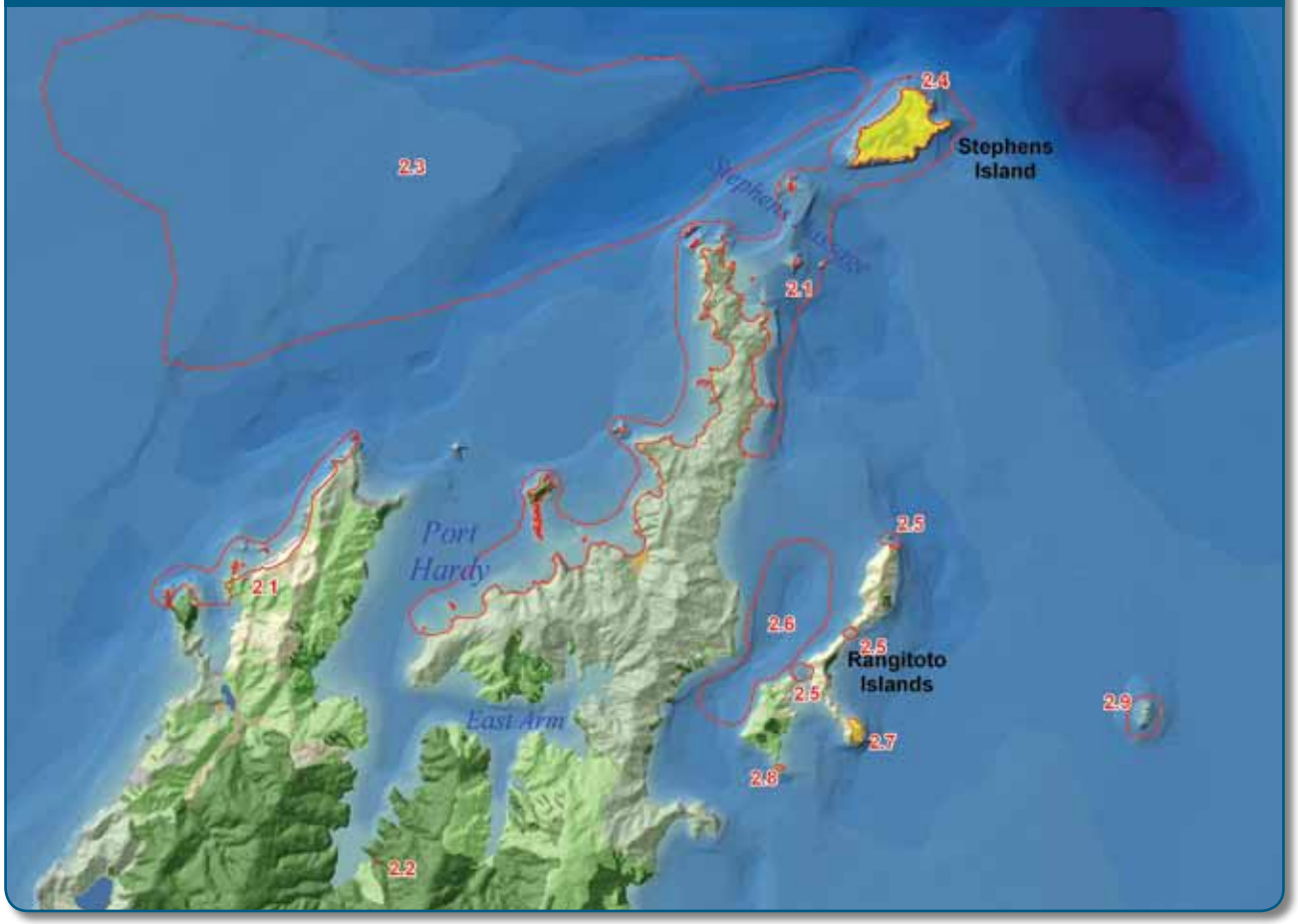
Greville Harbour Channel (MDC)

2 NORTH-WESTERN AND EASTERN D'URVILLE AND NORTHERN OUTER SOUNDS TO CAPE JACKSON

MAP 5 - SITES WITHIN BIOGEOGRAPHIC ZONE 2 (1 of 3)



OVERVIEW

This biogeographic area has a diverse range of habitats due to its complex coastal topography, water depth and hydrology. There are exposed and semi-sheltered rocky headlands and islands, large sheltered coastal bays (Admiralty, Anakoha and Guards Bays; Port Gore), deep and very sheltered inlets (Port Hardy), intertidal sand and mudflats (head of Anakoha Bay), high current areas (French

Department of Conservation Te Papa Atawbai
MARLBOROUGH DISTRICT COUNCIL

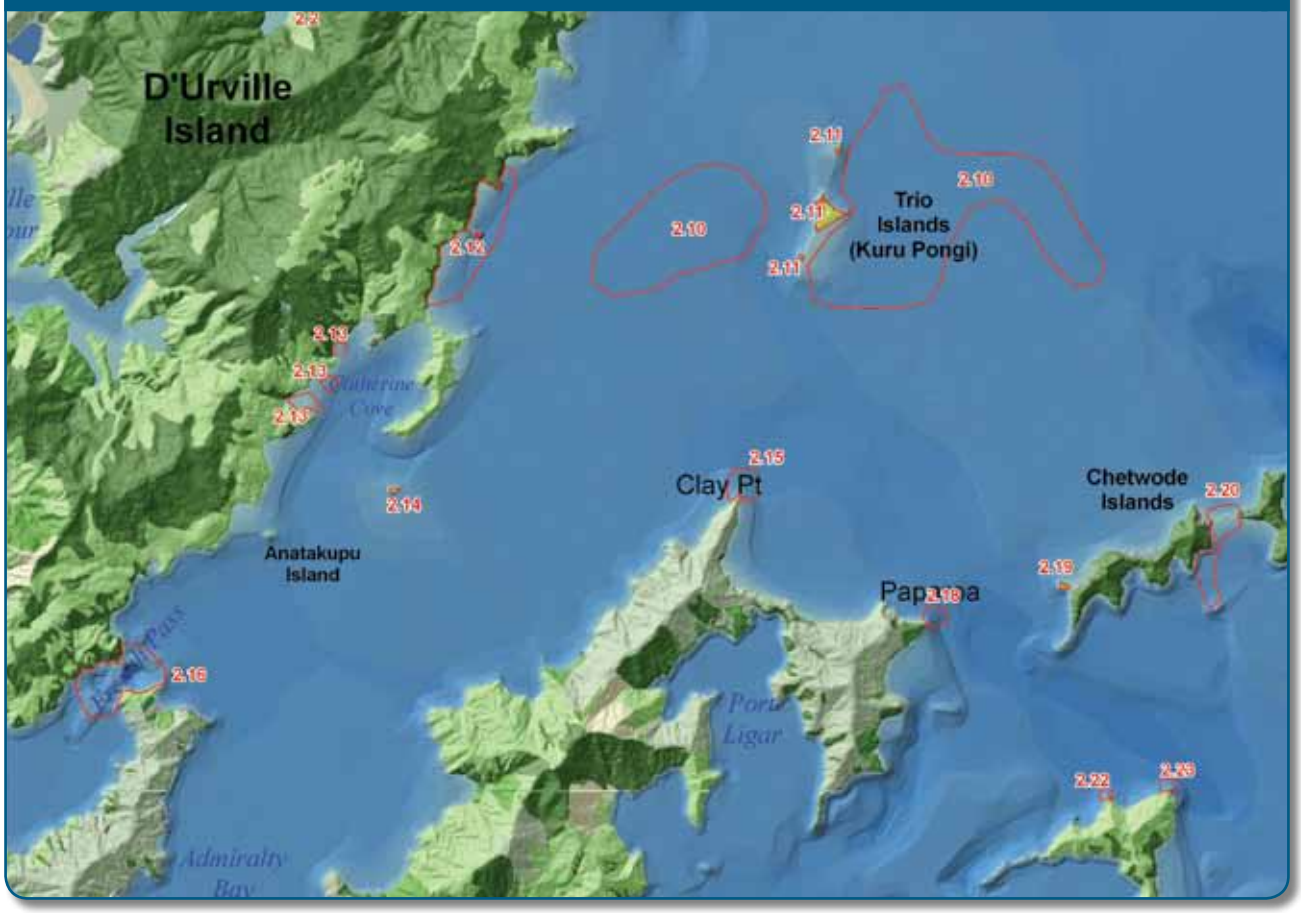
Pass, Stephens Passage, Allen Strait), large areas of subtidal sands and muds and deep rocky reefs. The animal and plant life reflects this diversity of habitats and the change from relatively cool coastal waters in the east to warmer waters in the west.

The north-west coastline of D'Urville Island and Stephens Island are exposed to wind and seas from the north and west, and Stephens Island is also affected by large southerly swells coming through Cook Strait. The rest of the coastline is relatively sheltered. Maximum charted depths range from approximately 45m to 309m but generally do not exceed 60m. Areas greater than 100m deep are largely restricted to French Pass (105m), Nile Head (105m), a large semi-circular depression extending from approximately two nautical miles west of Cape Stephens to four miles east of Stephens Island (228-307m), and small holes between Paparoa and Ninepin Rock (111m) and off Cape Lambert (110m) and Cape Jackson (309m).

The most significant bathymetric feature of this area is an extensive shallow bank, usually less than 30m deep, that extends north-west from Titi Island to McLarens Bay on D'Urville Island. The Chetwode, Trio and Rangitoto Islands are also located on this bank, while Sentinel and Jag Rocks are seaward of it. This shallow bank forces the main channel of Pelorus Sound to turn abruptly south-east at its mouth and continue another four nautical miles before opening into Cook Strait between Titi Island and Alligator Head. It also extends west from Paparoa to Clay Point and Trio Islands.

The floor of Admiralty Bay is largely flat and depths range from approximately 33m to 46m. Port Gore, Waitui and Guards Bays are relatively shallow. The 30m contour extends across the mouths of these bays and the bottom rapidly shelves into deeper water seaward of the mouth. A deep trench of 73-89m known as Rangitoto Roads is located between Old Man's Head and McLarens Bay and it separates Rangitoto Islands from D'Urville Island.

MAP 6 - SITES WITHIN BIOGEOGRAPHIC ZONE 2 (2 of 3)



MAP 7 - SITES WITHIN BIOGEOGRAPHIC ZONE 2 (3 of 3)

A large part of the area's seafloor is covered in silty sand. Mud and sandy mud predominate in Admiralty Bay, inner Port Hardy, Anakoha Bay, Guards Bay and Port Gore. Large areas of calcareous gravels occur in French Pass, off north-west D'Urville Island, north and east of Stephens Island, north-west and south-east of Sentinel Rock and from Cape Jackson to McManaway Rock. These calcareous sediments are largely drift shell and also cover the bottom of Allen Strait. Rocky reefs extend below 60m off steep headlands and isolated pinnacles but elsewhere are generally not below 12-18m depth. Well sorted gravel beaches are a feature of north-east D'Urville Island and these gravels are also in the shallow subtidal areas along this coast.

Marine Farms are located in Port Hardy, Admiralty Bay, Anakoha Bay, Guards Bay and Port Gore. They are predominately farming green-lipped mussel with some trials of Pacific oyster being carried out in Admiralty Bay.

The area is popular with boat owners from Nelson, Wellington and other parts of the Marlborough Sounds and is an important recreational fishery. Admiralty Bay and Port Gore provide some trawling for flatfish and other species.

There is a complex circulation of water in the area, caused by the semi-isolation of Tasman Bay, the D'Urville Current (warm, saline and well stratified water from the Tasman Sea pushed into Cook Strait by westerly and northerly winds), estuarine flow around the mouth of Pelorus Sound and strong tidal mixing in the Cook Strait narrows. The summer sea surface temperature (SST) gradient from Cape Jackson to Two Bay Point is approximately 3°C (e.g. 15-18°C in January). Water in Tasman Bay is somewhat isolated from offshore waters and tends to be warmer, less saline and more stratified. The annual SST ranges from 10°C to 21°C and the maximum summer SST in Tasman Bay is also greater than elsewhere in the outer Marlborough Sounds. The flow in Tasman Bay tends to be in an anticlockwise direction with water entering the bay near Farewell Spit and flowing out around the top of D'Urville Island, speeding up as it passes by.

Department of Conservation Te Papa Atawbai
MARLBOROUGH DISTRICT COUNCIL

Strong currents in the area are caused by tides being out of phase on either side of the country. These semi-diurnal tidal progressive waves enter Cook Strait from the east and west and are reflected after passing through the Cook Strait narrows. This produces small tidal elevations, rapid changes in the phase of tidal elevations and strong currents in the narrows. It also results in large tidal variations across western Cook Strait with small tides in the Strait and large tides and uneven tidal flows in Pelorus Sound. The tidal range at the mouth of Pelorus Sound is approximately 2.3m compared to 1.5m at Picton. The combination of strong tidal currents and varying depths of water produce strong tidal mixing in the water off Pelorus Sound. This mixing results in elevated levels of dissolved inorganic nutrients and low vertical temperature gradients in this part of Cook Strait. A surface thermal front sometimes separates the cooler well-mixed water off Pelorus Sound from warm, well stratified, low-nutrient water further offshore. Well mixed water with moderate nutrient concentrations is transferred into Pelorus Sound below the dilute outgoing surface flow. The D'Urville Current flows west to east through Cook Strait and mixes with up-welling and the Southland Current to form the Wairarapa Counter Current in eastern Cook Strait.

BIOTA

Common pelagic fishes include anchovy, pilchard, sprat, garfish, jack mackerel, kahawai, trevally, blue mackerel and barracouta. Larger pelagic predators such as juvenile thresher shark, bronze whaler, blue shark, and kingfish are relatively common during summer. Large schools of jack mackerel are found offshore, north and east of this area.

Macroalgal (seaweed) abundance and diversity on the shallow sheltered reefs in Port Hardy, Admiralty Bay, Anakoha Bay, Titirangi and Hikoekoea Bays (inner Guards Bay) and Port Gore is limited and similar to the inner Pelorus and Queen Charlotte Sounds. Tubeworm colonies (mainly *Galeolaria hystrix*) are a common feature of rocky reefs along the western shoreline of Admiralty Bay, as far as Catherine Cove and D'Urville Peninsula. There are also small colonies at sheltered locations in Anakoha Bay, Guards Bay and Port Gore. When surveyed in 1990 those in Melville Cove, Port Gore, were all dead.

Elsewhere, shallow rocky reefs have forests of large brown algae. Narrow flapjack forms a broad subtidal fringe from low water to approximately 3m depth. Forests of flexible flapjack or paddle weed grow below 3m depth. Flexible flapjack dominates in the relatively sheltered sites, with paddle weed often restricted to the subtidal fringe. At exposed offshore sites paddle weed may form extensive forests to at least 24m depth. Beds of giant kelp are found in outer Port Gore, on the western shoreline of Waitui Bay, around Titi Island, in Lord Ashley Bay, Forsyth Island and at Hapuka Rocks on D'Urville Island. This species is an indicator of water temperature and does not grow in areas where the highest monthly SST is more than 16-17°C. The distribution of giant kelp has retreated eastward since 1942, which suggests that waters in western Cook Strait have been warming[176]. Other cold water species found in the area include, strap kelp, which is restricted to Cape Jackson and Stephens Island, and bull kelp which is found only at Cape Jackson. Other common algae include oak-leaf seaweed, *Marginariella* spp., *Sargassum sinclarii, Cystophora* spp., *Halopteris* sp., *Carpomitra costata*, brown tongue weed, sea rimu, *Caulerpa flexilis,* sea grape*, Ulva* spp, coralline turfs and *Asparagopsis armata*.

Common invertebrates include various sponges (*Ancorina alata, Aplysilla sulphurea, Polymastia fusca, Stelleta conulosa,* orange cup sponge*, Tethya ingalli, Aaptos aaptos*), wandering anemone, jewel anemone, noble chiton, black sea slug, black-foot paua, yellow-foot paua, starry limpet, catseye, Cook's turban, spotted topshell, tiger topshell), opal topshell, *Serpulorbis* spp., nudibranchs, window oyster, red rock crab, rock lobster, jewel star, dividing star, seven-armed star, snake star, sea cucumber, kina, arborescent bryozoans, the brachiopods *Waltonia inconspicua* and *Notosaria nigricans*, and compound ascidians. Below 24m depth, reefs in the outer part of this area support a diverse range of sponges and other encrusting invertebrates.

Common reef fishes include conger eel, rock cod, southern bastard red cod, sea perch, slender roughy, common roughy, sweep, butterfly perch, marblefish, red moki, blue moki, tarakihi, yellow-eyed mullet, spotty, banded wrasse, scarlet wrasse, blue cod, butterfish, a variety of triplefin and leatherjacket.

Hapuka are still on some deep reefs but have been depleted by intense commercial and recreational fishing. Goatfish are found occasionally on reefs and soft sediments.

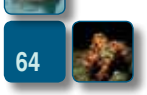
Soft sediments support varied assemblages depending on the depth, composition and hydrology. Bottom trawling, dredging and fishing has modified the species assemblages in Admiralty Bay, Guards Bay and possibly Port Gore. Species composition and nutrient cycling are also modified beneath marine farms. Three widespread invertebrate assemblages are found in this area. The *Amphiura-Echinocardium* (brittle star and sea urchin) assemblages are found in muds in Anakoha Bay and Port Gore and are widespread in inner Pelorus and Queen Charlotte Sounds. It is also probably widespread in Admiralty Bay. The *Austrofusus-Notocallista* (whelk and bivalve mollusc) assemblages are found in silty-muddy sand in outer Guards Bay and Port Gore, and in the entrance to Queen Charlotte Sound. The *Corbula-Terebratella* (bivalve mollusc and brachiopod) assemblages are found in silty sand along the course of the Pelorus channel between the Chetwode Islands and Cape Jackson. It also occurs in the entrance to Queen Charlotte Sound. Horse mussels are widely distributed in the outer Sounds with large beds in the middle of Guards Bay, Waitui Bay and Port Gore prior to 1989. Surveys since then have failed to find the Guards Bay bed and it seems likely this has been destroyed by commercial scallop dredging. The horse mussel bed in Waitui Bay was resurveyed in 1990 and was found in shelly sand between 6m and 12m depth118. It had a high percentage cover of algae (*Asparagopsis armata, Adamsiella chauvinii, Ulva* sp.) and supported large swarms of mysid shrimps, several hermit crab and crab species, scallops and several seafloor bivalves (purple sunset shell, fine *Dosinia*, small dog cockle). Red gurnard and spotty were also common among the horse mussels.

Large areas of bryozoan corals (*Celleporaria agglutinans*) are a distinctive feature of the area. These bryozoan beds are found on coarse shelly sand, on slopes below approximately 24m depth off Titi, Chetwode, Trio and Rangitoto Islands, and at 40m to 60m depth off Sentinel and Jag Rocks. These beds are diverse habitats and support benthic and plankton-eating fish, including commercially valuable species such as blue cod and tarakihi. Dead *Celleporaria* colonies in Admiralty Bay suggest that bottom trawling, Danish seining and scallop dredging have also damaged seafloor assemblages there. In the high currents of French Pass and Allen Strait the bryozoan *Galeopsis porcellanicus* forms compact, tightly branching colonies that can cover almost the entire substratum. Beds of the large brachiopod *Neothyris* cf. *compressus* are common in areas of calcareous sediments with moderate current below 30m depth, such as the Trio Islands, Jag Rocks and Old Man's Head. Beds of large dog cockles are also common in these habitats.

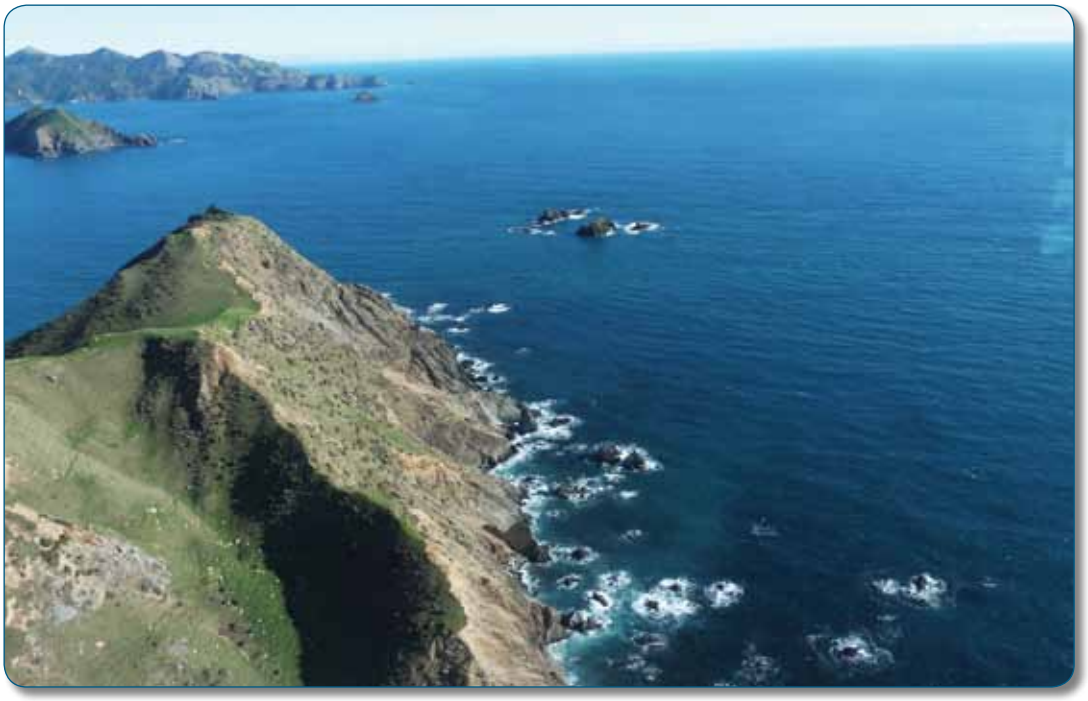
Demersal fishes found in this area include hagfish/blind eel, broadnose seven-gill shark, spotted spiny dogfish, northern spiny dogfish, carpet shark, rig, school shark, electric ray, smooth skate, rough skate, short-tailed stingray, eagle ray, elephant fish, red cod, two-saddle rattail, red gurnard, scaly gurnard, john dory, ling, hake, hoki, common warehou, silver warehou, snapper, tarakihi, spotty, blue cod, spotted stargazer, giant stargazer, opal fish, gemfish, frost fish, witch, brill, lemon sole, common sole, sand flounder, leatherjacket and porcupine fish. In 1940 all of Admiralty Bay out to a line drawn from Clay Point to Halfway Point on D'Urville Island was identified as an important spawning ground for lemon sole. However it is not known if prolonged trawling and dredging has adversely affected the spawning ground.

King shag colonies are found on Te Kuru Kuru Island, North Trio Island and Sentinel Rock. The only breeding colonies of New Zealand fur seals in the Marlborough Sounds is on Stephens Island and the Trio Islands, while Te Kakaho, the outer Chetwode Island, are important hauling grounds for the seals. There is a large resident population of bottlenose dolphins in this area and other common marine mammals include the dusky dolphin, common dolphin and killer whale. Up until 1961, residents of D'Urville Island regularly saw humpback whales in Admiralty Bay and French Pass during the annual migration.

Pacific oysters were brought to Admiralty Bay in the early 1990s by mussel farmers seeking to diversify. Spat used in these trials was collected from Whakitenga Bay in Croisilles Harbour. Other exotic marine species found in this coastal area include: *Asperococcus bullosus* (on the wreck of the Mikhail Lermontov), *Cliona cellata, Tethya aurantium, Polydora hoplura, Polydora websteri,* blue mussel, red rock crab, *Aplidium phortax, Asterocarpa cerea, Botryllus schlosseri, Corella eumyota* and *Didemnum "candidum"*.



SIGNIFICANT SITES



Port Hardy entrance, Rakiura Rocks

2.1 D'URVILLE ISLAND NORTHERN COAST (Subtidal)

This section of mostly rocky coast stretches from Bottle Rock north to Stephens Passage, around Stephens Island and then south along the eastern shoreline of D'Urville Island to Patuki. Rocky reef habitats are characterised by a high diversity of macroalgae, invertebrate and fish species due to the variety of depths, wave aspects and substrata. Because of its size, this site has been divided into four sections.

BOTTLE ROCK TO NILE HEAD

Steep rock walls drop almost vertically to a sand and gravel seabed at approximately 40m depth. The upper parts of these walls are covered in relatively dense Narrow flapjack to approximately 6m depth. In patches devoid of flapjack there are dense, compressed mats of agar weed. Below 6m depth a forest of paddle weed replaces the flapjack, spreading to approximately 12m depth before thinning out. Sparse paddle weed grows to a maximum depth of approximately 18m depending on the angle of the bottom and topographic shading. Below the paddle weed forest the substrate is covered with encrusting coralline algae, the small brachiopod *Waltonia inconspicua*, massive sponges (*Ancorina alata, Stelleta conulosa*), orange finger sponges and colonial cup coral. Grazing invertebrates are common, particularly large kina, noble and butterfly chitons, yellow foot paua, white cats eye and circular saw shell. Crevices are filled with sponges, jewel anemones, zoanthids and bryozoans. Common reef fishes include butterfish, banded wrasse, scarlet wrasse, spotty, blue cod, Yaldwin's triplefin, blue-eyed triplefin, blue dot triplefin, yellow-black triplefin, common roughy, sea perch, red-banded perch, butterfly perch and leatherjacket.

SQUADRON ROCKS/VICTORY ISLAND TO CAPE STEPHENS

This semi-sheltered, western coastline is characterised by shallow reefs of large boulders and rock outcrops that drop on to clean sand, cobbles and small boulders at approximately 12m depth. In places large shallow areas of sand and well sorted gravels separate patch reefs from the shore. Dense kelp forests cover the reefs to at least 12m depth. Narrow flapjack is the dominant kelp species to approximately 4m depth. Below this a forest of paddle weed extends down to approximately 9m, along with flexible flapjack, oak leaf seaweed and *Marginariella boryana*. Oak-leaf seaweed and *Marginariella boryana* are most abundant at exposed sites, and are replaced by flexible flapjack in sheltered areas. A flexible flapjack forest approximately 2m high dominates the reefs below 9m.

Sponges, bryozoans and other encrusting species grow beneath overhangs and in caves. The brachiopods *Waltonia inconspicua* and *Notosaria nigricans* are also abundant. At least 29 species of reef fish have been recorded although there is a relatively low abundance and diversity in the flexible flapjack forest.

Table 3 - List of Sites of Significance in Biogeographic Zone 2

No.	Biogeographic Zone 2	Level of information	Representa-tiveness	Rarity	Diversity & pattern	Distinctive-ness	Size	Connectivity	Catchment
2.1	Northwest D'Urville Island coast	2	H	L	H	M	L	L	M
2.2	Port Hardy - South Arm	3	H	H	L	H	L	L	H
2.3	Northwest D'Urville Island coast	4	?	?	?	?	?	L	L
2.4	Stephens Island (Takapourewa)	2	H	M	M	H	H	L	H
2.5	Rangitoto channels	2	M	L	M	M	L	L	L
2.6	Rangitoto Passage	2	H	L	M	H	M	L	L
2.7	Puangiangi Island	2	M	M	L	M	L	L	M
2.8	Takawhero Stack	1	M	M	L	M	L	L	M
2.9	Jag Islands	1	H	L	M	H	L	L	H
2.10	Trio Bank	2	L	L	M	L	H	L	L
2.11	Trio Islands	2	H	M	M	H	H	L	H
2.12	Penguin Island	2	L	L	L	M	M	M	H
2.13	Catherine Cove	2	H	M	M	M	M	L	M
2.14	Stewart Island	4	M	H	L	M	L	L	H
2.15	Clay Point	1	M	L	M	M	L	L	L
2.16	French Pass	1	H	L	M	H	L	L	L
2.17	Admiralty Bay	3	H	L	L	H	H	L	L
2.18	Paparoa	1	M	L	M	M	L	L	L
2.19	Chedwode Stack	2	M	M	M	M	M	L	H
2.20	Chedwodes	1	M	L	M	M	M	L	H
2.21	Sentinel Island	2	H	M	M	H	L	L	H
2.22	Goat Point	1	M	L	H	M	L	L	M
2.23	Culdaff Point	1	M	L	H	M	L	L	M
2.24	Allen Strait	2	H	L	H	H	L	L	M
2.25	Anakoha Bay	1	M	L	M	M	L	H	M
2.26	Titi Island	3	M	M	M	H	M	L	H
2.27	Titi Island mounds	2	M	L	M	M	L	L	M
2.28	McManaway Rocks	2	H	L	H	H	L	L	L
2.29	Witt Rocks	2	H	L	H	H	L	L	L
2.30	Waitui Bay	4	M	L	M	M	H	L	L
2.31	Port Gore - outer	4	?	?	?	?	?	?	?
2.32	Port Gore	4	M	L	M	M	H	L	L
2.33	Port Gore - inshore	3	M	L	M	M	M	L	L
2.34	Gannet Point	2		HL	M	H	L	L	M

Key

1 = Brief visit
2 = Qualitative report
3 = Quantitative report
4 = Personal communication
H = High
M = Medium
L = Low

Department of Conservation Te Papa Atawbai
MARLBOROUGH DISTRICT COUNCIL

STEPHENS PASSAGE AND STEPHENS ISLAND

Stephens Passage is an exposed, relatively shallow area with high tidal currents making study difficult. In places the bottom is armoured with small boulders and cobbles. There is very little macroalgae cover below 18m, with the rocky substrata heavily covered with encrusting coralline algae. Large numbers of of kina in the shallows may be responsible for 'barrens'dominated by coralline crust. Large brown algae cover the tops of large boulders and rock walls around pinnacles such as Saddle Rocks and the Sisters. Narrow flapjack is the dominant kelp to approximately 4m depth, dense paddle weed, oak leaf seaweed and *Marginariella boryana* grow from 4m to 6m. Below 6m a forest of flexible flapjack extends to approximately 18m depth. On walls and beneath overhangs the rock surface is covered in encrusting invertebrates particularly sponges (*Stelleta conulosa, Darwinella sulphurea,* orange finger sponge, pink golfball sponge), jewel anemones and arborescent bryozoans. Large blue cod, butterfly perch, banded wrasse, scarlet wrasse, spotty and oblique swimming triplefin are the most abundant reef fish at safe diving depths.

Stephens Island has been recognised as a New Zealand fur seal breeding and haulout area since approximately 1970[366,367]. The seals breed at Razorback Point at the eastern end of the island and along the mid-section of the southern shore. In 1995 it was estimated that between 264 and 314 pups were born each year from 1992 to 1994[336,337]. There is only one other recognised breeding area in the Marlborough Sounds at Trio Islands, but numerous other haulout areas are known.

The steep cliffs of Stephens Island continue to between 9-12m depth below low water and are covered by a dense forest of large brown algae. From low water to approximately 4m narrow flapjack dominates with smaller amounts of oak-leaf seaweed, *Marginariella boryana* and slender zigzag weed. Understorey species include turfing coralline algae (*Corallina officinalis, Arthrocardia corymbosa*), agar weed, sea rimu and *Halopteris* sp. Below 4m there are vertical and near vertical faces covered by dense paddle weed forest with patches of *Sargassum sinclairii*, oak-leaf seaweed, *Marginariella boryana*, strap kelp and slender zigzag weed. From approximately 12-15m depth the island is ringed by large boulders that grade into cobbles between 15-18m. Above 15m the boulders are covered by a dense forest of flexible flapjack, reaching 1.5m tall. Between 15-18m flexible flapjack rapidly diminishes to be replaced by encrusting coralline algae, sponges (including *Ancorina alata* and *Polymastia fusca*), anemones and bryozoans. Reef fish are abundant, particularly butterfish, scarlet wrasse, blue cod, tarakihi, butterfly perch and oblique swimming triplefin.

At a depth of approximately 18m boulders and cobbles give way to a broad expanse of coarse sand, pebbles and cobbles. The sand, approximately 90% of the area, is generally rippled with little conspicuous epifauna while the cobbles and pebbles support a variety of small algae and occasional paddle weed and *Sargassum sinclairii*. Very high densities of small blue cod have been observed in this area.

BILLHOOK PT – PATUKI

The steep coast drops to a shoreline of gravel beaches, broken rock and rocky headlands. Rocky reefs below the low-tide mark give way to a mixture of wave-rippled pebbles, granule-sized sediments and coarse clean sand at 6-7m depth. Narrow flapjack dominates the shallow reefs to approximately 3m, with mixed flexible flapjack, paddle weed, oak-leaf seaweed, *Sargassum sinclairii* and *Marginariella* spp. below this. Understorey algae include green sea lettuce, *Zonaria* sp., brown tongue weed, gummy weed, *Asparagopsis armata* and agar weed. Large numbers of grazing invertebrates are present including black-foot paua, yellow-foot paua, virgin paua, black sea slug, Cook's turban and kina. Despite the shallow water, the reefs support at least 30 species of fish, including seahorse, at least 13 triplefins, black goby, banded and scarlet wrasse, spotty, blue moki, red moki, tarakihi, butterfish, marblefish and blue cod. Large octopus are also relatively common.

Between the shore and approximately 12m depth coarse sediments surrounding the reefs are often worked into mega-ripples that contain large numbers of bivalves such as large dog cockle, small dog cockle and *Corbula zelandica*, with smaller numbers of morning star shell, fine *Dosinia*, purple sunset

shell, purple cockle and elongated Mactra. Horse mussels are rare here. Dead shells provide habitat for small seaweeds and invertebrates such as wandering anemones, chitons, top shells, circular saw shells, *Turbo granosus* and sea stars. Blue cod, goatfish, spotty and red gurnard are common. Below 12m is smooth clean sand, home to hermit crabs and sand divers.

Assessment of ecological significance (Bottle Rock to Patuki inshore reef)

This large section of coast is the best example of diverse inshore rocky habitats and species within the northern outer Sounds. A wide variety of shore aspects from east to west-facing as well as a range of tidal currents add to site complexity.

2.2 SOUTH ARM PORT HARDY (Intertidal)

Port Hardy is a large harbour at the northern end of D'Urville Island. At the southern end of the Port is South Arm, a bay 3.7 km long and up to 1.9 km wide. South Arm has 13 km of coastline and a sea area of 360 ha.

Assessment of ecological significance

There is a small area of a sea sedge (*Carex littorosa*) in a bay on the eastern side of the Arm approximately 950m from the head of South Arm. This is the only known location of sea sedge in the northern Sounds biogeographic area. The adjoining catchment is protected within the D'Urville Island Scenic Reserve.

2.3 OFFSHORE NORTHWEST D'URVILLE ISLAND (Subtidal)

This area has not been formally surveyed and the boundaries and biological attributes are based on information obtained from commercial fishers and a single mention in a scientific paper[40]. This site is a large offshore area (approximately 6000ha) along the north-western coast of D'Urville Island. It reportedly supports a bryozoan community dominated by the Separation Point coral.

Assessment of ecological significance

Bryozoans form tree dimensional mounds that support a wide variety of species including invertebrates and fish[25,36, 90]. This site is potentially the largest area of bryozoans in the Marlborough Sounds, however the quality and composition of the biogenic habitat is not known.

2.4 STEPHENS ISLAND (TAKAPOUREWA) (Terrestrial)

Stephens Island is located approximately 3 km north-east from the northern tip of D'Urville Island. The island covers approximately 150 ha and is steep and rugged with towering cliffs and an exposed rocky coastline. Stephens Island is administered by the Department of Conservation and landing is by permit only.

Red billed gull (MDC)

Assessment of ecological significance

Stephens Island has outstanding biological values, providing a refuge for a large number of rare animals and plants, some found nowhere else in the world[41]. Huge populations of seabirds have a major impact on the ecology of the island[41]. An estimated, one million fairy prions[41,343] breed on Stephens Island, which is thought to be a quarter of the world population[365]. The red-billed gull colony is the largest in Marlborough[169]. A variety of other seabirds breed on the island including sooty and fluttering shearwater, diving petrel and little penguin.

Department of Conservation Te Papa Atawbai
MARLBOROUGH DISTRICT COUNCIL

Stephens Island (MDC)

2.5 RANGITOTO CHANNELS (Subtidal)

The Rangitoto Islands are located some 860m off the eastern coast of D'Urville Island. The narrow passages between the islands and the northern tip of Wakaterepapanui Island provide three high current habitats.

Assessment of ecological significance

These sites are some of the best examples of high current habitats in Marlborough. There is a broad coverage of encrusting organisms including sponges, jewel anemones and colonial and compound ascidians. A 1994 survey[102] recorded numerous hydroid trees and the associated predatory nudibranch (*Jason mirabilis*), as well as 15 fish species. Blue cod, juvenile butterfish and banded wrasse were abundant in the passages. The northern island is protected within the Whakatere Papanui Island Recreation Reserve. The middle and southern islands are privately owned.

Rangitoto Channel (MDC)

2.6 RANGITOTO PASSAGE (Subtidal)

This high-current habitat is located in the passage between the Rangitoto Islands and D'Urville Island. The seafloor is dominated by bryozoans, mostly Separation Point coral and lace coral[102].

Assessment of ecological significance

The rocky habitat located in the passage appears to have protected this area from the impacts of commercial dredging. As a result this is the largest known area supporting dense and intact bryozoan mounds in Marlborough. Bryozoan mounds support a wide variety of invertebrates and fish[40].

2.7 PUANGIANGI ISLAND (Terrestrial)

Puangiangi Island is the middle island of the Rangitoto group, located on the eastern side of D'Urville Island, approximately 19 km north-east of French Pass and 11.5 km north of Clay Point. Puangiangi Island has 6.3 km of coastline and covers 65 ha.

Assessment of ecological significance

Sooty shearwater breed along the eastern cliffs of the island. Sooty shearwater colonies in Marlborough are relatively small but they are important because they improve soil fertility which helps several threatened plant species. The size of the colony is expected to increase since rats were eradicated in 1999.

2.8 TAKAWHERO STACK (Terrestrial)

Tinui Island is the southern most of the Rangitoto Islands, located on the eastern side of D'Urville Island, approximately 18.5 km north-east of French Pass and 11 km north of Clay Point. This site is a small rock stack located near the eastern shore of Tinui Island.

Assessment of ecological significance

Sooty shearwaters breed on this small offshore stack. Sooty shearwater colonies in Marlborough are relatively small but they are important because they improve soil fertility which helps several threatened plant species.

2.9 JAG ISLANDS (Subtidal)

The Jag Islands are located approximately 5.4 km east of the Rangitoto Islands. The Jags consist of five main stacks and numerous smaller rocks. In total they have an area of less than 2 ha and reach a height of approximately 40m above sea level.

Assessment of ecological significance

The subtidal reef supports a wide variety of invertebrates, algae and fish[102]. Of particular note are massive schools of oblique swimming triplefin living amongst the macroalgal forests around the islands and stacks. Although widespread in Marlborough, the high numbers of triplefins has not been recorded elsewhere in the region. There is also a bed of giant lampshell around the base of rocks at the northern end of the island[118].

2.10 TRIO BANK (Subtidal)

This site is made up of two areas located on either side of the Trios Island. This community is located on the edges of a shallow sand bank extending from the Chetwode Islands to the Trio Islands, and a sand mass between the Trio Islands and the southern end of the Rangitoto Islands. This area supports ascidians, sponges, hydroids and bryozoans. The biogenic clumps formed by these species range from common to sparse abundance, which may be due to commercial dredging and trawling in this area.

Assessment of ecological significance

These remnant clumps of organisms form a reef structure and support a wide variety of invertebrates and fish[40]. Based on historic accounts this area once supported more biogenic habitats. Despite this reduction the area supports a greater variety of species than expected for sand substratum[90].

2.11 TRIO ISLANDS (Terrestrial)

Trio Islands are a small group of islands approximately 4.5 km north-east of Clay Point and 8 km north-west of the Chetwode Islands. There is one main island with a smaller island 800m north-east, and another 550m south-west.

Assessment of ecological significance

North Trio Island supports one of the largest breeding colonies of king shag in Marlborough. A 2006 winter survey[340] recorded an average of 205 birds present. Middle Trio has a large colony of diving petrel, fairy prion and fluttering shearwater[30]. A relatively small number of breeding sooty shearwater use the island and the occasional flesh-footed shearwater has been seen[48]. Little penguins build nests throughout the island. South Trio regularly supports a colony of red-billed gulls.

2.12 PENGUIN ISLAND (Subtidal and Terrestrial)

This 3.1 km stretch of coast is located 1.8 km north of the base of the Catherine Cove Peninsula along the eastern shoreline of D'Urville Island.

Assessment of ecological significance

The area between Penguin Island and D'Urville Island is one of the best examples of a dense and large dog cockle bed in this biogeographic area[102]. Sooty shearwater and blue penguin nest on the island. The coastline and forest catchment are part of the D'Urville Island Scenic Reserve, which ensures relatively low sedimentation levels enter into the adjacent marine environment.

2.13 CATHERINE COVE (Subtidal)

This site is located along the western shoreline of Catherine Cove on D'Urville Island and includes Cherry Tree Bay. This site is made up of dense beds of calcified algae called rhodolith located in shallow water between 6m and 26m depth where they form dense groups of calcified algae.

Assessment of ecological significance

Rhodoliths are known in only three small sites in Marlborough. They are a biogenic habitat forming species and support other species including blue cod. This is the only known bed of rhodoliths in the northern outer Sounds biographic area. Rhodoliths beds provide habitat for a variety invertebrates[17,26,133,160,174,283,353,355].

2.14 STEWART ISLAND (Terrestrial)

Stewart Island (Te Kuru Kuru) is a small island in outer Admiralty Bay, approximately 1 km south of D'Urville Peninsula and 6.7 km west of Clay Point. Stewart Island has a circumference of approximately 410m and land area of 0.7 ha.

Stewart Island (MDC)

Assessment of ecological significance

This island has become a regular roost for approximately 20-30 king shags with a few nests being established each season[339,340]. This is the smallest and most vulnerable of all king shag nesting sites in Marlborough because nests are near sea level and may be damaged or destroyed during storms. King shags breed at relatively few locations in Marlborough which makes all roosting and breeding sites very important.

2.15 CLAY POINT (Subtidal)

Clay Point, the northern-most mainland point of the Marlborough Sounds, is located 13 km north-east of French Pass and is a prominent landmark. It marks the eastern side of the entrance to the greater Admiralty Bay area and is approximately 60 km by sea from Havelock. This site is a large rocky reef system that is subject to strong tidal currents. Outcrops of bedrock create near vertical walls covered in rich encrusting organisms, including a wide variety of sponges, brachiopods, ascidians and jewel anemones. A dense bed of brown macroalgae dominated by paddle weed and flexible flapjack was recorded to 11m depth[118]. Other species of red and brown seaweed including *Zonaria angustata* and *Asparagopsis armata* were recorded under the algal canopy. The substratum at greater depths is a mix of cobbles, shell and sand.

Assessment of ecological significance

This site represents one of the best high-current rocky reef habitats in the northern Sounds biographical area. The extensive reef system covers a wide variety of depths and aspects thereby establishing a wide range of habitats.

2.16 FRENCH PASS (Subtidal)

French Pass is a narrow passage of 518m that separates the mainland and D'Urville Island. There are two main channels throught the pass separated by a shallow rocky reef that is exposed at low water. This area supports a community of encrusting filter-feeding organisms that take advantage of food brought daily by the fast tidal currents. Large beds of mussels, anemones and barnacles grow on rocks on the reef. Large sponges and colonies of bryozoans live on near vertical rock walls in and around the northern passage. On the western side of the passage are large areas of shell debris made up of mussel, dog cockle and barnacle shells. The Pass is popular for fishing for blue cod, snapper and kingfish. Little is known of the biology of French Pass as it is one of the most difficult areas to dive in New Zealand.

Assessment of ecological significance

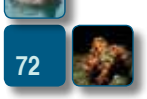
French Pass is the best example of a high-current environment in Marlborough. Rocky and soft sediment substrata found at a range of depths, combined with the very strong tidal currents, result in a wide variety of habitats.

2.17 ADMIRALTY BAY (Subtidal) (MAP 22)

The greater Admiralty Bay extends some 15 km from the head at Hamilton Bay to a line joining Bonne Point (north-west headland) with Clay Point (north-east headland). Admiralty Bay is partially bounded by D'Urville Island to the west and is connected to Croisilles Harbour via French Pass. It has 60km of coastline and a sea area of 8,500 ha. The outer bay is 7.5 km wide, while the inner bay narrows to 3.5 km. This site is an important habitat for dusky dolphins.

Assessment of ecological significance

Two areas of biological importance for dusky dolphins have been identified in Admiralty Bay. Inner Admiralty Bay (the area south of a line drawn from Clayface Point in the west and Whangapoto Point in the east) is the most frequently used winter habitat for dusky dolphins. The wider Admiralty Bay area including Current Basin and Catherine Cove is also utilised by dolphins but less so than inner Admiralty Bay. The number of dusky dolphins using this wider area can vary significantly within and between seasons.



Dusky dolphins are widespread in the Southern Hemisphere and are not regarded as endangered nationally or internationally. However Admiralty Bay has gained recognition as an important winter feeding ground for some of the dusky dolphins found off Kaikoura at other times of the year[337,338,339]. Of particular interest is the way the dolphins work co-operatively to round up their food into bait balls while in Admiralty Bay.

2.18 PAPAROA (Subtidal)

Paparoa is a rocky headland at the eastern entrance to Pelorus Sound. This area is swept by regular and relatively strong tidal currents, particularly on the outgoing tide leaving Pelorus Sound. Rock outcrops close to shore are covered in biogenic habitat-forming species such as ascidians, hydroids, sponges, anemones and bryozoans[94].

Assessment of ecological significance

This area is one of a limited number of sites swept by regular and strong tidal currents. The regular tidal currents allow habitat forming species such as bryozoans, sponges and hydroids to establish on the rocky and soft substrata.

2.19 CHETWODE STACK (Terrestrial)

This small un-named island is located immediately off the western shore of Nukuwaiata Island (western Chetwode Island). It is approximately 1.8 ha with a circumference of approximately 580m.

Assessment of ecological significance

The island supports a colony of breeding sooty shearwater. Sooty shearwater colonies in Marlborough are relatively small but they are an important part of island ecosystems as they improve soil fertility which helps several threatened plant species.

2.20 CHETWODES (Subtidal)

This site is made up of two separate areas. The channel between the two main Chetwode Islands is approximately 525m wide and features a number of small rocky stacks swept by strong tidal currents. This area is a combination of bedrock and cobble and boulder substrata close to the channel and dead whole and broken shells further away from the passage. The second part of this site is the seafloor between the passage and The Haystack, a small island to the south. It is dominated by soft substrata with occasional rocky reef habitats.

Assessment of ecological significance

The high-current habitat in the passage supports ascidians, hydroids, sponges and bryozoans as well as associated encrusting species. The area between the passage south to The Haystack is dominated by Separation Point bryozoans and finger sponges[118]. The habitats and communities of both sites support a greater diversity of species compared with nearby areas without biogenic formations[90,174].

Allen Strait bryozoan (Rob Davidson)

2.21 SENTINEL ISLAND (Terrestrial)

Sentinel Rock is a small stack located approximately 2.8 km east off the eastern tip of the outer Chetwode Island (Te Kakaho). The rock is 0.49 ha with a circumference of approximately 290m.

Assessment of ecological significance

This small rock stack is one of the four most important roosting and breeding sites for king shag in Marlborough. A study between 1992 and 2002[339] recorded an average of 51 birds over winter. Because king shag breed and roost at relatively few sites, all sites are considered very important.

2.22 GOAT POINT (Subtidal)

Goat Point is a headland on the north-western shore of Forsyth Island. Goat Point is located approximately 1.5 km inside the Pelorus Harbour limit, some 56 km by sea from Havelock. The subtidal seafloor is a steep rocky reef extending offshore from the headland. It is swept by strong tidal currents.

Assessment of ecological significance

Rocky areas extending from Goat Point have been colonised by sponges, anemones, ascidians, corallines and hydroids including habitat-forming species such as bryozoans and tubeworms. These habitats support large numbers of species and are often important nursery areas for fish[40].

2.23 CULDAFF POINT (Subtidal)

Culdaff Point is located at the north-east corner of Forsyth Island. The area immediately offshore is a steeply shelving shore swept by strong tidal currents.

Assessment of ecological significance

Rocky areas have been colonised by sponges, anemones, ascidians, corallines and hydroids including habitat-forming species such as bryozoans and tubeworms. Large *Ancorina* sponges are particularly noteworthy at this site. Rocky shores extend over a wide depth range providing a variety of habitats and this is one of the few sites of its kind in the northern Sounds biogeographic.

Allen Strait (MDC)

2.24 ALLEN STRAIT (Subtidal)

Allen Strait is a narrow body of water that separates Forsyth Island from the mainland and connects Forsyth Bay to Anakoha Bay in the east. Strong tidal currents sweep through this 260m gap which is shallower than the bays east and west. The area has a large population of blue cod and is popular with fishermen.

Assessment of ecological significance

This site is the best example in Marlborough of an area dominated by the habitat-forming bryozoan, *Galeopsis porcellanicus*[90, 118]. It is also important for the variety of current dwelling species including anemones, hydroids, nesting mussels and colonial ascidians. Mats of living barnacles are found in the deeper and central parts of the Strait. The robust triplefin is a distinctive element of the fishlife.

2.25 ANAKOHA BAY ESTUARY (Intertidal)

Anakoha Bay is located in the outer Marlborough Sounds east of Forsyth Bay. It has a coastline of approximately 17.5 km and sea area of 967 ha. Anakoha Bay is approximately 2.6 km wide at the mouth (between Allen Strait in the west and the eastern headland of Tawaroa Point) and 6.5 km long. The site is the tidal flats and small estuarine area at the head of Anakoha Bay.

Anakoha Estuary (MDC)

Assessment of ecological significance

The estuary at the head of Anakoha Bay is surrounded by 20 ha of coastal forest. This site is one of the best examples of salt marsh vegetation leading to mature coastal forest in Marlborough. Few areas of this type remain in Marlborough.

2.26 TITI ISLAND (Terrestrial)

Titi Island is located approximately 4.6 km west of Forsyth Island. Titi Island covers 24ha and has a circumference of approximately 3.3 km, and is approximately 1.2 km long and 300m wide.

Assessment of ecological significance

This island is an important breeding colony for sooty shearwater, flesh-footed shearwater and little penguin[152]. It has the largest breeding colony of sooty shearwater and the only breeding colony of flesh-footed shearwater in Marlborough. It is likely that smaller species such as fairy prion and diving petrel also breed on the steep northern faces.

2.27 TITI ISLAND MOUNDS (Subtidal)

The soft sediment seafloor along the northern shoreline of Titi Island supports a variety of biogenic habitat-forming species including horse mussels, hydroids, sponges and bryozoans. Horse mussels, hydroids and sponges are relatively common at the north-western end of the island in water 20-30m deep. Large colonies of the Separation Point coral live below 30m along the northern side of the island.

Assessment of ecological significance

A wide variety of invertebrates and fish live in association with bryozoan mounds[40]. Reef fish known from this area include large schools of butterfly perch and juvenile blue cod. Habitats of this type have restricted distributions in Marlborough.

2.28 MCMANAWAY ROCKS (Subtidal)

McManaway Rocks are located in Cook Strait approximately 6.5 km north-north-west of Cape Jackson. The top of the southern pinnacle rises from deep water to approximately 13.5 m below the surface. The sides slope steeply to the west, and drop abruptly into deep water via a series of ledges to the east[118]. There are relatively few cracks but in places very large boulders sit on the ledges. There are strong tidal currents, and large brown seaweeds (paddle weed, *Sargassum sinclairii*) are restricted to a few scattered plants confined to the shallowest parts of the pinnacle. Branching coralline algae and large spiny goose barnacles also grow on the tops. Turfing brown and red algae (*Halopteris* sp., brown

Zooanthids
(Roberta D'Archino)

tongue weed, *Carpomitra costata, Plocamium costatum, Euptilota formosissima*) cover 15-20% of the substratum to at least 30m depth. The remainder of the substratum is encrusted with coralline algae, numerous sponges (including large *Ancorina alata, Latrunculia brevis, Polymastia fusca, Polymastia* sp., *Iophon minor,* pink golfball sponge, *Aplysilla sulphurea*), plumose hydroids, colonial cup coral jewel anemones, zooanthids, compound ascidians, brachiopods and arborescent bryozoans.

Fish species within safe diving depths are not particularly diverse but there are huge schools of butterfly perch, red banded perch, various triplefin and abundant blue cod and hagfish. Kingfish are frequently encountered around the rock and the deeper parts of the reef system are fished for hapuku.

Assessment of ecological significance

Offshore rock stacks are relatively uncommon in Marlborough. These stacks support a distinct assemblage of species usually in high numbers[118]. Their remoteness and exposure to bad weather limits fishing and netting. This has resulted in the presence of a unique assemblege of fishes and invertebrates. The large range in water depth, good light penetration and extremes in wave exposure help create a variety of habitat types.

2.29 WITT ROCKS (Subtidal)

Witt Rocks are located approximately 13.9 km offshore from Cape Lambert. Little is known about the biology of these remote rocks but local fishers report bryozoan beds, diverse macroalgae and encrusting communities. Two rock pinnacles rise steeply but do not reach the surface. The eastern rock is less than 10m below the surface, while the western pinnacle comes to less than 30m. A third rocky pinnacle, further to the south-west, rises up to approximately 70m depth.

Assessment of ecological significance

Offshore rock stacks are relatively uncommon in Marlborough[101]. These stacks support a distinct assemblage of species usually in high numbers[118]. Their remoteness and exposure to bad weather limits fishing and netting. As a result the fish fauna is usually rich and diverse. The large range in water depth, good light penetration and extremes in wave exposure help create variety in the habitat.

2.30 WAITUI BAY (Subtidal)

Waitui Bay is a large north-facing bay west of Cape Lambert and opens directly into Cook Strait. Waitui Bay has a coastline of approximately 13.28 km and sea area of 1310 ha. The mouth of Waitui Bay is approximately 6.2 km wide.

Assessment of ecological significance

A large area of central Waitui Bay supports horse mussels and associated encrusting species[118]. This is one of the two largest horse mussel beds in this biogeographic area. They provide shelter and refuge for invertebrates and a variety of fish, including juveniles of commercially and recreationally exploited species such as scallops and snapper as well as having profound effects on ecosystem structure and function[15,75,184,287,290].

Department of Conservation
Te Papa Atawbai
MARLBOROUGH DISTRICT COUNCIL

2.31 PORT GORE - DEEP OFFSHORE (Subtidal)

Port Gore is a large bay approximately 7 km wide between Cape Lambert on the west and Cape Jackson on the east. It opens directly into Cook Strait and has 37.5km of coastline and a sea area of 5550 ha.

Assessment of ecological significance

An area south-east of Cape Lambert is dominated by bryozoans, probably Separation Point "Coral", according to commercial fishers. A wide variety of invertebrates and fish live in association with bryozoan reefs[40]. This area has not been scientifically surveyed and little is known about it. This area is estimated to be approximately 314 ha in size.

2.32 PORT GORE - OFFSHORE SHALLOWS (Subtidal)

Based on historic surveys, a large area of central outer Port Gore supports a horse mussel bed and associated encrusting species.

Assessment of ecological significance

This is one of the two largest horse mussel beds in this biogeographic area however this area has been trawled regularly and their present condition is unknown. Beds on this scale are important components of the ecosystem. They provide a substratum for other species to settle and refuge from predators; they influence water flows and sedimentation rates; they produce deposits rich in organic carbon and nitrogen[15,75,290,291]. Horse mussels are also capable of filtering up to 80% of small particles from the water, affecting phytoplankton concentrations and water clarity[287].

2.33 PORT GORE - INSHORE (Subtidal)

This stretch of coast extends from Hunia north to southern Pig Bay. The coastline of approximately 2 km supports a variety of species often in good numbers. Within this area there are dense beds of horse mussels, scallops and red algae as well as a variety of other species associated with these communties[86]. Up to 14 horse mussels per square metre have been reported. Beds of tubeworm (*Owenia petersenae*), and small and large dog cockle are also known along this coastline. Egg cases from elephant fish have also been recorded, and blue cod are common.

Assessment of ecological significance

The density of horse mussels and the associated variety of species here make this relatively short stretch of shallow subtidal shoreline unique in the northern Sounds biogeographic area.

2.34 GANNET POINT (Subtidal)

Gannet Point is a headland located on the eastern side of inner Port Gore. A dense bed of dog cockles is present 50-70m offshore. Mounds of tubeworms (*Owenia petersenae*) have colonised in sand at 10-20m depth and covered up to 90% of the seafloor 110-150m offshore. Within this offshore zone, other species include horse mussels, scallops and red macroalgae. Beyond 190m this community is replaced by a silt and fine sand with relatively few species and low abundance[272,273].

Tubeworm mound (Rob Davidson)

Assessment of ecological significance

This community assemblage is the only one of its type known in Marlborough. The colonies of this tubeworm are unusual as this species is not common outside sheltered harbours such as Manakau and Ranganunu. The Gannet Point community is therefore significant at a national level (Geoff Read, pers. comm. NIWA).