on a map in a previous study.[12]

There are four reefs in the north-western part of the territory (Pukeroa, Koutu, Tangahoe, Hingahape) separated by a long stretch of sand from there towards the southeast (Rangitawhi, Waipipi, Waipapa).

It has been stated that the Waipapa Reef is the last reef between Waverley and Waikanae but this was not substantiated. Waipapa and Waipipi reefs were covered to a large extent by sand. Waipipi Reef had in the past been a source of large mussels.

Waipapa Reef had a large population of small seedling type mussels but no edible-sized shellfish. In the past it was a source of red crab and large mussels.

At the time of the survey work from which this information is taken (1983), the northernmost Pukeroa Reef was no longer used due to pollution from the nearby Kiwi Co-operative Dairy company's outfall one km to the south (now Fonterra). The outfall has now been extended, and monitoring, undertaken with tangata whenua, shows the inshore reef is now in a good state.

The reef known as Koutu is extensive, covering several hectares, while Tangahoe and Hingahape are much smaller.

Rangitawhi can be used only at very low tide.[13]

Nga Ruahine-Rangi

Nga Ruahine is associated with the South Taranaki coast from Waihi Stream in the southeast, to well beyond the northern boundary of the study area at Manaia. Unfortunately, the project team was not very successful in engaging with either Nga Ruahine iwi, or the individual hapu for the purpose of this project. Therefore information of Nga Ruahine has been gathered from previously published reports.

Nga Ruahine is made up of more than nine hapu. Four of those have been identified with territory in the study area. They include Ngati Tu, Ngati Manuhiakai, Inuawai, Okahu,[14] and Umutahi/Kaniti.[15]

Important sites

Papakainga (or settlements) were found at the mouth of every river in the Nga Ruahine-Rangi rohe. For example, at the mouth of Kapuni Stream there are three pa sites – Orangituapeka Pa on the west side, Waimate Pa and Wharuwharunui Pa on the east side.[16] At the mouth of the Inaha Stream is Otaika Pa, and also the site of the former Heretoa Mission Station, which was established in 1842.[17]

Urupa, or burial grounds are located on these settlements.[18] Canoe landing places, or Tauranga waka, were where the ancestors'canoes were housed and launched from. The rohe of Nga Ruahine-Rangi is based on the canoe landing places, and these Tauranga waka hold the mana and rangitiratanga of the ancestors.[19]

Whare-Wanganga (Maori universities or places of learning) were also situated along the coast.

Early Maori settlement

Settlement concentrated in coastal areas

It is thought that by the 14th century, settlement of coastal areas around New Zealand was widespread but sparse.[20] Most early settlements were within five or six kilometres of the coast. This, in large part, reflects the importance of fishing and gardening and as sources of food.

"Kaimoana was gathered right along the coast. The Opunake area was the main food source. It had a diversity of foods. But there are pockets of high concentrations of paua, mussel and crayfish all along the coast. Local hapu still know these." – Tangata whenua.

Historical documents show that there was extensive occupation along the coast from Manaia to the Whenuakura River, extending some distance inland (up to about 12 km). The rivers were particularly important.

There are a number of well known moa hunter sites at mouths of rivers along this stretch of the coast.[21] These sites are of national archaeological importance. Extensive moa hunter sites have been found at the mouths of the Waingongoro and Kaupokonui rivers and a smaller moa hunter camp has also been located in sand dunes on the cliff top immediately to the south of Hawera.[22]

Seasonal fishing camps important to inland iwi

There are major concentrations of pa sites in all the major river valleys particularly Patea, Whenuakura, Waitotara, and Whanganui.[23]

Even when living further inland, groups would come down to the coast to fish in summer, and return up river with stocks of dried and smoked fish for winter consumption.[24]

Important fish were shark, snapper, kahawai and hapuku, but anything taken was likely to be eaten.

"There was once a hapuku reserve in a certain large hole off the coast. I have tried, but can't find a legal reference to this. It was the favourite fishing spot for canoes to catch hapuku. Half way between Wanganui and Kai Iwi – about 3-4 km off. A very deep hole. But then a commercial fisherman found it and emptied it. People would protest about that now." - Tangata whenua.

Wanganui

Descriptions of Wanganui from the 1840s note the presence of many 'fishing' villages at or near the mouth of the Whanganui River (from Putiki south).[25]

"In his diary from the 1840s, Rev Richard Taylor talks about there being so many fish at the mouth of the Whanganui River, that one could 'almost walk across the river mouth on the fish.'" - Tangata whenua.

There are records from the 1840s of kahawai, dogfish and small shark being caught in large numbers and dried for later consumption at the Whanganui River mouth.[26]

Waipipi

There was evidence of fishing camps in the coastal dunes at Waipipi including middens, ovens, flaked stone and net sinkers.[27]

Patea

An important archaeological site, the Waitore site, is located between the Patea and Whenuakura rivers. It is currently the earliest stated assemblage of wooden artefacts in New Zealand. The site was buried under metres of sand and was only uncovered by a stream cutting into the dune.[28]

Analysis of a midden 100 m inland, dated back to AD 1525, included very small tuatua shells and the bones of small fish. Bird species included NZ quail, pukeko and harrier.[29]

Waitotara

The Waitotara area has a long history as a major fishing ground for the Maori and was suitable for growing kumara.[30]

At Waitotara, there is an 1840 record of a deserted fishing village with racks and fish bones near the mouth of the Waitotara River.[31]

Round pits from which Maori removed sand to mix with soil for the kumara crop are recorded along the coast in this general vicinity.[32]

Waingongoro

Out at sea from the mouth of the Waingongoro River, there were tribal fishing grounds or tahuna. In the old days, the canoes would put out to the fishing grounds at the correct seasons, and would remain there for some days at a time.[33]

The fishing ground for hapuku was some miles out to sea. The spot was located by paddling the canoes until an old rimu tree on the peak of Tirotiro-moana seemed on a level with the sea. This rimu has been cut down long since. There were other fishing grounds nearer the shore for kahawai and tamure (snapper).[34]

"Maori used the river mouths, reefs and 5-15 miles off coast for targeting sharks. Species included school, rig, mako, bronze, wharehou – it has a strong run in spring and autumn – you can judge when it is there by the water temperature. They would set nets deep to catch it. They also got tarakihi, snapper, jack mackerel, gurnard off the reefs. Natural burley [a fish attractant] at river mouths meant the best fishing was there." - Ministry of Fisheries officer.

The Waingongoro itself was an important source of food supply for Maori. In its waters were caught tuna, piharau, kokopu and pokotea. Along the coast were secured kutai, pipi and paua.[35]

Archaeological excavations at Waingongoro have revealed significant quantities of extinct birds (including moa), sea mammals, early artefacts and evidence of cooking and dwelling.[36]

Te Ranga-tapu, the ancient village of the Moa hunters is located at Ohawe Beach. Te Ranga-tapu means 'the sacred band'. The pa was situated on the eastern bank at the mouth of the Waingongoro River, where rising ground lent itself to defence.[37]

Te Ranga-tapu has a history of over six centuries, for it was actually a settlement of tangata whenua before the arrival of Turi of the Aotea canoe in the middle of the fourteenth century. These earlier people knew the river as Wai-aro-riri, 'the angry waters', and the mountain as Puke-haupapa, 'ice hill', before the men of the heke renamed them Waingongoro and Taranaki.[38]

Te Ranga-tapu in due course became a fortified pa of the Nga Ruahine of the Ngati Ruanui tribe.[39] By 1865 Te Ranga-tapu Pa had become simply a fishing village.[40]

Opposite Te Ranga-tapu Pa, and on the western bank of the Waingongoro River, was Te Kawau Pa. This coastal pa was at the mouth of the river, but there has been so much erosion by the sea only a small part of the earthworks remains.[41]

Shellfish uncommon

Shell middens are rare compared with other areas of northern New Zealand. This reflects relatively unfavourable conditions for shellfish along the coast at least as far south as the Rangitikei River mouth.[42]

Much early historical evidence lost

Rates of erosion around the coast in the last 150 years, and at river mouths suggest the probability that an unknown number of sites at river mouths and on the coast have been lost.[43]

The legend of Ohawe

The people of ancient Te Ranga-tapu Pa, and the related people of the sister pa, Okahu-titi, and of other pa of the Nga Ruahine hapu, enjoyed the fishing at the mouth of the Waingongoro. The fish of that place were theirs, and had been so for generations. This right was a treasured possession of the hapu, and was jealously guarded. The inhabitants of the Ohawe Pa were Ngati-Tupaea hapu. (Ohawe pa was on the heights above the eastern end of Ohawe Beach, close to the site of General Cameron's Waingongoro 1865 redoubt. The West Coast sea has claimed practically the whole of this old pa). Although they lived so near the river, they had no share in the fishing rights at the mouth, and they were envious. The legend goes that the Ohawe people dug a new channel overnight to divert the course of the river so that it should have a new outlet to the sea, and thus the fishing rights at the mouth would be rendered valueless. They achieved this, but Ra-wiri-wai-mako, the aged and learned tohunga of Te Ranga-tapu restored the former mouth by invoking a southerly storm which filled up the new channel and resulted in the river flowing in its old and natural course again. To this day, the place where the channel was dug may still be seen, following the shortest route from the bend of the river to the sea.[44]

How resources were traditionally managed

Several aspects are important in understanding traditional management:

- a specific iwi, hapu or whanau was responsible for the resources of a particular area, e.g. a reef. They were known as the kaitiaki for that area;
- kaumatua and kuia (the elders) would hold, practice, and pass on to the next generation specific knowledge and skills about how to use and manage that area's resource; and
- in South Taranaki, there were regional variations in management arrangements.

Maori relationship with the sea

Water forms a central part of life for Maori, both as an important source of food and in a spiritual sense. The proximity of Maori settlements to rivers and coastal resources throughout history reflects the vital importance of water to the Maori.[45]

In Maori mythology, Tangaroa is 'God of the Sea' who has laws governing the way the environment is to be used. The name 'Tangaroa' was a sacred one, only spoken aloud by the priests, ordinary people described the god of the sea as 'Maru.'[46]

As gifts of Tangaroa, fish and other marine resources are far more than a food source; their inherent value as taonga is inextricably based in the wider social, spiritual and cultural situation of iwi, hapu and whanau. These linkages to the sea are incorporated into waiata, proverbs and haka.[47]

Kaumatua and kuia taught the ways of the land and the water and showed how the resources of Tangaroa were to be cared for. These practices known as tikanga include the turning back of rocks after gathering kai, not eating mataitai (kina, paua, mussels) while at the beach, and returning kai moana shells after the food has been eaten.[48] Other practices included certain rituals, which varied seasonally, and included such things as blessing the waka with kelp, offering up the first fish of the season etc.[49] Women traditionally were not involved in such rituals.

Specific knowledge about particular resources and accompanying rules were respectively held and administered by those who were kaitiaki for a specific area.

Fishing Karakia

The fish, the fish of Waitotara,

The fish, the fish of Whenuakura,

The fish, the fish of Patea,

The fish, the fish of Tangahoe,

The fish, the fish of Waingongoro,

The fish, the fish of Kawhia,

The fish, the fish of Taranaki,

The drawing to us the fish,

To this deep hole, to this bank,

The fish to this ledge of rock,

The fish to this current made sacred,

The fish to the current made sacred by Tane,

To the sacred current of Tangaroa.

A West Coast karakia, used by tohunga on the return of a successful fishing party. Translated by the Rev. Richard Taylor.

Source: Houston 1965, p 144.

Specific kaitiaki for each area

A report on kaimoana in South Taranaki carried out by the then Taranaki Catchment Commission in the 1980s illustrated that individual reefs were known by name, and managed by specific hapu. That report noted that several people consulted through that study stated that they would not consider taking seafood from reefs in other areas without the consent of, or without being accompanied by, a member of the local hapu.

"The resource was managed by specific hapu in the area. We generally knew what the consumption of whanau and hapu was. There was a quota type system. If you had more tangi or hui, well sorry, if you'd had your share for the season." - Tangata whenua.

Knowledge of the resource

The knowledge held about the resources would include:

- an understanding of the resources themselves, e.g. when fish were spawning, where and when they are found;
- knowledge about how to access the resource, including knowledge of weather, waves and sea temperature; and
- what should be practised to ensure the resource was available in the future, e.g. limits on how much was taken, or periodic bans (rahui).

"The old people knew where and when spawning took place and avoided fishing at those times. In comparison, commercial fishermen target spawning snapper. I used to be a boat builder, and I would

go out as part of the sea trials on the boats in the 1960s. I have seen them hauling in long lines with spawning snapper on." - Tangata whenua.

"As part of that basket of knowledge the old people had… was how to read the weather. I can remember my father in law, who died some 14-15 years ago, teaching us how to count waves before jumping on the rocks to avoid getting splashed." - Tangata whenua.

"[The old people] knew when to fish. They would impose rahui (if someone died there would be a ban on fishing). That is broken down now." - Tangata whenua.

"Everything had a season and they would only gather enough. They used to dry shellfish in the sun." - Tangata whenua.

Management varied between the north and south

Traditional fisheries management varied between the south of the study area and the north, partly in response to the different conditions of the coast.

"Ownership issues are very tight especially in the ring plain of the mountain and its coastal reef systems. There is a unique rights system.

This doesn't apply so much south of Hawera, where access points become the issue. In the southern area, fishing beds are not so concentrated. This is partly because there are more soft shore areas, and [more dispersed] species such as surf clams." - Ministry of Fisheries officer.

The need for inland hapu and whanau to access coastal resources led to sharing arrangements between those living on the coast, and those inland.

"Our hapu – Mokoia – had a rule to provide what the sea had to offer to the inland hapu. You will see that permeating through waiata, mihi mihi, and korero.

For example, Mokoia has a tradition in which there is a three week timeframe to catch tuna (eel) for the year. This occurs after a full moon, in accordance with the Maori fishing calendar. You could catch hundreds of eel per night. Eel are best caught at night, not during the day.

We would use a gaffe and spears and a tilly lamp pumped with gasoline. The old people did this. Our job as kids was to gather the tuna and put them in a pit. Our job during the day was to get manuka and smoke and dry them. Then we would deliver them to the hapu. This took place year in and year out. None of us would go to school.

In times when there was an absolute glut we would let the rest go. It was drummed into us. If you catch everything in there, how will it continue? If you catch them all, there won't be any left." - Tangata whenua.

Customary management today

Introduction

The 20th century has brought far-reaching changes to traditional social and community structure, as well as to local environments and their resources and management. Despite this, the importance of kaimoana to hapu and whanau is not diminished.

Framework for traditional management remains

Traditional resources are still part of the basic diet of many families. Hapu and whanau still hold detailed knowledge, but in many places there have been significant losses both of species and their habitats, as well as the traditional cultural and spiritual frameworks governing environmental management.

This was born out in the face-to-face interviews. Respondents emphasised that the framework for traditional management was still in place, if a little shaky, and used at least in part.

"The traditional concept of placing rahui (harvesting bans) is still used. It is placed by kaumatua of a seaside hapu... before the advent of email it would be made known via hui. Kaumatua of inland hapu would tell their whanau." - Tangata whenua.

Legal mechanisms allowing for traditional management continue to operate.

"There are defined customary fishing areas and reserve areas at almost every river mouth. These were important as launching points, also for whitebait, lamprey… Kaitiaki would regulate take off each reef." - Ministry of Fisheries officer.

Some traditional resources no longer accessed

Some resources were no longer accessed, or being accessed in a different way to the past. Some types of fin fish are not targeted in the way they had been in the past.

"Maori have moved away from fin fish that required community effort to reach in 1930s-40s. They used big row boats at that time. Now individual families gather food concentrated on the close shoreline and river mouth fisheries." - Ministry of Fisheries officer.

However, certain fin fish such as kahawai and hapuku are still highly valued, even if they are not targeted to the same extent that they were in the past.

"Most popular fish was the frost fish. When walking along the beach on a cold morning at a certain time of the month you would find them. They were just starting to be available again and the weather changed. Not many frost fish now. The scientific reason is that the fish stranding was something to do with the full moon." - Tangata whenua.

Some traditions no longer practiced

A few respondents felt that some traditions were not being practised at all.

"The transient nature of people today and technological advances, e.g. scuba tanks, have changed things. People can launch from Wanganui, go in, blow a place away and you won't see them. We've also been a bit lethargic ourselves." - Tangata whenua.

"Gathering of kai used to be preceded by very old karakia. The people with that knowledge have now passed on. There is no longer that level of spirituality associated with harvest…Those people could see the decline of fish stocks over time and decided not to pass on knowledge – if less of us today have that knowledge of where customary fish stocks are, then we are less likely to go and get it..Pakaraka Marae has a good example of this. Karewaonui (waka) was used by the hapu for fishing. As soon as last captain died, they took it out of water and decided not to use it again…He had decided there was no one around him who could safely carry on that parcel of knowledge about the kaimoana." - Tangata whenua.

Some people were concerned that recent legal changes were further undermining customary fishing.

"Now they are defining our customary rights for us. I believe only I can define customary rights. What the government is pushing is wrong. Customary rights are about feeding the whanau. It is not just about hui and tangi." - Tangata whenua.

Access to traditional resources has also been affected by ongoing coastal erosion, and modern day issues such as pollution.

"In the past we could gather in the same place, but now it has moved further out on the reef. This is because of the erosion. You can only go there in certain tides. A real low tide when we can walk." - Tangata whenua.

"The Waipipi sand mining almost destroyed the mussel beds. Whitakau (Puhu) are gone." - Tangata whenua.

"We never gather kaimoana from the [Whanganui] River now because of the pollution. Now we gather mainly north of Castlecliff." - Tangata whenua.

Traditional ways of managing resources were being forced to adapt.

"If your [mussel] reefs turn over then you move down and concentrate effort on where there are good healthy fish. This is different to the past, when kaitaiki would regulate take off each reef." - Ministry of Fisheries officer

One tangata whenua respondent was critical of the permit system:

"The current permit system doesn't work. My cousins fill out the piece of paper, but then there is no monitoring and no policing of it. People issue permits over areas that they are not the home people of" – Tangata whenua.

This person suggested instead that Haukainga (home people) be better recognised and given the resources to manage their rohe (takiwa taonga-o-nga-matua/Tupuna).

9 WHAT PEOPLE FEEL IS AT RISK

Introduction

Chapter Three discussed what people valued about the coast. People were also asked to identify management issues, threats and risks to those values. Those qualities that people valued about this coastal area were seen to be threatened from changing uses of the resource and changing technology.

In this chapter

This chapter summarises the responses people gave when asked to identify what was at risk. The key themes arising from answers to this question were:

- risks to the marine environment from oil exploration, ironsand mining, trawling, biosecurity;
- risks to fishing and fish stocks;
- risks from pollution;
- risks of coastal erosion;
- risks to natural character of the coast; and
- risks to coastal infrastructure.

This chapter summarises the responses obtained through workshops, written questionnaires and face-to-face interviews without any attempt to 'ground truth' or correlate people's views with that gathered from technical reports. Part II of this report includes chapters that summarise available technical information from monitoring and research, and should be read in conjunction with this chapter.

Risks to the marine environment

Continued oil exploration, ironsand mining, and trawling impacts on habitat on the sea bottom were mentioned as being risks to the marine environment:

"The ironsands permit that the Chinese government has got for exploration… could do huge damage. Also the gas field exploration and seismic surveys are devastating for fish – fish disappear for months or even years. This is a regular pattern. It was done for Kupe. They go looking for domes, opening old wells and so forth." - Ministry of Fisheries officer.

"Oil exploration has done damage… they originally used explosives. There were columns of water 80 ft in the air. Now they use pulses which are less damaging." – Former commercial fisher.

"Taking of sand [in the past] has upset the balance of the coast." - Recreational fisher.

A couple of respondents felt that marine life as a whole was at risk.

"Everything is at risk. The whole environment is at risk. Air, water

temperatures, the level of fish stocks, the status of the whenua leading onto the beaches, and political instability at every level.... Warming oceans and rising sea levels – you can't make a scrap of difference to that." – Tangata whenua.

"The whole environment is at risk because of the plague of spiky sharks (the possum of the sea.) When they arrive in April, to when they leave, they breed 2-3 times. An average number would be 10 young." - Commercial fisher.

Biosecurity was also seen as a significant risk area:

"We could have oil rigs coming in with stuff stuck on their hulls."- Regional council officer.

Management beyond the 12 mile limit was identified as a risk by one public management agency and the lack of good information by another:

"The regulation is uncertain. There's a lack of integration between statutes and a poor job [done] of regulation by central government." - Regional council officer.

"Lack of information on the biodiversity of the marine life off this coast makes it difficult to know if the current management is sufficient to look after its biodiversity." – DOC officer.

Risks to fishing and fish stocks

Fish stocks and fishing were seen as being at risk by a significant group of respondents (15), with a number of people saying that fish stocks were at risk from over fishing (6), and others mentioned the risk to fish stocks from the increasing numbers of people and boats (11).

In relation to types of fishing at risk, surfcasting (shore fishing) and gathering kaimoana was particularly mentioned.

"We [surfcasters] are on the end of the food chain. There's bugger all." - Recreational fisher.

Misuse of the fishing resource was mentioned most frequently as a threat to fish stocks.

"The pressure is both recreational and commercial. You can get 70 boats out there in a day. Once upon a time, you'd just have 4 or 5." – Recreational fisher.

"It could be fished out like New Plymouth with a combination of commercial and amateur." - Charter operator.

There were different views about exactly who was to blame for this misuse however.

A handful of respondents mentioned growth in recreational fishing, and poor recreational fishing practices.

"The biggest risk to fish stocks is the uncontrolled growth in the recreational fishing sector which contributes nothing towards fisheries management costs or catch information." – Commercial fisher.

"We have a guy down here [our local beach]. I have seen him mincing up little blue cod for bait. He used to mince up every little thing he could... this guy sells the stuff. Uses it to pay for diesel and petrol. I feel sorry for people in ten years time. There will be nothing left." - Former commercial fisher.

The quota management system was criticised by a handful of respondents.

"The quota system is ridiculous. The quota for recreational fishers is too high."- Recreational fisher.

Another group of respondents thought the reduction in fish was because numbers of commercial fishers had increased (13).

A large group of respondents (13) mentioned trawling and trawler damage as threatening fish stocks and fishing. There was a common perception that trawlers 'came in too close.' A couple of respondents perceived the problem as 'outsiders with bigger boats.'

"Trawlers rip weeds and seabed with chains in the process of flattening the ground to drag the net." - Former commercial fisher.

"Too much trawler pressure is destroying food beds. The areas holding fish are now very small in size compared to 5-10 years ago." – Recreational fisher.

"Trawling makes the biggest difference. The trawl diagrams show two thick lines of points." – Recreational fisher.

"When the sea is calm to fish with rods, there is [a] bloody trawler putting miles of net 200 metres off the shore." - Recreational fisher.

One or two respondents perceived that the decline in fish stocks was because trawlers were targeting when the snapper came in to spawn.

Bottom trawling was mentioned as a problem by a couple of respondents.

"The seabed is being destroyed by bottom trawling." - Recreational fisher.

Pair trawlers also came in for a mention related to the decimation of the snapper fishery in the 1980s.

"...1980 Nelson trawlers worked out that snapper were spawning in Golden Bay. There is a story of 2 pair trawlers having a tow and physically stopping because they were so full of snapper they filled the hold and the deck and continued to tow, returning to Nelson towing a full net... a lot of fish were wasted. Stupid stuff like that. This decimated the snapper fishing. There is [only about] 16 nautical miles between this fishery and Golden Bay." - Former commercial fisher.

The unevenness of fishing activities was noted by two respondents as having the potential to pose a threat.

"In summer there are huge influxes of holiday makers to Kaupokonui, Ohawe, Waiinu, Waverley – huge camp areas. Full of people. Just as popular as North Taranaki. There are nets in the river, and an

increase in calls from landowners about nets across streams for mullet and flounder..

There are pulses of activity that can disturb the stability of the fishery for a period. This, plus the unstable ecosystem, e.g. rivers pouring silt out in times of flood, just adds to this." - Ministry of Fisheries officer.

Specific fish stocks were mentioned by a number of respondents as being at risk. These included kina, snapper, kahawai, blue cod, paua, groper, tarakihi, trevally and crayfish, particularly stocks on the North Trap.

"They [large fishing boats from outside the area] throw away big fish that can't be sold to Japan so [snapper] spawning potential is lost." - Former commercial fisher.

Commercial fishing practices, particularly new technology and long lines were seen as posing a threat.

Long lines were mentioned by a handful of respondents as the reason for declining fish stocks. Two respondents mentioned Japanese long liners operating in the 1960s or 1970s. However, one respondent did not think long lines posed a problem.

Nets were mentioned by quite a few respondents, both in terms of the use of nets in general, and the damage that could be done by lost nets.

"Gill nets are being lost. They should be banned. You shouldn't be allowed to abandon a gill net. One month I saw one washed up that had been improperly anchored. It ended up on the beach rotting. Full of crabs and fish.... Abandoned nets also cause pollution." - Recreational fisher.

Set netting was also mentioned as a cause of fish stock decline by a handful of respondents.

The loss of breeding grounds was given as a reason for the risks to snapper and kahawai.

Poaching and black market sales were seen as a threat to both paua and kina.

"People are taking more than the legal limit, and then selling them." – Commercial fisher.

Other risks to fish stocks mentioned included:

- illegal fishing practices;
- floods and damage to catchment areas on land, e.g. erosion of river banks dumping mud on the seafloor. The floods of February 2004 were specifically mentioned by a few respondents;
- cliff erosion resulting in lack of food;

"Cliff erosion damages marine life in rock pools and deposits rubbish on the beach."- Local resident.

- seasonal weather patterns and rougher sea conditions;
- fish killed during oil surveys in 1960s;

- predator fish and mammals on the increase; and
- reduction in food for fish since the closure of the Patea freezing works.

It should be noted, however, that a couple of respondents specifically mentioned that they believed fish stocks were not at any risk. These included blue cod and snapper.

"I believe that there is an extensive blue cod fishery that is rejuvenating itself." - Former commercial fisher.

"Nothing's at risk. The quota management system is doing a good job of managing fish stocks and preventing any decline in species." - Commercial fisher.

Risks from pollution

Pollution was seen as a reason why fishing was at risk by a handful of respondents. There were mentions of damage to paua and kina and mussel reefs as a result of pollution.

"There are mussel reefs at Waitotara where my family used to go in summer 10 years ago. Then one time my wife and I got sick. We thought it was a oncer, but the same thing happened again the next year. We took samples to the Heath Department and they told us they identified faeces in the mussels. They couldn't be sure if the source was animal or human… This happened not long after the settling ponds were put in at Waiinu settlement. I believe that they are too close to the shore because it is a very porous area." - Tangata whenua.

"Our food resource is at risk. Dairy farms are increasing. Where does the run-off go? They have ponds, but it has to go somewhere." – Tangata whenua.

"I have seen evidence of shellfish damage, e.g. mussels… too much nitrogen will cause excessive growth.. You can crumble them up with your hand."- Recreational fisher.

"Pauas are abundant, but not too big. In areas of high turbidity there are lesions on the shells. The old guys say they don't recall seeing that in the old days, 40-50 years ago." - Ministry of Fisheries officer.

"There are fewer crabs. A crustacean type honeycomb with red worm casts has disappeared. It was on the low tide zone and was used as burley [used to attract fish]. It disappeared at the time of the urea plant – about 30 years ago." Recreational fisher.

Pollution was also mentioned as a threat to the coastline in general. People mentioned the Fonterra Hawera dairy factory, plastic along the beaches and the potential threat of an oil spill.

However, a few people don't see pollution as posing a great risk.

"Pollution is not a great risk because the oil companies have got a vested interest in not having a spill." - Local resident and naturalist.

"The oil industry is perceived as an issue, but monitoring shows

minimal environmental effects, especially with new seismic methods." - Regional council officer.

"A lot of people blame pollution for no, or small sized, kaimoana. The truth is environmental quality has improved and the problem is caused by over fishing." – Regional council officer.

One respondent said that there had hopefully been an improvement in Wanganui's waste water disposal.

Another said there was less algae in coastal rivers as a result of better effluent disposal and riparian planting.

"20 years ago people got typhoid from mussels, not now." - Recreational fisher.

"There is more silt in the rivers. This is a result of deforestation, precipitation and deterioration of river water quality." - Local resident.

Risks of coastal erosion

Natural processes such as cliff erosion were seen as a significant risk by a handful of respondents (6).

"Banks are unstable with rain and sea encroachment."- Recreational fisher.

One regional council officer predicted that with climate change, storm events are likely to be more pronounced which would increase pressure at the sea - cliff interface.

Kai Iwi village was identified as at risk from erosion.

Several respondents commented on the loss of sand to beaches and dunes.

One area of concern was the loss of the sandy shore north of Kai Iwi, perceived by some to be the result of changes in wind patterns.

"You can't walk the beach when the tide is coming in now as there are no escape routes between Kai Iwi and Okehu. I am concerned that someone will get buried under a collapsing cliff." - Recreational fisher.

One respondent gave an alternative explanation to why this was occurring.

"The big problem is the extensive planting of pine trees on the sand dune areas near the Okehu Stream. They prevent the natural wind drift of sand into the stream that distributes it along the beaches south east of the point."- Local resident.

Other respondents felt the Patea Dam was to blame for erosion in that area.

"The Patea Dam has reduced the amount of sediment coming down the river. The bar is inside now, instead of beyond. Lack of sand replenishment on the beaches is causing excessive cliff erosion." - Recreational fisher.

"[Since] the dam, we have lost our coastal beaches. Erosion is running at 800 mm per year and the Queen's chain is being lost." - Recreational fisher.

"The water is not as deep at the Patea wall." - Recreational fisher.

Another local resident commented on dunes disappearing "4 chain in 20 years" and identified that sand drifts were increasing with more southwest and southeast winds.

Risks to natural character of the coast

Subdivision pressure was seen as posing a significant risk.

"The biggest thing is the number of houses being put in totally inappropriate locations. Instead of a pastoral expanse they are breaking it all up – a spread of houses which will end up with nothing being natural." - Local resident and naturalist.

"Buildings should not be built on the foreshore. Building development should be prevented, especially on areas where ancestors are buried." - Tangata whenua.

Associated with this was a perception that access to the coast was also at risk.

"Access across farmland relies on the good will of farmers." - Local resident and environmentalist.

"Sales of private land are blocking access. Publicity about Maori claims is also causing problems." - Local resident.

Four wheel drive motorbikes were seen as a factor by several respondents.

"Ease of access by ATV's hasn't helped either." - Former commercial fisher.

"Motor bikes are the biggest curses – they don't use their proper tracks causing erosion of marram grass, creating ill feeling between the council and fishermen – we don't go in the sand hills, yet we get the blame for it." - Recreational fisher.

A number of specific features were listed as being at risk along the coastline. These included the significant geological formations called 'ventifacts' found in a number of areas and rare plants, including pingao.

"Pingao grass has all but been lost to this coast." - Former commercial fisher.

"People are taking pieces of rock formations for souvenirs."- Local resident and naturalist.

"Miniaturised plants around the blowholes area – they are not as lush and diverse as in the past. They are being damaged by grazing (rabbits)." - Local resident and naturalist.

A new seaweed?

A few respondents mentioned they had noticed a new species of seaweed.

"There is a red weed that blossoms and breaks off." - Recreational fisher.

Photo credit: L. Douglas

"There is a red algae that wrecks your fishing line. It gets washed up as a thick layer on the shore about twice a year. Two new species of shellfish appeared along with the algae after the iron sand carriers were anchored off the Waverley coast." - Recreational fisher.

Risks to coastal infrastructure

Coastal infrastructure was also mentioned as being at risk by a few respondents, of which the Wanganui Port was named.

"There is no proper control of the harbour – Port management don't know what they are doing. This is particularly in regard to dredging operations. They need to dredge out the basin on a regular basis, but the barges are being sold off." – Former commercial fisher.

10 WHAT PEOPLE WANT FOR THE FUTURE

Introduction

In the research conducted, people were asked what they wanted for the future of the area. Many people had suggestions for how that vision might be achieved. These suggestions are discussed in the following chapter.

This chapter outlines what people wanted for the future. The themes arising from answers to this question were that people wanted:

- the area kept as it is;
- use of the resources to be sustainable;
- the fishery protected or improved;
- erosion controlled;
- continued access; and
- beach improvements.

Keep the area as it is

A significant number of respondents (42) said they wanted to keep the area as it is. Opinions on what was needed to ensure this occurred varied however.

"We live at Ohawe Beach, walk daily and fish whenever possible. We want to continue doing this successfully. It is an unspoilt area which is respected by most of the community." – Local resident.

"Keep it as it is now or better. I am a diver not a hunter so I want to preserve it for my kids and others." –Recreational diver.

"Keep it like it is. Reducing fishing areas will add pressure to the remaining areas." – Local resident.

Ensure use of resources is sustainable

Quite a few respondents (14) wanted to see the area sustainable in the future for future generations.

"We need sustainability into perpetuity. Forever." – Tangata whenua.

"Balanced use. Recognise people are part of the system and that use is sustainable, and has outcomes that represent people's values for the area." – Recreational fisher and diver.

"It should be protected but not shut down. The beach is for everyone." – Recreational fisher.

A significant number of people commented on the need to sustain marine life and the fishery overall (7).

"What we want is a sustainable, well managed fishery that meets the needs of New Zealand as a whole." – Ministry of Fisheries' officer.

"It's a tall order, but I'd like it to go back as far as possible to the state it was in before we stuffed it up with over exploitation of marine mammals, land and fisheries and deforestation." – Local resident.

One respondent said they wanted to see fewer spiky dogs and paddle crabs, believing that their increased presence is the sign of some sort of ecological imbalance. A number of respondents were keen to see a future without over exploitation:

"I wouldn't like to see over exploitation of the shellfish beds." – Recreational fisher.

"Ensure onshore reefs are not stripped of undersized species." – Local resident.

"Estuaries need greater protection or awareness of the value of estuaries needs to be greater as they are very vulnerable to pollution." – Local resident and naturalist.

Protection for future generations, particularly for the grand children, was raised by a number of respondents including recreational fishers, tangata whenua and a former commercial diver.

"I would love to take my grandchildren down to the beach with spears and get flounder. To see the kahawai surfing in the waves, and to watch them go after the fish. I would like to be able to look all the way from Castlecliff to Kai Iwi, from horizon to horizon, and to see the birds in feeding frenzies. With kingfish numerous too." - Tangata whenua.

Protect or improve the fishery

Having a plentiful supply of fish in the future was mentioned by a significant number of respondents (15).

"The most important thing is to preserve fish stocks so we can take our grand kids out and catch a fish." - Recreational fisher.

In particular, improving shoreline fishing was mentioned by a handful of respondents and others mentioned protecting whitebait breeding areas.

"I would just like the chance to go down and throw a rod into the water and have a chance to catch a fresh fish. That chance is getting less and less every year." - Local resident.

Erosion control

A handful of respondents wanted to see erosion better controlled in the future, and one younger respondent wanted to ensure that the water stayed the same colour it was now "and didn't get more brown." One respondent sought erosion protection from the stream at Ohawe to Snapper Bay.

Public agencies also saw erosion control as important.

"I would like to see the end of big brown slicks coming out of the river systems – I would like to see a reduction in inland land management practices that allow timber and silt to egress into the marine environment." - Regional council officer.

Access

Ensuring continued free access to the beaches and coastline in the future was important to a number of respondents. The existence of the Queen's Chain was seen as important to retain. Access for specific activities, including swimming, surfing, walking and boat launching was discussed. Ohawe Beach and river mouth were specifically mentioned.

Some respondents wanted to see improved access.

"Access to coast and beaches all the way to Paraparaumu. A great coast, not enough access. [Coast could] cope with thousands of visitors for all purposes if spread out."- Recreational fisher.

Beach Improvements

A handful of respondents wanted a future where the beaches were clean and tidy with less pollution.

"I don't want the sewerage going in there." - Local resident.

"Less dead animals." - Local resident.

"I want to be able to swim in the Kai Iwi Stream."- Local resident.

A couple of respondents wanted use of 4WD vehicles (motorbikes and cars) restricted in some areas for safety and retaining a peaceful environment:

"I want an area of beach that is vehicle free, where there are no 4WD bikes, so the kids can play safely." - Local resident.

"With all the 4 wheel motorbikes and 2 wheelers going up and down the beach it sometimes feels like a motorway... Even though I ride a quad bike I would be happy to seem them all banned for 6 weeks at Christmas time."- Local resident.

A desire to curb residential development and over development of amenities was expressed by a few respondents.

"Don't wreck it with overdevelopment of facilities, e.g. concrete ramps." - Recreational fisher.

"We would not like to see unlimited residential development along it." - Local resident.

Visions for the future of specific beaches were discussed. For example, at Castlecliff Beach a few people wanted to see a better managed swim beach, with holes and rips dealt with. Improved beach facilities were envisioned for the future at Patea, including provision of lifeguards, and improvements to ablutions such as provision of showers and toilets "with paper and clean taps."

Economic Opportunities

A small number of respondents wanted to see new economic opportunities followed up. Included amongst a range of ideas was seeing Wanganui functioning again as a working port, exploring ironsand mining, oil exploration (although these were equally identified as a risk to the area in Chapter 9) and tourism.

"A lot more dollars are to be made showing people things than in a commercial fishery, if this is done properly. A lot of people just want to look, for example at the reef out here." - Recreational fisher and diver.

One respondent felt that commercial fishing opportunities were under-exploited in the area and any applications should be seriously considered. These could be viable if properly controlled. Crayfishing, squid and leatherjacket were all potentially viable fishing enterprises in the vicinity.

"It is a 'forgotten coast' – it has never been commercially crayed – and not trawled as far as I know." - Former commercial fisher.

How did this survey compare with another study?

A wider survey[50] carried out on behalf of all the Taranaki district councils and Taranaki Regional Council called "Future Taranaki," found that residents considered that protection of the natural character of the coastline was very important. Overall they considered that the region's natural environment is of a high quality but that there is no room for complacency about what they have.

Almost three quarters of telephone respondents from that study felt that protecting the quality of the water around the coastline was very important. In South Taranaki the coastal environment was considered to be under threat from both erosion and property development. There was a strong feeling that the coast should not be subject to over development as residents do not want to see Taranaki turn into a "Mount Maunganui." It was also felt that erosion needed to be addressed to protect farms and roads.

Therefore, there was considerable consistency in views from the current study and this previous research.

11 HOW PEOPLE WANT THE COAST MANAGED IN THE FUTURE

Introduction

A minority of respondents felt management should be 'kept as it is' with some reiterating the self-management role played by the weather, but the

Photo credit: L. Douglas

majority of respondents contributed ideas to improve coastal and fisheries management. People were asked how they wanted risks or threats managed. A wide variety of ideas were put forward to deal with those aspects seen as being at risk. People were also asked to identify ways of reconciling conflicting aspirations for coastal management.

In this chapter

This chapter sets out the key suggestions made for ways to improve future management:

- more local management;
- change agency responsibilities;
- more communication and consultation;
- more education and awareness;
- more enforcement; and
- base decisions on factual information.

There was also a raft of specific suggestions for managing various aspects of the coast. These included suggestions for managing:

- marine protection;
- recreational fishing;
- commercial fishing;
- customary fishing;
- coastal development;
- coastal erosion; and
- land uses affecting the coast.

No judgement has been made on which of these ideas is more worthy than others, as to do that would have required detailed information about the workings of current local arrangements to which the researchers were not party. The themes, however, provide a useful indication of where coastal users see improvements could be made to current management arrangements.

More local management

There was a strong call for more local level management.

A handful of respondents made suggestions for how this might be achieved through people working and deciding together. These included setting up some sort of working committee, or a structure that followed the Guardians of Fiordland model (this is further explained in Chapter 22).

A couple of respondents mentioned continuing the current project approach in some sort of modified form. Some advocated involvement of recreational fishers in such a forum, others advocated those that farmed the adjoining coast to be included. One respondent suggested that a Port Liaison Committee be established at every port so that locals could look after their own area while another suggested a recreational fisher's lobby group.

"We need representation from all users to reconcile different views." - Recreational fisher.

Photo credit: L. Douglas

"[We need to] get Maori, local people and people with a good knowledge of the coast to manage the fishery. We need a local office for access to a management strategy." - Local resident and recreational fisher.

This type of approach found endorsement from a Ministry of Fisheries representative:

"The expectation is that what we should head towards is stakeholders and iwi working together to identify rules they consider appropriate… Increased decision-making capacity of locals. This should leave the government to set high-level boundaries." - Ministry of Fisheries officer.

There was a call by some for co-management.

"We need a joint partnership with Maori, district and regional councils and central government." - Tangata whenua.

"Tou Rou Rou

Taku Rou Rou

Ka ora ai te whanau

Ka ora ai te hapu

Ka ora ai te iwi

'with your basket of knowledge, and my basket of knowledge put together.' An ancient whakatauki with modern day value." – Tangata whenua.

"We need to ensure co-management of coast by DOC and Council does not leave gaps... Deal with coastal issues on a continuum – councils [should be] working alongside [each other] or together rather than in isolation."- Local resident and environmentalist.

A couple of respondents saw value in identifying a common goal between all the parties involved in coastal management, not just the agencies.

Kai Iwi circa 1920

Credit: Wanganui Regional Museum

"Many people want sustainability for the environment. But we all have our own interests. The trick is someone listening really well who is able to pull this together into a common goal that all parts of the community can buy into. Make it robust and sustainable. [Find someone] who can listen best and put it together best. The commercial aspect is the biggest problem. And this applies within Maoridom too." –Tangata whenua.

Some wanted to see locally relevant management approaches, e.g. approaches that took into account the small size of mature paua in the region. One suggested establishment of areas with specific management goals. User pays was also mentioned.

A few respondents felt management would be improved if statutory management areas could be broken down.

"One way to improve fisheries would be to have sub-areas within existing areas in the quota system for more accurate localised Totally Allowable Catch (TAC) management." – Commercial fisher.

"It would be nice to think it could be managed as a separate area – rather than as part of the wider area. Perhaps if recreational fishers had a little more say when we could sense the decline in the fishery before it is let go and then have to fight to get it back. At the fishing club we get feedback all the time – could use this to build up a picture from the boating committee, then get a recommendation written out on behalf of the club to go to someone who could do something about it. In this way we could contribute to managing the resource properly at the local area." - Recreational fisher and diver.

Several people identified that the sustainability task carried a degree of individual responsibility.

"Look after the fish. Take only enough for a feed." - Local resident.

The need for good governance was mentioned by some respondents.

"We need to see honesty and fairness by all involved to manage and preserve the coast." - Commercial fisher.

Change agency responsibilities

A few respondents suggested that there be changes to the agencies responsible for coastal and fisheries management.

Some believed that DOC should take over responsibility for inshore fisheries, as long as it was properly resourced.

"MFish haven't done enough. There was the voluntary no-trawl agreement – and they have increased kingfish size in the last 20 years but [it's] not good enough. Not solving the issues here [for shoreline fishing]... Would be OK if left to police it and had more staff. DOC should run inshore fishing – has big lump of it with whitebait, should do same thing it does for whitebait... MFish has enough on its plate with commercial fisheries." - Recreational fisher.

One respondent however specifically said that DOC should not be involved however.

Photo credit: L. Douglas

"Not DOC. Too many greenies. [Should be] a local authority but using the expertise of people who know what they are talking about." - Local resident.

One respondent suggested that regional councils should be involved in the policing role.

A few respondents spoke of establishing a 'single agency' approach to coastal management, with the major benefit of reducing confusion. The Local Government Act was seen as a potential route for achieving this.

"A single agency with responsibilities, for instance under the Local Government Act, [you] could allow a regional council to apply RMA [Resource Management Act] processes to the whole area... Look at the RMA system – it's worked on land. This approach to coastal management could allow integration both beyond the 12 mile limit and within."- Regional council officer.

The division of coastal management responsibility between DOC and regional councils was commented on by one respondent.

"[It] doesn't help having DOC dealing with restricted coastal activities (RCA's)." - Regional council officer.

A Department of Conservation officer highlighted recent developments with a national Marine Protection Area Strategy which anticipated DOC and the Ministry of Fisheries working with regional forums that would include regional councils, iwi and stakeholders to look at ways of progressing marine protection. This is further discussed in Chapter 22.

More communication and consultation

Better communication and consultation between all the parties was highlighted by quite a group or respondents. Several ideas were put forward, including:

- the need to keep talking;
- a need for public discussion in an open forum;
- the need to identify ways to keep everyone informed, e.g. through a mailing list, or something like this project; and
- the importance of proper consultation.

"When people stop talking, they find differences come up and things get confused. And emotion comes into it – because it's fishing. Even if we disagree we still need to talk. Sooner or later we will find common ground." - Ministry of Fisheries officer.

"More often than not the main view is the same thing just coming from different directions." – Tangata whenua.

"We need to recognise that all cultural views have a similar element – that values of recreational use are sympathetic to conservation use." - Local resident and naturalist.

"Talking to people (such as this project) is a good way of compiling information. It encourages people to think more about the information they have... We need to make people think about the environment – so they don't take it for granted." - Former commercial fisher.

In particular, the need to bring commercial fishers and recreation fishers together was mentioned specifically by a couple of respondents. Others mentioned the need to include oil companies.

"Get them to work together to solve problems." - Former commercial fisher.

Whilst there was a strong call for consultation to include all the parties, there were some differences of opinion over just what this meant. A couple of respondents wanted stakeholders consulted first, with others later on. These respondents wanted the rights of fishers, particularly recreational fishers recognised ahead of others who don't use the resource.

"We should be investigating 'rights based' systems. We need to structure processes and organisations that allow decisions at the right scale. We need to get those who don't normally get involved to where they can be involved, and accountable." -Recreational fisher and diver

There was a concern among a few respondents that their views wouldn't be taken into account.

"You can influence the local council but not the regional council." - Commercial fisher.

"You feel that even if you had a view, it would not be listened to." – Tangata whenua.

Quite a number of respondents felt that people needed to be prepared to reach an agreed position. Suggestions for achieving this included negotiating an outcome, or entering into some form of dispute resolution. One respondent suggested getting everyone to buy into a written goal.

"Depends on what they want for the coast… I like to see fairness. You can't please all of the people all of the time." - Recreational fisher.

"I'd like to see the differences between us and the people who couldn't care less reconciled – I'd like to see the public protecting the resource instead of exploiting it." - Local resident

"Everyone should have a part in conserving fish stock." – Charter boat operator.

"… Get all of the community engaged, where everyone has to buy in and agree in print what their vision is… we need to manifest this into a written vision that answers 'what are we trying to achieve here?'" - Tangata whenua.

A couple of people also felt achieving this would take quite a long time, and that timeframes should reflect this.

"It is achievable. Our [iwi vision document] took seven years but we got there. Sometimes we are too constrained by timeframes to drive this sort of process… we need to take away the timeframe." - Tangata whenua.

More education and awareness

Quite a significant group of people felt that there was a need for education as a means of increasing awareness as part and parcel of resolving differences.

Two key aspects were highlighted – the need for education about the resource and risks to it, and the need for education to understand other users of the resource.

A couple of respondents were concerned about the 'false blame' often put on commercial fishers, and sought more education, starting with boat clubs, to overcome this.

"A lot is blamed on 'trawling' when it actually isn't occurring. Many boats people see are set netters – a huge difference between set nets and trawlers and what they do. Sometimes they are crayfish boats. These are rigged up in a way that makes them look like trawlers but they are actually crayfish boats. They go in 30-40m off shore and people think they are trawling. People also get confused when boats are trolling (running lines run off the back for tuna)…Set netting involves a lot of laying and picking up gear. Boats doing this may well have trawl gear on board…There was even confusion over the Tangaroa! [the NIWA research vessel]. We need a programme to educate – fishing clubs first, talking together." - Ministry of Fisheries officer.

"It's about educating people. The people fishing off here [Patea] are mainly locals. If they look after it, it can stay the way that it is." - Recreational fisher and diver.

"A knowledge of past history – and possible problems in the future

– should be discussed with all the interested parties." - Former commercial fisher.

"We need to re-sensitise New Zealanders to the value of New Zealand heritage and its environmental worth. This is a societal responsibility. My hope is that all New Zealanders would want the same for the environment to be available for use but to be protected. We tend to take things for granted and don't view them for the treasures that they are." - Local resident and naturalist.

Photo credit: L. Douglas

" We need to raise the awareness of the whole community of the special values of this coast, and how we all need to work together to protect representative bits of it for future generations. Wanganui, for example, has generally turned its back on its coast, and doesn't see itself as a 'beach-side' town." – DOC officer.

"People have to be made aware of the commercial fishers' right to catch the quota." - Commercial fisher.

"[We need] more education of everyone about retaining fish stocks – tossing rookies back. That's the rules." – Recreational fisher.

"People need to be educated regarding how to care for coastal flora and fauna." - Former commercial fisher.

Maori fishing traditions were seen as having something to offer here.

"Maori traditions are useful. Leave it as you found it." – Recreational fisher.

A couple of respondents wanted better education of families and children about the values of their local beaches.

"I think for the benefit of the next generation someone starts a club where kids can join and learn to protect our environment. If no one looks after it, it'll get worse." –Recreational fisher.

"I want to see kids of the next generation helping their environment improve with their help with planting more native trees and protecting animals. I want to see the South Taranaki coastline protected better and actually see people, children helping." - Local resident.

More enforcement

A number of respondents wanted to see MFish better resourced so that it could carry out more surveillance and monitoring, therefore more effectively policing the fishing regulations. Better resourcing of the inshore fishery was specifically mentioned. Having people permanently in local areas, even on a part time basis, was seen as one possible option.

"There should be someone with local presence being kaitiaki for regulations and reserves."- Regional council officer.

Someone else wanted to see it made easier to contact MFish.

In a call for more prosecutions, some respondents also wanted the law improved to enable this.

"I'd like to see MFish checking bag limits. Certain fishermen and some divers are known to over fish frequently and they are never caught. This needs to be monitored." - Diver.

The need to manage the summer influx was discussed.

"Target competitions in summer, beach festivals etc. Amazing what a marked vehicle does. Makes people compliant."- Ministry of Fisheries officer.

The need to enforce customary take was also mentioned, including a need for improved laws governing this area.

The need for better policing of quota was also raised.

Base decisions on factual information

The importance of having discussions about future management based on factual information or 'hard data' was emphasised by quite a few respondents.

"If they don't agree with the evidence they are only looking after themselves." Recreational fisher.

"Good technical data, at the scale relevant to the area being managed, is important in making management decisions." – DOC officer.

The potential of commercial fishers to provide some of the factual data was acknowledged by several respondents.

"[In our current project] the parties that can affect the environment are not there. What would be really good would be to have commercial fishers involved. What they say should be fact." - Recreational fisher.

"Recreational fishers don't fish very much – hours with hooks in water is what it's about… consider three rods and three hours a day – the equivalent of about 50 hooks. Compare this with 5000 hooks in the water for 3-4 hours – that is 15-20000 hooks in just one day. Thus most recreational fishers don't have a concept of what is going on. Whereas commercial fishers will have a very good understanding of what is out there…. On an average day you will have 25 km of line out." - Former commercial fisher.

Ideas for marine protection

A few respondents wanted to see a marine reserve or exclusion area established.

"I'd like to see a marine reserve to give fish a chance to breed, and an opportunity to watch what happens in the area, so we can understand it better." - Local resident and environmentalist.

"I would be quite happy to see a reserve." – Diver.

"By creating exclusion areas, everyone would be excluded. I have a reserve area mapped out in my mind for this. It is a logical place with defined boundaries." – Recreational fisher.

"A protected area would populate the nearby surrounds once the reserve is 'full' of species." - Diver.

Most of those who indicated support for some sort of marine reserve favoured a small reserve that did not affect on-shore fishers.

"Potentially a small reserve area to try and maintain fish population. Don't stop surfcasters." - Recreational fisher.

The North and South Traps were mentioned as a possible site by a number of respondents.

"The North and South Traps do need preserving. They are almost the icon of the area, quite a goldmine." - Former recreational fisher.

"A small marine reserve – maybe around shell rock areas – such as South Trap – probably needs to go out from Snapper rock – doesn't need to be that big an area." - Regional council officer.

Another person favoured a marine reserve at one of the Traps but was concerned it couldn't be properly policed. While another person was concerned that establishment of a marine reserve would transfer pressure to other areas with detrimental effects, for example if one of the Traps became protected whilst the other was not.

The purpose of a reserve was important to some respondents.

"Reserves are OK for monitoring but not for a no take approach for recreational fishing." - Recreational fisher.

"Marine reserves will do nothing. You're talking about hook time in water. Compare 15,000 – 20,000 hooks in the water from a commercial fisher with even 100 boats recreational fishing – they wouldn't put anything like this in the water. Recreational fishing has a negligible impact." - Former commercial fisher.

It should be noted, however, that quite a few respondents specifically stated that they did not want to see a marine reserve established. Management options, including voluntary approaches or catch limits and other such measures were seen as more favourable.

"A fishing reserve would make life unfair for surfcasters and locals." - Local resident.

"No reserves please. It is naturally protected." - Recreational fisher.

"You'd never get a marine reserve through. You'll get shot by the Maoris. What can you do? There are more boats every week!" - Former commercial fisher.

One respondent summed up the dilemma quite eloquently:

"A marine reserve is like a rubbish dump or a prison. We need them but nobody wants one on their back door."- Recreational fisher.

A handful of respondents discussed parks or protected areas. One sought that DOC or MFish should take steps to establish a marine park. A benefit seen of marine parks was that they would enable local people to set the rules.

Ideas for changing recreational fishing management

Some people believed that recreational fishing should be afforded preferential status or the area designated for recreational fishing only.

Photo credit: J. O'Leary

"In my view, NZ recreational fishers should have priority right to catch the fish and the surplus caught for export." - Recreational fisher.

"Our fishing resource is one of our last natural resources. The value of this resource is huge and the recreational potential is larger than the commercial catch. Having a good sustainable resource will bring in more money than commercial fishing." -Recreational fisher.

"Save it for recreation fishers while it is still the best fishing spot in the country." - Recreational fisher.

There was a range of ideas proposed to change recreational fishing rules. These are listed here without any attempt to prioritise them, but in accordance with how frequently the idea was proposed:

- reduce the amateur bag limit e.g., reduce the blue cod bag limit from 20-10;

"Daily limits of 20 fin fish plus 10 snapper per person are too high. No-one needs that amount."- Recreational fisher.

"Reducing the legal limit will discourage amateurs selling their fish." - Recreational fisher.

- reduce fish size limits;
- license recreational fishers;
- get recreational fishers to log daily catches. One person suggested that logs be used instead of a daily catch rate;
- one person suggested that bag weight rather than size and number be used;
- rules for gear limitations;

"Use only 25 hook long lines and 60 m gillnet." – Recreational fisher.

"Hook size needs to be increased on blue cod and long shank hooks used instead of box snapper hooks." - Commercial fisher.

- change rules for owning nets;

"You could consider licensing net owners. Would stop flounders/rig being over fished, e.g. if lose a net, can't get another one. Would take people who can't manage the net out of the equation." - Former commercial fisher.

- ban set nets for recreational fishers;
- ban long lines for recreational fishers;
- restrictions during spawning – either restrictions in spawning areas or at spawning times; and
- improve handling practices, to enhance fish survival.

"We need to encourage people to unhook in the water, to use a towel when handling fish, and to handle and release undersize fish in a way that improves their chance of surviving when they are thrown back in." - Recreational fisher and diver.

There were a few comments relating to retaining existing fishing rules:

Photo credit – P.Brommers (used with permission from S. Hornby)

- one person felt the current snapper limit was sustainable; another person thought that the ability for recreational fishers to long line should be retained, primarily for snapper.

  "We need to retain the ability to long line recreationally. It's important for catching snapper, a skittery fish." - Former commercial fisher.

- another person suggested an increase in paua take to 20.

There were a range of area based fishing management suggestions including a system of rotation like that in place for scallops at the top of the South Island, which allows recovery of fish stocks.

"Rahui (bans or restrictions at certain times) is intuitively the better way to go – you can use it to close in the short term and then think about rules for when you reopen the fishery. Stratifying close, near and off-shore activity might also help." - Ministry of Fisheries officer.

A couple of respondents wanted seeding of fish or shellfish investigated as a means of improving the fishery.

A handful of respondents (6) sought establishment of artificial reefs. A couple of these wanted the reefs established for fishing and diving.

"Establish a few artificial reefs in the 20-30 m [depth] area."- Recreational fisher.

"I would like to see an artificial reef made closer to Wanganui, maybe off Kai Iwi." - Local resident.

Ideas for managing commercial fishing

A significant number of people reiterated their support for the quota system, although a few people discussed the importance of it being well managed, and a few wanted cuts in quota. One person didn't see much point in changing quota as a management tool, saying it was too hard to police. The quota system was seen by some as having shortcomings for inshore fishery management.

"In Area 8 the companies own quota all over NZ. They can walk in anywhere they like. Area 8 should be like the crayfish- allocated to so many boats that fish in the area. Should be locally restricted, the same as paua and crayfish." - Former commercial fisher.

"I don't have faith in the ability of MFish to manage the quota system – every large commercial fishing area is in a state of crisis or collapse. They call kahawai the 'shit fish' and just throw it away... Look at the orange roughy experience. They annihilated it.... Commercial fishing and whaling should cease now. Or be severely regulated." - Tangata whenua.

Some people expressed concern about the fisheries permit system, and the fact that permits could be issued without the need to take into account known environmental impacts. There was a call for the impacts of both recreational and commercial fishing to be quantified.

The concern also extended to the need to think more about impacts in planning or improving facilities for fishing.

"It's not about building a boat ramp... it's about what effect it's going to have beyond that, for example by fixing the area at Patea, it means better access. This will mean more people. Need to look at the bigger picture and the effect this could have." - Tangata whenua.

A significant number of people wanted restrictions on how and where commercial fishers could fish. One respondent, however, made a plea that commercial fishers not be stopped from accessing favoured places.

Other specific suggestions in relation to commercial fishing included:

- retain the voluntary 'no trawl' agreement already in place;
- replace the voluntary regime with a ban on trawling, with suggested distances varying from 2 km to 15 km;
- ban gill nets, with suggestions ranging from a complete ban, to 2-12 nautical miles off the coast;
- ban set nets;
- not allow any commercial fishers 'in close';

"There should be a blanket moratorium on commercial fishing within five kilometres because this is a nursery area."- Recreational fisher.

- reduce overall fish exports;
- restrict the areas where commercial fishers can go – one respondent suggested outside the 12 mile limit;

"There should be closer monitoring of commercial operators and introduction of a boundary, i.e., how close to shore are they allowed to fish. Have noticed an operator working approximately 40 m off Waverley Beach." – Recreational fisher.

- ban trawling – bottom trawling; 'trawling with gates and chains' and instead returning to long line;

"I'd like to see a total trawl ban inside the Graham bank for all bigger boats." - Former commercial fisher.

- minimum distance for long lining from the coast;
- vessel size limit in close;

"I would like to see set netting banned or at least pushed out to 6 miles. This would allow breeding grounds to rebuild." – Former commercial fisher.

- keep foreign vessels out; and
- prohibit taking of ironsand.

One respondent felt management responses should emphasise tighter control in the areas where commercial pressure was the greatest, and that this wouldn't necessarily be within South Taranaki.

"The snapper follow warmer water. They leave in May and come back in August. We should understand [where they go] and manage where snapper is being commercially hit – target New Plymouth and Golden Bay, not here." - Former commercial fisher.

Ideas for managing customary fishing

There was a call from a number of respondents, including iwi and other fishers, for better management of customary fisheries.

"[We need to] change the policy on Maori entitlements because the current policy is allowing stripping of shellfish." - Recreational fisher.

There was a concern that the paua fishery was mismanaged. Some wanted to see tighter policing of Maori gatherings.

"[I] don't think Maori should be able to get food for hui or tangi – [They] don't need 150 crayfish or 100 paua. It seems they get given an open permit to get as much as they like under a customary permit – it is wide open to abuse... I think daily bag limits are more than generous. There should be an emphasis on this." - Recreational fisher and diver.

One respondent suggested that a higher authority was needed to give permission for Maori customary fishing.

A number of tangata whenua believed part of the answer to this lay with regaining the knowledge the old people had. Education and the need to build respect for nature were key issues.

"We are taking on the responsibility to educate our own iwi in traditional management and everything that goes with this – the spiritual aspects and so forth." – Tangata whenua.

Ideas for managing coastal development

A couple of respondents wanted the Resource Management Act used to regulate coastal subdivision, through controls in district and regional plans. One person felt that development would self-regulate as there would only ever be a limited demand.

There was a call for consistency across councils in their approach to the rules.

"Everywhere you go, local authorities have separate rules for subdivision. South Taranaki District Council, for example, said it would revise its subdivision rules but I haven't heard anything. By way of example, there is a sandy bay at Ooanui, very natural, with dotterels and other birds. It is a valuable area. There is a DOC reserve and covenanted land. Now there are six sections for sale on the back fence. Also another development planned. I went and talked to the developer, to try and make them aware of what was there. They are now promoting it on the basis that there is a natural reserve area there. But people will bring cats and dogs. I hope we can get the people buying alongside us, and that they can become the area's protectors. They would be the greatest hope." - Local resident and naturalist.

One respondent suggested specific management steps.

"You need to have room along the coast for natural events to occur, i.e., don't build houses so close to the dunes and beach. For example, allow 500 m from the high tide line." - Local resident and environmentalist.

Ideas for managing coastal erosion

The need to update information about local erosion risk, and the potential need to revise existing risk management zones, for instance at Mowhanau and Kai Iwi, was acknowledged by agency respondents.

A couple of people put forward suggestions to reduce cliff erosion.

Some advocated using natural processes, whilst others suggested more interventionist approaches.

"Cut down the trees and do not replant dune areas. Erect signs to educate visitors and the public about the fragile nature of the beach and how it should be preserved." - Local resident.

"There is an example where there had been gravel extraction, but now is a stepped cliff which is retaining vegetation with stock excluded. It is not eroding."- Local resident.

"Lay sand sausages to trap sand – e.g. like the moles that have created the beach at Castlecliff. If you laid sand sausages perpendicular to the cliff just south of Mowhanau and by Archers Bridge it would allow sand to accumulate."- Local resident.

Ideas for managing land use affecting the coast

A number of respondents wanted changes to land use practices to reduce impacts from land on the fishery and coastal birds, plants and animals.

"[On the] farms up stream. Areas alongside [the streams] should be covenanted, e.g. whitebait habitat, where there is private land, otherwise they risk being drained. Forests are still being felled, with increased flood risks." - Local resident and naturalist.

Specific suggestions included:

- improved grazing management, e.g. stock exclusion from river banks, fencing of cliff edges;
- riparian planting;
- better management of nitrogen and phosphorous;
- encourage tree planting on cliff tops, coastal edge;
- stop the dunes being washed away;
- investigate land uses so that natural sand drift occurs; and
- establish observation points along the coast to check shifting sand and its effects.

"I'd like to see a national park strip from the mountain to the coast to provide a corridor of bush for bird life." - Local resident and naturalist.

Part II A summary of published information on the South Taranaki coast

Summary

This part of the report on the South Taranaki-Whanganui coast summarises information gathered from existing literature. Comments from participants in the research described in Part I of the report are scattered throughout. An overview is first provided of the climate, ocean, geology and biology.

The climate of this area is described as a maritime temperate climate with prevailing westerly winds and a higher than average rainfall due to the influence of Mt Taranaki. The oceans in turn are influenced by the currents spiralling off Farewell Spit, bringing nutrient rich water into the high wave environment of the South Taranaki Bight area. Undersea sand ripples, sand waves and drowned dunes are features of the seabed and influenced by both ancient geology and present day waves and currents.

Looking north around the South Taranaki Bight from Castlecliff Beach, Wanganui

Photo credit – L.Douglas

The geology of the area influences the biology. The stretch of coast from Manaia down to Ohawe beach is strongly influenced by the volcanic Mt Taranaki. From Ohawe to Castlecliff, Wanganui, the geology consists of sedimentary rock, uplifted terraces and highly erodable cliffs. This section of the study area will be referred to as the 'papa-rock' section.

There is likely to be differences in the biology between these two different geology types, although little study in the intertidal or subtidal area of the 'papa-rock' section has been undertaken. Species richness across the whole area is described as low, a by-product of a rugged high energy physical environment, and yet, despite this, a rich fishery is reported.

Existing literature about resource use along the coast is summarised. There is little quantitative information on the level of recreational fishing in the area. Surveys on recreational fishing are carried out by the Ministry of Fisheries, but at a nationwide scale. The Ministry of Fisheries also gathers data on commercial fishing, but again, much of that is gathered at a larger scale than just this study area. The area has a rich history of commercial fishing that has included whaling and the birth of New Zealand's deep sea fishing industry. Other marine resource use in the area includes some oil and gas exploration, black sand mining

and limestone extraction.

Taranaki Regional Council undertakes extensive monitoring of both the state of the coastal environment and of specific coastal permits (discharges). Monitoring tends to conclude that the region has excellent coastal water quality which compares well with other regions in New Zealand. Gaps in monitoring, such as monitoring of the Wanganui wastewater discharge, are identified.

The final chapters in Part II summarise the current management structure for managing the coast in terms of the responsibilities of the different agencies and tools that are available for changing management. The report then concludes with chapter exploring recommendations for 'where to from here'.

12 CLIMATE

Introduction

Climate is important as it has a major bearing on the use of the coastal environment, as well as shaping the features of the environment itself.

The coastal region of South Taranaki is, like much of the rest of New Zealand, a 'maritime temperate' climate, with no great extremes between summer and winter.

The area is located in central New Zealand, and typically the weather patterns are characterised by the eastward migration of anticyclones at five to seven day intervals, separated by low pressure troughs.

Photo credit – L.Douglas

Anticyclones account for settled conditions, which occur about 25% of the time with the rest of the weather being determined by the low pressure systems.

Topography influences local weather patterns, particularly the cone of Mt Taranaki. This means that parts of western Taranaki have quite high rainfall, whilst its rain shadow to the east means other areas are drier and sunnier.

"The weather protects this coast." -Many recreational fishers.

"Every day is a good day if the weather is right." - Recreational fisher.

Wind

Prevailing westerly wind

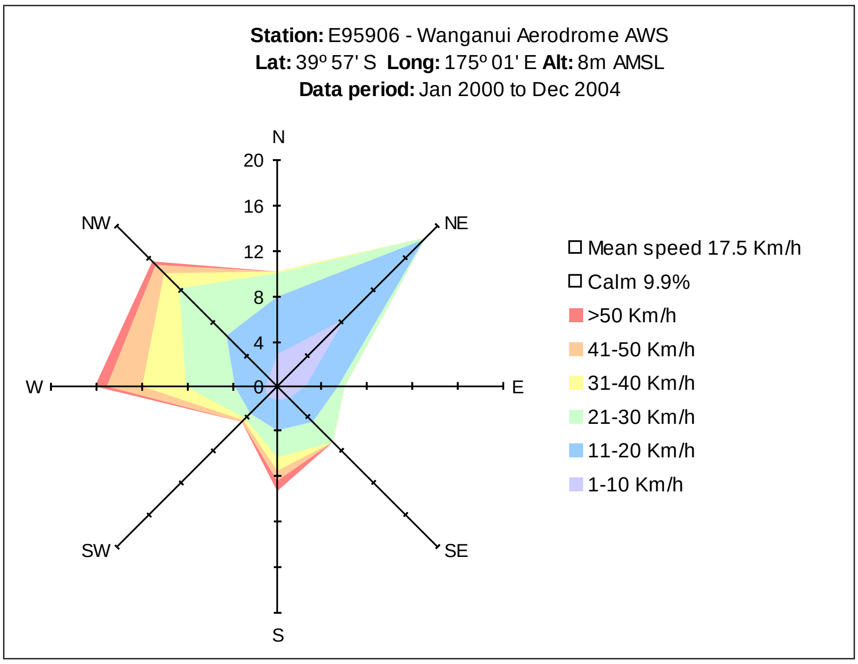
The region is directly exposed to the prevailing westerly airflow, and is known as one of the windier parts of New Zealand.

Wind records taken at Patea show that westerly winds tend to predominate during spring and summer and northerly winds predominate during autumn and winter.[51]

The strongest winds tend to be from the westerly direction.

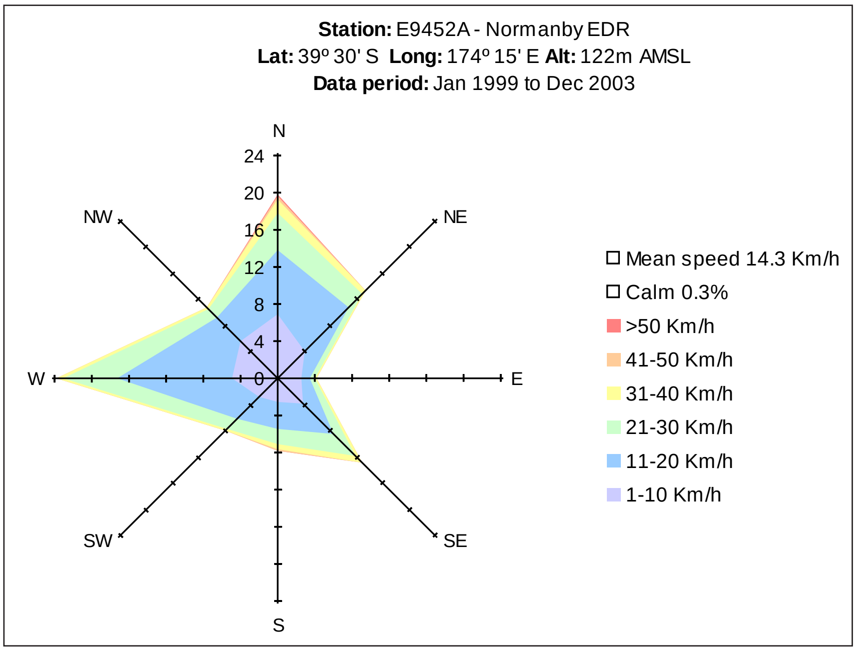
Wind rose data for Wanganui Airport and Normanby show a significant variation in average wind direction between the northern and southern parts of the study area.

FIGURE 3: WIND ROSE FROM WANGANUI



Source NIWA

FIGURE 4: WIND ROSE FROM NORMANBY



Source NIWA

Influence of El Nino and La Nina

Patterns are further modified in response to El Nino/Southern Oscillation (ENSO) events, whereby an El Nino event typically results in a west-southwest anomaly superimposed on the "normal" wind conditions, causing strengthened and more frequent west- southwesterly winds.

For a La Nina event the opposite is generally true, and this results in an east-northeasterly wind anomaly.

> ***Interpreting Wind Rose Diagrams***
>
> - The wind rose diagrams show the percentage frequency of winds of various strengths for the eight compass points, in a 'footprint' pattern.
> - The extent of the 'footprint' along each axis, gives the overall frequency from that particular direction.
> - The width of each colour along the axes gives the frequency of winds within the strength range represented by those colours.
> - North, east, south and west directions cover 50 degree sectors (e.g. east: 070º to 110º), while northeast, southeast, southwest and northwest directions cover 40 degrees (e.g. southwest: 210º to 240º).

Source: NIWA

Seasonal variation

The path of anticyclones across New Zealand shows a seasonal variation with their influences extending further South during summer and autumn months.

"The past three years have been a lot rougher than the previous four years. The direction of the wind has changed – we got out more often in our smaller boat that we had before, than we do now with our bigger boat!" - Recreational fishers.

Influence of topography

The airflows in the greater Cook Strait region (within which the study area falls) are influenced strongly by topography, and for this reason, it is difficult to generalise wind conditions offshore from weather stations onshore.

However, studies done for the Kupe Gasfield development area, indicate that wind measurements from the offshore Maui platform are likely to be representative of the Kupe location, which is within the study area.[52]

The wind from the Maui platform indicates that the predominant onshore winds in the study area are likely to be west and southeast.

Rainfall

Two key factors influence rainfall on the South Taranaki coast. These are exposure to moist westerly airflows and the influence of Mt Taranaki.

Exposure to moist westerly airflows

As the region is located in central New Zealand and on the west coast, it is directly in the path of prevailing moist westerly air masses. As a result, rainfall is higher than the average for the rest of New Zealand.

The influence of Mt Taranaki

The western most parts of the South Taranaki coast are in the lee of Mt Taranaki, and therefore subject to what is called a 'rainshadow' effect. Moist westerly winds are forced to rise, and therefore lose their moisture as rain on the exposed side of Mt Taranaki. Those areas closer to the mountain have slightly higher rainfall than those further away.

TABLE 7: SOUTH TARANAKI RAINFALL

LOCATION	AVERAGE ANNUAL RAINFALL (MM)
Hawera	1176
Patea	1159
Wanganui	906

Source: Hawera, Patea figures, Taranaki Regional 2003a; Wanganui figures, Horizons Regional Council 2005.

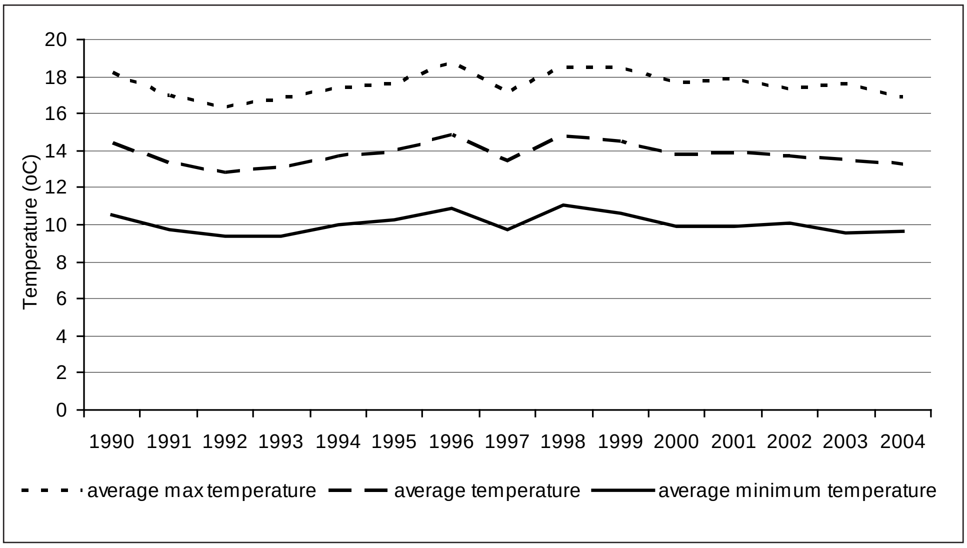
Temperature

Mild climate

The mild climate of the South Taranaki area sees it having an average temperature of about 14 degrees (taken at Wanganui Airport).

"The nights are colder. The days are still hot, but it gets colder quicker on the beach." - Recreational fisher.

FIGURE 5: DAILY AVERAGE TEMPERATURE FROM WANGANUI AIRPORT BETWEEN 1990 AND 2004



Source: NIWA

13 THE OCEAN

Introduction

A number of factors affect the seas of the South Taranaki Bight. These include tides, currents, waves and water temperature. These factors, in turn, are influenced by topography and climate. The oceanography of the area is very complex, featuring upwellings and strong tidal flows.[53]

This chapter summarises information known on the following topics:

- seawater;
- waves;
- tides; and
- currents.

Seawater properties

The seawater in the South Taranaki Bight has a number of features that affect the marine plants and animals that live there. In particular, nutrients are brought into the area by cooler currents spinning off Farewell Spit. Those nutrients are then used by microscopic algae to grow, which are then fed on by microscopic animals that are in turn fed on by fish.

Water temperature

The water temperature near the seabed on the continental shelf, around about 100 m deep, stays fairly constant at about 13.5°.[54]

Average temperature over the surface of the ocean off the Patea coast has been reported to range from 19° in summer to 13° in winter. These temperatures decrease towards the south.[55]

"I think the sea temperature has changed. I've seen quite a few tropical fish offshore that I have never seen in the past." - Recreational fisher.

Thermal layering

During settled periods of weather in the spring and summer months, thermal layering of the water column occurs over a large portion of the Western Cook Strait, including the study area. It is caused by solar heating of the upper water column. On the continental shelf, this usually breaks down by late autumn, when the water column becomes isothermal (meaning that the temperature is more or less the same throughout).

As stormy weather can occur at any time of the year, it can quickly cause significant vertical mixing, breaking down any layering that might have been caused by warmer water sitting on top of cooler water. As a result, the water might not be layered into warmer/cooler sections. However, this can occur during settled periods of weather during summer months.

Upwellings of cold nutrient-rich water

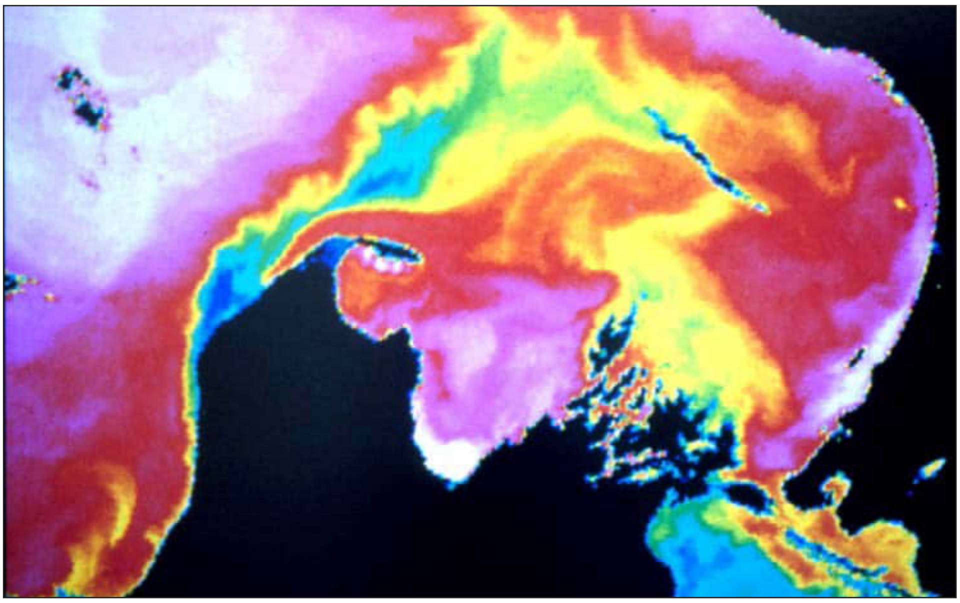
The temperature regime of coastal waters, unlike the deep ocean, is influenced by upwellings of water. Upwellings are cold, often nutrient-rich waters from the ocean depths which rise to the surface. This can happen when strong, usually seasonal, winds push water away from the coast, bringing cold, nutrient-rich deep waters up to the surface.

The South Taranaki Bight is known to be affected by upwellings that originate off Cape Farewell from the Kahurangi shoals. It is thought that currents from Westland flow past the Kahurangi shoals and around Farewell Spit resulting in meanders and eddies.

FIGURE 6: SCHEMATIC REPRESENTATION OF THE BIOLOGICAL EVENTS RESULTING FROM THE UPWELLING OF COLD, NUTRIENT-RICH WATER AT KAHURANGI

Source, McComb 2004 from Bowman et al., 1982

FIGURE 7: CZCS SATELLITE IMAGE OF SEA SURFACE TEMPERATURE SHOWING UPWELLING PLUMES OF COLD WATER BEING SHED AS VORTICES FROM THE KAHURANGI SHOALS / CAPE FAREWELL



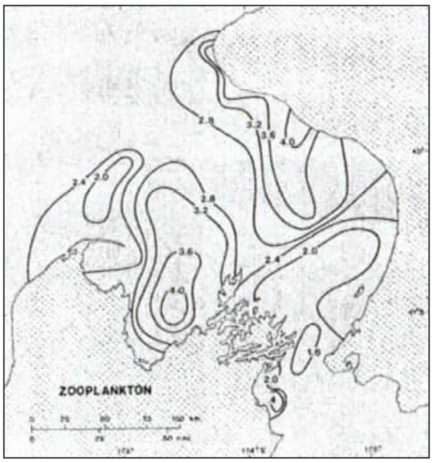
(Photo courtesy of P.McComb)

"Pulses" of the upwelled water in these eddies are rich in nutrients and so grow phytoplankton (microscopic algae). The eddies move towards the South Taranaki Bight. As they move, the nutrients in the water are used up so by the time they get to the South Taranaki Bight they are rich in phytoplankton.

By comparison with other parts of New Zealand, the greater Cook Strait region is very productive, with high levels of nutrients and phytoplankton that form the basis of the food chain and so are important for the fisheries.

As a result of the high phytoplankton levels, zooplankton (microscopic animals that feed on plankton) levels in the South Taranaki Bight can be more than four times as great as in all other New Zealand continental shelf areas, and six and a half times greater than the North Taranaki Bight.[56]

FIGURE 8: DISTRIBUTION OF ZOOPLANKTON (>0.2 MM) EXPRESSED AS THE LOGARITHM OF THE WET WEIGHT CONCENTRATION (MG.M-3) IN JANUARY 1980.



(Source: McComb 2004 from Kibblewhite et al., 1982).

"While scuba diving off Ohawe beach in August 2005, I noted that the water column, from the surface down to 20 m was thick with plankton (clearly jelly type with a black centre), some formed strings up to a metre in length." – Diver.

The wave environment

Introduction

The South Taranaki Bight has what is known as a 'high energy wave environment.' There are two main types of waves that influence the area:

- ocean generated waves, which have been formed far away; and
- wind generated waves, which are generated locally.

These two types of waves, along with other factors such as climate and topography, influence the wave environment both on and offshore.

Understanding ocean generated waves

The South Taranaki Bight has high exposure to waves that originate in the Tasman Sea and Southern Ocean. The waves tend to be 'long-period' waves which means that they tend to be larger and stronger compared to 'short-period waves' which are smaller and less energetic. They also are typically fairly uniform in shape and usually travel in sets, with some distance between each one. When measuring this distance in seconds, the time lapse between ocean waves observed in South Taranaki is around 12 to 14 seconds.[57]

How rough the waves are depends on the season. The waves are most energetic in August, and least energetic in February. Storm waves can occur any time of the year however.[58]

As these ocean waves from the west and southwest approach the coast, they lose height, get further apart and approach the Whanganui Coast more or less shore-normal (i.e. at right-angles to the seafloor contours). This occurs through a process known as wave refraction where the direction of a wave is changed when it moves into shallow waters at an angle to the seafloor contours. The shallow depths for considerable distances offshore influence this.[59]

Waves reaching the shore are still sufficiently large to subject the coast to a moderate to high wave energy attack.

Ocean generated waves contribute to long-shore drift

Although waves arrive more or less normal to the shore, there is an imbalance of wave energy between north and south[60]. This, combined with the coastal currents that also operate in the north-south direction, mean that there is a strong littoral movement of sediment down the coast in a southeast direction. [61,62]

Energy in the waves at Kai Iwi

The process of wave refraction reduces the energy a wave has. Therefore the less 'refracting' it does before arriving at the coast, the more energy will be left when it actually breaks on the shore. In this way one expert observed that the place that would be getting the maximum energy during westerly waves along the coast, is in the vicinity of Kai Iwi stream.[63]

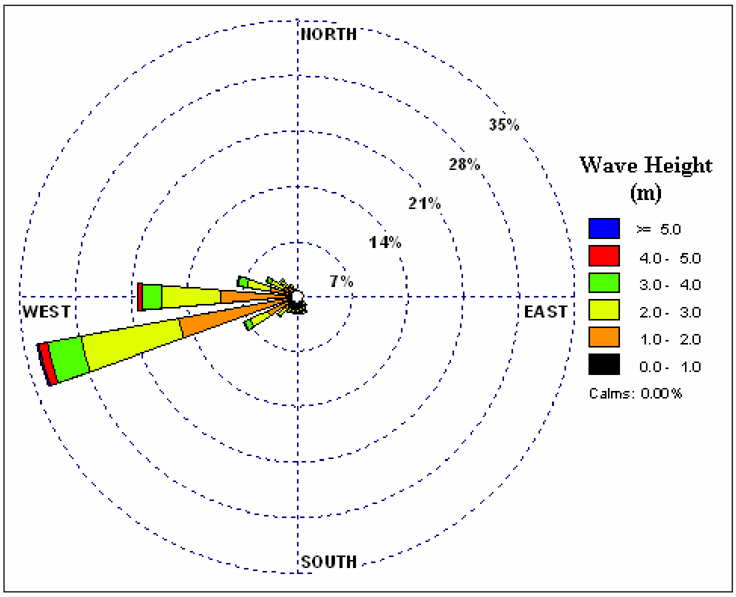
Understanding locally generated waves

The South Taranaki Bight is also exposed to locally generated waves, caused by the wind, predominantly from the southeast.[64] These waves are the ones responsible for the 'chop' to be seen on the sea in windy conditions.

General wave characteristics

The wave pattern along the coast is very regular, being dominated by southwest winds. Figure 9 illustrates that wave height is generally between 1 and 3m, although this can increase 3-fold during storms.[65]

FIGURE 9: ANNUAL WIND ROSE FOR THE ROLLING GROUNDS (OFF THE COAST OF PATEA) SHOWING WAVE HEIGHT AND WIND DIRECTION, DERIVED FROM AN 8-YEAR WAVE HINDCAST.



Source: P. McComb, Metocean Solution Ltd (ww.metocean.co.nz)

Wave characteristics at Ohawe

Based on information from a variety of studies, the characteristics of the waves at Ohawe have been described[66] (see Table 8).

TABLE 8: WAVE CHARACTERISTICS AT OHAWE

CHARACTERISTIC	SITUATION AT OHAWE
General wave environment	A mixture of locally generated storm waves and longer period ocean swells generated by storms to the south
Wave direction	Primarily from southwest to southeast This is due to wave refraction
How often it is calm	10% of waves are less than 1 m high
Average wave height	1.3 m high Waves 10.23 seconds apart. Breaking waves of 4 m height were observed
Dominant deepwater wave (most frequently occurring)	Approaches from south to south-west About 1.0 to 1.3 m high Waves 6–8 seconds apart
Average deepwater storm wave height	Wave height of about 2.7 m Some waves measured at 11m high

Source: Single, 1996

Wave characteristics at Whanganui

The characteristics of the waves at Whanganui have also been described by various authors. Even though the data allows only an incomplete comparison, it is evident there are some differences with conditions at Ohawe. The features for which information was available are summarised in Table 9.

TABLE 9: WAVE CHARACTERISTICS AT WHANGANUI

CHARACTERISTIC	SITUATION AT WHANGANUI
General wave environment	Most (~75%[67]) waves appear to have been locally generated[68] Mean wave period is 10.1 s (range 3.5 s to 19 s)
Wave direction	~42% approach from the west ~24% from the south ~34% approach normal to shore[69]
Mean deepwater storm wave height	The Sedco rig offshore of Whanganui recorded a wave in excess of 10m.[70]

Source: Burgess, 1971; Macky, 1991; Shand & Shepherd, 2003.

How the waves impact on the seafloor

A number of 'bedforms' on the seafloor are attributed to the influence of waves and currents. Sand ridges, sand ribbons, mega-ripples and sand waves have been identified in depths of up to 60 m off Whanganui. These are the result of waves and currents. Research conducted in the 1970s suggested that such is the energy of waves and currents on this coast, that the waves have the potential to affect the seafloor at even greater depths. Waves have the potential to stir sediments on the inner and middle continental shelf (< 70 m deep) during annual storms and probably down to 130 m depth during the maximum 25 year storm.

Currents

The west coast of New Zealand is affected by a number of currents (Figure 6).[71] The warm D'Urville current flows west from the Tasman current into the South Taranaki Bight. This current has never been measured (P.McComb pers com).

Along this coast, about half of the currents are due to tide, the rest are caused by local winds and some coastal-trapped waves (P.McComb pers com).

"The southerly brings the clear water in." - Recreational diver.

Tides

The Cook Strait region is known for its unique tidal environment. When it is high water at one end of Cook Strait, it is almost low water at the other end. This results in a significant difference in sea level that then drives strong tidal flows through the strait and complex water circulation patterns to the west, up into this area.[72]

The central west coast of New Zealand has the highest tidal ranges. The Whanganui coast is characterised by a neap tidal range of 0.8 m and a spring tidal range of 2.4– 3.2 m. Neap tide is a tide that occurs when the difference between high and low tide is least, i.e. the lowest level of high tide. Spring tides are the exceptionally high and low tides that occur at the time of the new moon or the full moon when the sun, moon, and earth are aligned.

This concurs with tide data given for the Waitotara area of between 2 and 2.5 m for spring tides and 1 and 1.5 m for neap tides.

"It's difficult to dive [the Traps] between tides because of strong currents – 4-5 knots at times. It's best to dive at the top or bottom of a tide and that hour either side of the tide changing." – Diver.

"Another feature of the Traps is that there can be murky water on top, but clear water further down."- Diver.

14 LANDFORM AND GEOLOGY

Prepared by Felicity Maxwell.

Overview

The 'volcanic coast'

The study area can be divided into two distinct geological sections. The western section of the study area – from Manaia down to the Waingongoro River, is strongly influenced by the volcanic cone of Mt Taranaki. It will be referred to as the 'volcanic coast'. Eruptions have built up a ring plain around the volcano. The sea cliffs in this section of the study area are composed of hard volcanic rock derived from Mt Taranaki.

There is also an extensive bouldery reef that extends some distance offshore in this section.

The 'papa-rock coast'

In the majority of the study area, from Castlecliff up to the Waingongoro River, the countryside comprises low hills of sedimentary rock, and uplifted terraces formed by the sea. The coastal cliffs are comprised of soft and easily eroded sedimentary rock - mainly mudstones and sandstones. This rock is commonly referred to as 'papa' rock, and so for the purposes of this report, this section of the study area will be referred to as the 'papa-rock coast'. The shoreline is one of sand beaches with some papa reefs.

In this chapter

This chapter contains the following topics:

- how the landscape was formed;
- coastal processes of the papa-rock coast ;
- features of the papa-rock coast; and
- features of the volcanic coast.

How the landscape was formed

Important geological phases

The geological evolution of the region occurred in several major phases. These include the laying down of the sedimentary rocks, followed by tectonic uplift and then the formation of marine terraces and river valleys. The eruption of Mt Taranaki was also important in structuring this area.

Deposition of sedimentary rocks

Several features are important in understanding how the deposition of sedimentary rocks has shaped the landforms and seafloor of South Taranaki. These include the South Taranaki Basin, the Taranaki Fault and the Whanganui Basin. These are described below.

The South Taranaki Basin

The land that forms the Taranaki Bight has not always been where it is now. Some 80–65 million years ago in the Cretaceous Period, when New Zealand started drifting away from Australia, a sequence of rocks began to accumulate on top of hard basement rock in a sedimentary basin that opened up between the two continents.[73]

That basin continued to develop and collect marine and terrestrial sediment over the following tens of millions of years. The basin, known as the South Taranaki Basin, is now situated westward of a major fault line called the Taranaki Fault.

The Taranaki Fault

The Taranaki Fault is buried several kilometres below the surface. If a line were drawn from the fault up to the surface, it would intersect the coastline near Hawera Township. Up to 7 km of sediment collected in the South Taranaki Basin next to this fault.[74]

The Taranaki Fault brings a ridge of hard basement rock called the Patea-Tongaporutu High to a relatively high level, next to the sedimentary rocks.[75]

The Whanganui Basin

From around 5 million years ago, in the Pliocene Period, when New Zealand was close to its present position, and subduction under the North Island had commenced, another sedimentary basin started to form. Subduction is the process by which one crustal plate (a piece of the earth's crust) is pushed or pulled under another.

Waiinu faultline, Waitotara Beach

Photo credit- A.Cox

This basin is known as the South Whanganui Basin. It is oval-shaped, and extends from the Taranaki Fault in the west to the Ruahine and Tararua Ranges in the east. From the north it extends from the volcanic plateau (where Mt Ruapehu is), to the Marlborough Sounds in the south.[76]

About half of the area lies offshore.[77] Up to 4 km of mostly marine sediments comprised of mudstones and sandstone, has collected in the deepest part of the basin.[78]

The South Whanganui Basin developed by the area progressively sinking to the south and rising to the north.[79] Geologists think that the development of the South Whanganui Basin is linked to subduction of the Pacific Plate under the North Island, which lies on the overriding

Australian Plate. The plate interface is apparently 'locked', and flexure or basin development in the Australian Plate is caused by major down-dragging by the Pacific Plate.[80]

During formation of the South Whanganui Basin, sedimentation continued in the area of the adjacent South Taranaki Basin, burying the older sediments it contained and also burying the Taranaki Fault.

Oil and gas field development

The conditions in the Taranaki Basin have provided all the requirements for oil and gas generation, with organic rich mudstones being the source of the oil. This is currently New Zealand's only oil and gas producing basin, and the resource has been developed over the past 45 years.[81]

Tectonic uplift

Tectonic uplift is a geological process most often caused by continental plates pushing against each other causing one plate to become elevated. Tectonic uplift has resulted in the marine rocks that were deposited in the South Whanganui Basin and over those of the South Taranaki Basin now being exposed on shore.[82]

The South Whanganui Basin continues to be uplifted at the northern and eastern margins, with continued subsidence and sedimentation to the south. Such tectonics result in a 'landward sediment source – seaward sediment sink' situation, which may result in sediment being transported off-shore.[83]

Formation of marine terraces and river valleys

Between 680 000 and 60 000 years ago, a number of seaward-facing terraces were formed by wave action at times of high global sea level,[84] cutting into the emerging shoreline.[85]

Waves eating away at the shoreline formed wave-cut benches backed by sea cliffs. A regime of net tectonic uplift[86] meant these benches, initially at sea level, were successively raised above sea level to increasing heights.

As each wave-cut platform formed, it collected its share of beach sediments – such as beach gravels, sand and shells. If sea level dropped, and when the surface was uplifted, it continued to collect sediments from the land – such as river gravels, wind-blown sand dunes, volcanic ash fall, peat and clay.

At times when sediment supply was reduced, the sediment layers stopped piling up, erosion planed off the top layers, and the terrace surface was formed.[87]

In response to the uplift, rivers also cut deep valleys through the terraces to reach the sea.

Eruption from Mt Taranaki

Mt Taranaki became active at some time before 130 000 years ago, erupting volcanic rock with a composition known as andesite. By about 100 000 years ago lahars (flowing from Taranaki) and breccias (rock composed of sharp-angled fragments embedded in a fine-grained rock) were reaching the South Taranaki coast, covering marine terraces along this end of the Taranaki peninsula, and the older mudstones and sandstones. Continued eruptions, up until the last major episode about 245 years ago have built up the Taranaki Ring Plain.

Recent geological history

Global sea level around New Zealand stabilised at its present level about 6500 years ago. Since then, the sea cliffs of South Taranaki have continuously retreated.[88] Beaches, reefs and sand dunes have formed, and the landscape has taken on its current form. There has been rejuvenation of some fault zones.[89]

The coastline is still actively uplifting. Uplift rates increase the further inland one goes from the present coastline. At Mowhanau Beach, the estimated uplift rate is 0.3 m/1000 years.[90]

The role of rivers and streams

Rivers and streams make their way to the coast, running over the Taranaki volcanic ring plain in the west, and through highly dissected mudstone and sandstone country in the east.

The smallest streams drop over the cliff edge in waterfalls. Larger streams and rivers break the line of cliffs – some having cut narrow gorges down to the sea, others have wider valleys bordered by river terraces.

At the mouths of some rivers, sand dunes have drifted inland. In a few places dunes or sandbars have allowed formation of shallow lagoons. Sand has also blown up onto the cliff tops and a considerable way inland forming large distinctive dunes. Offshore the seafloor is mainly sandy.

Coastal processes of the papa-rock coast

Geological features of importance

The geological features of importance along the mudstone and sandstone-dominated coast (the papa-rock coast) include uplifted marine terraces that extend from Hawera to Wanganui, continuous, and eroding, coastal cliffs and intermittent coastal reefs. Wind shaped rocks at Waitotara, a drowned forest and a couple of estuaries are also of scientific significance.

The uplifted marine terraces

A series of marine terraces that have been uplifted over time are a significant geological feature of South Taranaki.[91] They form a 20 km wide coastal strip from Hawera to Wanganui, with remnants occurring at up to 300 m altitude.[92]

This is New Zealand's most complete sequence of uplifted marine terraces, and are some of the best preserved in the world. They are rated as internationally important.[93]

Sites forming part of this terrace sequence include Kai Iwi, Nukumaru, Waitotara, Waiinu, Waitotara, and Tapuarau (Hawken's Lagoon and Dunes). Good examples of the terraces can be seen at Inaha Beach, the area southeast of Ohawe Beach, and the western end of Castlecliff.[94]

Continuous Coastal Cliffs

A sweeping line of cliffs of sedimentary rock, up to 60 m high in parts, extends southeastward from the Waingongoro River.

Approaching the Whanganui River, the cliff forms a siltstone bluff about 10 m high which was historically referred to as the 'North Head.'[95] The castle-like appearance of this headland to approaching mariners resulted in the town that developed nearby being called Castlecliff.[96]

The lower parts of these cliffs expose sedimentary rocks that were deposited over South Taranaki Basin sediments and in the adjacent South Whanganui Basin. An inspection of the cliffs reveals layers of mudstone and sandstone, some with fossil seashells, and also some limestone.

The layers of sediment that accumulated beneath the sea are generally tilted at a shallow angle of 3-70 to the southeast, so that as you move in that direction along the coastline, the layers you see at beach level get progressively younger.[97]

Higher in the cliffs, marine terrace deposits such as gravels, sand and peat, can be seen lying horizontally, capping the gently dipping older rocks.[98]

Some cliff exposures are scientifically important because they are the national reference sections for certain periods of geological time (i.e. the Waipipian, Mangapanian, Nukumaruan, Castlecliffian and Haweran Stages of the Pliocene and Pleistocene Periods).

Why the cliffs are eroding

All the sedimentary rocks in the cliffs are relatively young geologically speaking, so they are soft, unconsolidated, and easily eroded.[99]

Along most of the length of the South Taranaki Coast, the cliffs are retreating, as waves lapping at the cliff base at high tide destabilise the steep faces, which then fall away catastrophically. Compounding this process is groundwater seepage through the sea cliffs.[100]

There are abundant artesian springs arising from the cliffs.[101] Seepage intensifies after heavy rain. When the top layers are saturated, they are extremely sensitive to collapse. The fallen cliff material is dumped at the back of the beach and is eventually redistributed by wave action, perhaps contributing to the formation of offshore bars.

The fallen material provides temporary relief from further cliff erosion, as it keeps the waves away from the base of the cliff.[102]

Because of the fairly uniform and non-resistant nature of the rocks along the coast, promontories or sea stacks are seldom produced. If present they are small and short-lived features.[103]

"There were three islands just off Kai Iwi... they were still there in the 1950s. Now they are mostly eroded away. The remains of the first one still has steps carved in the back that used to be there when I was a boy... there was also a low island just off the Kai Iwi Beach – at the turn of the century it was low enough that people would swim stock up onto it." - Local resident

Three stacks, Kai Iwi, 1967

Photo credit – A.Cox

Promontories may form where there are more resistant layers, such as near Nukumaru, south of the Waitotara River mouth. A layer of more resistant limestone there erodes slowly compared to surrounding sandstone and siltstone.[104]

At Waverley Beach the sea has carved picturesque caverns and ravines from the mudstone in the cliff. Such features occur at zones of weakness, such as faults or joint planes.[105] There are a few fault zones intersecting the coastline. The strongest faults trend northeastward and displace beds downward to the east.[106]

How fast are the cliffs eroding?

Erosion of the sea cliffs is episodic, and will be more pronounced in some years than others. The mostly likely conditions for cliff failure are during episodes of prolonged heavy rain and onshore wave attack from the southwest.[107]

One slip could result in the retreat of the cliff edge by 2–15 m.[108]

The longer-term rate of change can be determined if the position of the cliff face over time is known. Cliff retreat rate has been reported to be 0.4–0.85 m/year in most places, occasionally in excess of 1 m/yr.

"There has been a freshening in the cliff erosion in the last five years – probably due to the reduction in sand supply from Taranaki. Sand used to blow inland into rivers and was then transported back to the coast. Longitudinal dunes used to march across Wanganui. Now that the sand isn't re-entering the system via the Whanganui River, there is evidence of river bank erosion on the true right bank." - Council officer.

A study made in 2003 of the coastline from Waitotara to Turakina, south of Wanganui, found the most severe erosion was along the sea cliffs of the Mowhanau Beach area. High tide and waves were frequently reaching the cliff base, and despite the drought conditions, ground water was observed

Cliff erosion in progress, Pukeroa reef, Hawera

Photo credit D.Govier

seeping from the sea cliffs, contributing to the numerous localised slope failures.[109] Severe erosion in this area since the late 1990s has put houses at risk.[110] The variability in cliff retreat at Mowhanau Beach over historical times is described in the following case study in the box below.

Mowhanau Cliff Retreat

A recent detailed study of coastal cliff retreat compared reliable early survey data to data collected in a new 1999 survey. Rates of retreat were calculated for localities around Mowhanau Beach (see table below). An average net rate of retreat up to 0.8 m/yr was found.

Between Kai Iwi and Mowhanau Streams, from 1962 to 1982 the cliff base advanced, contrary to the long term trend of retreat. This can be explained by the construction of a limestone rock revetment (a facing of stone to protect the cliff against wave erosion) prior to 1982, seaward of the cliff base.

Southeast of Mowhanau Stream, rates of retreat of the sea cliffs have varied significantly this century. As a consequence of cliff retreat, a concrete gun bunker established about 1940 on the cliffs has since collapsed onto the beach.

Around a small promontory southeast of Mowhanau Stream, cliff erosion has resulted in a limestone rock structure, probably constructed at the same time as the one in front of Mowhanau village, i.e. pre-1982, being left stranded on the beach.

Southeast from the small promontory, in a shallow bay, retreat has slowed over the last 50 years or so. This is thought to be

Bunker, Kai Iwi

Photo credit – A.Cox

a temporary situation, likely to accelerate once a remnant stack and small promontory have been destroyed by the sea. At present these provide temporary protection from the full force of the waves.

Coastal Cliff Retreat Rates in the vicinity of Mowhanau Beach

LOCATION	TIME SPAN	TIME (no. of years)	Retreat (m/yr)	Average net rate of retreat (m/yr)
Northwest of Kai Iwi Stream	1962–1999	37	0.10–0.38	0.2
Near Kai Iwi Stream	—	—	—	0.1
Between Kai Iwi and Mowhanau Streams	1902–1999	97	0.3–0.5	—
Southeast of Mowhanau Stream	1902–1999	97	—	0.4
Around a small headland southeast of Mowhanau Stream	1942–1999	57	0.39–1.26	0.8
Southeast from the small headland, in a shallow bay	1876–1982 1942–1999	106 57	— 0.3–0.4	0.8 0.3
Further southeast in deep bay	1942–1999	57	—	0.5
Further southeast	1942–1999	57	—	0.3

Source: Gibb, 1999.

Intermittent coastal reefs

At the base of the cliffs, waves have cut a platform into the sedimentary rock. Mainly this is covered in beach sand, which laps up to the foot of the cliffs. However, the more resistant layers of sedimentary rock occur as reefs at low tide, and may project locally through the sand.[111] At river mouths there are no platforms as the rivers cut deep channels (as much as 9 m for the Whanganui River) which are filled with recent sediment.[112]

The largest reef is off the coast of the Waitotara River mouth.[113] The low headland southeast of the river mouth is formed of shell-limestone faulted against sandstone to the east. The limestone extends into the sea as a series of reefs that are well known fishing grounds.[114]

Extent and formation of beaches

All along this coast sandy beaches lap at the base of the cliffs.[115] Beach sand is moving constantly in a southeasterly direction within the breaker zone by a process called longshore drift.[116]

"The shoreline between Wanganui and Waitotara is shallower now. This area has filled up with sand. It has affected snapper surfcasting, also kahawai and gurnard.

You can see a second sand bar now. There are breaks on there. [We] used to be able to do long lining in there, and drive a boat onto the beach, but not now. There is sand up over the reefs. It affects mussels, kinas etc, thus snapper don't have them to feed on either." - Former commercial fisher.

The sand banks up against anything jutting into the sea that may be in the path of movement, such as natural headlands or man-made jetties, or the moles at the mouths of the Patea and Whanganui rivers. The long and wide beach at Castlecliff has formed in this way.[117] The mean rate of accretion at Castlecliff Beach over the 91 year period between 1879 and 1970 has been 5.05 m/yr.[118]

These barriers have acted as barriers for littoral drift from the northwest to the southeast, with significant changes resulting.[119] By 1970 the shoreline had extended to approximately 550 m northwest of the river mouth. Thereafter a state of dynamic equilibrium existed, i.e. the shoreline has been relatively stable, with minor year to year fluctuation.[120]

Moles at the mouth of the Whanganui River, circa 1910

Photo credit – Whanganui Regional Museum

On the southeast coast, erosion has occurred. The greatest rate of erosion occurred near the river mouth, resulting in shoreline retreat of approximately 200 m.[121]

For several kilometres northwest of Ototoka Beach, the beach is growing as a result of the net southeast longshore drift of sand being trapped updrift of a collapsed headland of relatively erosion resistant limestone.[122]

A consequence of the shore building out by sand accretion is that the stranded cliffs in these areas are protected from erosion. They become stable and not prone to further landslip when a slope of approximately 400 is reached.[123]

Where does the beach sand come from?

Beach sand is derived from coastal erosion and is brought down to the coast by rivers draining the sedimentary and volcanic hinterland.[124]

The beaches along the South Taranaki coast are known for their component of ironsand. The mineral composition of the sand indicates that it is derived from the volcanic rock of Mt Taranaki.

The proportion of ironsand decreases in a downdrift direction, away from Mt Taranaki, as this sand mixes with sediment brought down from the catchments comprising sedimentary rocks.[125]

Significant quantities of sediment are added from the major river catchments.[126]

For example, the Whanganui River at the southeastern boundary of the study area is 305 km long, flowing for much of its length through well-dissected sedimentary marine sediments.[127] At Wanganui the annual sediment yield is 486 tonnes per square kilometre.[128] The mouth of the Whanganui River is a major mixing area for sediments coming down the river and those moving by longshore drift down the coast.[129]

"The Patea Dam has reduced the amount of sediment coming down the river. The bar is inside now, instead of beyond. Lack of sand replenishment on the beaches is causing excessive cliff erosion." - Recreational fisher.

"The water is not as deep at the Patea wall." - Recreational fisher.

Beach boulders and wind-blown rocks

Boulders made of andesitic rock (a form of volcanic rock) litter the shore. They are derived from the marine terrace gravels at the tops of the cliffs.[130]

Erosion of these rocks by wind-blown sand has formed the Waitotara ventifacts, which are of considerable scientific importance.[131] Ventifacts are individual rocks, a few centimetres in size, that have been shaped by wind erosion. These fine-grained rocks are eroded by strong, unidirectional winds and generally develop blunt, high faces on the windward end and a keel on the top.

Sand dunes

Another feature of the South Taranaki Coast is the sand dunes. Large parabolic dunes have blown a considerable distance inland, occupying a coastal strip from Patea south into the Manawatu region.[132]

The oldest dunes are probably less than 5 000 years old. The youngest dunes, now active, are advancing northeastward perpendicular to the coast under the influence of two dominant directions of strong winds – westerlies and southerlies.[133]

Dunes cover large areas of the marine terraces.[134] At the Waingongoro River mouth the line of cliffs is breached to the extent that sand dunes extend some distance inland.[135]

At the Patea River mouth sand dunes are also present. This is the only locality where erosion of dunes has been noted.

There is a build-up of low dunes at Nukumaru Beach.

The sea cliff at Castlecliff loses height and disappears under a mantle of dunesand. Castlecliff is built on low dunes covering gravels of an old delta of the Whanganui River.[136] The newly accreted land seaward of the cliff at Castlecliff is characterised by sand dunes.[137]

Coastal sand dune habitat is recognised as being under considerable threat. Due to significant modification, for example the planting of pines and marram, and modification for farming, very few of the areas on the South Taranaki coast remain unmodified.[138] The area of active duneland in New Zealand has undergone a striking decline since the 1950s. Taranaki, for example, has lost 70.54% of active dune land since then.[139]

"There used to be sand dunes along this stretch (Okehu to Mowhanau). Older people have told me how they used to fish and camp in this area. 70 years ago the beach was similar to how it is now. This suggests a cyclic process of erosion and dune aggregation."- Local resident.

Drowned forest

At Waverley Beach, below high-tide level, a drowned forest is evident. It is thought that the forest died as a consequence of sea level rise between 7000 and 6500 years ago. Pollen analyses provide evidence of podocarp-dominated forest with common hutu and akeake. These are plants that typically enjoy very mild coastal climates, probably milder than today.[140]

At the estuary of the Waitotara River, totara trunks in an old soil profile submerged 1–3 m in the tidal estuary are about 1000 years old. These sub-fossilised totara stumps of a drowned forest give the river its name.

The drowning of this forest indicates minor subsidence in the vicinity and was probably due to tectonic activity (as global sea level has not changed in the last 6500 years.)[141]

Estuaries

The estuaries of the larger rivers display further features. For example, the Whenuakura Estuary comprises two lagoons, a sandbar, an island, and a tidal mudflat at the back of the inner lagoon. The estuary is bound to the northwest by a cliff and the southwest by sand dunes.[142]

Around the mouth of the Waitotara River are swampy lakes and lagoons caused by advancing dunes ponding small streams.[143] The Waitotara Estuary has high ecological importance and is recognised as being scientifically important.[144] It is considered to be one of the best representative estuaries in the region, in a region where there are few unmodified estuaries.[145]

Features of the papa-rock coast

The seabed

The seabed dips gently out to sea, reaching about a 50 m depth on average at what would be the outer boundary of the coastal marine area (out to 12 nautical miles).[146]

Factors influencing the seabed

The seafloor is influenced by a number of factors. These include the underlying geology, such as the formation of the Whanganui Basin and the eruption of Mt Taranaki, and current day processes, such as the transportation of sand and the influence of waves and tides. The processes discussed in the literature are explored here. They include:

- formation of offshore sand bars;
- transportation of sediment to the sea;
- sand waves on the seafloor; and
- drowned sand dunes.
- Formation of offshore sand bars

The dominant longshore drift is southeastward and beach sand is moving slowly, forming bars northwest of the mouths of smaller streams, which flow across its course.

The movement of the sand is delayed by these streams, but periodic changes in the outlets of a stream which breaks through the neck of a bar at times of flood, allow the sand of the bar to resume its southeastward movement.[147]

Formation of the Whanganui River bar

The Whanganui River mouth is of the bar-forming type.[148] The mouth of the Whanganui River is characterised by multiple bars – two or three subtidal sand-bars are usually present.

It has been suggested that a process of 'net offshore bar migration' is occurring at the mouth of the Whanganui River.[149]

It is thought that the process follows a 3-stage model: bar generation near the shoreline; bar maturity and systematic seaward migration across the inner nearshore; and finally bar dissipation (flattening out) and disappearance in the outer nearshore.

At Wanganui it is thought the bars undergo net offshore migration with the mean lifecycle of a bar being about 3 years.[150]

Transportation of sediment to sea

Most river-borne sediment reaches the sea during flood conditions when much of it may bypass the breaker zone to be dumped on the shelf. Once in the sea the two types of sand – the ironsand and the lighter sand – are deposited in different environments. The ironsand remains on or close to the coast to either help build up the beaches or to be blown inland to form dunes.

Some sand escapes seaward to a depth of about 15 m. The light sand escapes seaward and is sorted by storm waves and strong currents into its constituent sand and mud fractions. The resuspended mud is carried further offshore while the sand fraction remains on the inner shelf.[151]

Sand waves on the seafloor

The seafloor has been described as a sand wave environment. It comprises mostly fine grain sand and pockets of shell hash, in a rippled topography.[152]

The sandy seafloor is mobile. A mobile seabed exposed to waves and currents will not remain stable, and has the potential to be worked into sedimentary structures termed 'bedforms'. The terms to describe these structures include bars, dunes, anti-dunes, ripples, sand waves and ribbons.[153]

Sand ridges, sand ribbons, symmetrical mega-ripples and sand waves have been identified in depths up to 60 m off Wanganui in the South Taranaki Bight.[154] This gives the area a complex topography.[155]

Drowned sand dunes

An interesting feature of the seabed is a series of shore parallel ridges (aligned northwest–southeast) 23 km long, 4 km wide, 5–15 m high, and separated by flat seafloor, being several hundred metres to several kilometres apart. These structures are stable and formed on land (as dune systems) sometime between 12 000 and 9000 years ago. They have since been covered as the sea level rose to its present level.[156]

Rubble strewn platform

Another interesting seafloor feature described in the literature is a rubble-strewn platform that extends south from the Patea River into the Manawatu. It ranges from a few hundred metres to 6 km wide, and rises 25–30 cm above the surrounding seabed.[157] Aside from this description however there is little recorded about this feature.

The North and South Traps

The North and South Traps are two tall adjoining underwater pinnacles, located approximately 6 km offshore from Patea. They are an unusual feature of this sandy coast.[158] Again, detailed mapping information on the Traps is currently non-existent, although some preliminary habitat mapping work has recently been completed, using drop video cameras to identify different habitat types.

Features of the Volcanic Coast

In the western-most part of the study area, the influence of Mt Taranaki can be seen in the character of the cliffs, reefs and beaches along the coastline and on the seafloor itself. The seafloor is also characterised by the existence of ancient river channels.

Volcanic cliffs

Around the end of Taranaki Peninsula and extending along the southeast into the study area, the coastline is derived predominantly from volcanic lahar materials and breccia materials (rocks with fragments of volcanic rock embedded in a soft rock). The transition between this and the mudstone and sandstone dominated coastline is in the vicinity of the Kapuni Stream and Waingongoro River mouths.

The volcanic coastline is rugged, with cliffs varying from 5–25 m in height. Erosion rates for this area are low because the material in the cliffs is relatively resistant and the shoreline is protected by extensive reefs.

Volcanic rock reefs

The predominant feature along this stretch of the coast is the almost continuous, large boulder-platform reefs, which are left as the finer grain volcanic rocks are eroded away.[159] The reefs extend up to several kilometres offshore at a low gradient.[160]

Beaches of the southern ring plain

Beaches are cobble-gravel, generally of a pocket nature, located between the extensive reefs, or associated with stream or river mouths.[161]

The beach below cliffs at Manaia has accumulations of boulders, stones, pebbles and sand patches. The beach has the following three zones:

- a boulder platform with a steep upper shore 11 m wide of large stones which are mobile under wave action;
- a nearly horizontal platform 100 m wide of a few big rocks > 2 m diameter, boulders 0.25–2 m diameter, stones <0.25 m diameter, pebbles and sand patches; and
- a steeper sloped 'lower shore' section.

In much of the platform and most of the lower shore the stones are jammed tight or 'cemented' together and few are mobile.[162]

Seabed of the southern ring plain

A good view of the seabed off the volcanic ring plain area was obtained in February 2005 by the company Origin Energy. They surveyed the seabed as part of investigations and planning for a new pipeline between the proposed Kupe offshore platform (beyond the 12 mile limit) and the shore. Origin took digital video images along the proposed pipeline route, from the proposed tunnel entrance seawards for a distance of 2.65 km.[163]

At 1.2 km from the shoreline the seabed is dominated by eroded remnants of a volcanic debris avalanche deposit. Typically the intact (non-eroded) volcanic rocks along the Taranaki coast consist of fragmented material cemented together with mud and ash. Here, however, because of erosion, the gravels, cobbles and boulders have been reduced to a more rounded form. Patches of sandy seabed – highly mobile as evident by the presence of wave-induced ripples – were also seen.[164]

The next 300 m was hard reef of intact volcanic rock comprised of angular cobbles and gravels, with some pockets of sand. No large boulders were observed on the hard reef.[165] These rocks are the margin of the debris avalanche. Beyond here the seabed is mudstone, typically covered by a thin veneer of sand, and occasional cobbles and boulders.[166]

Ancient submerged river channels

Ancient river channels called 'palaeochannels' exist off the Taranaki coastline. These were carved by rivers in the last Ice Age, 20 000 years ago, when the sea level was lower and the Taranaki coastline was 100 km south of where it is now.

These palaeochannels resulted in Origin Energy having to increase the depth of its horizontal drill hole from 20 m to 50 m below sea level.

15 BIOLOGY

Introduction

Species richness and abundance along the South Taranaki coast is low compared to other New Zealand coasts.[167] This is attributed to the rugged, high energy, physical environment, high sediment loads and eroding and mobile substrate.

The area contains species that are also found in other exposed coasts around New Zealand. Recovery from disturbance to the inter-tidal habitat has been reported to be slow.[168]

The marine biology of the papa-rock coast (described in chapter 14) differs from that of the volcanic coast due to the different geology of these areas.

A rich fishing ground is reported in one study. There is a major area of demersal (bottom feeding) fish, including snapper, tarakihi, blue cod and gurnard.

There is some conflict between those reports of a species poor environment, and those describing existence of a rich fishery. It may be that it is rich in terms of abundance, but lacking in the total number of species compared to elsewhere, e.g. the northern regions. Research to explore this along the papa-rock coast would be desirable.

Sandy areas, both on beaches and along the base of cliffs contain few marine species due to sand movement and frequent pounding by waves.

In this chapter

This chapter summarises existing literature on the plants and animals of the seashore, seabed and waters of the South Taranaki Bight, and some of the physical processes affecting them.

The geology of the area, the rock type, landforms and tectonics together with physical processes such as wind, rain, waves, tides and currents creates both the landforms that plants and animals live on, and the physical conditions they must contend with.

The following topics are in this chapter:

- the inter-tidal zone;
- the sub-tidal zone;
- fish;
- marine mammals; and
- birds.

The inter-tidal zone

Defining the inter-tidal zone

The inter-tidal zone is the area of the coastline that gets covered and uncovered by the tide, i.e. between the mean high water spring (MHWS) and low water spring. It includes areas that may be covered, or uncovered only by very high, or very low tides, e.g. spring tides and king tides.

Environmental conditions in the inter-tidal zone

The South Taranaki Coast is notable for the low level of intertidal plant and animal species richness and abundance, compared to other New Zealand coasts.[169] This has been attributed to the following factors:

- rugged physical environment;[170]
- high terrestrial sediment inputs into coastal waters due to rivers; draining sandstone, siltstone and mudstone catchments.[171] The effects on coastal water quality are most noticeable after significant rainfall;[172]
- nearshore coastal waters that are often turbid;[173]
- homogeneous substrate type;[174]
- rapidly eroding soft sandstone cliffs;[175]
- mobile sandy beaches;[176] and
- regular sand inundation of the reefs – both volcanic and papa.[177]

"The coast is always changing. There are a lot of reefs dominated by cliffs. Off Hawera, near the Fonterra outfall, there is always a dirty patch 100m off here where cliffs come down. The high tide erodes it, so the water is always dirty." - Council officer.

The inter-tidal zone of the papa-rock coast

The papa-rock coast is dominated by soft sedimentary rocks such as sandstone and mudstone. There are however, some areas where harder, more consolidated rock is exposed and forms rocky reefs. There are also areas where the cliffs protrude sufficiently far into the sea to allow an inter-tidal zone to establish.

Limitations about what is known

The only substantive work done in recent decades on this part of the coast includes work done for the company Origin Energy at Geary Road, and some of the Taranaki Regional Council monitoring sites. It appears from the literature that little work at all has been conducted on inter-tidal reefs south of the Tangahoe River.

Life on the rocks

Marine plants and animals found living on the base of protruding cliffs at Geary Road include:

Seaweeds (red and green algae), limpets, snails, little black mussels,

Photo credit – A.Cox

sea squirts, topshells, piddocks, chitons, perwinkles, tubeworms and barnacles.[178]

Of note at the Geary Road site were organisms living on large limpets, e.g. little black mussels, or algae. Isopods are common organisms throughout the study area.[179]

The boring activities of various animals may even contribute to the erosion of the sandstone and mudstone cliffs, although clearly the geological composition of the cliffs is probably more important to explain erosion.

Protruding reefs allow species to establish

A recent study found organisms on the base of the cliffs only where the cliffs protruded significantly into the sea from the main line of the coast. In these areas, where there was sufficient distance down the shore to allow inundation during mid to high tide, intertidal species were found in small depressions of the cliff face. Red and green algae (Enteromorpha species) were present around the high tide mark.[180]

Mussels at Waitotara

Earlier studies of the Waitotara area describe mussel beds exposed at low tide on the rock cut platform.[181]

One of these studies also infers a cover of diverse species. The author observes that the coast off Patea is not heavily populated by shellfish. Only small black mussels inhabit the rock platform at low tide. The report goes on to note that this platform supports a heavy cover of marine organisms which are an intricate part of the marine ecosystem and draw fish near to shore.[182]

Marine life of Waiinu Reef

At Waiinu, a reef noted as unique in this sand dominated area, the area is characterised by limestone rock outcrops extending from mean high water spring to 3–5 km offshore.[183]

Where the rock platform is backed by a sandy beach and low dunes, the little black mussel covers most of the raised areas. Other organisms include seaweeds - green algae such as *Ulva lactuca*, red algae and coralline algae; catseyes, whelks, limpets, chitons, green-lipped mussels and barnacles.[184]

Beyond the zone of little black mussels, a clean coralline turf covers most of the rock. Minor brown algae and green-lipped mussels are scattered through this turf. Many of the species associated with the little black mussel are also present.

The offshore reefs provide suitable habitat for many fish species including snapper, tarakihi, groper and trevally.[185]

Life on the sandy beaches

Exposed sand beaches typically support low numbers of organisms and have low species diversity in comparison to sheltered beaches, estuaries and rocky reefs.[186] This is because the sandy area between the rock platform and the cliffs is often shifting and pounded by waves at high tide.[187]

Although the presence of sandhoppers in sand burrows at the base of cliffs had been found in previous studies of the area,[188] none were found in the recent work done for Origin Energy at Geary Road.[189] No other creatures were found either.

Photo credit – L.Douglas

Finding no living creatures appears consistent with what others have observed, describing these habitats as 'devoid of life'.[190]

Work done a decade ago identified a wide variety of shells on Kai Iwi Beach. These included triangle shell, purple cockle, venus or sunset shell, tuatua, whelk, coarse dosinia, large dog cockle, horse mussel, plicate barnacles, cats eye, periwinkle, limpet, queen scallop, arabic volute, pink sunset shell, little black mussel, periwinkles, pipi, trough shell, and cockle.[191]

The inter-tidal zone of the volcanic coast

Only a small part of the study area, that north of Hawera, sits within what can be termed the volcanic coast. In this area, the cliffs and reefs are dominated by hard volcanic rock, and the beaches tend to be gravely.

Life on the rocks

Marine plants and animals found living on the rocky reefs include seaweeds (red and green algae, both encrusting and turf forming in nature), crabs, limpets, anemones, snails, little black mussels, sea squirts, topshells, piddocks, chitons, tubeworms, barnacles, periwinkles and limpets.[192]

Sand inundation common

The effects of sand inundation are evident in much of this habitat, with 'sand scour' zones of 30-40cm inhibiting growth to the higher parts of boulders.[193] The low species and biodiversity of the Inaha Road intertidal hard shore monitoring site, for instance, appeared to be the result of intermittent sand inundation and the presence of dense tubeworm colonies.[194] The location of these reefs – on the edge of the Taranaki ring plain, yet exposed to the mobile sandy beaches to the east – makes it likely for these reef areas to be inundated with sand often.[195]

Life on the sandy beaches

Recent studies of the area confirm previous findings that there are few or no species living on the sandy shore in this part of the study area. [196]

Studies in North Taranaki on similar shoreline also indicate a decreasing trend in the number of organisms down the soft shore, with the lowest numbers at the low tide level. This trend appears to be associated with the increased exposure time to wave attack lower down the shore – a very mobile and abrasive environment. In addition, this part of the coast lacks seaweed and other drifting organic matter that otherwise would be deposited higher up the shore, providing habitat and a food source for intertidal species.[197]

The subtidal zone

Environmental conditions in the subtidal zone

The biology of the subtidal zone in the South Taranaki – Whanganui coast has been described as generally species poor, with a low abundance of organisms compared with other parts of New Zealand. This has been attributed to the following environmental conditions:

- intense wave action;
- high silt load delivered by the region's rivers;
- high average rainfall;
- substrate type, e.g. homogenous subtidal boulder reefs;
- high water turbidity in nearshore areas; and
- sand inundation of reefs.

Limitations about what is known

The seafloor studies upon which conclusions have been made are predominantly to the north and west of the study area. A number of these studies themselves have been hampered by poor visibility and inclement weather.

However a number of these studies, including those most recently conducted for Origin Energy, conclude that some areas are biologically significant for the South Taranaki Bight.

This suggests that further work is needed to better describe the subtidal environment of this area, particularly along the 'papa-rock' coast.

Subtidal zone of the papa-rock coast

Type of seafloor influences the subtidal biology

There are two main types of seafloor:

- rock and hard substrate; and
- soft bottomed areas, e.g. shell, sand or mud.

Rocky, predominantly inshore areas, such as the sedimentary rock platforms and other reefs such as the North and South Traps appear to be biologically significant for the South Taranaki coast.

These areas are home to animals and seaweeds with an 'encrusting' habit, possibly because of the interplay of high wave action, sediment loading and associated scour inhibits the growth of more erect species.

Sandy bottom areas support fewer species.

As a general rule, species numbers and diversity increase towards the shore, with the highest numbers in the nearshore area.[198]

Encrusting algae and seaweeds

Encrusting and small turfing red and brown algae and coralline algae (paint and turf) dominate the hard substrates of subtidal reefs. Large brown algae are uncommon, which is thought to be due to lack of sufficient light penetration.[199] Other seaweeds are present on most of the low rocks though are less abundant overall than coralline algae.

Turfing algal patches may be ephemeral, being more prevalent in summer months. It is noteworthy that these plants can cope with very low light conditions.[200]

Encrusting animals

Inshore reef and boulder habitats of the area support bryozoan and sponge communities.[201] Bryozoans are tiny colonial animals that generally build stony skeletons of calcium carbonate, superficially similar to coral.

In a study of animals living beneath boulders, numerous bryozoans have been found, whereas sponges were considered to be relatively rare.

Other animals

Molluscs are the most abundant mobile organisms on reef and boulder habitats. Various worms, barnacles, chitons, bivalves (mussels) and small gastropods occurred. Beneath rocks there were also three bivalves living in sand and gravel and at least three brittle star fish species.[202]

Common sponges and ascidians on hard rocks and some erect sponges were also present, which may be a function of increasing depth with increasing distance offshore.[203] Ascidians are sack-like marine filter feeders.

Offshore reefs a food source

Along the mudstone and sandstone dominated coast, good fishing grounds exist around reefs, which provide abundant food species for fish.[204]

Sizeable reefs out from Patea have been described as being responsible for some of the best fishing in Taranaki.[205] These 'rubble-strewn platforms' have been described as containing abundant food species for fish such as corals, bryozoans, sponges, crustacea, mollusca and polychaetes. These organisms are an intricate part of the marine ecosystem and draw the demersal fish such as snapper, tarakihi, blue cod and gurnard near to shore.[206]

North and South Traps

These two large adjoining reef systems are located approximately 6 km offshore from Patea. The area is an important marine habitat in a sandy environment. The tall underwater pinnacles are an unusual feature on a sandy coast. The reef has high ecological value, with forests of the seaweed Ecklonia and a high diversity and abundance of marine life present.[207]

Photo credit J.O'Leary

Photo credit J.O'Leary

Sandy seafloor

Animals that live in burrows or in the sediment on the seafloor are called infaunal species. The soft subtidal sediments (sands and silts) support a lower diversity of species and lower abundances in comparison to the stable reefs, with polychaete worms, heart urchins and hermit crabs being the most common fauna. Six common bivalve associations, which vary with water depth, have also been described.[208]

Sand-wave areas are dominated by bivalves, polychaetes and scavengers.[209] Polychaete worms are the most abundant organisms living in the sand, along with hermit and nut crabs and an amphipod.[210]

The low biological diversity is ultimately due to the mobile sediments.

In a quantitative survey of soft sediment habitats within the south Kupe region, a total of 64 species that lived in the sand were identified.[211]

Subtidal zone of the volcanic coast

While the boulders and rock platforms provide habitat for more marine life including paua and crayfish, compared with the sandy beaches to the southeast, [212] marine life tends to diminish beyond the edge of the volcanic debris as the seafloor tends to be mainly mudstone.

Work done off Opunake (just out of the study area, but typical of the volcanic debris reefs) described a variety of species, including some not reported further south.

Kelps have been reported as being present but never dominant. *Carpophyllum maschalocarpum* is the main species to around 5 m where it is replaced by *Ecklonia* radiata down to a depth of at least 20 m. Kelp stands have been estimated to be only 25 cm tall. The lack of large seaweeds may be due to the high turbidity in this coastal region – rough water and low light.[213]

One metre above the base of the boulders, attached organisms include some seaweeds, sponges, a mussel (not normally harvested by humans), a sedentary snail and several encrusting polyzoans.[214]

Molluscs are the dominant mobile species, which include limpets, top shells, chitons and paua. Sea urchins are also present,[215] although not as dense as in other parts of New Zealand with similar substrates. A reason put forward for this is the influence of wave height and sediment movement in nearshore areas.[216]

Fish

Overview

The fishes of the South Taranaki Bight are all species found in other parts of New Zealand. There are no known endemic species.

Reef fish diversity appears to be slightly lower than for other parts of New Zealand, and at least one study believes abundances to be generally lower as well.

As mentioned previously, zooplankton, or microscopic animal life is the basic food supply for fisheries and shellfish, and is at high levels in the South Taranaki Bight.[217]

Reef fish found in the South Taranaki Bight

Species found during formal surveys are common to exposed coasts in New Zealand.

Species described as the characteristic fish of Taranaki subtidal reef areas are shown in Table 10.[218]

TABLE 10: REEF FISH OF SOUTH TARANAKI

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE
Blue cod	*Parapercis colias*	Most abundant species
Spotty	*Notolabrus celidotus*	
Scarlet wrasse	*Pseudolabrus miles* –	Slightly higher densities than spotty
Red moki	*Cheilodactylus spectabilis*	
Butterfly perch	*Caesioperca Lepidoptera*[219]	
Triple fin	*Forsterygion (Tripterygion) varium*	Variable triple fins were the most abundant of the five “blennies”.[220]
Blue mao mao	*Scorpis violaceus*	Can reach high densities.[221]
Leatherjacket[222]	*Parika scaber*	

Large numbers of sharks were reportedly found in the area off Patea stretching down into the Manawatu in the 1970s.[223]

Limitations on what is known

A comparison of fish diversity among nine sites, of which the Taranaki coast was the most southern, found that the Taranaki coast had the lowest equal diversity, with a Northern Harbour site. Abundances of all species were generally low with the greatest mean density being approximately 12 per 500 sq m.[224]

At least one of the published studies from which these fish species were identified noted the difficulties associated with counting fish in conditions of different underwater visibility.[225]

The presence of Ministry of Fisheries' data showing commercial fishing resources, and the reports of fishers and divers contributing to this study suggests species may be more diverse than previously reported. Both the general lack of studies, particularly in the southern and eastern parts of the South Taranaki Bight, and the difficulties of studying the inshore area because of turbidity and unfavourable weather may be reasons why fish diversity appears under reported.

Kaimoana species

Resources that can be gathered from the shoreline, however, continue to be of great importance. A study by the Taranaki Catchment Commission of customary seafood (excluding fish) conducted in the early 1980s from Manaia southeastward as far as about Waverley, identified a number of edible species present (Table 11).[226]

TABLE 11: CUSTOMARY SEAFOOD

SEAFOODS MAORI NAME, ENGLISH NAME (WHERE IN COMMON USE)	SCIENTIFIC NAME
karengo (sea lettuce)	*Letterstedtia petiolata*
kina (sea eggs or sea urchin)	*Evechinus chloroticus*
karikawa (dark rock shell)	*Haustrum haustorium*
koiri (Neptunes necklace)	*Hormosira banksii*
kotoretore (sea anenome)	*Isocradactis magna*
koura (crayfish)	*Jasus edwardsii*
kuku (mussel)	*Perna canaliculus and Mytilus edulis*
ngakihi (also known as miti miti – limpet)	*Cellana ornata and Cellana radians*
papaka (crab)	*Hemigrapsus edwardsi*
paua	*Haliotis iris*
pupu (cats eye)	*Turbo smargdus*
rori (sea slug, or 'poor man's paua')	*Scutus breviculus*
wheke (octopus)	*Octopus Mauram*

Source: Taranaki Catchment Commission 1983, p 25.

Other edible species mentioned were:

Inanga (whitebait), Parengo (sea weed), Piharau (lamprey eel), Pipi (not common and usually very small) and Toke (worm, used as bait to catch tuna (eel).

Marine Mammals

Overview

Little is known about the movements of marine mammals through the South Taranaki Bight.[227]

Occasional sightings and strandings confirm their presence. It appears the area may have been of importance for whale breeding in the past.

Whales

Whales that have been observed off the New Zealand coast are usually observed on seasonal journeys between their breeding grounds in temperate and subtropical areas and the rich feeding grounds of Antarctica.[228]

Research by the Department of Conservation indicates that a branch of the winter migration route of whales travels up the South Taranaki coast from the Cook Strait region to Cape Egmont.[229] Department of Conservation sighting records include humpback whales and the occasional southern right whale in this general vicinity.[230]

Historically the area from Cape Egmont to Kapiti was thought to have been a breeding ground for southern right whales. Sightings of these whales today, however, are very rare. These whales have been seen along New Zealand coasts during winter when they come to breed and give birth to their young.

Whale and dolphin sightings

Whale species observed specifically within the South Taranaki Bight include:[231]

- humpback whales,
- southern right whales,
- sperm whales,
- pygmy sperm whales,
- beaked whales (Family Ziphiidae),
- pilot whales,
- orca, and
- common dolphins.

In all, 31 species of whales pass through the northern Cook Strait area on their migrations.[232]

Marine mammal strandings

Te Papa (the Wellington museum) maintains a database of marine mammals that have been stranded along New Zealand's coast. The following species have stranded along the South Taranaki – Whanganui coast:

- Andrew's beaked whale
- Arnoux's beaked whale
- baleen whale
- beaked whale
- bottlenosed dolphin
- common dolphin
- dusky dolphin
- false killer whale
- goose beaked whale
- Hector's dolphin
- humpback whale
- long finned pilot whale
- minke
- orca
- pygmy right whale
- pygmy sperm whale
- scamperdown whale
- Shepherd's beaked whale
- sperm whale
- straptooth whale
- striped dolphin.

South Taranaki important for rare whales and dolphins

Orca is classified in the Department of Conservation threat status as being nationally critically endangered. Southern right whales are classified as nationally endangered.

There are scant records of observations of Hector's dolphins (*Cephalorhynchus hectori*) within the area. The North Island Hector's Dolphin has just recently been recognised as a new subspecies, and is now known as the Maui's Dolphin (*Cephalorynchus hectori maui*). Maui's dolphins are generally found along the northwest coast of the North Island, between Taranaki and Dargaville, although the population is concentrated between Raglan and Manukau harbours. This dolphin is listed as nationally critically endangered by the Department of Conservation.[233]

In the 1930s, the existence of a new type of beaked whale, *Tasmacetus shepherdi* (or Shepherd's beaded whale), was discovered, following a stranding at Ohawe Beach.[234]

Between then and 1976, there were five more records of this species in the New Zealand region, and two from the eastern Pacific. This stranding information may suggest that the area is important for rarely seen or unusual species such as beaked whales as well as pygmy right whales, false killer whales and long-finned pilot whales although the data is not strong.[235]

Photo credit - DOC.

***Tasmacetus shepherdi* – whale discovered for first time at Ohawe beach**

On November 7 1933, a beaked whale became stranded at Ohawe Beach. Following publicity of the stranding in the Hawera Star, Mr G Shepherd, the then Curator of the Wanganui Alexander Museum, visited the site to collect information from which to positively identify the species. Mr Shepherd recognised that it was unique and would be of value to science. He took care to document many of its features, and even brought home as many of the bones as he could, disguising the strong smell as best he could with wrappings and Lysol!

The creature was later written up by W.R.B Oliver, who found it to be a new genus and species. He named it "Tasmacetus shepherdi" in recognition of the work of Mr Shepherd in helping to positively identify it.

Source: Oliver, W.R.B., 1937.

Dolphin Sightings

DOLPHIN SIGHTING

Several Mowhanau residents, who were alerted by Janice Carson about 8.00 am on Thursday morning, were able to enjoy the sight of a large pod of dolphins swimming and cavorting about a mile off Kai Iwi Beach. It was estimated to be a pod of about 25 - 30 dolphins which was making its way slowly up the coast. Jim Campbell of DOC was alerted and hoped to have someone out in a boat to observe these wonderful creatures. Mowhanau residents have been asked to keep a coastal watch for any whales or dolphins as well as other marine animals. DOC is compiling records of their presence in these waters.

Source: Patea/Waverley Press, 3-4-05

Of concern to the Department of Conservation was an incident in November 2004, in which a mid-water trawler captured 20 dolphins (19 common and 1 bottlenose) in five tows in the South Taranaki Bight.

It was noted that this incident occurred adjacent to the range of the critically endangered Maui's dolphins. While there are no records of trawlers catching Maui's dolphins, trawling within their range must create some risk.[236]

In response to this particular incident, the companies involved agreed to take a number of steps to try to avoid such by-catch happening again.

Seals

The South Taranaki coast is used as a 'haul out' area for fur seals when they come ashore to rest. The origin of these seals is unknown. Seals are known to rest on the Maui platform structure, and it is likely that other artificial structures, such as platforms for the proposed Kupe development will serve the same purpose.[237]

While seals breed at the Sugar Loaf Islands in northern Taranaki, it is unknown whether these seals forage in the waters of the South Taranaki Bight. It is feasible that they may predominantly forage in deeper water further out to sea, as information from satellite tracking reveals that seals, especially females, can forage up to 200 kilometres beyond the continental slope in water deeper than 1000 m.[238]

Birds

Overview

Bird diversity along the South Taranaki coast did not appear to be high from the literature. Seabirds known to inhabit the South Taranaki coast include little blue penguins, diving petrels, grey faced petrels, fluttering shearwaters, gannets, white fronted terns, a couple of different prion species (Fairy and broad billed) and a number of gull species. Arctic skuas have also been observed out at sea.

Estuaries are important bird breeding sites for oystercatchers, banded dotterels and pied stilts. They also play host to a number of migratory species. Cliffs provide habitat for some bird colonies, particularly black backed gulls. Beaches contain less bird diversity than the estuaries.

Estuaries important to birds

The South Taranaki coast contains a number of estuaries that are important for birds, even though most estuaries have been modified in some way. The most important estuaries for birds are the Whanganui River Estuary, the Whenuakura Estuary and the Waitotara Estuary.

Breeding birds that rely on these estuaries are oystercatchers and banded dotterels.

Estuaries provide impotent stop over spots for a host of migratory or seasonal visitors. Migratory species that have been observed in the estuaries in this area include: knots, godwits (e.g. bar-tailed godwit), cattle egrets, royal spoonbills, white herons, shags, waterfowl, wrybill, turnstone, eastern curlew and whimbril.[239]

The Whanganui River Estuary is noted as nationally significant for the threatened royal spoonbill.[240]

"Royal spoonbills migrate up and down NZ after breeding. They can be found in the salt marsh at the Patea River. Some people confuse these with kotuku (white heron)." - Local resident and naturalist.

The Waitotara Estuary is an important stop over point for migratory wading birds including royal spoonbill and banded dotterel, and international migrant birds including eastern bar-tailed godwit.[241]

Whenuakura Estuary

This estuary is in a relatively natural state with extensive mudflats. The area is important for wading birds, including some migratory species.

Species for which it has particular importance include the threatened

Caspian tern, rare variable oystercatcher, royal spoonbill, black-fronted dotterel and white-fronted tern.[242] Variable oystercatcher has been recorded nesting in this area.[243]

International migratory wading birds recorded here include turnstone, eastern bar-tailed godwit and knot. The Australasian gannet has also been observed.[244]

The mudflats provide good feeding areas for herons, stilts and other birds. Sand bars provide roosts for those species and gulls and terns.

Other birds that have also been observed here include white-faced heron, pied stilt, red-billed gull, welcome swallow, banded dotterel and black-backed gull.[245]

Beaches provide habitat for more common bird species

Birds that have been recorded on Waverley Beach[246] include the red-billed gull and the black-backed gull. Other species recorded are common in other habitats, such as skylark, blackbird, yellow hammer, chaffinch, goldfinch and sparrows.

The area from Nukumaru Beach to the crest of the foredune contains the largest and least damaged population of pingao in the Foxton ecological district.[247] It provides habitat for a number of common bird species listed above, and in addition, habitat for banded dotterels.[248]

Cliffs provide bird habitat too

The cliffs from Kai Iwi to Waiinu Beach, as well as Okehu Stream and Ototoka Beach, are noted for black-billed gull colonies, as well as presence of NZ pipit.[249]

The cliffs right along the coast between Patea and Manutahi are recorded as having black-backed gull colonies. Specific areas include the Kakaramea Powerhouse Cliffs (extending from Patea Beach to Manawapou River) and Tapuarau (Hawken's Lagoon).[250]

Other species that have been recorded along the sea cliffs in the study area were:[251] Australasian harrier, rock pigeon, silvereye, blackbird, skylark, chaffinch, spur-winged plover, dunnock, starling, gannet, variable oystercatcher, house sparrow, welcome swallow, magpie, yellowhammer and the NZ pipit.

16 RECREATIONAL FISHING

Overview

There are few accurate records about the recreational use of this area.[252] This is because quantifying recreational harvest is very difficult scientifically and there is considerable uncertainty around the accuracy of the available estimates. However, the Ministry of Fisheries continues to undertake a range of research projects to improve their ability to better estimate recreational take.

The paucity of published information on the recreational fishery at the scale of the South Taranaki coast compared to the importance placed on that fishery by those interviewed (in Part I of this report) suggests that far more information gathering or research on the state of the area's recreational fishery is required.

The area is reported as a rich fishery.[253] This is in contrast with the area further north around Cape Egmont, which is believed to support a more limited fishery.

In this chapter

This chapter summarises information, where available, on the following topics:

- what research is undertaken on recreational fishing;
- how information on the recreational catch is gathered;
- problems with the recreational catch estimates; and
- what the surveys show.

What research is undertaken on recreational fishing?

The Ministry of Fisheries gathers its recreational fishing statistics using quota management areas (QMAs). The area encompassing this study area is QMA 8,which takes in the central west coast of the North Island from Tirua Point in the north to Titahi Bay in the south.

How is information on the recreational catch gathered?

One method that has been used is the 'tag-ratio method' where a number of fish are tagged and then released, and then fish caught with tags by both recreational and commercial fishers are recorded. This method gave an estimation of 250 tonnes from QMA 8 in 1991.[254]

However, there were problems with this method with under-reporting or tags recovered by commercial fishing being reported as recreational catch.

The first national survey into recreational fishing was undertaken in 1995/96, followed by a second national survey in 1999/00.[255] These national surveys have been done by what is known as the telephone/ diary survey. Households are contacted by telephone and fishers are asked if they will keep a diary recording their fishing activity over a whole year.

In addition, surveys at boat ramps around the country are used to obtain data on the size and weight of individual species caught by recreational fishers. With the diaries and boat ramp information, an estimation of the numbers and weight of fish taken by diarists can be determined.

Problems with recreational catch estimates

However, difficulties arise when the estimate from the diary participants has to be extended to the whole population who went fishing. [256] These difficulties included problems with how fishers were recruited to fill in diaries and the use of a telephone interview to estimate the proportion of the population that fishes.[257]

The Recreational Technical Working Group (convened by the Ministry of Fisheries to look at this issue) concluded that the harvest estimates from the diary surveys should be used only with the following qualifications:

a) they may be very inaccurate;

b) the 1996 and earlier surveys contain a methodology error; and,

c) the 200 and 2001 estimates are implausibly high for many important fisheries.[258]

Because of the size of the reporting area and the way in which the data was collected, it is impossible to break down the area to consider recreational take just in relation to the study area. It is difficult to extrapolate from the national recreational surveys to just the South Taranaki area.

What the surveys show

The species described as being targeted by recreational fishers in "Area 8," the fisheries management area that includes the South Taranaki Bight include:[259] blue cod, kahawai, barracouta, flat fish, gurnard, red cod, snapper and yellow eyed mullet. In 1996, snapper, blue cod, yellow-eyed mullet and gurnard were the fin fish taken in greatest numbers by recreational fishers.[260] In 2000, the main fin fish species caught were snapper, blue cod, yellow eyed mullet, gurnard and tarakihi.

Crayfish are collected mainly while diving from private boats. Other shellfish collected in significant numbers include mussels, pipis and cockles. No scallops were gathered by recreational fishers according to the survey.[261]

It appears there may be higher numbers of people fishing.[262]

In QMA 8 recreational fishing is mainly undertaken from the shoreline or from private boats.[263]

The number of fishing trips undertaken by recreational fishers has a maximum during the summer months and quietens down from May to November.[264]

TABLE 12: RECREATIONAL HARVEST ESTIMATES FOR 1996 FOR SNAPPER, BLUE COD AND GURNARD.

SPECIES	FISH STOCK	NUMBER (ROUNDED TO NEAREST 1000)	TONNAGE RANGE	COMMERCIAL HARVEST (FOR 95-96 YEAR)	TACC (TOTAL ALLOWABLE COMMERCIAL CATCH) (FOR THE 95/96 YEAR)
Blue cod	BCO8	159 000	70-90	31	74
Red gurnard	GUR8	68 000	25-35	182	543
Snapper	SNA8	275 000	215-255	1558	1500

Source: Bradford et al, 1998

TABLE 13: RECREATIONAL HARVEST ESTIMATES FOR 1999-00 SNAPPER, BLUE COD, GURNARD, KAWAHAI AND CRAYFISH[265]:

SPECIES	FISH STOCK	NUMBER CAUGHT	ESTIMATED TONS	COMMERCIAL HARVEST (FOR 99/00 YEAR)	TACC (FOR 99/00 YEAR)
Blue cod	BCO8	232000	127-249	30	74
Red gurnard	GUR8	99 000	26-55	222	543
Snapper	SNA8	648 000	661	1604	1500

Source: Bradford et al, 1998

Fishing off Patea – a social study into the importance of the moles

A recent social survey reported that fishing from Patea is generally some of the best in Taranaki. This was attributed to sizeable reefs and a sustainable fishing regime lacking in pressure from commercial operations and a weather pattern that does not allow 'too much' fishing to occur.[266]

Kawahai

Kahawai are caught by a variety of recreational fishing methods and is one of the fish species more frequently caught by recreational fishers.[267]

The study area for this project falls into the FMA8 quota management area for kahawai (west coast of the North Island). As discussed above, obtaining accurate estimates for the recreational kawahai harvest have proven very difficult. A research project is underway to estimate recreational catches of kahawai using a mixture of aerial sightings and boat ramp surveys. This is being trialled in the KAH 1 quota management area in 2004-05 (upper east coast of the North Island) and a similar programme is proposed for KAH 8 in 2006-07.[268]

A survey carried out by the Recreational Fishing Council found that 47% of just over 2000 respondents felt that kahawai stocks had 'declined significantly' and 32% felt they had 'declined a little' over the previous five years.[269]

In 2005 the Minister of Fisheries decided to reduce the total allowable catch for all kahawai quota management areas by 10%.[270] Some recreational groups remain concerned about a perceived decline in the fishery.[271] Recreational fishers consider that kahawai stocks have declined in abundance, availability and size of fish in the main stocks over the long term and in recent years.[272]

Fishing for snapper in South Taranaki – a student's study

In 1997 a student study of the snapper fishery in the South Taranaki Bight was undertaken. The study found, as with many other parts of New Zealand, that hard data concerning catch rates specifically in the South Taranaki area was lacking.[273]

The 1997 study compiled information from written records held by members of the Patea and Districts Boating Club. This showed an overall decline in recreational snapper catch rates between 1981 and 1997, with a significant drop in catch after a good year in 1990.[274] Information from one local commercial fisher's records was also reported. This too showed a drop-off in the years following a good 1990/91 year.

At the local level, the perceived reason for this dip after 1990 was heavy fishing from pair trawlers which were reported to have taken an estimated 500-800 tonnes of snapper from the South Taranaki Bight area between Patea and Hawera during 1991/92.

The report noted that 'large trawlers with sophisticated equipment operating in a relatively small area are capable of taking fish in such quantities that it will lower the breeding stock and reduce fish numbers available in future years.'[275]

Future research into recreational use

The Ministry intends to do specific survey work in 2005/06 to try and better ascertain the actual recreational take.

17 COMMERCIAL FISHING PAST AND PRESENT

Overview

Fish and seafood have been caught and traded since the earliest settlements. With arrival of European settlers, the first significant coastal resource use was of whales. Development of a domestic fishing industry took quite a bit longer, not really becoming established until the 1960's. However, from early times the coast provided a valuable transport route. The commercial fishing industry has undergone changes brought about by fishing regulations that led to the quota management system. Information on commercial fishing is gathered from fishers' returns by the Ministry of Fisheries. As with the recreational fishing data, much of this information is gathered at a much larger scale than the study area.

In this chapter

This chapter contains the following topics:

- whaling in the 19th century;
- the ports of Wanganui and Patea;
- commercial fishing; and
- aquaculture.

Whaling in the 19th century

Industry at its height in 1830s

Shore whaling was one of New Zealand's earliest industries and at its height in the late 1830s. Onshore stations varied in size and typically involved both Maori and European in their operation.

Southern right whale targeted

The southern right whale was the preferred whale for shore-based whalers. It was easy to catch; floated after it was killed; and had a good amount of oil and baleen.[276]

Whaling took place between May and October, when southern right whales travelled up the east coast of the South Island, through Cook Strait and up to the South Taranaki Bight.

Poor practices led to rapid decline

The practice of hunting both mother and calf southern right whale directly contributed to the rapid decline of the species. In the mid 1840s Edward Jerningham Wakefield wrote:

"The success of the fisheries varies, of course, every season: but there is every reason to think that it is on the decline. The whales are, doubtless, unnecessarily thinned by the practice of killing the cows, and even the young calves, who do not survive the practice of making fast to them in order to catch their mother."[277]

South Taranaki whaling begins in the 1840s

In the South Taranaki area it appears whaling stations were not set up until the 1840s, when whaling was already on the decline. A station is thought to have existed at Wanganui, probably at South Beach.

Wakefield's account of the period 1839-1844 notes:

"Whales fill the whole 'Motherly' Bay extending along nearly 150 miles of coast, between Kapiti and Cape Egmont, ... In the 'Motherly' bay, as it is called, because they resort to it for calving, they have never been disturbed; and I have seen them in great numbers, basking outside the surf on the coast between Manawatu and Patea."

Wakefield probably wrote this part of his account of the area before onshore whaling had commenced from Wanganui, and possibly even before the Ngamotu (in New Plymouth) stations were established.[278]

In addition to the Wanganui station, there is a possibility there was also a whaling station near the mouth of the Kai Iwi Stream at Mowhanau, 15 km up the coast from Wanganui.

Whaling seen as a sign of progress

Although the whaling activities established were not that successful, the presence of a whaling station was touted as a sign of progress in a new settlement. Colonel Wakefield of the New Zealand Company in 1844 espoused the prospect of a successful whale fishery, noting that:

"Twenty tons of oil, and more than a ton of whalebone from R. Barrett's whaling establishment, have been shipped in the Urgent for Sydney."

A year earlier, in 1843, a census of the colony of Taranaki valued exports to New South Wales as detailed in Table 14.

TABLE 14: WHALE EXPORTS, 1843

COMMODITY	TONNAGE	VALUE
Oil (black whale)	6 tons and 150 gallons	88 pounds, 4 shillings and 3 pence
Whalebone	950 pounds	50 pounds 1 shillings and 0 pence

Source: Burgess, 1997

By the 1840s the southern right whale population around NZ waters had decreased drastically, as a result of overwhaling and the taking of female whales and their calves. After 1847 Wellington newspapers reported very little about whaling activities.[279]

Ports of Wanganui and Patea

Introduction

In the early days, goods were transported up and down the coast by ship. Ports were established at Patea and Wanganui to allow for this.

"Before the roads went in, coastal traders went up and down the coast." - Recreational fisher and diver.

The port at Wanganui

The Whanganui River had an important role in transportation for both native and colonial economies.[280] To improve operation of the port for vessels, jetties were constructed at the river mouth to prevent lateral migration of the channel and to increase depth.[281]

In 1884 and 1885 a 260 m long jetty was constructed. This ran from the silt stone bluff on the northwestern side of the Whanganui River mouth. In 1905 this jetty, referred to as the North Mole, was extended to 640 m. Additional extensions increased its length to 730 m by 1912 and 884 m by 1930.

Construction of the South Mole began in 1905 (670 m) and reached its final length of 975 m by 1912. During construction of the jetties the walls were raised only to low tide level. However, by 1940 the height had been increased to approximately 3 m above mean sea level.[282]

Patea port

The Patea River entrance is the site of the former Port of Patea that served the freezing works and town of Patea. The river entrance is bounded by two concrete block seawalls or moles which were constructed in the late 1800s and early 1900s.

"The walls at the Patea River were built in the 1890s. They were built for the cheese factory to ship goods up and down. After that, they were used for meat exports. This continued until the works shut down."- Recreational fisher and diver.

These moles run seaward a distance from the existing highwater mark of about 325 m on the southeast, or true left side, and about 112 m on the north, or true right side. There are also remnants of some other walls in the vicinity.[283]

In recent years, the condition of the moles has deteriorated to such an extent that it is likely the Patea River will break through behind the southeast mole and the entrance will be lost entirely. This is due to ongoing retreat of the coast to the southeast.[284]

Prevention works were recommended in 2003,[285] and in 2005, the South Taranaki District Council decided to proceed with the first stage.[286]

This will involve the reconstruction of an old wall on the southeastern riverbank between the end of the mole and a distance some 320 m upstream, in order to confine the river.[287]

The importance of the channel for fishing access was recognised in the decision to proceed with the works. It followed an impact assessment study that identified social and economic value in retaining a navigable channel in the Patea River.[288]

Future work includes repairs to the existing moles, a sea defence on the southeastern beach, and periodic sand dredging to improve entrance channel depths and to add sand back to the eroding southeastern beach.[289]

Commercial fishing

History

Throughout the 19th century and early 20th century, New Zealand's commercial fishing developed quite slowly. It was limited to inshore fishing grounds and was localised and small scale, using small boats, catching most fish by line or set nets.

Like other parts of New Zealand, commercial fishing in South Taranaki really started to develop following the establishment of the New Zealand Fishing Industry Board in 1964, which brought with it regulations and government support that encouraged new investors to enter the industry.[290]

A number of operators became active in South Taranaki, such as one enterprise illustrated below:

Wanganui Trawlers Ltd

Pam Williams together with her friend Gordon Swan established Wanganui Trawlers Ltd in 1965. The Company had a number of vessels built in Wanganui, including Stella Maris (their first vessel), Supernova (1967) and Galaxy (1969). Early on they also established a small processing factory.[291]

Whilst the fishing was very productive, bar and weather conditions meant that at certain times the fish had to be landed at Paremata and transported north for processing, particularly in the period August to October when strong westerly winds were often encountered off the Whanganui coast.[292]

During the early years, the vessels worked the South Taranaki Bight and also the west coast of the North Island, catching groper, snapper, tarakihi and gurnard.

By July 1972 Wanganui Trawlers Ltd was exporting 40% of its catch. Further expansion followed, and in 1975 the Company began exporting chilled fish to Sydney.

The establishment of NZ's Exclusive Economic Zone in 1978 opened up new opportunities.

The Company was allocated a percentage of deepwater resource, which it exploited through a joint venture company with the South Korean company Oyang Fisheries. The joint venture company was called Pacific Oyang Ltd. The company was instrumental in the development of NZ's deepwater fishing resources throughout the 1980s.

In 1992, the Company changed its name to Wanganui Seafoods Ltd, and by the mid 1990s, was processing 5,000 tonnes a year. Its squid product had a reputation for quality and was in demand overseas.[293]

It was sold to Sanford Ltd in 1994, a sad day for the company and particularly its founders Gordon Swan and Pam Williams.[294]

"The first groper was caught off Kai Iwi in about 1962." - Former commercial fisher.

Changes in fisheries management

From the late 1950s, foreign fishing boats started coming into New Zealand waters. At that stage NZ territorial waters extended just three miles offshore. The fishing industry continued to grow, but too many boats were chasing the same species.

Prior to 1965, New Zealand only controlled fishing within a 3-mile coastal limit. In 1965, a 9-mile fishing zone outside the 3-mile territorial zone was established. Many foreign fishing boats fished outside this 12-mile limit and New Zealand had no control over the fish taken from these waters. During these times, the New Zealand industry focused on a largely inshore fishery fished from relatively small trawlers and other vessels.

In 1978, New Zealand declared its 200-mile Exclusive Economic Zone (EEZ). This led to some control over foreign fishing. Foreign vessels were licensed and given quota for the main species.

By the late 1970s, many fishers were going out of business as their catch rates declined. By this time, foreign vessels were taking huge tonnages from the deeper waters around New Zealand.

Catches fell away again sharply after the Government cut back the level of foreign fishing, but picked up again as New Zealand companies got involved.

The introduction of the quota management system

In 1983 a new Fisheries Act was passed which allowed for the development of Fisheries Management Plans, for better regional management of fisheries.

The Act also excluded part-time fishers from the industry. Commercial fishers had to be earning more than $10 000 a year, or 80 percent of their income from fishing, to remain licensed.

"There were 74 commercial fishermen before [the] quota [system], now there is just one long liner and two gill netting." - Commercial fisher.

The Quota Management System was introduced in 1986. This fully established the concept of Total Allowable Catches and defined a process for bringing species into this management system. Individual Transferable Quotas (ITQs) were to be allocated on the basis of catch history. Catch levels dropped away again once ITQs were introduced. [295]

Today the fishing industry consists of three large corporate entities (Sealord, Sanfords and Talleys) and a number of smaller organisations, the majority of which lease rather than own fishing quota.[296]

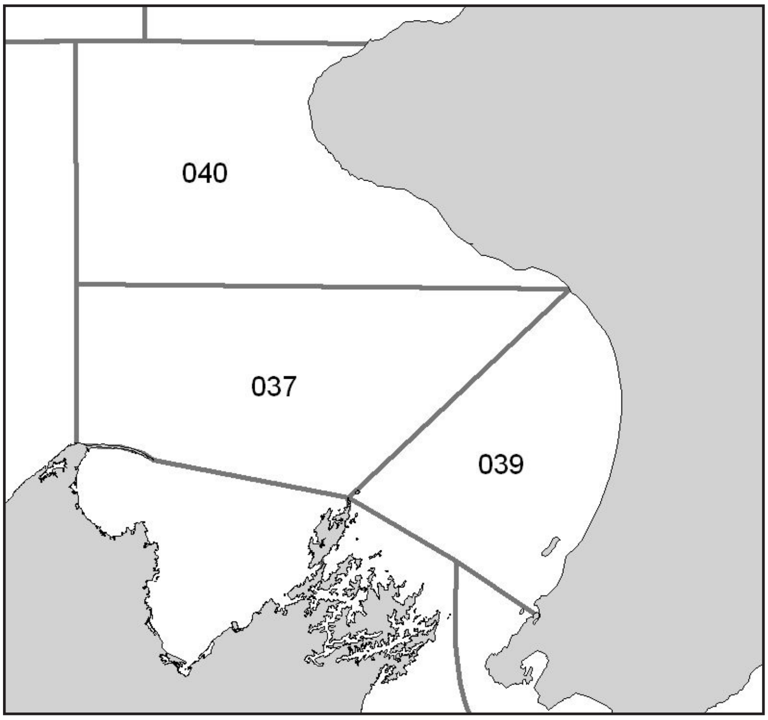
Maori are key stakeholders in the industry, and at 1999, owned about 40% of the quota.

In 1996 further changes were made to the Fisheries Act, providing for a stronger focus on overall ecological sustainability.[297]

Quota management areas

Quotas for particular species are established within quota management areas (QMAs), which are large areas of coastline. The QMA that encompasses the South Taranaki Bight is Area 8, or QMA 8.

FIGURE 10: STATISTICAL AREAS IN THE SOUTH TARANAKI BIGHT.



Source: Ministry of Fisheries

These provide the main framework for managing fish stocks.

Each QMA is split into smaller areas called fisheries statistical reporting areas (FSRAs).

The area of the South Taranaki Bight that this study is concerned with incorporates elements of two reporting areas, and is bounded by a third to the south (FSRA 39). The key units are statistical area 40 (most of the study area), and statistical area 37 (the southern most part of the study area) (Figure 10).

Fishing within each of these areas can be localised and can vary significantly from year to year as fish distribution changes.

Information gathered on the commercial fishery

The quota management system, established in 1986, relies on good quality catch information.

Commercial fishing vessels must provide certain information about where it is that they are fishing, and the catch that they have landed, including bycatch. The information gathered is used to help estimate fish stocks and to adjust quota levels.

The Ministry of Fisheries collects statistics about fish that is landed in the larger scale quota management areas (QMAs). Some fishing methods are also required to record the latitude and longitude of where they have landed their catch. For example, trawlers over 28m long record this information. Smaller trawlers however, are only required to note the fishing statistical area they have fished from.

Other research on commercial fishing

The Ministry of Fisheries primarily uses information gathered from fishers to estimate fish stocks and make changes to quota etc.

They also commission specific research on fish stocks of particular species. This research is usually species specific, although occasional studies, for instance into trawling impacts, may look at habitat overall.

Research into South Taranaki's fishery

No extensive surveys of the fishery resources on the continental shelf in this area were conducted until the 1970s. No new trawling surveys around the Southern Taranaki Bight have been undertaken since 1990.[298]

Research from bottom trawl surveys conducted by NIWA since that time show that the area supports a diverse assemblage of fish species. The most abundant species found included jack mackerels, barracouta, school shark, frost fish, tarakihi, rig, red gurnard, snapper, spiny dogfish and kahawai.[299]

Species targeted by commercial fishing

Species targeted by commercial and recreational fishers in the area[300] include all of the above species with the addition of blue warehou, blue cod, flatfish and the exception of frost fish and spiny dog fish which are generally regarded as a pest and dumped.

The most important deepwater species of statistical area 40 have been reported to be hoki and ling, whilst jack mackerel and barracouta are reported to be the most important pelagic fish in these waters.[301]

The main species caught within the South Taranaki Bight has not changed significantly since 1989, although a more diverse catch has been observed.

Jack mackerel has continued to dominate the catch statistics within the two zones along with barracouta and kahawai. Trevally was an important species from 1989 to 1992[302] however this species was not as apparent in the 1990 to 2003 catch statistics.

Blue mackerel, leather jacket, hoki, red cod, spotted dogfish, school shark, frost fish and warehou all formed part of the total catch in recent years.

Development of the snapper fishery

The commercial snapper fishery developed in the 1930s, with modest annual catches reported from 1930 – 1950.

Reported landings for the Snapper 8 fishery (North Island west coast) were 140 tons in 1931.

The records show a gradual increase in landings, with a sharp increase from 1973, the period during which commercial fishing expanded and notably pair trawling and Danish seine methods were introduced.[303]

Landing records show a high of 5,326 tonnes in 1976, after which total landings then sharply decline, down to 893 tonnes in 1986-87.

In 1986 the quota management system came into operation, and catch limits were set at a level intended to allow for stock rebuilding.[304]

By 1997, the Snapper 8 fish stock was increasing, but at 1997 was still only 81% of Bmsy (the biomass at which maximum sustainable yield can be supported).[305]

The catch limits set back in 1998, were, at the time, expected to see the snapper fishery rebuild to a point where the biomass was above BMSY.

However the Ministry of Fisheries has recently recognised that its rebuild strategy set in 1998 has not achieved the expected result, and that the current biomass of the stock is only about half of the target level.[306] In response the Ministry has reduced the total allowable catch in Snapper 8 be reduced to allow the stock to rebuild.

Rock Lobster fishery

The study area falls into the CRA 9 rock lobster quota management area. This fishery is geographically large. The fishery extends from north of Bruce Bay in the South Island to the Kaipara Harbour. Commercial lobster fishing is constrained to the northwest coast of the South Island and the area between Patea and Kawhia, in particular the Taranaki coastline. The 47 tonnes total allowable commercial catch (TACC) has remained unchanged since 1992.[307]

Area based restrictions to commercial fishing

The following area based restrictions apply to the South Taranaki area:[308]

- no commercial fisher shall use any Danish seine net in the lower North Island;[309]
- no commercial fishers shall take or possess any paua or mussels in the Whanganui River mouth area; and[310]
- shell fishing is prohibited between Tirau Point and the Whanganui River mouth.

There are a number of other, non-regulatory agreements also in force:

- voluntary ban on all pair trawling within four nautical miles of the coast; and
- voluntary ban on single trawling within two nautical miles of the coast from Cape Egmont to the north of the Rangitikei River.

Commercial fishing methods

Fishing methods evolve

By about 1980, line fishing and netting were the predominant inshore fishing methods along the South Taranaki coast. Trawling and purse seining (when a school of fish are encircled with a large net) occurred offshore, beyond 10 km, with the exception of Castlecliff, where trawling and purse seining occur about 5 km off the Whanganui River mouth.[311]

By the early 1990s, trawling, long lining, set netting and seining were the predominant fishing methods used in FSRA 40. [312]

Midwater trawling, bottom trawling and purse seining contributed the greatest proportion of yearly catch during 1990 to 2003,[313] as opposed to bottom trawling and set netting which contributed the greatest proportion from 1989 to 1992.[314]

Trolling and dredging has increased in status in recent years since the 1993 report with the yearly catches from these methods increasing.

Set netting and line fishing from smaller vessels continues to take place through the area. The pattern of fishing is determined primarily by the seasonal abundance of the prime target species.[315]

Trawling, long lining, set netting and seining are still the predominant fishing techniques used in these two zones, however there have been changes in fishing intensity using those various methods.[316]

Trawling

Trawling within the South Taranaki Bight

Trawling catch effort data enables a picture to be established of how much trawling is taking place in a particular area over a given period of time, as it is referenced to latitude and longitude points, for those trawlers over 28m in length. Smaller trawlers only record their catch by statistical area and so are not represented in Figure 11.

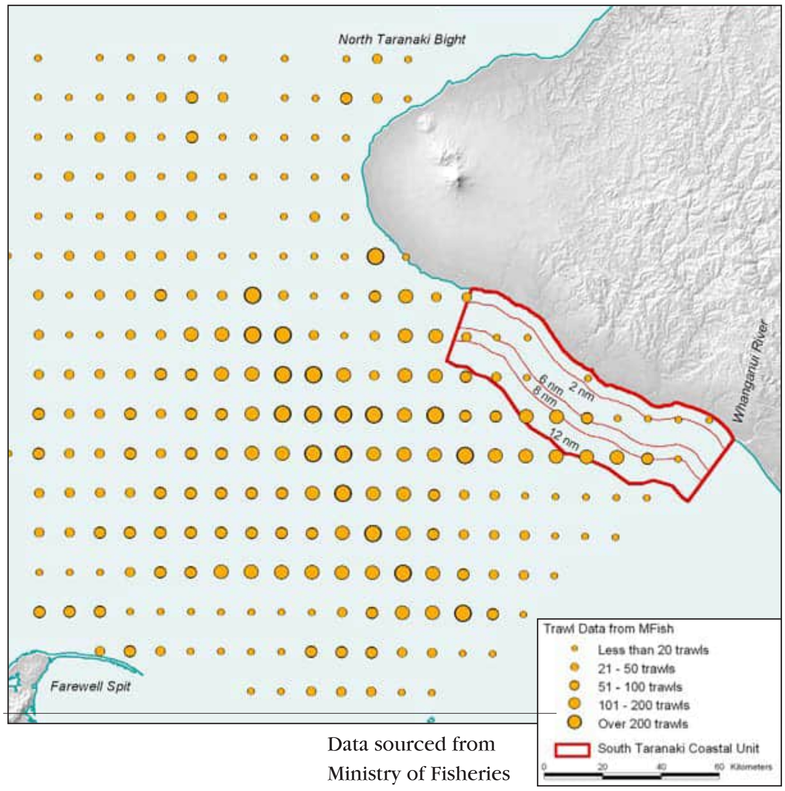
The catch effort illustrated in Figure 11 was based on all commercial fishing that had occurred within New Zealand's 200 nautical mile exclusive economic zones since 1990. It shows which sites are more frequently trawled.

The Ministry also collects other type of data such as volumes of fish landed.

Trawling intensity 1993-2003

The main trawling grounds on the South West Coast of the North Island lie between Kapiti Island and Wanganui.[317]

FIGURE 11: TRAWLING INTENSITY (OF VESSELS >28M)



Data sourced from Ministry of Fisheries

The data shows that trawling from large vessels is at greatest intensity about 30 km or so offshore in a band running southeast to northwest.

However, it is also clear that some trawling occurs within 2 nautical miles of the coast, well inside the study area.

Shift to mid-water trawling

The proportion of trawling to total fish catch is relatively unchanged. However there has been a shift within this method towards midwater trawling, which surpassed bottom trawling in 2000 as the dominant fishing method within the two main zones.

Midwater trawling has grown in popularity with the fishing industry. Bottom trawling catch statistics have gradually declined and bottom paired trawling has become almost extinct within the South Taranaki Bight, with no records of any catch taken by the technique over the last three years (to 2004).

Species targeted by trawling

Jack mackerel is the main target species of trawl vessels. Other important species include barracouta, trevally, tarakihi and kahawai.[318]

Most of the fishing for these species is by large foreign trawlers under charter, restricted to regions beyond 20 nautical miles from the coast, and thus outside the study area.

Trawling by smaller domestic vessels around and inshore of the area is primarily undertaken by smaller regional fishers (i.e. from Wanganui, Nelson, New Plymouth), and is restricted to some extent by the rock platform within five - ten kilometres of the coast.

The trawl surveys data provide very good information on the overall distribution of the main fish species as well as the main areas of abundance along the coast and the particular depths at which they are found.

Other fishing methods

Set netting

Small inshore vessels target the following species by set netting: rig, school shark, blue warehou and trevally.

Set netting is important to domestic vessels in these areas. It is seasonal, targeting species such as school shark, a species that is known to move into the inshore regions of the South Taranaki Bight in late spring - early summer.[319]

Species targeted by long lines

The catch from lining (bottom long line and trot line), particularly bottom long lining, is generally small and contributes to less than 5% of total yearly catch in FSRAs 040 and 037.

The yearly catch from lining in 1991 and 1992 comprised primarily of school shark, snapper, blue cod and gurnard.[320] These species have been described to be relatively abundant around and shoreward of the Kupe South site, and therefore likely to be an area fished by local domestic vessels.

Potting

The primary species collected by potting in statistical area 040 are rock lobster *(Jasus edwardsii)*. Paddle crabs are also caught by this fishing method.

Dredging

Dredging has occurred in the statistical area 37 since 1991, primarily for scallops. No commercial dredging is known from the statistical area 40.

Aquaculture

Taranaki has major constraints for each of the three established aquaculture species in NZ. However, technology is being advanced to enable aquaculture to occur on exposed coastlines (i.e. sub-marine structures). The established species for aquaculture in NZ are green shell mussels, salmon, and Pacific oysters.[321]

The constraints include:

- lack of sheltered water;
- bacterial loadings; and
- phytoplankton levels.[322]

Lack of sheltered waters

While some very large offshore aquaculture sites have been approved recently around New Zealand, the waters off Taranaki's coast are particularly exposed and high winds are frequent.

One report notes that when techniques for offshore aquaculture are established, with increased research and development, farming of shellfish and fin fish on Taranaki's open coast may become viable.[323]

Even when technology becomes available for offshore farms, they are likely to have higher operating costs than inshore farms. Offshore aquaculture is most likely to be used for filter feeding bivalves that require no feeding and relatively infrequent visits

Proximity to sheltered anchorages will affect travelling times, making the area around New Plymouth more favourable for offshore aquaculture than South Taranaki.

Bacterial loadings

River discharges will be a source of bacterial loadings that may cause restrictions on shellfish harvesting, mainly after heavy rainfall. Monitoring of shellfish quality would be prudent prior to aquaculture developments.[324] However, bacteriological water quality around Taranaki is regarded as excellent, with the location of any marine farms likely to be out of the influence of rivers.

Phytoplankton levels

Shellfish grown in coastal waters are limited by natural food availability. In one assessment of aquaculture opportunities in this area, phytoplankton levels were noted as being relatively low around the Taranaki coast compared to many other areas of New Zealand used for aquaculture. It further notes that phytoplankton levels will be a little higher in the northern Taranaki area, due to nutrients from the Waitara and Urenui rivers.[325]. This does not correspond with other information on nutrient levels in the South Taranaki Bight that are brought into the area through upwelling currents described in Chapter 13.

Constraints mapping project

The Taranaki Regional Council has recently undertaken a project to identify what constraints on aquaculture there are presently within the coastal management area. A GIS mapping exercise was undertaken where maps were produced of the Taranaki coastline and out to the 12 nautical mile limit.

High use and significant or important areas of the coast that can be considered to be constraints to the development of aquaculture were identified. The report identified that there were areas for which further research and consultation is necessary, such as commercial and customary fishing areas.[326]

Introduction

There has been an extensive history into mineral – oil, gas, ironsand and limestone exploration and extraction in the South Taranaki-Whanganui coastal area. This chapter summarises that history.

Oil and Gas

The Taranaki Basin

The Taranaki Basin, both onshore and offshore, has been the main area where petroleum has been found in New Zealand.[327] New Zealand's only producing petroleum facilities are located in Taranaki.[328] The exploration for, and development of, these resources continues today.

The South Whanganui Basin

The South Whanganui Basin is thought to hold a petroleum resource at its deepest points.[329] The deep part of the basin brings together, in a favourable time and place, all essential ingredients for petroleum accumulation.[330]

Kupe Gas Development

In mid 2005, consent was granted to Origin Energy to commence the Kupe Gas Project north of Hawera. The project is sited toward the northern most end of the study area. This involves:

- constructing an unmanned offshore platform above the Kupe Gas Field;
- undersea pipelines to bring the raw gas and liquids to shore, and to take chemicals, power and a communications cable from the shore to the platform; and
- an onshore production station located at the southern end of Inaha Road. The pipes will go underground where they cross the beach.

The environmental effects on marine life are expected to be minimal, unless there is a catastrophic event such as a major earthquake. Some seabed disturbance is expected during construction.[331]

Development of the gas field will place restrictions on certain commercial fishing in the immediate area. The field's owners propose to create a 500 m-wide fishing exclusion zone along the entire length of the undersea gas pipeline from the shore near Ohawe to the production platform 30 km out to sea, and another exclusion zone 500 m around the platform. Restrictions are likely to be similar to those around the Maui pipeline where vessels greater than 9m in length will be prohibited from anchoring and trawling will be prohibited. There are to be no restrictions on small recreational fishing craft.[332]

Ironsand

Ironsands rich in titanomagnetite

West coast sands contain titanomagnetite, a mineral derived from the breakdown of Mt Taranaki volcanics, which give the sand its characteristic colour. The ironsands are found in beach and dune deposits, and offshore along 480 km of coastline from Kaipara Harbour in the north to Wanganui in the south.[333]

The titanomagnetite is sourced from volcanic rock from Mt Taranaki and the Taupo Volcanic Zone. The potential value of these ironsand deposits for the steel industry in New Zealand was recognised by early European settlers. The first attempts to smelt ironsands were in 1849, on the west coast of the North Island.[334]

The fine grain size and high titanium content defeated traditional blast furnace technology, and it wasn't until the 1960s that an alternative process was developed that allowed successful iron extraction.[335]

The possibility of an iron sand mining industry in the beach sands of the area to the west of Wanganui was recognised and documented.[336] Economic resources were identified including the 'Patea Dunesand' (the coastal strip from Manutahi to Waitotara, including Waipipi), and the coastal strip between Wanganui and Waitotara.[337]

The Patea Dunesand was reported to have an average titanomagnetite content of 20%. Titanomagnetite concentration is higher in beach than dune sand, because of the greater concentrating power of water.[338]

Waipipi ironsand mining 1971-1989

A mining operation was established at Waipipi in 1971.[339] This followed renewed demand from Japan for supplies of the mineral titanomagnetite, found in ironsand.[340]

The operation was a joint venture between Marcona Corporation of San Francisco and Viking Mining Company of NZ to mine and export the deposits.

The next 13 years saw some 13.8 million tonnes of concentrate delivered to Japan's six major steel producers.

The Waipipi deposit has been defined by exploration drilling to be continuous over more than 15 square kilometres averaging about nine metres in thickness.[341]

The Waipipi plant closed in 1987, having produced about 15.7 million tonnes of concentrate.[342] A small resource remains at the Waipipi deposit.[343]

"When the iron sand ore was being pumped into the boats it went in as a slurry. It was settled and the water sent over the side. It made a huge mess. There was dirty water for ages." - Recreational fisher and diver.

Future ironsand exploitation

In March 2005, Sericho Developments Ltd, a Melbourne-based company, was granted an exploration permit for a 455 hectare area on the coast south of Waverley. This is near the former Waipipi site, running between Okotoka and Whenuakura. The Company is looking at opportunities to supply the growing Chinese economy with alternative supplies of iron ore to overcome a current shortfall in supply.

Other mineral extraction

Limestone extraction at Nukumaru

Shellrock is extracted from a site that includes part of the Nukumaru Recreation Reserve, and has been for several decades. Limestone in the region is scarce so this outcrop is valuable.[344]

19 MONITORING THE COASTAL ENVIRONMENT

Introduction

Monitoring carried out by the two regional councils – Tarankai Regional Council and Horizons Regional Council relates to either monitoring the general state of the environment, or to monitoring the effects of consented activities.

Monitoring the quality of marine intertidal communities along the coast provides a direct measure of the ecological diversity or 'health' of coastal waters.[345]

Ecological diversity incorporates both the number of species present at a given area and the relative abundance of the different species present. Higher diversity is expected with improved water quality.[346]

This chapter discusses the state of environment monitoring carried out by the councils, monitoring of beach water quality and the monitoring of shellfish undertaken by the New Zealand Food Safety Authority.

What is state of the environment monitoring?

The Taranaki Regional Council (TRC) carries out monitoring for its 'State of the Environment' programme. This aims to measure both the current quality of the coastal environment, as well as changes over time.[347]

The programme involves monitoring of six 'hardshore' and two estuarine 'softshore' sites in Taranaki.[348] Of those monitoring sites, only one hardshore and one softshore site are within the study area (Table 15). These are:

- Waihi Reef – rocky shore site; and
- Waitotara Estuary – soft shore estuarine site.

TABLE 15: SUMMARY OF STATE OF THE ENVIRONMENT COASTAL MONITORING IN SOUTH TARANAKI

LOCATION	TYPE OF MONITORING	REGIONAL COUNCIL	RECORDS HELD SINCE
Waihi Reef	Hardshore marine ecological	TRC	1985
Waitotara Estuary	Softshore marine ecological	TRC	1995
Waiinu Beach	Beach bathing water quality (Enterococci)	TRC	1997
Waingongoro River mouth	Freshwater contact recreational water quality (E. coli)	TRC	1996
Castlecliff Beach	Beach bathing water quality (Enterococci)	Horizons	2005
Kai Iwi Beach	Beach bathing water quality (Enterococci)	Horizons	2005
Mowhanau Stream	Bathing water quality (E. coli)	Horizons	2005

Source: TRC, HRC.

State of the environment reporting by the Taranaki Regional Council also includes monitoring popular swimming beaches for bacteria concentrations, and some physical and chemical parameters.[349] The results are available on the council's website (www.trc.govt.nz).

Horizons Regional Council (HRC) monitors bacteria concentrations, and some physical and chemical parameters, in some popular swimming beaches and estuaries (Table 5). Shellfish are monitored on at least one beach in the study area.

What has the monitoring found?

State of environment monitoring in the Taranaki Region has indicated generally excellent coastal water quality, which compares well with other regions in New Zealand.[350]

Hard and softshore ecological monitoring show stable communities and hence water conditions (over the last 20 and last 10 years respectively – the period for which data is available).

The generally excellent coastal water quality found in Taranaki has been attributed to the following:

- few development pressures on the coast;
- a reduction in the number of point source discharges to the coastal marine area;
- improvements in waste treatment and disposal options; and
- an exposed coastline with a high degree of nearshore flushing.

"20 years ago, there were 7 discharges along the South Taranaki coast. Now there are 3. This includes amalgamation of the dairy plant effluent with treated wastewater from Hawera. As a result of the consent process and public involvement there has been a decrease in the areas potentially impacted by discharges." - Regional Council officer.

State of environment monitoring in the Whanganui region, although it has not been longstanding, has identified high bacteria levels at popular bathing sites. These include Kai Iwi Beach and Mowhanau Stream. Water quality is rated only 'fair' at Castlecliff.

Where are the gaps in state of environment monitoring?

Coastal marine ecological monitoring for 'State of the Environment' purposes is sparse. Only one 'hardshore' site and one 'softshore' or estuarine site, are being monitored in the study area. However, a large amount of knowledge exists through consent related monitoring. (See Chapter 20).

If further sites were included, not only would it lead to an increase in knowledge of marine communities along the South Taranaki coast, it would also help interpret changes that may be observed at the two currently monitored sites.

Bathing water quality is monitored at five sites along the coast (three beaches and two estuaries). All are popular recreational sites.

However, there are other sites along the coast that are close to settlements and are known to be popular recreation areas that are not monitored, e.g. Waverley Beach.

No ecological monitoring of offshore marine sites in South Taranaki is being carried out.

Including such sites in the future, assuming such monitoring is technically feasible, could improve knowledge of what is there, and in the future, of changes and why they are occurring.

Diffuse discharges to the environment

It is likely that indirect discharges to the coast are occurring. These are sometimes called 'non-point source' discharges, as they can occur from more than one place.

Farm run-off containing agricultural effluent, fertilisers and herbicides may also affect the coast in this way. The riparian fencing and planting scheme undertaken by the Taranaki Regional Council goes some way towards reducing the amount of run-off entering waterways (refer to Figure 16 in Chapter 22).

The existence of, and risks posed by diffuse discharges could be investigated through strategic located state of the environment monitoring stations.

Rocky shore marine ecological monitoring – Waihi Reef

Long monitoring history at Waihi

There is a long monitoring history at the Waihi Reef site because it has also been used as the control (i.e. unimpacted) site for monitoring the effect of the Fonterra Whareroa/Hawera municipal combined discharge (discussed in the following chapter).

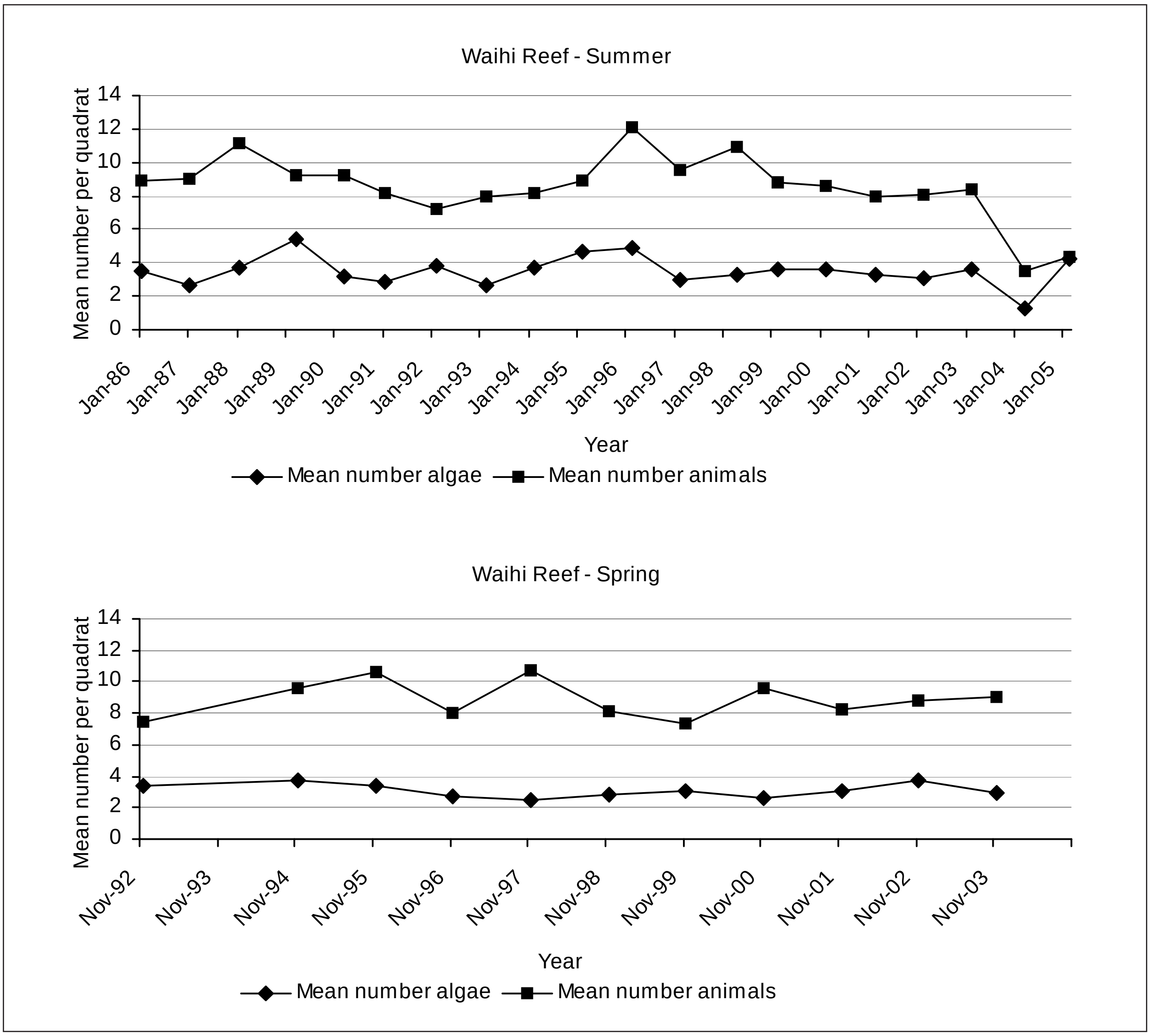
The Waihi Reef site is surveyed twice a year – in summer and in spring – and the results of the two seasons are analysed separately to remove any seasonal effects.[351]

Results from monitoring the Waihi reef site

The results (Figure 12) show that some variation in ecological diversity has occurred on this reef over time. The variations are typical responses to local environment conditions, such as storms, sand inundation, high levels of suspended silt and freshwater influence from rivers after rain. For example the lower numbers of animals and algae observed in January 2004 were the result of sand inundation of the reef.

Over the last few years the weather conditions have been severe with large swells, rough seas and high rainfall events all having an influence on the coast. As a result, very turbid water is present nearshore, which is also present as a layer of silt which covers the reefs, smothering both marine life and rocks. The turbid water also reduces the level of light the seaweed needs to grow, which is not ideal for algal growth.[352]

The Waihi Reef site has generally had a lower level of diversity than other hardshore sites elsewhere in Taranaki. This may indicate that the



Source: TRC

South Taranaki coastline has a relatively lower level of ecological diversity than the North Taranaki coastline because of the differing environmental conditions that exist, such as substrate, exposure and sediment load.[353]

Softshore estuarine monitoring - Waitotara Estuary

Decade of monitoring at Waitotara

The Waitotara Estuary is one of two sites in the TRC estuarine monitoring programme. The other site is at the Tongaporutu Estuary in north Taranaki.

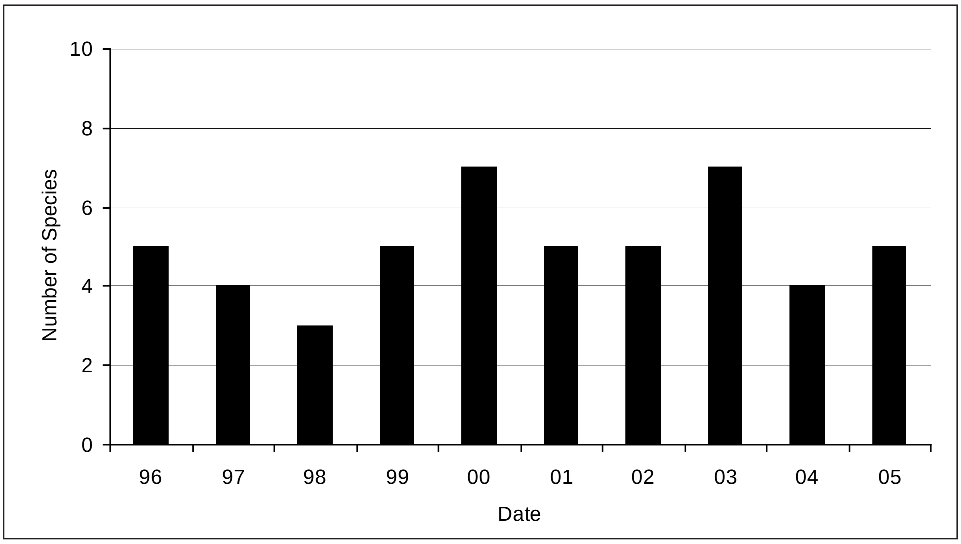
The ecology of the Waitotara Estuary is surveyed once a year, in autumn.[354] The results of the surveying over the last 10 years, since the monitoring commenced, are shown in Figure 13.

Waitotara estuary species abundance and diversity

The sand hopper is the most abundant species found, followed by the marine bristle worms. However, species dominance does change from year to year.[355]

Monitoring over the last 10 years has found healthy populations of juvenile pipis and cockles.[356]

FIGURE 13: SPECIES DIVERSITY FOUND IN THE WAITOTARA ESTUARY



Source: TRC

Fluctuations in diversity over time are evident. However, it appears changes have occurred to the ecological diversity and community structure of the Waitotara Estuary over time.

What happened to the estuary after the 2004 floods?

In February 2004 extensive flooding occurred in the Waitotara River which resulted in the whole lower catchment being underwater and a large inundation of silt. During 2004 the composition of the sediments in the estuary changed, going from a generally muddy habitat to a sandy habitat. As a result very few species were present, for example only 16 individuals were found in 12 core samples.

In 2005 this habitat changed back to a more mud dominanted environment. Only the sand hopper has come back in any great numbers, which demonstrates that it is not sensitive to its environment, but can adapt to changing conditions. In 2004 only 7 sandhoppers were found but in 2005, sandhopper numbers had increased dramatically and 4 640 were found!

Beach bathing water quality

Beach water monitored against national guidelines

Water quality is monitored at popular swimming beaches around South Taranaki. The programme monitors bathing beach water quality over time, and compares the water quality of bathing beaches against national marine water quality guidelines. These are called the Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas published by the Ministry for the Environment.

Sampling is undertaken at least 3 days after a flood to ensure consistency and minimise the effects of bacteria contamination from rivers. Samples are also taken at low tide, again to minimise the influence of nearby freshwater streams on the results.

Enterococci bacteria a key indicator

These national guidelines use Enterococci bacteria as the preferred indicator for the quality of marine waters.

Water samples are tested for the presence of Enterococci. This is a bacteria which indicates the possible presence of disease-causing organisms in water contaminated by human or farm effluent. [357]

The guidelines use the concentration of the bacteria as a measure of the risk to water users of contracting gastrointestinal and respiratory illness. Single sample Enterococci results are used to categorise beaches into one of four categories.[358] The four categories are given in the Table 16:

TABLE 16: BEACH WATER QUALITY SAFETY LEVELS

ENTEROCOCCI/100 ML	SAFETY CATEGORY	COLOUR
No single sample greater than 140 enterococci/100 ml	Surveillance	Green
Single sample greater than 140 enterococci/100 ml	Alert I	Yellow
Two consecutive single samples (resample within 24 hours of receiving the first sample results, or as soon as is practicable) greater than 280 enterococci/100 ml.	Action	Red

Source: Ministry for the Environment 2003.

Freshwater can be a contaminant source

Bacterial concentrations in bathing water are generally at levels not likely to be detrimental to human health. On a few occasions bacteria may reach ‘alert’ or ‘action’ concentrations. These times are likely to be when there is a greater influence from freshwater mixing with seawater.

The biggest risk to water quality at all beaches is the adverse effect of rivers discharging sediment and bacteria into the sea after high rainfall events.[359]

South Taranaki-Whanganui beaches that are monitored

Beaches that are monitored in this area are:

- Waiinu Beach;
- Castlecliff Beach;
- Kai Iwi Beach – Mowhanau Stream; and
- Ohawe Beach – Waingongoro River.

Waiinu Beach monitoring programme

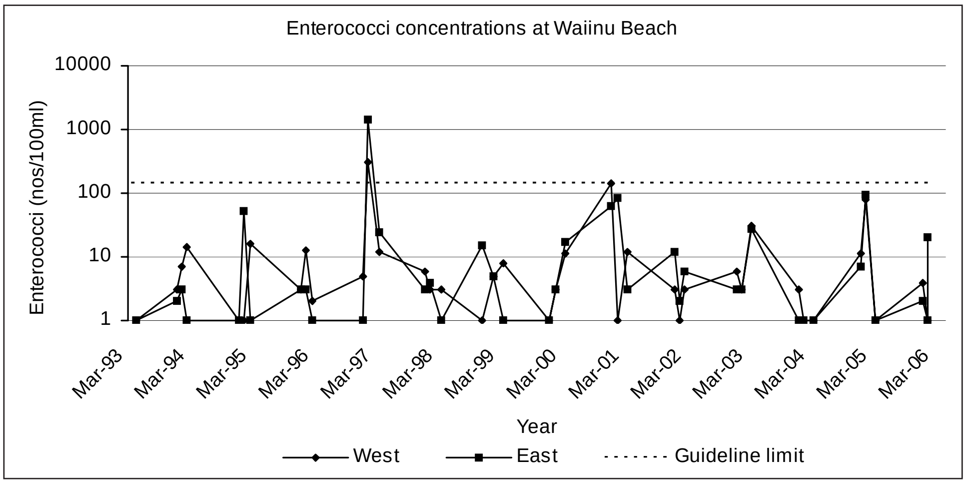
Treated domestic wastewater of up to 84 m3/day may be discharged from Waiinu Beach Settlement via seepage to land and groundwater.[360] The shallow groundwater receiving the treated effluent from the Waiinu Beach settlement flows toward the beach, more than 200 m away. The coastal seawater quality is therefore measured as part of monitoring the effectiveness of the effluent treatment system.

Monitoring carried out since 1992

Coastal water has been sampled each year since 1992 on three occasions over the summer months, at two coastal sites around Waiinu Beach.[361]

Each sample is analysed for faecal coliform bacteria, enterococci bacteria and conductivity.[362]

FIGURE 14: WATER QUALITY AT WAIINU BEACH MEASURED AS ENTEROCOCCI CONCENTRATIONS.



Source:TRC

Bacteria levels generally acceptable

Bacteria levels at Waiinu Beach, as can be seen from Figure 14, have generally been at acceptable levels for swimming and other contact recreation. Most samples collected since 1992 have been well below that level. These results suggest that Waiinu Beach is suitable for contact recreation (recognising the limited number of samples collected per season).[363]

Whilst these results show a stable, high quality environment, earlier monitoring carried out by the Rangitikei-Wanganui Catchment Board suggested that the Waitotara River may occasionally have a marked influence on Waiinu Beach coastal water quality. Samples with higher bacterial counts were correlated with lower salt concentrations, i.e. greater portion of freshwater influence from nearby rivers.[364]

Floods increase bacteria levels

Since 1992, bacteria counts have exceeded alert levels on only a few occasions. A common factor at these times has been heavy rain or flooding in the catchment area, bringing bacteria and silt onto the beach.

During the 2003–04 monitoring period for example, enterococci counts were low for the first two inspections but were elevated for the March sampling period. The March sampling was undertaken following extensive flooding during February 2004, which deposited a large amount of silt and other debris into the sea. This is supported by the low conductivity result and the colour being very brown and turbid during the sampling period due to the influence of the Waitotara River and run-off from the land.[365]

Castlecliff Beach water quality 'fair'

Monitoring of Castlecliff Beach water quality commenced in 2005. Records, therefore, only relate to this year (Table 17).

24 samples were taken over the summer months. The sample median was 13 enterococci per 100 ml and the range was <2 to 300 enterococci per 100 ml.[366]

As a result, the beach has been graded on an interim basis as suitable swimming for recreation with a grade of 'good'.[367]

TABLE 17: CASTLECLIFF BEACH WATER QUALITY TESTING FOR 2005

NO. OF SAMPLES	LEVELS FOR SINGLE SAMPLE OF ENTEROCOCCI/100ML	SAFETY CATEGORY	COLOUR
22	< 140	Surveillance (good)	Green
1	>140 to <280	Alert II (satisfactory)	Amber
1	> 280	Action (unsatisfactory)	Red

Source: Horizons Regional Council, 2005.

Kai Iwi Beach water quality 'poor'

Monitoring of Kai Iwi Beach water quality commenced in 2005. Records, therefore, only relate to this year (Table 18).

24 samples were taken over the summer months. The sample median was 28 enterococci per 100 ml and the range <2 to 9000 enterococci per 100 ml.

TABLE 18: KAI IWI BEACH WATER QUALITY TESTING FOR 2005

NO. OF SAMPLES	LEVELS FOR SINGLE SAMPLE OF ENTEROCOCCI/100ML	SAFETY CATEGORY	COLOUR
18	< 140	Surveillance	Green
2	>140 to <280	Alert II	Amber
4	Two consecutive single samples (resample within 24 hours) > 280	Action	Red

Source: Horizons Regional Council, 2005.

The health risk of swimming at Kai Iwi Beach was slightly higher than at Castlecliff. It could be considered "safe" about 80% of the time. [368]

During summer the Mowhanau Stream was flowing across the area where people generally swim. This meant on occasions Horizons was sampling a mixture of seawater and low bacterial quality fresh water from the agricultural Kai Iwi Stream catchment.[369]

Mowhanau Stream 'very poor'

Monitoring of Mowhanau stream commenced in 2005 (Table 19).[370]

Mowhanau Stream is a high use site, because it is used as a safe area for children to play. It had the lowest interim rating of 'very poor'.

25% of the samples taken at this popular swimming site were either amber or green. Further investigation to determine the source of the bacteria is underway.[371]

The following results were recorded from 26 samples taken:

TABLE 19: MOWHANAU STREAM WATER QUALITY 2004/05

NO. OF SAMPLES	E COLI LEVEL	ALERT LEVEL	COLOUR
1	<260 E coli per 100 ml	Acceptable	Green
6	>260 and <550 enterococci per 100ml	Alert	Amber
19	>550 E coli per 100ml	Action	Red

Source: Horizons Regional Council, 2005.

Whilst health risk from recreational contact with this stream seems quite high, community and Public Health Unit feedback did not identify any serious issues related to stream use. Wanganui Public Health Unit indicated that they had had no confirmed cases of any notifiable illnesses attributed to the Mowhanau Stream.[372]

Microbiological quality was also poor in the nearby Kai Iwi Stream.

14 samples conducted over the summer recorded one green, one amber and 12 red results.

Ohawe beach – monitoring of water quality at the Waingongoro River mouth

The Waingongoro River drains an extensively farmed catchment. There are 198 dairy farms and point source discharges from dairy sheds and municipalities number more than 110.[373]

This site is immediately upstream from the river mouth at Ohawe Beach. Thus, this site is within the study area.[374]

This site is sampled every summer since the programme began in 1996/97.[375] Thirteen samples are taken over the course of each summer season at regular time intervals, at high tide. Three types of tests are done. These are:

- Conductivity (this is a way of finding out how much salt is in the sample, so that the amount of freshwater influence can be taken into account);
- Bacteria (E. coli, Enterococci and faecal coliforms); and
- Temperature and turbidity (turbidity is a measure of how clear the water is).[376]

Water quality generally good at Ohawe beach

Based on the bacterial monitoring results, water quality levels for the Waingongoro River at Ohawe Beach are generally good over the last ten years.

Median E. coli bacteria number for the 2003/04 period was equivalent to that found in the previous season, continuing the general trend of improvement in bacterial water quality recorded over the last four seasons.[377]

However, since monitoring began, the alert and action concentrations of E. coli have been reached in some samples most summers.

A comparatively narrow range of E. coli numbers was recorded in the 2003/04 period. One of the thirteen samples that summer (taken on 9 December 2003) exceeded the alert concentrations. (1 sample is 8% of the 13 total samples). This elevated count followed shortly after a river fresh event in early summer. The concentration of bacteria at which action needed to be taken was not reached.[378]

Shellfish monitoring

The NZFSA (New Zealand Food Safety Authority) runs a programme to test shellfish and water samples from around the New Zealand coastline every week to make sure that shellfish are not contaminated with marine biotoxins from toxic algal blooms. Samples of water and shellfish are collected by health protection officers regularly. Public warnings are issued when shellfish are not safe to eat. This information can be found on the following web page: http://www.nzfsa.govt.nz/consumers/food-safety-topics/marine-biotoxin-alerts/index.htm (viewed 20 April 2006).

The South Taranaki Whanganui coast has on occasions, been closed for shellfish gathering because of a toxic algal bloom and the detection of high levels of Paralytic shellfish poison (PSP) in shellfish. Shellfish closures are put in place as a precaution when the levels of PSP reach unacceptable levels. Closures have been put in place over the summer of 2000, the summer of 2001 and between September and December 2003.

20 CONSENT MONITORING

Introduction

Under the Resource Management Act 1991, anyone discharging to the environment must have resource consent from a regional council, either Horizons Regional Council or Taranaki Regional Council, depending on the location. Monitoring is frequently required as a condition of such consents.

The purpose of this monitoring is twofold:

- to ensure the applicant responsible meets the conditions of its discharge consent; and
- to check on the impact the particular discharge might be having on the marine environment.

This chapter summarises the results of the environmental monitoring from the following discharges:

- Fonterra Whareroa/Hawera municipal combined outfall;
- Pacific Natural Gut String Company;
- Manaia Oxidation Ponds; and
- Patea Oxidation Ponds.

Those significant discharges that are not being monitored, for which current consents are held include:

- Wanganui wastewater treatment outfall.

TABLE 20: SUMMARY OF CONSENT MONITORING

LOCATION	TYPE OF MONITORING	REGIONAL COUNCIL	RECORDS HELD SINCE
Pacific Natural Gut String Company	Marine ecology	TRC	1989
Fonterra/Hawera municipal – Tangahoe River to Waihi reef	Marine ecology Shellfish tissue monitoring Beach Water quality (Enterococci)	TRC	1986
Manaia oxidation ponds	Marine ecological inspection	TRC	1998
Patea oxidation ponds (Patea river – 200m downstream of discharge)	Faecal coliform Samples analysed for water quality including enterococci and any visual effects of the discharge on the river.	TRC	1994
Wanganui wastewater	None	Horizons	

Source: TRC; HRC

Active coastal permits

There are 17 coastal permits active under the jurisdiction of Taranaki Regional Council within the South Taranaki study area and a small handful under the jurisdiction of Horizons Regional Council (Table 20). The majority of these consents are for minor structures built within the coastal marine area, e.g. boat ramps. A few concern drilling and freshwater use associated with hydrocarbon exploration, also relatively minor, and four concern discharges to the environment. (Table 20)[379]

Unauthorised incidents

The number of unauthorised incidents on the coast is low. Of all incidents reported to the Taranaki Regional Council each year, only between 3% and 5% are coastal related, and the majority of incidents reported to Horizons in the coastal area are air/odour related.

Gaps in consent monitoring

The Taranaki Regional Council monitors all consents that have the potential to have any adverse effects on the environment such as discharges. More minor consents, such as for boat ramps or structures, are not monitored on an annual basis.

The Wanganui wastewater discharge off South Beach is not being monitored until the discharge is fully treated (July 2007). This falls within the Horizons Regional Council region, and falls just outside the study area.

Fonterra Whareroa/Hawera municipal combined discharge

Single largest discharge in South Taranaki

The only major discharge into the study area is the combined Fonterra Whareroa/Hawera municipal outfall. The Fonterra plant was formerly known as NZMP Whareroa and, before that, Kiwi Dairies Ltd.

Wastewater discharge is via a long pipe which extends 1845 m offshore.[380] It was constructed in 1997 and has been used by Fonterra since then to discharge at a maximum rate of 26,000 m^3/day.

In February 2001 the Hawera oxidation ponds were connected, allowing a treated municipal discharge of 10,000 m^3/day.[381]

Prior to the construction of the long outfall, both wastes were discharged onto the shoreline and nearshore zone, resulting in unacceptable environmental impacts.[382]

Ecological diversity and shellfish tissue monitored

Measures of ecological diversity and shellfish tissue monitoring are undertaken to monitor the impacts of the outfall on the surrounding environment.

Marine ecology improved since long outfall installed

Marine ecology in the vicinity of the former NZMP Whareroa discharge has greatly improved since the new outfall was built. Monitoring is undertaken annually on a joint basis with Ngati Ruanui.

Since 1997, yearly spring and summer survey results have generally shown a considerable improvement in the health of the intertidal communities, primarily through a dramatic improvement in water quality. The evidence for this includes:

- An increase in ecological diversity;
- Decreased coverage of the seaweed Chaetomorpha sp.;[383]
- The disappearance of filamentous bacterial growths at the two most affected sites – at 30 m and 200 m southeast;[384]
- Disappearance of undesirable bacteria;[385]
- Increased coverage of desirable, common seaweeds and animals such as Corraline paint, Corraline turf, Ralfsia sp. and Ceramium sp.;[386]
- Fish observed from the camera surveillance of the outfall structure; and
- An observation that the area is becoming more popular with recreational fishers.

The two seaweeds Ulva sp. and Gigartina sp. are still very abundant. They are thought to be benefiting from the residual nutrients in the sediment. Over time it is expected that these seaweeds will decline in abundance to levels seen at other reefs.[387]

Environmental factors cause recent drop in ecological diversity

In spring 2003, all six monitoring sites, including the Waihi Reef control site, decreased in ecological diversity compared to the previous year. In the 2004 spring survey there was a further decrease at all sites sampled.

Species diversity and abundance dropped to levels below what was present before the long outfall was commissioned.

However, the control site could not be sampled in 2004 because the tide made it inaccessible.[388] The most recent results from the 2005 summer monitoring show diversity at most sites starting to recover (except for Pukeroa Reef).

This decrease in ecological diversity appears to be the result of environmental factors, rather than an effect caused by the Fonterra/ Hawera municipal combined outfall.[389]

The control site has also been affected, and high proportions of sand were observed in the sampling quadrats at times corresponding to the decreases in ecological diversity.

These environmental factors could be due to the rough seas experienced over the winter, and the increased turbidity of the water and sediment on the reef due to the large amounts of slips that had occurred along that stretch of coast. These slips have caused large clumps of clay and mud to be present out on the reef, which reduced the amount of suitable habitat for the intertidal animals to live on and under.[390]

Long term monitoring programme allows improvements to be tracked

The existence of a long term and consistent monitoring programme allowed changes in the marine environment around the outfall to be properly tracked.

Before construction of the outfall, at least 10 years of monitoring data had been collected. Since that time, a further 8 years of data has been collected. This information base has proved invaluable in meeting the aims of the monitoring programme, which are:

- To indicate any change in biological community structure attributable to the presence of the wastewater discharge via the outfall; and
- To determine any improvement in the adverse ecological effects previously attributed to the discharge through the old near-shore outfall. [391]

The sampling sites are those used for monitoring the Hawera municipal wastewater discharge, before it was connected to the Fonterra discharge pipeline.[392]

Shellfish tissue monitoring

Shellfish monitoring is undertaken along the coastline from northwest of the combined outfall, for several kilometres to the southeast (direction of longshore drift), as far as the Tangahoe River.

The aspects monitored include bacteria and trace metals.

Overall drop in bacterial levels

Since the Hawera wastewater was connected to the long outfall, faecal coliform bacterial levels in shellfish tissue have at most times been at acceptable levels to meet the recommended standard for human consumption (230 MPN/100 g). Prior to connection of the Hawera discharge, the recommended standard was exceeded more frequently.

The standard limits are still occasionally exceeded, but it is possible that this is due to the influence of the Tangahoe River flooding which has had very high levels of faecal coliforms on these occasions.

Trace metals not a problem

Levels of the trace metals cadmium, chromium, copper, mercury, nickel, lead and zinc in shellfish tissue have been monitored by TRC as part of consent compliance monitoring programmes for a number of years. Results show that trace metal concentrations in all samples collected at potentially impacted and non-impacted coastal sites have been consistently well below the Department of Health Food Regulations 1984 and recently gazetted New Zealand Food Standard 2001.[393]

Pacific Natural Gut String Company

Waste water discharged directly to coast

Since 1976[394], the small Pacific Natural Gut String Company Ltd has operated a processing plant on SH 45 west of Manaia, in the Kaupokonui catchment. This is just beyond the northern limit of the study area. Since the study area boundary is just to the southeast of the pipe outlet, which is in the direction of longshore drift, any effects of this discharge are reviewed here.

Wastewater is discharged from the plant directly into the Tasman Sea.[395] The waste includes various chemicals, storm water and animal products. The discharge runs along a pipe to the coast, exiting just a few kilometres to the west of the study area.[396]

Localised impact on coastal environment

The discharge has been monitored annually for the last 16 years by visual inspection and sampling. Chemical sampling has been of the effluent only, not the receiving waters. The receiving waters are however sampled as part of the Manaia oxidation pond discharge monitoring programme.

Although operation has predominantly been within the limits of the consent conditions,[397] monitoring during 2003 found that the discharge might be having an indirect effect on the reef ecology in the area.

There was a high silt level on the reef most likely caused by the discharge over the cliff suspending sediment and transporting it across the reef and into the rock pools where it was able to settle. Fewer species were present within the area of the discharge on the reef.[398]

Wider impact unlikely

Nevertheless, the effect described in 2003 was local, and monitoring in 2004 supported this, which found the reef was in a healthy state compared to other reefs around the coast, out of the influence of the discharge.

Manaia Oxidation Ponds

Treated effluent discharged to sea

The Manaia oxidation ponds discharge up to 330 m^3/day of treated sewage effluent into an unnamed stream, which then runs into the Tasman Sea.[399] This site is also just out of the study area for this project. The waste can also include Natural Gas Corporation Production Station wastes during emergency situations or low flow periods.

Marine ecological monitoring has been conducted on the receiving environment since 1998, at low tide, in the vicinity of the discharge. Inspections are carried out twice a year – in early summer and again in late summer.[400] The discharge and receiving waters are also sampled for bacteriological water quality at two sites, either side of the discharge, during winter, mid and late summer.

Localised impact on marine environment

Monitoring data collected since 1998 shows there to be an on-going localised effect on some marine species within the vicinity of the stream, as a result of nutrient enrichment.[401]

The discharge is also having an effect on the marine environment in terms of the silt loading on the reef. Silt acts like cement, sticking all the rocks together, which removes the under boulder habitat available for species to colonise.[402] Once the influence of the stream is absent, there is no silt on the reef.[403]

The remaining reef has, for the duration of the monitoring, been typical, in diversity and abundance, of other Taranaki reef sites.[404]

The treatment system is in the process of being upgraded.

Patea Oxidation Ponds

Treated wastewater discharged to river

The Patea oxidation ponds discharge up to 450 m^3/day of treated wastewater into the Patea River less than 1 km upriver from the river mouth.[405]

Monitoring comprises water quality testing in the Patea River Estuary where several physical and chemical parameters are measured.[406] There is a minimal visual impact of the discharge on the receiving waters of the Patea River. Water quality surveys are undertaken three times each year.

Faecal coliform numbers (130–140 per 100 mls) are typical of the lower reaches of a large river draining a developed catchment. Monitoring has shown that the bacterial water quality measured downstream of the discharge is usually similar to that measured upstream of the discharge.

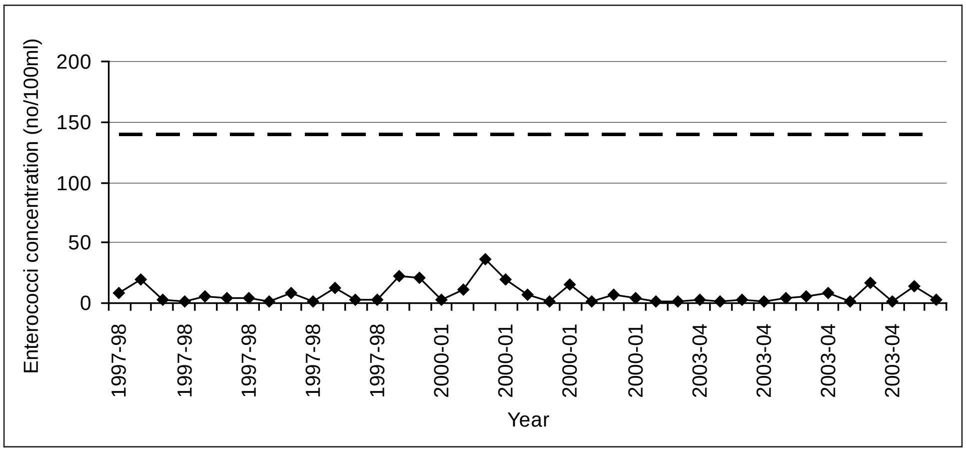
No significant impacts recorded

Bacterial numbers recorded below the discharge are well below the safe limit in the 2003 Guideline for Bacteriological Water Quality for Marine and Freshwater (MfE 2003) (Figure 15).

No significant impacts of the Patea treatment system on adjacent receiving waters were measured during the 2004-2005 monitoring period.

Nethertheless, the system is being upgraded as part of the consent renewal process presently underway.

FIGURE 15: ENTEROCOCCI CONCENTRATIONS AT PATEA BEACH 1997-2004



Source: TRC

Wanganui wastewater discharge

Wanganui wastewater scheme discharged to river and coast

The Wanganui wastewater scheme discharges up to 30 000 m^3/day of wastewater, including trade waste and partially treated domestic sewage, to the coastal marine area. The main discharge point is immediately to the southeast of the study area. [407] The wastewater is currently only partially treated (screened) but from 2007 it will be fully treated.

Discharges into the coastal marine area include three discharge points into the estuarine reaches of the Whanganui River (downstream from Cobham Bridge where it is zoned coastal marine area). These are used when storm water is overloaded. The main discharge point is at South Beach via an outfall pipe that takes the wastewater 1800 m off the beach.

The scheme itself also has other discharge points, but these are on the Whanganui River upstream of the coastal marine area.[408]

Periodic overflows pose health risk

When overflows occur, and raw sewerage is discharged into the river estuary (about 4% of the time), contact recreation may be rendered unsafe due to microbiological contamination. The storm water separation programme should, over time, reduce the number of these incidents.

Shellfish in the vicinity are likely to be unfit for human consumption.

No current monitoring programme

The discharges from the Wanganui wastewater scheme are not being monitored, so no quantifiable information is available on the impact of the discharges on the coastal marine area.

Future monitoring programme planned

A condition of the consent granted to the Wanganui District Council is that a monitoring regime be in place from 2007.

Monitoring will be required initially at five year, and later at ten year intervals. If non-compliance is found, monitoring may need to be conducted more frequently.

21 MANAGING THE COAST – WHO DOES WHAT?

Introduction

In New Zealand, the coastal marine area is managed under several different laws and several different agencies. This chapter describes these laws and the responsibilities and roles of the agencies that administer them.

The coastal marine area is defined in law as the area between the mean high water spring tide mark and the 12 nautical mile limit offshore.[409]

The uses of the coastal marine area that are managed include:

- fishing, in all its various forms;
- shellfish gathering and taking of kaimoana;
- aquaculture (fish farming);
- structures on, or in the seabed or the beach, e.g. wharves, platforms, pipelines;
- reclamations;
- discharges to the beach or sea, including to the air above the sea;
- mining or extraction from the beach or seafloor, e.g. taking sand;
- dumping of waste, e.g. sand or spoil; and
- using, damming or diverting seawater.

In this chapter

This chapter discusses the roles and responsibilities for the following organisations:

- Ministry of Fisheries;
- Regional Councils;
- Department of Conservation;
- District Councils; and
- Maritime New Zealand.

It concludes with a brief discussion on some recent multi-agency policy developments.

Ministry of Fisheries

What does the Ministry of Fisheries do?

The Ministry of Fisheries is the government agency responsible for the conservation and management of the fisheries, and carries out functions primarily under the Fisheries Act and associated regulations. The Ministry of Fisheries (MFish) was established as a stand-alone agency on 1 July 1995. MFish's primary purpose is to ensure that fisheries are sustainably used within a healthy aquatic ecosystem.[410]

MFish must consistently monitor the fisheries and advise the Government on all aspects of fisheries management. The Ministry is also responsible for carrying out the Government's policies to manage and conserve fisheries, and to actively encourage compliance of fisheries regulations by all fishers.

The Ministry of Fisheries has responsibilities under the Fisheries Act 1996. This provides for the management of fisheries, including shellfish. Under this Act, MFish administer the fisheries quota management system and other tools aimed at ensuring sustainable fisheries.

The Fisheries Act specifies responsibilities and controls on the setting and allocating of quota, the establishment of appropriate fish harvesting methods, the setting of seasons and the setting of size limits.

Managing the total allowable catch

Fisheries management areas that encompass the South Taranaki coast study area include:

- Quota Management Area 8; and
- Fisheries Statistical Report Areas 37 and 41.

Customary fishing

The Ministry of Fisheries approves and enforces Maori customary fishing arrangements under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.

MFish is also responsible for the approval and enforcement of taiapure and mataitai. These are areas of special significance to tangata whenua, which they manage as a source of food, or for spiritual or cultural reasons. As yet, there are none of these local fisheries areas in the study area.[411]

Sustainability Measures Round

The Ministry of Fisheries provides the Minister of Fisheries with annual advice on sustainability measures and other management controls. These measures include total allowable catches, apportioning that catch among customary, recreational and commercial fishers, and regulations to manage the impacts of fishing on the environment which can be at a national, regional or local scale.

Regional councils

Regional council jurisdiction

Two councils have jurisdictions that fall within the South Taranaki coast study area. These are:[412]

- Taranaki Regional Council in the northwest; and
- Manawatu-Wanganui Regional Council (Horizons Regional Council) in the southeast.

The boundary between the two regions in the coastal marine area is a line extending from a site east of Waiinu Beach, being the southern edge of the Waitotara River catchment.[413] The council's seaward boundary is the 12 nautical mile limit.

What do the regional councils do?

Regional councils have coastal marine area responsibilities under two main Acts. These are:

- Resource Management Act; and
- Maritime Transport Act.

Under the Resource Management Act they must have a regional coastal plan. Its main role is to guide the decisions they make on coastal consent applications.

Under the Maritime Transport Act they must have an oil spill contingency plan to manage potential impacts on the environment.

Coastal plans under the Resource Management Act

A regional coastal plan must promote sustainable management of natural and physical resources in relation to the coastal marine area.[414]

The activities the coastal plan has to cover include structures, reclamation and foreshore works, air quality, extraction of sand, shingle and shell, taking, using, damming and diversion of water; discharges; and dumping of waste.[415]

The plan does this through identifying:

- issues to be addressed by the plan;
- objectives to be achieved that address those issues;
- policies and methods, including rules to be used to achieve the objectives; and
- the anticipated environmental results.[416]

Regional coastal plans in South Taranaki

The regional coastal plans of both regional councils became operative in 1997.[417] Taranaki Regional Council intends to begin a review of its regional coastal plan in 2006. Horizons Regional Council is reviewing all its regional plans in its 'One Plan' process, including its regional coastal plan. A draft 'One Plan' is expected to be notified in 2006.

Both regional councils have identified different management zones in their plans. These zones reflect environmental differences in parts of the coast. Different rules are applied depending on which coastal zone is involved.

In addition, the plans identify areas of 'outstanding natural value' as required under the Resource Management Act.

Outstanding natural areas recognised in regional coastal plans

The plan lists the following areas as being significant, and seeks to manage resource use and development in a manner that sees their values protected:

- Waitotara Estuary;
- Waiinu Reef;

- Waverley Beach;
- North and South Traps;
- Whenuakura Estuary; and
- Whanganui River Estuary.

Making decisions on coastal consents

Activities in the coastal marine area are managed and controlled through the resource consent process.[418]

A regional coastal plan can specify different classes of rules. These are set out in the table below. The system is designed to keep adverse impacts of an activity to a minimum. Applicants for coastal consents may well have to take steps to avoid or remedy any damage to plants, animals or the physical environment.

TABLE 21: TYPES OF RESOURCE CONSENT

ACTIVITY CATEGORY	DESCRIPTION	COASTAL CONSENT REQUIRED
Permitted activity	Can be done as of right if certain conditions are met	No
Controlled activity	Council must give permission but can specify controls	Yes
Discretionary activity	Council can say no and can specify controls	Yes
Non-complying activity	Council can say yes only if effects are minor, can specify controls	Yes
Prohibited activity	No consent can be granted	Activity not allowed

Source: TRC; HRC 1997.

Other regional council responsibilities under RMA

In addition to their specific responsibilities in the coastal marine area, other regional council responsibilities have a bearing on the coastal marine area. These include:

- soil conservation;
- management of rivers and lakebeds;
- management of surface and ground-water;
- management of hazardous substances; and
- management of natural hazards.

These need to be considered alongside coastal marine area management functions so as to achieve integrated management and consistency.[419]

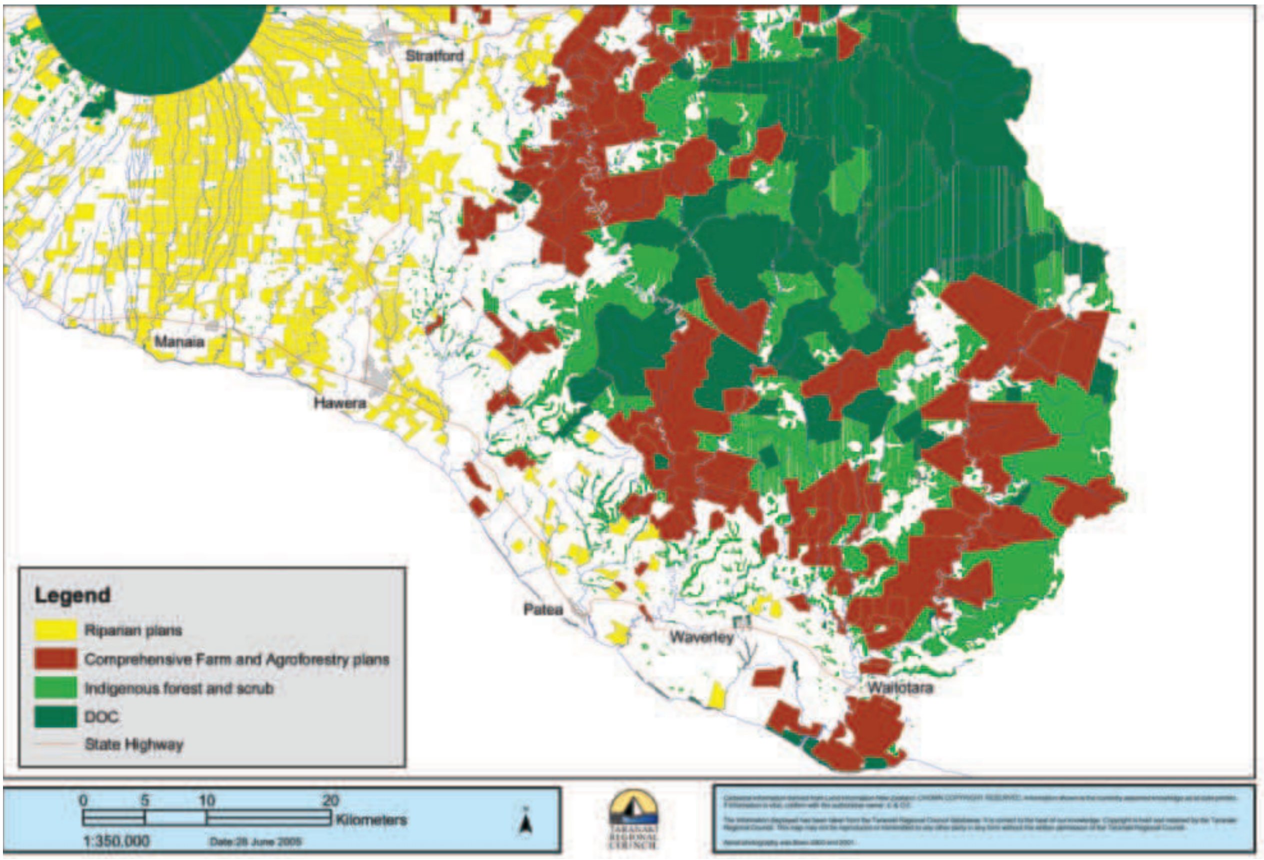
Land plan considers coastal impacts

An aspect of the Resource Management Act that is particularly important is the onus on those preparing plans to think about connections with the environment beyond just what their particular plan is for.

The Regional Freshwater Plan for Taranaki aims to improve inland water quality, which ultimately affects the quality of water discharged to the coastal waters. Significant parts of the Freshwater Plan deal with the control of discharges to rivers and streams. The plan also addresses *the effects of run-off into rivers from agricultural land by promoting activities such as stream bank riparian planting.*[420]

The Taranaki Regional Council has prepared riparian, agroforestry and comprehensive farm plans for a large part of the region (figure 16).[421]

FIGURE 16: RIPARIAN, AGROFORESTRY AND FARM PLANS PREPARED BY TRC



Source: TRC

Marine pollution regulations

Regional councils are responsible for enforcing the Resource Management Act (Marine Pollution) Regulations 1998.

These regulations deal with the dumping and incineration of waste and the discharge of sewage, garbage, ballast water and other wastes from ships and offshore installations.[422]

Maritime Transport Act responsibilities

Under the Maritime Transport Act 1994, regional councils must plan for, and conduct, if and when necessary, what is called a 'Tier 2' response (including wildlife response) to marine oil spills that might occur.

Regional councils are responsible for maintaining a team of trained staff to deal with such emergencies.

Oil spill planning and response has two action levels or tiers - 'Tier 1' contingency plans are developed by individual companies or operators and set out the response to small spills.

'Tier 2' contingency plans set out the response to large spills beyond the ability of a company or operator to contain.

Oil spill management plans for South Taranaki

Both regional councils have prepared a regional Tier 2 Marine Oil Response Plan. The objective of the Taranaki plan for example, is to safely mitigate the effects of a marine oil spill and, if possible, assist with the restoration of oil damaged environments.[423]

Department of Conservation (DOC)

Department of Conservation jurisdiction

The South Taranaki coast study area is located within the Wanganui Conservancy of the Department of Conservation.

Wanganui Conservancy covers the area from the Manawatu River to the Mokau River.

What does the Department of Conservation (DOC) do?

DOC has coastal marine area responsibilities under the following Acts:

- Resource Management Act (1991);
- Marine Mammals Protection Act (1978);
- Marine Reserves Act (1971);
- Conservation Act (1987);
- Wildlife Act (1953) and;
- Foreshore and Seabed Act (2004).

Responsibilities under the Resource Management Act (1991)

DOC is involved in implementing the Resource Management Act in the following ways:

- DOC prepared the New Zealand Coastal Policy Statement – a national policy statement covering activities within the coastal environment.[424] This national policy is currently being reviewed;
- DOC advocates for conservation values through making submissions on proposed regional coastal plans, and other planning documents (e.g. district plans), which deal with management of the coastal environment;[425] and
- the Minister of Conservation has the final decision making on activities that are described as 'restricted coastal activities' (a special type of discretionary activity). The day to day management of these is however the responsibility of the regional councils.

Marine Mammals Protection Act (1978)

This Act protects all marine mammals within New Zealand waters from human disturbance and harm.

The Department responds to calls about stranded marine mammals. This allows it to maximise the use of dead specimens for the benefit of conservation, science, and for cultural purposes.

DOC issues permits for marine mammal watching activities.

Under the Marine Mammals Protection Act, no person is allowed to hold a marine mammal in captivity or take any dead or live marine mammal from its natural habitat or other place. If a person kills or injures a marine mammal (in the course of fishing or fishing under license or permit granted under the Fisheries Act) they are required to report this to an officer of the Department of Conservation or Ministry of Fisheries.

Marine Reserves Act (1971)

DOC has a role in establishing and managing protected marine areas through the creation of marine reserves under the Marine Reserves Act 1971.

Under this Act, marine areas can be preserved if they contain underwater scenery, natural features, or marine life which is of such distinctive quality, or so typical, or beautiful, or unique, that continued preservation is deemed in the national interest.[426]

DOC objectives for marine protection in South Taranaki

The Wanganui Conservancy's objectives in relation to marine protected areas are:

- identifying, establishing and effectively managing a network of marine reserves and protected marine areas;
- increasing knowledge of marine ecosystems;
- increasing public support for protection of the coastal environment; and
- assisting and encouraging local groups to investigate and apply for reserves.[427]

There are no marine reserves or marine protected areas in the study area.

Some of these objectives have now been superceded by the Marine Protected Area Policy described in Chapter 22.

DOC responsibilities under other acts for the coastal marine area

DOC has responsibilities under other acts and regulations for activities in the coastal marine area. DOC should:

- advocate the conservation and protection of marine biodiversity and protection of habitats under the Conservation Act 1987;[428]
- manage the whitebait fishery under the Whitebait Fishing Regulations

1994;

- protect some animals and birds under the Wildlife Act 1953. Marine mammals and other marine fish and marine invertebrates are not covered by this Act; and[429]
- carry out responsibilities under the Foreshore and Seabed Act – to act on behalf of the Crown as 'landowner'. Responsibilities include weed control and fire fighting, and removal of "nuisances" - abandoned cars and dead livestock below MHWS.

District Councils

District council jurisdiction

Two district councils fringe the South Taranaki coast study area. These are:

- Wanganui District Council; and
- South Taranaki District Council.

What do district councils do?

District councils have no direct role in the management of the coastal marine area below the mean high water spring mark. However, they do have reserves management responsibilities where they manage reserves adjacent to the coastal marine area.

Furthermore, they are responsible for protecting the natural character of the coastal environment from inappropriate subdivision, use and development under the Resource Management Act 1991.

District Councils are responsible for the control of most effects of activities landward of the coastal marine area, including activities in the coastal environment (above mean high water spring mark).[430]

The boundary between the two district councils is at Nukumaru.

District planning under the Resource Management Act

District plans have been prepared for both district councils.

Both aim to protect the natural character of the coastal environment, while providing for the development of existing coastal settlements and activities and enhanced public access to the coast.[431]

District plans manage land use and issues of subdivision and natural hazards.

> ***Special rules needed for coastal erosion risk***
>
> In 1999 it was recommended to Wanganui District Council that they define a Coastal Landslip Hazard Zone at Mowhanau Beach. This beach experiences severe erosion. Such a zone could be incorporated into both the council's Land Information Memoranda and the Proposed District Plan, including appropriate policies and rules to manage existing and future subdivision, use and development at Mowhanau Beach.[432]

In 2003 it was recommended council define Coastal Hazard Zones for all its existing coastal settlements as well as areas that have potential for coastal subdivision and areas where infrastructure could be at risk.

Extension of the Coastal Landslip Hazard Zones at Mowhanau Beach to include the mouths of Kai Iwi and Mowhanau Streams was also recommended.[433]

A 'Kai Iwi Beach Coastal Hazard Zone – (Overlay Zone)' appears in the Wanganui District Plan. Some activities are prohibited in this zone, others may be permitted, controlled, or restricted discretionary activities. Further provisions are made for the coastal environment in a 'Coastal Environment Special Management Zone', the boundaries of which are defined on maps accompanying the plan.

Maritime New Zealand

Under the Maritime Transport Act 1994, Maritime New Zealand (formerly the Maritime Safety Authority) is responsible for:

- maritime navigation and safety;
- marine pollution (e.g. Oil spill) prevention and response; and
- licensing the disposal of dredging spoil at sea (regional councils also issue permits for such activities).[434]

The Maritime Transport Act 1994 specifies nationwide restrictions relating to the discharge, transport and possession of harmful substances.[435]

Multi-agency policy developments

There are a number of national level initiatives that are being developed across agency boundaries that are of relevance to management on the South Taranaki coast. These are now discussed.

Oceans Policy

Beyond the 12 nautical mile limit fourteen government departments are involved in the marine environment, with at least 18 pieces of domestic legislation governing the ocean, and various other marine policy initiatives are still being promulgated.

To promote better integrated management of the marine environment, central government is currently developing an Oceans Policy. The policy will provide a clear statement of what New Zealanders, individually and collectively, value about the sea and coastline, and what relative priorities should be attached to different options at different times and in different places.[436]

The Offshore Petroleum Industry Environmental Practices Guideline

To encourage best environmental practice in the offshore petroleum industry, voluntary guidelines have been developed between central government and the industry by the Ministry for the Environment.

Parties are Biosecurity New Zealand, Department of Conservation, Maritime Safety Authority, Ministry of Economic Development, Ministry for the Environment, Ministry of Fisheries, Petroleum Exploration and Production Association of New Zealand, and the Ministry of Foreign Affairs and Trade.[437]

Purpose

The purpose of this chapter is to set out the various management tools that are available for marine management that can be used for local level management.

Fishing Exclusions under the Fisheries Act 1996

The purpose of the Fisheries Act is to ensure sustainability and the Act's principles require the maintenance of biodiversity.

Fishing exclusions can be used to protect ecosystems when the threat is fishing related or fishing is the only activity in the environment. For example the primary biodiversity asset on seamounts (underwater mountains) is the seafloor community. Bottom-disturbing fishing methods are the threat. Closing the seamounts to fishing effectively protects the ecosystem from known threats.

Fisheries plans

Fisheries plans also offer a potential mechanism for stakeholder and community initiatives to protect, maintain, or restore habitats and ecosystems that are important for marine biodiversity.

Marine parks

Fishing exclusions under the Fisheries Act 1996 can be used by local communities to create 'marine parks' although there is no specific 'marine park' creating legislation. For example, the Sugar Loaf Islands Marine Protected Area was initially proposed by a local community group who prepared a report for the Ministry of Agriculture and Fisheries, who in turn established fishing regulations under the Fisheries Act 1983 which controlled commercial and amateur fishing in the area. It was only later, in 1991 that a special law was created for the Sugar Loaf Islands to protect them from the adverse effects of oil prospecting and development.

Customary fishing tools

The Kaimoana Customary Fishing Regulations only apply in an area when tangata whenua have appointed Tangata Kaitiaki (Maori Committee) for that area. Until that happens, the only rule allowing the taking of fish for customary purposes is Regulation 27 of the Fisheries (Amateur Fishing) Regulations 1986.

Customary fishing authorisations are to be made on a standard form prescribed by regulations, and must specify a number of conditions including the purpose, quantity and size of the fish to be caught, and the dates, location and methods of fishing. An authorisation may also include requirements to satisfy tikanga and local custom.

Tangata kaitiaki must keep records and provide quarterly reports to the

Ministry of Fisheries of authorisations, catches and locations. They may also have a role in Ministry management processes, including providing comment on the activities of commercial and recreational fishers, which might affect Maori customary fishing. They may develop management plans for tangata whenua for the fisheries in their rohe moana.

Mataitai reserves

The Kaimoana Regulations also cover the establishment of mataitai reserves. These reserves provide a tool for tangata whenua to manage all non-commercial fishing in some of their traditional fishing grounds.

Mataitai reserves are areas set aside as traditional fishing grounds where tangata whenua have a special relationship with the place. They are established under the Fisheries Act 1996 to recognise and provide for non-commercial customary food gathering by Maori. Maori and non-Maori may fish in mataitai reserves.

The process of establishing a mataitai can be lengthy and includes consultation with the local community and written submissions from commercial quota owners and recreational fishers. Once a mataitai is established, commercial fishing is excluded from that area.

The day after a mataitai is established, the only difference is that commercial fishing may not occur in a mataitai reserve unless recommended by the tangata kaitiaki. They can make bylaws restricting or prohibiting the taking of fish, aquatic life or seaweed in the reserve, if they consider this necessary for sustainable management.

Rahui – temporary closure of a fishing area

The Fisheries Act also provides for temporary closure of a fishing area, or for restriction or prohibition of particular fishing methods, to be declared under sections 186A and 186B.

These closures, restrictions or prohibitions may be imposed to recognise and make provision for the use and management practices of tangata whenua in the exercise of non-commercial fishing rights, to improve the availability or size (or both) of fish, aquatic life or seaweed resources, and to recognise customary fishing practice in a particular area. A restriction or prohibition on a particular fishing method may be imposed only if that method is having an adverse effect on the use and management practices of tangata whenua in the exercise of non-commercial fishing rights.

Consultation with interested stakeholders, including tangata whenua, environmental, commercial, recreational, and local community interests must be undertaken before a closure, restriction or prohibition may be imposed.

Taiapure reserve

Taiapure is a newly coined mix of Maori words for ‘coast’ and ‘procedure’. Taiapure may be established under the Fisheries Act 1996 in estuarine and coastal waters that have customarily been of special significance to any iwi or hapū as a source of food or for spiritual or cultural reasons.

A taiapure proposal from a local community must go through a complex process before the Minister of Fisheries may approve the establishment of the taiapure and appoint the management committee. This committee then makes recommendations to the Minister for regulations for the conservation and management of the fish, aquatic life or seaweed in the taiapure.

Regulations apply equally to tangata whenua, to Maori from other areas, and to non-Maori, for the control of fishing in the area. Commercial fishing may be allowed within a taiapure, but only if the management committee recommends this as part of the regulations.

Marine mammal sanctuaries

Sanctuaries can be established under the Marine Mammals Protection Act 1978 to protect particular marine mammal species (e.g. dolphins, whales, seals, sea lions) by establishing areas within which activities known to have adverse effects on a species are prohibited.

Marine Reserves under the Marine Reserves Act

The purpose of the current Marine Reserves Act (1971) is to set aside areas for the purpose of scientific study if they contain underwater scenery, natural features, or marine life which is of such distinctive quality, or so typical, or beautiful, or unique, that its continued preservation is in the national interest. The purpose of the proposed new Marine Reserves Act will be to protect and preserve areas in the marine environment for the conservation of marine biodiversity.

Applications for marine reserves (under the 1971 Marine Reserves Act) can be made by any university, any body appointed to administer coastal reserve land, any organisation with an objective of the scientific study of marine life, tangata whenua or the Director General of Conservation. Marine reserve applications go through a long complex process of information gathering and consultation before being considered by first the Minister of Conservation and then the Ministers of Fisheries and Transport.

"Guardians of Fiordland" model - an example of community initiated management

The Guardians of Fiordland's Fisheries & Marine Environment Incorporated were a group of commercial and recreational fishers, scientists and iwi. They prepared a marine conservation strategy for Fiordland's fisheries and marine environment in 2003 to address their concerns about the impacts of human activities on Fiordland's fisheries and marine environment.

The strategy is the result of an eight year process of discussion, consultation and negotiation and provides conservation management measures for the Fiordland marine environment.

The strategy was then implemented by government through the passing of the Fiordland (Te Moana o Atawhenua) Marine

Management *Act 2005* and the establishment of the Fiordland Marine Guardians, a new advisory committee responsible for providing advice to management agencies and ministers on the management of the Fiordland Marine Area. The members of the new Guardians group represent the various sectors of the marine area's users, including recreational and commercial fishers, scientists, the local iwi Ngai Tahu, environmentalists and tourist operators. Government agencies involved are the Ministry for the Environment, the Ministry of Fisheries, the Department of Conservation, and MAF Biosecurity along with Environment Southland.

The Fiordland Marine Management Act:

- recognises the local, national and international importance of Fiordland's marine environment;
- creates the Fiordland (Te Moana o Atawhenua) Marine Area, encompassing 882,000 hectares, including Milford and Doubtful Sounds;
- creates eight new marine reserves, totalling about 9430 hectares, adding to existing reserves, and increasing the percentage of the fiords area in marine reserves from 1 to 13 per cent; and
- provides for the more effective management of 'marine areas of special significance': areas identified by the Guardians for their special and ecologically fragile features.

Marine Protected Area Policy and Implementation Plan

At the end of 2005 the Ministers of Conservation and Fisheries released a marine protected area (MPA) policy[438] to establish a more strategic approach to marine protection. This policy envisions the establishment of regional based forums, consisting of representatives from the various interest groups, to look at available information and identify where 'marine protected areas' should be applied for.

The Government is strongly committed to protecting representative samples of the full range of marine habitats and ecosystems as part of a wider strategy to effectively conserve New Zealand's biodiversity.

Key components of the policy include first establishing a consistent approach to the classification of marine habitats and then the establishment of a protection standard that will be used to assess whether individual management tools or a combination of management tools provide sufficient protection to a site for it to be designated as a marine protected area.

The policy outlines processes for marine protected area planning that are based on a common approach to habitat and ecosystem classification and are directed by the priorities identified in the inventory process. Planning for offshore marine protected areas will be implemented at a national level, while planning for nearshore marine protected areas will be implemented at a regional level.

Both the nearshore and offshore processes will be designed to allow for constructive engagement with tangata whenua, user groups, and the public to ensure that marine protected area planning is inclusive, without compromising biodiversity protection objectives. Both processes will be underpinned by a commitment to minimise the adverse impacts of new marine protected areas on existing users of the marine environment and Treaty settlement obligations.

A trial of the regional planning process is underway on the west coast of the South Island. A forum has been established there consisting of commercial, recreational and environmental interests, and is in the process of gathering information on the coast that will help it begin a process of identifying sites that should be included in a marine protected area network for the west coast of the South Island.

Part III Where to from here?

OVERVIEW

This project has highlighted the importance of the South Taranaki-Whanganui area for local residents, recreational fishers, commercial fishers and environmentalists. Drawing on many years of experience from those who contributed information for the project has identified that this area has an important fishery but that there have been significant and noticeable changes.

Even more importantly, this project has resulted in a greater understanding of stakeholders and issues associated with coastal management. Informal but important relationships have been established.

The review of the literature (Part II of this report) further highlighted a number of areas for which further research and information would be desirable.

Practically everybody, including those who felt that fishing had not changed, put forward suggestions for changing the management of the area – from changing rules to establishing forums to facilitate greater input from locals and resource users in how the area is managed.

In addition, this project has begun to establish open and positive relationships between the various users and managers of the coastal area. This in itself is an important outcome that needs to be maintained by ongoing communication.

In this chapter

This chapter identifies gaps in knowledge and information about the South Taranaki-Whanganui coastal marine area that became apparent during the course of this research.

It discusses the management suggestions put forward by respondents and recommends how these might be further worked on and followed up by both agencies and the community.

Future information gathering

Introduction

This project was initiated as an outcome from a coastal inventory project undertaken by the Department of Conservation and Taranaki Regional Council, which highlighted a lack of published reports for the South Taranaki coast.

Since the completion of that inventory, the application and environmental effects report for the Kupe pipelines and platform undertaken for Origin Energy have now become publicly available. The literature review undertaken for this project drew heavily on the work undertaken for Origin Energy.

Despite this, there are obvious gaps in available information which are discussed below.

Lack of information on the nature of the seafloor biology

In terms of the seafloor biology, both subtidal and intertidal, there is a paucity of published surveys available for this part of the coast, particularly the section of the study area described as the 'papa-rock coast' (from Castlecliff to the Waingongoro River).

In addition, despite being recognised as areas of importance in regional coastal plans, there is little information available on the biology of the estuaries within the area. Little information on bird communities of the estuaries has been published, although some observations may have been gathered by the Orthinological Society. Apart from some monitoring of sand and mud dwelling invertebrates undertaken by Taranaki Regional council in one estuary, information on other estuaries is definitely lacking.

Lack of information on the nature of the seafloor

There are anecdotal descriptions of features of the seafloor that are important for the biology of the area, however very few of these features have been formally mapped. Recreational fishers and divers have described in the course of this study areas of papa reef or rubble that are not depicted on any chart.

Mapping of the seafloor features, whilst examining uses of the various habitat types by fish or seafloor creatures, would be a valuable first step towards gaining a better quantitative picture of the area. Recent video camera mapping of the North and South Traps is a start[439].

Lack of information on the fish diversity and abundance

It is clear from the responses obtained from both recreational and commercial fishers that this area is of high significance both in terms of diversity and abundance of fish recorded. However, this does not tally with the very few scientific surveys that have concluded that the area generally has a paucity of species. Whilst studies into the local fish life have been hampered by visibility and weather, it is suggested that further local level research into fish diversity and abundance in this area is warranted.

Frequently research into fish stocks is undertaken at a much larger scale than the scale at which this project was targeted. It is impossible to take information gathered at the scale of say the entire west coast of the north island, and apply it to the area of interest. However, it is at the local scale that people are generally most interested.

Research into specific species, such as the spiny dogfish, was certainly identified by those interviewed as being necessary.

Lack of information on the recreational use of the area

This project has been one of the first to highlight the importance of the South Taranaki Bight for recreational fishing. However, the nature of the research was such that it was unable to quantify the level of recreational use, or obtain data on the frequency of use, areas most frequented, other types of recreational activity etc. It is likely that more quantitative information is going to be required for future management.

Research into data held by local people – such as their fishing diaries or log books could be a method to better quantify recreational use of the area, catch rates and possibly changes to the fishery over time. A number of people indicated through this project that they would be happy to make this information available. This included commercial fishing information from former commercial fishers such as Audrey Cox.

Lack of information on current and historic customary use of the area

Nga Rauru and Ngati Ruanui were represented on the project team and consequently were able to provide excellent input to the project. Unfortunately however, Ngati Ruahine and Tupoho were less able to be involved due to other priorities and time pressures. The report highlighted a potential need for more marae-based information gathering on current and historic customary use of the area.

One alarming discovery through this project was that in some places elders are becoming reluctant to pass on traditional knowledge, because of a perception the resource might then be misused, and as a consequence it is becoming lost from even those within the iwi.

Recommendations for further information gathering

The following actions are recommended:

Undertake, as part of background work for the upcoming Taranaki and Horizons regional coastal plan reviews, research that will:

- describe the nature of the seafloor biology between Castlecliff and Waingongoro;
- describe the estuarine ecology for the Waitotara, Patea and Whenuakura estuaries; and
- survey and map the seafloor along the 'Papa rock' coast between Ohawe and Castlecliff.

Undertake, using fisheries research funds and other environmental funds to which this may be appropriate, research that will:

- describe the diversity and abundance of fisheries in the South Taranaki Bight;
- investigate the perceived proliferation of spiky dogfish and paddlecrabs;
- search out and analyse locally held fishing records;
- quantify recreational fishing taking place in the South Taranaki Bight; and
- quantify both historic and current customary use of the area.

Progressing ideas for management

Introduction

This research has highlighted that the South Taranaki-Whanganui coastal marine area is a highly significant area. People recognised the special nature of the coast and also that it could be vulnerable to a number of risks. At the least those interviewed on the whole sought that the area stayed the same; and some respondents sought that the sustainability of the area be improved, and/or its values and amenities enhanced.

Virtually all respondents put forward ideas to change or improve management of the area. The suggestions made are discussed below:

More local involvement wanted for fisheries management

A key theme arising when people were asked for suggestions for future management was a desire for more input at a local level to fisheries management. However there was no clear consensus on the form that this might take. As the research did not quantify, nor obtain views from respondents on what was already in place for facilitating local level management, a useful first step would be to do this.

The Ministry of Fisheries, for instance, runs a 'Fisheries Liaison Committee' which includes both recreational and commercial fishing interests and serves as a forum for raising concerns or ideas about research needs, quota levels, fishing rules etc. However, recent low attendance at these meetings seems to signal a lack of interest in such a local forum, and may lead to the end of the Wanganui Fisheries Liaison Committee. This is in direct contrast to the views expressed by many of those interviewed through this research.

A discussion by the project team, or a similar grouping of iwi, agency, industry and community representatives, could be a useful means of teasing out whether the results are simply because people don't know about the liaison committee, or because there is a perception (or possibly a reality) that it cannot enable local level management in the manner sought by many respondents.

In addition, the Ministry of Fisheries has set up regional recreational and customary forums (although at a far larger scale than this project) which could also potentially play a role in enabling greater local level management.

Both regional councils are looking to review their coastal plans in the near future. There may be an opportunity, through those coastal plan reviews, to incorporate aspects of the suggestions made for local level management. However, this would not deal with the management of fishing, which appeared to be of more concern to those interviewed.

Changing agency responsibilities

A related suggestion made by some respondents was for changes in the agencies responsible for the coast. There was a perception some would do a better job than others, and that there were both overlaps and gaps in management.

Effort into achieving more integrated management between the agencies with coastal management responsibilities could be a means of taking on board these suggestions in the short term, given any changes to agency roles may necessitate major policy and/or legislative changes before they are adopted.

This might take the form of more regular inter-agency meetings, and formalised involvement with plan and strategy development processes to ensure better integration. Delegations of authority may be another inter-agency option.

Improvements to enforcement

One of the matters behind the call by some for changes in agency responsibility was a perception that enforcement levels were inadequate, with some mentioning nearshore and inshore areas.

Whether in fact enforcement does actually need to be improved is a matter that requires further discussion, including discussion with those involved in the enforcement role, and those that perceive it to be inadequate.

More education required

A major theme that came through was for more education and awareness-raising. Two elements appeared important: firstly, education about the resource, the state of the resource and steps to manage it sustainably; and secondly, education about the various marine resource users, particularly commercial fishing practices and impacts. Proponents felt that such education would help improve understanding between recreational and commercial fishers.

This could be pursued through the following types of actions:

- publishing this report and disseminating it widely could be a way of raising awareness of the importance of the area;
- presentations on the key outcomes of the research could be made to various community groups;
- posters, pamphlets, videos, etc could be produced to educate people about the special values of the coast;
- information about commercial fishing boats, gear and practices could be circulated by the fishing industry;
- newspaper stories could be written about events happening in the area, or results of research undertaken, etc.; and
- a South Taranaki-Whanganui coastal newsletter or website could be developed.

More communication and consultation

Related to the education theme were many suggestions seeking greater communication between agencies, between agencies and the community and between the various sector groups (e.g. between Maori and other recreational fishers).

Some options for increasing communication could be:

- access to other research on the web, for example through the Taranaki Regional Council explorer website; http://www.trc.govt.nz/xplorer/xplorer.htm and the Horizons Regional Council site http://www.horizons.govt.nz/;
- regular information sharing through the project team, or some new but similar forum that continues to meet regularly (even if only annually), which could help to maintain and strengthen those relationships now forged, and enable cross fertilisation of ideas and issues; and/or
- a South Taranaki-Whanganui coastal newsletter or website as suggested above.

Suggestions for changes to management in specific areas, e.g. commercial and recreational fishing

Many different ideas for improving future management in specific areas were put forward. These included changes to management for:

- marine protection,
- recreational fishing,
- commercial fishing,
- customary fishing,
- coastal development,
- coastal erosion, and
- land uses.

The ideas put forward for each of these areas require evaluation and critique before recommendations are made in respect of them.

What could be a useful next step, would be to reconvene the project group or a group of similar composition, and at that meeting, or a series of meetings, workshop the suggestions made with the help of experts in a position to comment on the following aspects, in relation to each of the areas listed above:

- what mechanisms are currently in place, and how well they are working, for example, rahui in particular areas;
- what voluntary, policy or legal mechanisms exist to implement a suggestion, for example, land use rules in district plans as a means of reducing land use impacts on the coast; and
- what are the costs, benefits and practicalities of each suggestion, for example, the effectiveness or otherwise of changing fishing tackle in managing particular fish species?

Out of this, as a continuation of the ‘action research’ model used in this project, suggestions seen as having real promise could be identified and steps taken to work out how best they could be trialled and implemented.

This might take the form of exploring ideas from Part II of this report (chapter 11) which sets out some of the tools through which such alternatives might be implemented. Or, it could take the form of putting forward suggestions to the appropriate agency for changes – e.g. those suggestions made seeking changes to land management, where it affects the coast, could be put to territorial local authorities and regional councils, for incorporation in upcoming plan reviews.

Recommendations for progressing management ideas:

The following actions are recommended:

Convene a meeting of those agencies involved in management of the coastal marine area, to:

- seek a commitment to continuing the project team to enable a further cycle of action research, so that the suggestions made here can be workshopped and evaluated, and from that, specific recommendations made by that group for future management of the coast;
- consider options for better integrating coastal management within and between agencies; and
- identify a means for reviewing enforcement levels and strategies in consultation with coastal users.

Convene a meeting, or meetings of the project team with the purpose of assessing the suggestions made in this chapter, including:

- deciding, after consideration of all the options, on the form and nature of 'local level management' to promote with relevant agencies;
- education and communication initiatives to be adopted separately or jointly by project team members;
- deciding on the future or otherwise of the project team, including whether any new, multi-group forum should be initiated; and
- forwarding copies of this report to relevant agencies, highlighting those suggestions and recommendations of relevance to them.

Appendix 1

FACE-TO-FACE INTERVIEW QUESTIONS

Preliminary questions:

1. Are you happy to have your name included in the list of people interviewed to go in the final report?
2. Would you like a copy of the final report?
3. How long have you lived in the South Taranaki area?

Current use of the coast:

4. How do you use the coast?
5. How long have you used this area?
6. How often do you get out?

Your experience of the coast

7. Tell us about the best day you've had out there.
8. What was your worst day?
9. What do you know of the history of fishing in this area, or the history of diving or of coastal resource use in this area?

Areas of Use

10. Where are you fishing/diving/gathering kai moana? (recorded on map)
11. Does where you fish/dive/gather kai moana change according to the weather?
12. What type of seafloor do you target?
13. Can you tell us what it's like down there?
14. What are the common fish caught / seen ?
15. What other species are you catching?
16. Where? (Indicate also on map)
17. What is it rare to catch?
18. Where?
19. [if applicable] What fishing gear are you using?
20. Who else is using the resource?

Changes

21. Is it easier or harder to catch fish / see marine life / gather seafood than in the past?
22. Why do you think this is?

23. What else has changed? (changes in who's fishing or gathering kaimoana, how they're doing it (technology), where they're doing it, weather, ocean etc), Why?

Marine Mammals

24. Do you ever see marine mammals when you are out on the coast?
25. What species? Where?
26. What mammals is it rare to see? Where?
27. What changes have you noticed in the species you've been observing? (numbers, location, different species etc), Why do you think this is?

Birds

28. What birds do you see when you are out on the coast? Where?
29. What is it rare to see? Where?
30. What changes have you noticed in the species you've been observing?
31. (numbers, location, breeding or not etc), Why do you think this is?

Customary questions (if applicable)

1. What is your iwi/hapu/whanau's association with this part of the South Taranaki coast?
2. How was the coast used in the past?
3. Where were kaimoana gathered?
4. How has this changed over time?
5. Where is kaimoana gathered now?
6. Who else is using the resource?
7. How were species managed traditionally?
8. How are they managed now?
9. Are these management approaches working?
10. [If not] what could be done to improve it?

Aspirations

32. What's important to you about the South Taranaki coast area?
33. Is anything at risk? Why?
34. [if a risk is identified] How would you like to see this dealt with?
35. What do you want the area to be like in the future?
36. Describe how you'd like it to be in the future
37. What do you want for its future management?
38. If people have different views about what they want for the coast, how could we reconcile these different views in the future?

Closing questions

39. What questions do you hope that the research we are doing will answer?
40. What other research do you think should be done?
41. Do you have written records about this area?
42. [If yes] Would you be prepared to make these available for further research?
43. Do you have photos of the area that could be used in our final report?
44. Who else could you recommend we talk to, who has a good knowledge of the South Taranaki Coast area?

Appendix 2

FISH COMMON TO SOUTH TARANAKI

In the absence of specific research about fish species of the area, the following information has been summarised from Paul (2000), Francis (1988) and Andrew and Francis (2003). Information on fish growth, maturity and reproduction can be highly variable between geographic areas, and may not be directly applicable to the South Taranaki coast. However, in the absence of more specific information, the following background information is included:

Snapper/ Tamure

- Snapper occupy a range of habitats, including rocky reefs and areas of sand and mud bottom.

Photo credit – S.Sammons.

- They are predators and consume a variety of invertebrates, particularly crustaceans. Large snapper have powerful teeth and can eat paua, mussels, limpets, paddle crabs and kina.
- They congregate before spawning and move on to the spawning grounds, usually in November-December where they release many batches of eggs throughout these months, although the spawning season may extend to March.
- All snapper begin life as females – during 3rd and 4th years, about half of them change sex to become males.
- Larvae live as plankton for a short time. Young fish school in shallow water and sheltered areas and move out to deeper water in winter.
- Snapper first reach maturity from 20 to 28 cm long at three to four years of age, and can live up to 60 years.
- Snapper over 4 kg are between 40 and 50 years old.
- Snapper from the west coast of the North Island grow faster and reach a larger average size than elsewhere.

Rig

- Other names include spotted dogfish, gummy shark, smoothhound and pioke (sold as lemonfish).
- They are common in shelf waters around NZ to depths of 200m.
- The adult population enters shallow water during spring and summer.
- During autumn there is a return migration towards the outer shelf

Photo credit – S.Sammons.

– considerable movement along the coast.

- Growth rate and reproductive rate probably slow.
- They feed on crabs, burrowing worms and other invertebrates.

Spiny dogfish

- Other names include southern dogfish, spurdog, spineback or spiky.
- It occurs world wide in cool temperate seas.
- The average size is 70-100cm, reaches 125cm.
- It is common off south and east coasts of South Island, ranging north in winter to lower half of North Island.
- Females come to shallow areas to pup.
- They feed on a variety of fish and invertebrates, including squid.
- Growth and reproductive rates probably low.
- Considerable nuisance to commercial and recreational fishermen.
- Dangerous to handle when alive – the fin spines can be jabbed painfully into an arm or hand.

Red Gurnard

- They are generally found on open sandy bottoms, rather than near reefs.
- Spawning season is spring and summer. Spawning grounds are widespread, although localised over the inner and central shelf
- Growth is rapid initially – fish mature at 4 yrs – then growth slows. They have a high mortality rate – few live beyond 10 years.
- They feed on crustaceans, especially small crabs and shrimps. The pectoral fins are used to locate food. They 'walk' on the bottom using their sensory feelers – when these feelers come in contact with prey they scare them into the open and snap them up.
- The large pectoral fins are spread to give stability when

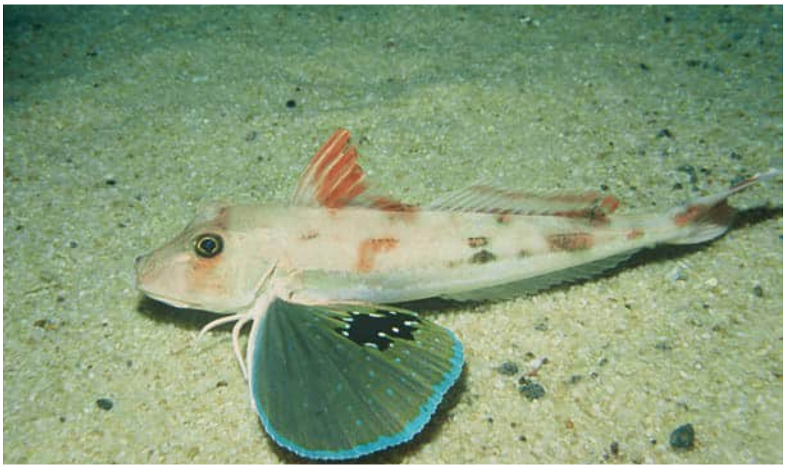


Photo credit
– DOC Image Library

swimming, but also used by gurnard displaying to each other, or for flashing open to scare off predators.

Blue cod

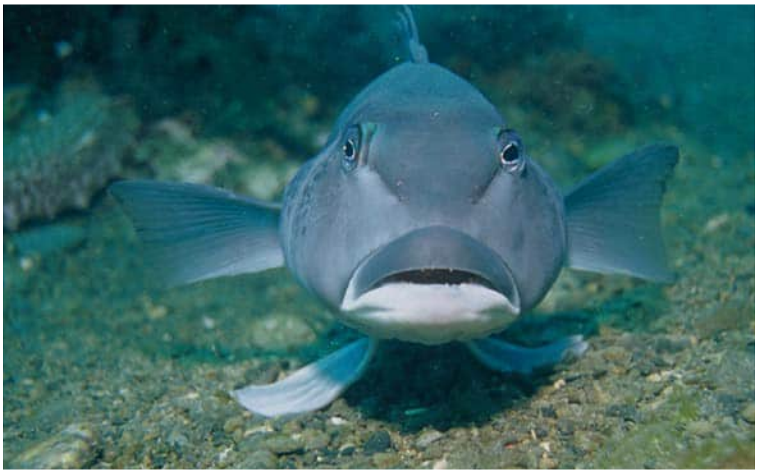


Photo credit
– DOC Image Library

- Colouring varies depending on age and sex – they mature as either males or females, but some females eventually change sex to become males. All blue-coloured fish are males, but brown-coloured fish may be either sex. Females reach 25 cm before changing sex.
- Depth range extends from shallow (as juveniles) out to depths of 150m – usually on or near reefs, although small adults occur over more open seafloor where there is some encrusting bottom life.
- Spawning takes place from late winter to early summer – probably on the central to outer shelf .
- Young fish appear on shallow reefs in summer, grow rapidly in the first year, then there is a moderate growth rate (although this varies according to habitat).
- They probably live 10-15 years.
- They are voracious predators, feeding on wide range of bottom-living animals – although they feed on anything.
- Large male cod are territorial – at certain times of year thought to be migratory – perhaps almost schooling.
- They are easily approached under water by divers – sometimes swim up to divers and nip their fingers and ears.

Tarakihi

- They have a distinctive black band across the neck or shoulder (hence the Australian name 'jackass').

Photo credit
– DOC Image Library

- They are common all around NZ.
- As larvae, they float around the ocean for 7-10 months, then settle out as juveniles on reefs or rough ground, then as adults they school in 100-250m deep water.
- Spawning takes place in late summer and autumn, and there are important nursery grounds known in Manawatu.
- Growth rate is slow – average adult age of 10-20 years. They have been recorded to about 50 years.

- They feed on wide variety of small invertebrates – have small mouths and weak teeth power, so can't eat hard-shelled animals, preferring instead to suck worms and other small animals from the sand or mud.

Kahawai

- They school by size and ages - schools of 20-35cm juveniles are common. Adult schools contain mixed ages.
- They are present throughout NZ but more abundant about and north of Cook Strait.
- They live in a variety of habitats – from estuaries to open waters off shore. They seem to prefer inshore shallow waters.
- They are known to be strongly migratory, although seasonal patterns are not understood, and are likely to vary from year to year.

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- They are probably late summer spawners but little is known.
- Growth rate is moderate – adults are, on average, 5-15 years old and can reach 25 years.
- They feed on variety of pelagic animals – crustaceans and small fish. They are found to feed exclusively on single prey species if present locally.
- They are sturdy, powerful fish that put up a fight for recreational fishers.

Hapuku (pronounced hapuka) or Groper

- They are likely to be slow growing and long lived. Average size 80-100 cm, reaching at least 150 cm, weight increases rapidly with length – 80 cm fish = 6-10 kg, 120 cm fish – 25-30 kg.
- They occupy a wide depth range, from reefs and pinnacles a few metres below the surface, to the open seafloor at 400 m deep. They have been heavily fished, so now rarely seen shallower than 40 m and then only at remote places.
- They are migratory although little is known of their movements.
- Spawning takes place in winter – but spawning grounds and location and behaviour of juvenile fish are unknown.
- They make spawning migrations in July-September in central New Zealand but the location of spawning grounds and details of migrations are unknown.
- They eat a variety of fishes, squid and large crustaceans, including crayfish. They have also been reported to consume large numbers of spiky dogfish (C.Duffy pers com).

Rock Lobster

- They are widespread around NZ – within depth range of 5-100 m.
- They are usually associated with reefs – but at certain times groups may be found on clear ground some distance from shelter.
- Large males prefer to mate with large females – large females have many more and larger eggs than smaller females. Females choose large males to shelter with.
- Crayfish court for several minutes or as long as 2-3 days before mating.

Photo credit – R.Guy (used with permission from S.Hornby

- Females moult between February and May. Mating takes place a few weeks later – eggs are then deposited under the tail and are incubated for 3-6 months. Very large females may brood as many as half a million eggs.
- Females gather together to release their larvae en-masse. The larvae drift freely in open waters for 10-20 months (growing through 11 further stages) before settling out near the shore as larvae and then moulting into juvenile lobsters.
- Moulting occurs frequently in small juveniles, twice a year for larger animals and once a year when mature.
- Every outer covering of the rock lobster moults, even the linings of the gills.
- Feeding is generally nocturnal, although rock lobsters have been observed foraging out in the open during the day in Te Rongokoko Marine Reserve at Gisborne. They eat a wide range of invertebrates and algae, preferring molluscs and crustaceans.
- Crayfish have no eyelids, so when exposed to bright sunlight – on a boat for instance – the visual pigment is rapidly destroyed and they are blinded for days or perhaps permanently.
- Most undertake seasonal inshore-offshore movements associated with moulting, reproduction and feeding. Large numbers of females move inshore during autumn to moult – with mating and egg laying taking place up to a month later. They then move into deeper areas to hatch their eggs.
- Large males may aggregate away from reefs during winter and summer – they form pods with their antennae facing outwards for protection during the day.

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