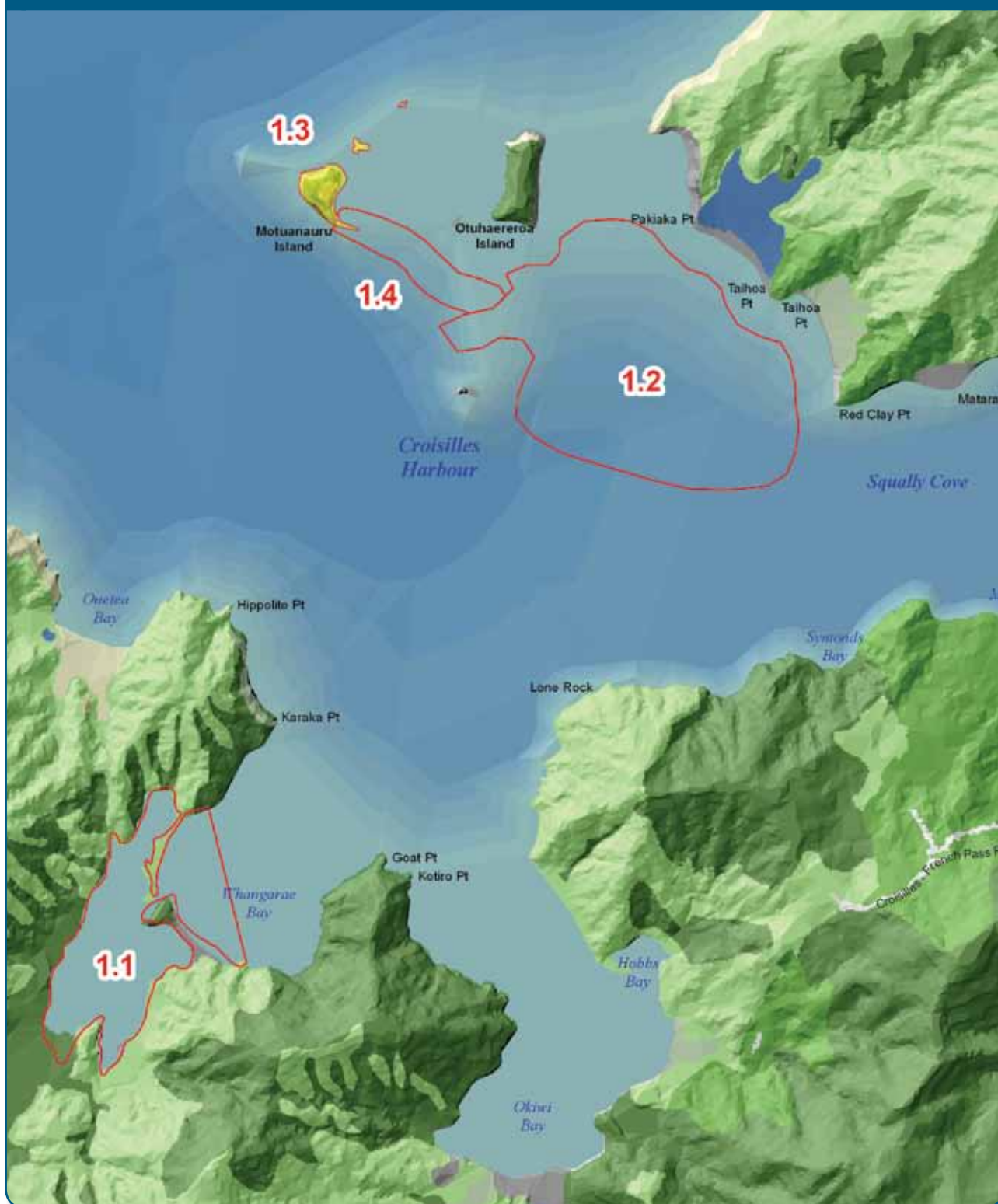


SITES OF ECOLOGICAL SIGNIFICANCE

- 1 TASMAN BAY (CROISILLES HARBOUR, KAKAHO POINT TO CURRENT BASIN, SOUTH-WEST D'URVILLE ISLAND TO TWO BAY POINT INCLUDING GREVILLE HARBOUR)

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



MAP 4 - SITES WITHIN BIOGEOGRAPHIC ZONE 1 (2 of 2)



OVERVIEW

The area has a varied but mostly rocky coastline interspersed by bays often with sandy beaches. Maximum depth varies from less than 20m in Croisilles Harbour to approximately 60m off Two Bay Point. Throughout most of Current Basin the maximum depth varies from approximately 25m-33m but just west of Reef Point depth reaches 68m due to scouring by strong tidal currents through French Pass.

Offshore rocky reefs are largely confined to south-west D'Urville Island between the Beef Barrels and Rahuinui Island. Coastal rocky reefs extend to between 6m and about 20m maximum depth before giving way to coarse gravels and sand. These may be worked into large waves (mega-ripples) by the combined action of waves and currents. Below about 24m these coarse sediments grade into soft, sandy muds. Much of Croisilles Harbour is exposed to winds and swell from the north and consequently has a relatively large area of shallow coarse clean sand in its entrance and middle reaches. In contrast the floor of Squally Cove, the harbour's eastern arm, is dominated by muds. Large areas of shallow, relatively clean sands also occur in Manuhakapakapa and Greville Harbour entrance, D'Urville Island. Inside Boulder Spit Point, Greville Harbour, the shoreline is very sheltered and rock and sand substrates are restricted to a shallow subtidal fringe.

Most of the coast is exposed to the north and west. Long-term average swell height is 1-1.5m. Circulation in Tasman Bay is strongly influenced by wind speed and direction but mean circulation is consistently anticlockwise. Water tends to enter near Farewell Spit and flow out around the top of D'Urville Island, with a return south-westerly flow along Nelson Boulder Bank. Residence time of waters in the bay is estimated to be from one to three months. Tidal flows of 0.15 to 0.3 metres per second are superimposed on weaker mean circulation of 0.0 to 0.1 metres per second. Tidal currents up to 1.6 knots (0.8 metres per second) occur in the middle reaches of Current Basin, reaching 5kn to 8kn in French Pass itself. Tidal elevation at Nelson is 1.3m and 1.5m at Croisilles Harbour.

Water in Tasman Bay is somewhat isolated from offshore waters, and in summer tends to be warmer, less saline and more stratified. Annual range in sea surface temperature in Tasman Bay is large, falling to about 10°C in winter and rising to 19-20°C in summer. Salinity varies from less than 31 parts per thousand to 35 parts per thousand. Dilution of surface waters is mainly due to winter floods.

BIOTA

Groups of estuarine macroinvertebrates (invertebrates big enough to see) in the region typically contain between 80 and 100 species. Estuaries are an important feeding and roosting area for waders, including eastern bar-tailed godwit, banded dotterel, variable oystercatcher, white-fronted tern, black-backed gull and red-billed gull.

Most estuaries retain at least some areas of intact vegetation sequence from coastal forest through to salt-meadows and salt marsh (*Juncus krussii* var. *australiensis*, *Apodasmia similis*, *Schoenoplectus pungens* and glasswort). Mill Arm supports good populations of a species of sea sedge (*Carex litorosa*) that is declining in its distribution and ranges nationally. The nationally uncommon native musk is well represented within the brackish salt pans of Wairau Lagoons. Cockle and to a lesser extent pipi beds are usually along the estuary channels. Banded rail are present. Land surrounding Whangarae Estuary supports populations of the regionally rare swamp maire and dune supporting *Spinifex sericeus*.

Phytoplankton communities in Tasman Bay are variable but typical of New Zealand coastal waters. There is a winter-spring diatom bloom dominated by species such as *Chaetoceros* spp., *Skeletonema costatum*, *Asterionella japonica*, *Leptosylindricus* spp., *Eucampia* spp., *Nitzshia* spp., *Thalassionema* spp., *Thalassiosira* spp. and *Coscinodiscus* spp. Small nanoplanktonic species are always an important component of the community and frequently dominate it. Phytoplankton production is potentially limited by nitrogen and peaks after rain and floods, and may involve conspicuous red-brown blooms of the non-toxic ciliate *Mesodinium rubrum*. Toxin-producing species recorded from Tasman Bay include *Dinophysis fortii* and *Dinophysis acuminata*. Nuisance blooms of *Phaeocystis pouchetii* have occurred in the bay, clogging fishing gear and potentially smothering fish and the seafloor.



Zooplankton is dominated by calanoid copepods (mainly *Arcatia ensifera*, *Corycaeus aucklandicus*, *Euterpina acutifrons*, *Oithona similis*, *Paracalanus indicus*), medusae and larvaceans (*Oikopleura* spp.). These are all typical inshore species. Although zooplankton populations appear to follow phytoplankton production, significant phytoplankton sedimentation to the seabed occurs in some years. Copepods are an important source of food for anchovy, pilchards and jack mackerel. In turn, these baitfish and large zooplankton become food for trevally, kahawai, barracouta, blue penguins, fluttering shearwaters, gannets, spotted shag and white-fronted tern. Other large predators include thresher shark, bronze whaler, blue shark, kingfish, common dolphin and bottlenose dolphin.

Subtidal rocky reefs are characterised by low cover and a limited diversity of macroalgae. With the exception of paddle weed, which is restricted to small stands off headlands, islands and shallow sections of offshore reefs between Greville and Croisilles Harbours, there are no laminarian kelps or bull kelp present in Tasman Bay. Dense beds of large brown algae dominated by narrow flapjack are limited to depths of less than 3m. Other brown algae present include slender zigzag weed *Cystophora torulosa* and brown tongue weed. Beneath the flapjack zone there is often a narrow band of mixed algae dominated *Sargassum sinclairii* and flexible flapjack. Below 4m large brown algae are rare, except for small patches of flexible flapjack, and reef areas have a high coverage of crustose coralline algae, large numbers of small kina, colonial cup coral, common anemone, and the sponges *Ancorina alata*, *Aplysilla sulfurea*, *Crella incrustans* and *Tethya ingalli*. In the north-east of this coastal area flexible flapjack occasionally forms forests down to 12m.

Common encrusting invertebrates in this area include the mollusc *Serpulorbis aotearoicus*, false oyster, window oyster, small colonies of the bryozoan *Celleporaria agglutinans*, and the small red brachiopod *Waltonia inconspicua*.

Sponges, hydroids and compound ascidians become increasingly abundant with depth and form diverse "sponge gardens" in places. The ambush star and the sea star (*Stichaster australis*) are distinctive elements of the fauna in the area. The large, rare giant sponge chiton has been recorded on sponges in Croisilles Harbour. Serpulid tubeworm mounds (mainly *Galeolaria hystrix*) grow on rocky outcrops and cobble reefs below 15m in Current Basin but are not a conspicuous feature of reefs elsewhere in this area. Rock lobsters are present on reefs throughout.

Hydroid trees
(Rob Davidson)



Common reef fish include short-tailed stingray, eagle ray, conger eel, rock cod, sea perch, slender roughy, sweep, butterfly perch, goatfish, yellow-eyed mullet, marblefish, red moki, tarakihi, spotty, banded wrasse, scarlet wrasse, blue cod, triplefins (yellow-black triplefin, common triplefin, mottled triplefin, variable triplefin, blue-eyed triplefin, longfinned triplefin, spectacled triplefin) and leatherjacket. Butterfish are found on reefs that support dense beds of large brown algae. Snapper are present year round but are most abundant inshore during summer.

Gravels and coarse sandy sediments on the open coast appear to support relatively few organisms. Bivalves found in this habitat include large dog cockle, purple sunset shell, frilled venus shell, and fine *Dosinia*. The offshore muddy sediments support a fauna described as an "*Amphiura rosea* – *Dosinia lambata* community". Key species within this community are mostly deposit feeders and include: turret shell, brittle star, *Amphiura rosea*, heart urchin and the bivalves silky *Dosinia*, *Neilo australis* and *Nucula* spp.. The sandier sediments support similar plant and animal life, though there are some differences. Key species are the bivalves pink sunset shell,

silky *Dosinia*, nut shell, *Neilo australis*, strawberry cockle, *Scalpomactra scalpellum*, brittle star, sand dollar and heart urchin. Common species on the seafloor include scallops, speckled whelk, common hermit crab, plankton hermit crab, orange hermit crab, cushion star and eleven-arm star. Tasman Bay and Croisilles Harbour support important commercial and recreational scallop fisheries.

Croisilles Harbour also supports a unique shallow sand assemblage characterised by low silt and high densities of the small irregular urchin *Apatopygus recens* and the patchily distributed New Zealand lancelet. This is the southern-most recorded population of New Zealand lancelet. It has been collected from depths between 6m and 17m off Moukirikiri Island and Karaka Bay within Croisilles Harbour. Densities off Moukirikiri Island reached 450 per square metre. Lancelets are vulnerable to disturbance from dredging and siltation.

Snapper are important predators in Tasman Bay. Tagging and genetic data indicate the Tasman Bay population is isolated from other snapper populations off the north-west and east coasts of the North Island. Adult snapper gather in Tasman Bay in summer to spawn and disperse to northern Westland, the outer Marlborough Sounds and lower North Island in winter. Inside Tasman Bay snapper segregate by size. Large snapper are generally found schooling between 11m to 18m depth in southern parts of Tasman Bay, whereas small fish (including large numbers aged between two and three years) are found in shallower water around the western shoreline. Snapper found in deep water in the middle of the bay are mostly older than four years. Snapper were over-fished between 1977 and 1980 when aircraft were used to spot sub-surface schools for pair trawlers and purse seiners. Before this, much of the adult population had been unavailable to conventional bottom trawlers

Other fish found in this biogeographical area include spotted spiny dogfish, carpet shark, rig, school shark, electric ray, 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, goatfish, tarakihi, yellow-eyed mullet, spotty, blue cod, spotted stargazer, opal fish, witch, lemon sole, speckled sole, common sole, yellowbelly flounder, sand flounder, leatherjacket and porcupine fish.

The invasive Pacific oyster is well established in Croisilles Harbour and Manuhakapakapa. Other exotic marine species include ship worm, sponge crab, red rock crab, *Anguinella palmate*, *Bowerbankia imbricata*, *Bugula flabellata*, *Bugula neritina*, *Bugula stolonifera*, *Conopeum seurati*, *Cryptosula pallasiana*, *Tricellaria porteri*, *Watersipora subtorquata*, *Corella eumyota* and *Didemnum "candidum"*. Until relatively recently many of these species, such as blue mussel and red rock crab, had been considered part of New Zealand's indigenous marine life.

Table 2 - List of Sites of Significance in Biogeographic Zone 1

No.	Biogeographic Zone 1	Level of information	Representativeness	Rarity	Diversity & pattern	Distinctiveness	Size	Connectivity	Catchment
1.1	Whangarae Estuary	1	H	M	M	H	H	L	M
1.2	Croisilles Harbour entrance	2	H	M	M	M	H	L	L
1.3	Motuanauru Island	2	H	M	L	M	L	L	L
1.4	Motuanauru Is. boulder bank	2	H	L	M	H	H	L	L
1.5	Coppermine and Ponganui Bays	2	H	M	M	H	L	L	M
1.6	Rahuinui Island	1	H	H	L	M	L	L	M
1.7	Inner Greville Harbour	2	H	H	L	H	H	H	M
1.8	Greville Harbour channel	2	H	M	M	M	L	H	H

Key

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

SIGNIFICANT SITES

1.1 WHANGARAE ESTUARY

Whangarae Bay is located approximately 5 km south-east of Cape Soucis and forms the south-western arm of Croisilles Harbour. Whangarae Estuary has a coastline of approximately 6.8 km, and covers an area of 113.5 ha. The estuary is approximately 2.3 km long, and up to 1 km wide.

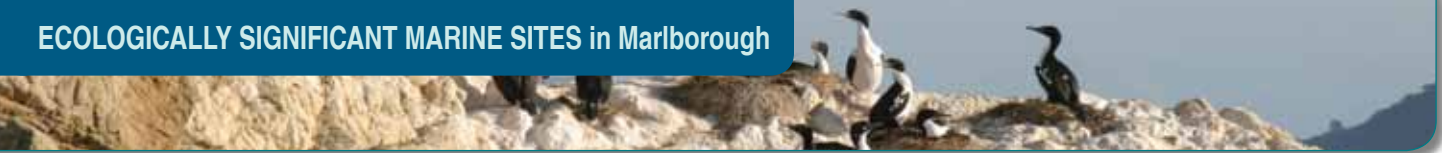
Whangarae Estuary
(MDC)



Assessment of ecological significance

Whangarae Estuary is the largest and most natural estuary in the Tasman Bay biogeographic area¹⁰¹. The lack of development, farming, port development and urban and industrial development makes this estuary an important control area, enabling comparisons with other estuaries in Marlborough that have been impacted by human activities¹⁰³. It has uninterrupted vegetation sequence from salt marsh and herb field through to fringing species and coastal forest. Apart from the south-eastern hillside and estuary edge, most of the bush catchment is privately owned and has been logged in the past. However it is now predominantly regenerating coastal forest. Around the estuary fringes are stands of the regionally rare swamp maire tree representing one of the few known sites of its kind in the South Island. *Spinifex*, a regionally rare sand-dune plant, grows on the south-east sand spit, along with other native coastal and sand-inhabiting plants. Sand spits with remnant native vegetation cover are relatively rare in Marlborough.

Whangarae Estuary provides habitat for several regionally rare species including the banded rail and fern bird. Observations suggest that the estuary supports a relatively wide variety of estuarine habitats and associated species.



1.2 CROISILLES HARBOUR ENTRANCE (Subtidal)

About 368 ha of subtidal sand flats are on the northern side of the entrance to Croisilles Harbour between the Croisilles Islands and the northern headland to the harbour. Ranging in depth from 5 to 15m, the flats have been commercially dredged in the past but are now dredged only by recreational fishers during the scallop season. The sand flats are bisected by occasional channels that provide deeper habitats for some species.

Assessment of ecological significance

This area is one of the largest and best examples of shallow, tidally swept sand flats in Marlborough. The flats provide habitats for a variety of species often found in large numbers. For example, beds of scallops are widespread and regularly recorded throughout this area. These flats are the only known site in Marlborough where the New Zealand lancelet has been recorded¹⁰³.

1.3 MOTUANAURU ISLAND (Terrestrial)

Motuanauru Island is the western-most and second largest of the three Croisilles Islands on the eastern side of the entrance to Croisilles Harbour. It has a coastline of approximately 1.4 km and covers an area of approximately 9.5 ha.

Motuanauru Island
(MDC)



Assessment of ecological significance

Motuanauru Island is one of the best examples of a seabird nesting island in the Tasman biogeographic area. Sooty shearwater, fluttering shearwater and diving petrel regularly nest on the island. The island is important to seabirds because there are no mammal predators or weka, which eat small birds and eggs.

In most years white-fronted tern breed at this site, often on the islets north-east of Motuanauru³⁴¹. The adjacent island, Otuhaereroa, is also predator-free apart from weka. Sooty shearwater and fluttering shearwater also breed on Otuhaereroa in small numbers.

1.4 MOTUANAURU ISLAND BOULDER BANK (Intertidal and Subtidal)

A 1.2 km long boulder bank extends south-east from the southern end of Motuanauru Island.

Assessment of ecological significance

This is the largest single boulder bank habitat in the Marlborough Sounds¹⁰³.

1.5 COPPERMINE AND PONGANUI BAYS (Subtidal)

Coppermine and Ponganui Bays are along the southern coastline of D'Urville Island in Current Basin (2.9 km west of French Pass). Within these relatively shallow bays there is approximately 22 ha of rhodolith bed. In these bays rhodoliths are found between 6 and 26m deep and cover up to 100 % of the silt and dead shells on the seafloor.

Assessment of ecological significance

This is the largest known rhodolith bed in Marlborough and the only one in the Tasman biogeographic area. Much smaller beds are found in two other bays in Marlborough. The privately owned catchments are clad in regenerating forest which ensures low sedimentation in the bays. Calcified algae play a critical role in the ecosystem by providing additional habitat^{17,26,133,174,160,283,353,355}.

1.6 RAHUINUI ISLAND (Terrestrial)

Rahuinui Island is located along the south-western end of D'Urville Island, 7.5 km up from its southern tip. The island consists of three small land masses approximately 1 km due east of the D'Urville coast.

Assessment of ecological significance

King shags roost on the northern-most island and have been breeding there since 1996. Nearby islets are occasionally used by these birds, but less frequently than Rahuinui Island. King shags breed in relatively few places in Marlborough so a catastrophe at any of the breeding sites could threaten the whole population. All roosting and breeding sites are therefore considered significant.

1.7 GREVILLE HARBOUR (Intertidal and Subtidal)

Greville Harbour is a large inlet on the western side of D'Urville Island, some 66.5 km by sea from the entrance to Port Nelson. The harbour is roughly 6 km long and between 0.5 km and 2 km wide. The entrance to Greville Harbour is a boulder spit composed of large rounded boulders that extends 0.5 km from the northern side of the harbour and 0.25 km from the south of Greville Harbour entrance.

Assessment of ecological significance

The forested catchment around Greville Harbour provides a stable low-sediment environment but much of this land is privately owned – only the eastern slopes of Mount Jackson to the western shoreline of Mill Arm is a reserve. There are good populations of the nationally declining sea sedge in the delta systems at the head of the harbour, along the north-west shore of Mill Arm and in Wharairiki Bay, Punt Arm and Smylies Arm. These areas provide the greatest concentration of sea sedge in the northern South Island and are the only locations known in the Tasman biogeographic area.

1.8 GREVILLE HARBOUR CHANNEL (Subtidal)

Greville Harbour is a large inlet on the western side of D'Urville Island, some 66.5 km by sea from the entrance to Port Nelson. The harbour is roughly 6 km long and between 0.5 km and 2 km wide. The entrance to inner Greville Harbour is defined by a boulder spit composed of large rounded boulders that extends 0.5 km from the northern side of the harbour and 0.25 km from the south with a tidal channel approximately 140 m wide at low water between the two boulder spits.

Assessment of ecological significance

The tidal channel located between the boulder spits represents a fast flow habitat. Fast flow habitats are located at isolated locations in Marlborough. These habitats support a wide range of species often in relatively high abundance compared to marine areas with low or minor tidal flows.