Port of Picton

Baseline survey for non-indigenous marine species (Research Project ZBS2000/04)

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Executive Summary

This report describes the results of a December 2001 survey to provide a baseline inventory of native, non- indigenous and cryptogenic marine species within the Port of Picton.

- The survey is part of a nationwide investigation of native and non-native marine biodiversity in 13 international shipping ports and three marinas of first entry for yachts entering New Zealand from overseas.

- Sampling methods used in these surveys were based on protocols developed by the Australian Centre for Research on Introduced Marine Pests (CRIMP) for baseline surveys of non-indigenous species in ports. Modifications were made to the CRIMP protocols for use in New Zealand port conditions.

- A wide range of sampling techniques was used to collect marine organisms from a range of habitats within the Port of Picton. Fouling assemblages were scraped from hard substrata by divers, benthic assemblages were sampled using a benthic sled, and a gravity corer was used to sample for dinoflagellate cysts. Mobile predators and scavengers were sampled using baited fish, box, starfish and shrimp traps.

- The distribution of sampling effort in the Port of Picton was designed to maximise the chances of detecting non-indigenous species and concentrated on high-risk locations and habitats where non-indigenous species were most likely to be found.

- Organisms collected during the survey were sent to local and international taxonomic experts for identification.

- A total of 215 species or higher taxa was identified from the Picton Port survey. These consisted of 148 native species, 9 non-indigenous species, 25 cryptogenic species (those whose geographic origins are uncertain) and 33 species indeterminata (taxa for which there is insufficient taxonomic or systematic information available to allow identification to species level).

- Fourteen species of marine organisms collected from the Port of Picton had not previously been described from New Zealand waters. These consisted of a newly-discovered non-indigenous species (the ascidian, *Cnemidocarpa sp.*), a cryptogenic amphipod (*Meridiolembos* sp. aff. *acherontis*) and 12 species of sponge that did not match existing species descriptions and which may be new to science.

- The nine non-indigenous organisms described from the Port of Picton included representatives of five phyla. The non-indigenous species detected (ordered alphabetically by phylum, class, order, family, genus and species) were: (Annelida): *Dipolydora armata, Dipolydora flava* and *Polydora hoplura* (Bryozoa): *Bugula flabellata* and *Watersipora subtorquata,* (Phycophyta): *Undaria pinnatifida* and *Griffithsia crassiuscula* (Porifera): *Halisarca dujardini* and (Urochordata): *Cnemidocarpa* sp.

- The only species from the Port of Picton on the New Zealand register of unwanted organisms is the Asian kelp, *Undaria pinnatifida*. This alga is known to now have a wide distribution in southern and eastern New Zealand.

- Most non-indigenous species located in the Port are likely to have been introduced to New Zealand accidentally by international shipping or through domestic translocation or natural spread from other locations in New Zealand.

- Approximately 56 % (five of nine species) of NIS in the Port of Picton are likely to have been introduced in hull fouling assemblages and 44 % (four species) could have been introduced by either ballast water or hull fouling vectors. Ballast water was not attributed as a definite introduction vector for any of the NIS encountered in the Port of Picton.

- The predominance of hull fouling species in the introduced biota of the Port of Picton (as opposed to ballast water introductions) is consistent with findings from similar port baseline studies overseas.

Introduction

Introduced (non-indigenous) plants and animals are now recognised as one of the most serious threats to the natural ecology of biological systems worldwide (Wilcove et al 1998, Mack et al 2000). Growing international trade and trans-continental travel mean that humans now intentionally and unintentionally transport a wide range of species outside their natural biogeographic ranges to regions where they did not previously occur. A proportion of these species are capable of causing serious harm to native biodiversity, industries and human health. Recent studies suggest that coastal marine environments may be among the most heavily invaded ecosystems, as a consequence of the long history of transport of marine species by international shipping (Carlton and Geller 1993, Grosholz 2002). Ocean-going vessels transport marine species in ballast water, in sea chests and other recesses in the hull structure, and as fouling communities attached to submerged parts of their hulls (Carlton 1985, 1999, AMOG Consulting 2002, Coutts et al 2003). These shipping transport mechanisms have enabled hundreds of marine species to spread worldwide and establish populations in shipping ports and coastal environments outside their natural range (Cohen and Carlton 1995, Hewitt et al 1999, Eldredge and Carlton 2002, Leppäkoski et al 2002).

Biosecurity[1] is important to all New Zealanders. New Zealand's geographic isolation makes it particularly vulnerable to marine introductions because more than 95% of its trade in commodities is transported by shipping, with several thousand international vessels arriving and departing from more than 13 ports and recreational boat marinas of first entry (Inglis 2001). The country's geographic remoteness also means that its marine biota and ecosystems have evolved in relative isolation from other coastal ecosystems. New Zealand's marine biota is as unique and distinctive as its terrestrial biota, with large numbers of native marine species occurring nowhere else in the world.

The numbers, identity, distribution and impacts of non-indigenous species in New Zealand's marine environments are poorly known. A recent review of existing records suggested that by 1998, at least 148 species had been deliberately or accidentally introduced to New Zealand's coastal waters, with around 90 % of these establishing permanent populations (Cranfield et al 1998). To manage the risk from these and other non-indigenous species, better information is needed on the current diversity and distribution of species present within New Zealand.

BIOLOGICAL BASELINE SURVEYS FOR NON-INDIGENOUS MARINE SPECIES

In 1997, the International Maritime Organisation (IMO) released guidelines for ballast water management (Resolution A868-20) encouraging countries to undertake biological surveys of port environments for potentially harmful non-indigenous aquatic species. As part of its comprehensive five-year Biodiversity Strategy package on conservation, environment, fisheries, and biosecurity released in 2000, the New Zealand Government funded a national series of baseline surveys. These surveys aimed to determine the identity, prevalence and distribution of native, cryptogenic and non-indigenous species in New Zealand's major shipping ports and other high risk points of entry. The government department responsible for biosecurity in the marine environment at the time, the New Zealand Ministry of Fisheries (MFish), commissioned NIWA to undertake biological baseline surveys in 13 ports and three marinas that are first ports of entry for vessels entering New Zealand from overseas (Fig. 1). Marine biosecurity functions are now vested in Biosecurity New Zealand.

The port surveys have two principal objectives:

[1] Biosecurity is the management of risks posed by introduced species to environmental, economic, social, and cultural values.

i. To provide a baseline assessment of native, non-indigenous and cryptogenic[2] species, and
ii To determine the distribution and relative abundance of a limited number of target species in shipping ports and other high risk points of entry for non-indigenous marine species.

Figure 1: Commercial shipping ports in New Zealand where baseline non-indigenous species surveys have been conducted. Group 1 ports surveyed in the summer of 2001/2002 are indicated in bold and group 2 ports surveyed in the summer of 2002/2003 are indicated in plain font. Marinas were also surveyed for NIS in Auckland, Opua and Whangarei in 2002/2003.

The surveys will form a baseline for future monitoring of new incursions by non-indigenous marine species in port environments nationwide, and will assist international risk profiling of problem species through the sharing of information with other shipping nations.

This report summarises the results of the Port of Picton survey and provides an inventory of species detected in the Port. It identifies and categorises native, introduced ("non-indigenous") and cryptogenic species. Organisms that could not be identified to species level are also listed as species indeterminata.

DESCRIPTION OF THE PORT OF PICTON

The Port of Picton is located at the head of the sheltered Queen Charlotte Sound, on the north-eastern tip of the South Island of New Zealand (14^{o} 17'S, 174^{o} 00'E). The head of Picton Harbour is divided into two bays by Kaipupu Point, with the Port of Picton including facilities in both bays. The main port activity takes place at Picton, situated at the head of the eastern bay where there are a number of finger wharves including three ferry terminal berths and the

[2] "Cryptogenic:" species are species whose geographic origins are uncertain (Carlton 1996).

Waitohi Wharf (Fig. 2). The Waimahara Wharf located at the head of the adjacent, western bay (Shakespeare Bay) was not sampled during this survey.

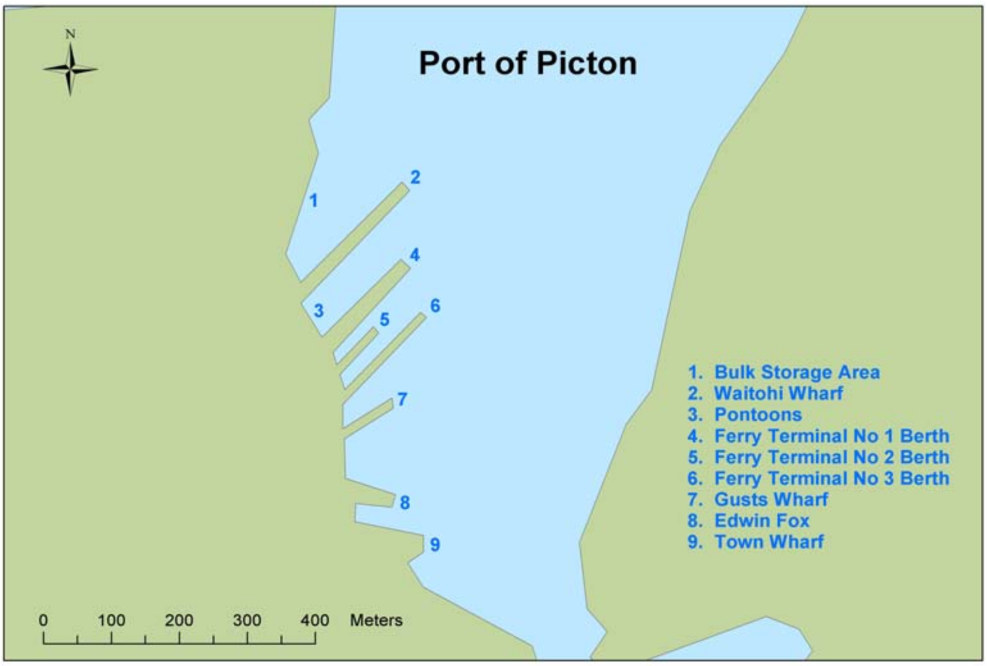

Figure 2: Port of Picton map

Picton was first established as Te-Wera-a-Waitohi by Te Atiawa Māori. When Europeans sailed up Queen Charlotte Sound for the first time they found a well established village which was an important trading point with North Island Māori, with a population of around 200. In December 1844 Francis Dillon Bell, representing the New Zealand Company, and Sir George Grey, the Governor, purchased the site. By 1850 Picton was fully established and had begun servicing the antimony, copper and coal mines in the area as well as gold mining up the Pelorus valley, although mining had ceased by 1953. As the population and farming increased a number of processing units set up to service the town. Eventually the railway linking Picton to Blenheim and the rest of the country was built. This resulted in Picton becoming the main inter-island travel port for New Zealand (www.marlboroughonline.co.nz) with terminal facilities established at the port in 1962 (www.teara.govt.nz).

In 2000, the new deep water port facility, Waimahara Wharf, opened in Shakepseare Bay. This new development complements the port's existing facilities. The 200 m long Waimahara Wharf is designed as a multi purpose berth with the ability to be expanded northwards if required. With a depth alongside of 15.3 m at low tide the wharf provides deep-water access. The addition of mooring dolphins will allow Panamax vessels to be accommodated. With quayside storage of 10 ha the wharf area is ideally suited to activities such as the current log handling shipping. The Port of Picton is currently run by Port Marlborough NZ Ltd (www.portmarlborough.co.nz), established in 1988.

PORT OPERATION AND SHIPPING MOVEMENTS

The Port of Picton is a relatively small shipping port, but has berths serving both road and rail traffic for the Cook Strait inter-island ferry services. The port also has wharves for water taxis, commercial launches, vessels at anchor, and large visiting recreational vessels. No. 1 berth caters for vehicle-carrying high-speed ferries. No. 2 berth services road and rail-carrying conventional ferries. On the eastern side of No. 2 wharf is a larger wharf (No 3. berth) for vehicle-carrying conventional vessels. Waitohi Wharf is a general-purpose finger wharf providing berths and facilities for overseas and coastal cargo vessels – mainly those involved in coastal trading (salt loading, cement discharge), fishing and those which sail the Cook Strait. The wharf also serves as the berth for passenger cruise ships, accommodating vessels up to 265 m long. Berth construction is predominantly concrete deck on a mixture of steel casing (concrete internally) and precast concrete piles with wooden fendering piles. Further details of the dimensions of each berth, the adjacent draught and the cargo each berth handles are provided in Table 1.

There is one recreational marina adjacent to the Port of Picton. The Picton Marina has 232 floating concrete pier/wooden pile berths for vessels 8-35+ m in length. Waikawa Marina is just five minutes drive from the port and has 600 floating concrete pier/wooden pile berths for vessels 8-20 m in length.

Recent analyses of international shipping arrivals to the Port of Picton showed that there was a total of eight international ship visits during 2002/2003 (3 merchant, 3 pleasure and 2 passenger vessels) with 37.5 % arriving from Australia and the remainder not resolved in terms of country of origin (Campbell 2004). The majority of vessel visits to the port are from within New Zealand. In 2000, there were 69 registered fishing vessels in the Port of Picton (Sinner et al 2000).

The Port of Picton facilitates a significant interisland passenger/freight service involving two companies: The Interisland Line and Strait Shipping. Each year Interislander vessels accommodate over one million passengers, 230,000 domestic vehicles and operate over 5,700 sailings (http://www.interislander.co.nz), while Strait Shipping runs 1,300 return trips between Picton and Wellington annually (www.strait.co.nz).

In 2004, timber loaded at Waimahara wharf totalled 332,745 tonnes, a 5 % decrease in volume from the previous year. Salt made a significant contribution to cargo volume with a record 73,878 tonnes shipped through the port. Cement and fish totalled 12,101 and 13,910 tonnes shipped respectively. This gave a total of 432,634 tonnes in non-ferry cargo shipped during 2004. In 2004, there were 12 visits from passenger cruise vessels (www.portmarlborough.co.nz).

Vessels unable to be berthed immediately in the port may anchor inside the Sound west of Mabel Island (41°16'S, 174°00.7'E) in 25 m of water. Pilotage is compulsory on vessels over 500 GRT unless with Pilot exemption (www.portmarlborough.co.nz; accessed 16/06/05).

Vessels are expected to comply with the Voluntary Controls on the Discharge of Ballast Water in New Zealand (http://www.fish.govt.nz/sustainability/biosecurity/: accessed 07/06/05); vessels are requested to exchange ballast water in mid-ocean (away from coastal influences) en route to New Zealand and discharge only the exchanged water while in port. A total volume of 6,956 m^3 of ballast water was discharged in the Port of Picton in 1999, with the largest country-of-origin volumes of 1,618 m^3 from Japan, 154 m^3 from Australia, and 5,184 m^3 unspecified (Inglis 2001).

Within the port, there is no on-going maintenance dredging. Scouring by vessel thrusters and propellers ensures the berths are kept free from sedimentation (Robin Boyce, Port Marlborough NZ Ltd, pers comm.). The inner part of the Sound is generally over 20 m in depth. The minimum depth in the main channel west of Long Island is 13.4 m, whilst the alternative channel to the east of Long Island has a minimum water depth of 19.2 m. Neap tidal range is 0.6 m and spring tidal range 1.7 m.

A proposal is underway to develop a new ro-ro berth on Westshore in the north western corner of Picton Harbour. This development would include provision of a support area for the marshalling of vehicles and cargo, and will relieve berth and marshalling activity on Waitohi wharf. The proposal also includes extension of sheetpiling to provide a wharf for commercial fishing vessels to load and discharge and, as a second stage the construction of floating berths for fishing and commercial vessels. Port Marlborough is also developing a 7 ha reclamation alongside the existing Havelock marina as a marine industrial cluster with additional berthing (220 new berths for vessels up to 30 m in length) (www.portmarlborough.co.nz).

EXISTING BIOLOGICAL INFORMATION

We are not aware of any existing biological studies that describe marine communities in the immediate environment of Picton Harbour, although impact assessment studies were conducted for the Shakespeare Bay port development (Duckworth 1987) and the Cawthron Institute has been involved in on-going studies of the flora and fauna of the new port facility in Shakespeare Bay.

The invasive kelp *Undaria pinnatifida* was identified in the Marlborough Sounds in 1991, and this area is deemed in the optimal temperature zone for this macroalga (Sinner et al 2000).

Taylor and MacKenzie (2001) investigated the Port of Picton for the presence of the toxic blooming dinoflagellate *Gymnodinium catenatum*, and did not detect resting cysts (sediment samples) or motile cells (phytoplankton samples).

In 2004, Port Marlborough NZ Ltd spent $44,000 on environmental monitoring and attempted to eradicate the ascidian *Didemnum vexillum*, a nuisance species that fouls marine habitats (www.portmarlborough.co.nz).

Survey methods

SURVEY METHOD DEVELOPMENT

The sampling methods used in this survey were based on the CSIRO: Centre for Research on Introduced Marine Pests (CRIMP) protocols developed for baseline port surveys in Australia (Hewitt and Martin 1996, 2001). CRIMP protocols have been adopted as a standard by the International Maritime Organisation’s Global Ballast Water Management Programme (GloBallast). Variations of these protocols are being applied to port surveys in many other nations. A group of New Zealand marine scientists reviewed the CRIMP protocols and conducted a workshop in September 2001 to assess their feasibility for surveys in this country (Gust et al. 2001). A number of recommendations for modifications to the protocols ensued from the workshop and were implemented in surveys throughout New Zealand. The modifications were intended to ensure cost effective and efficient collection of baseline species data for New Zealand ports and marinas. The modifications made to the CRIMP protocols and reasons for the changes are summarised in Table 2. Further details are provided in Gust et al. (2001).

Baseline survey protocols are intended to sample a variety of habitats within ports, including epibenthic fouling communities on hard substrata, soft-sediment communities, mobile invertebrates and fishes, and dinoflagellates. Below, we describe the methods and sampling effort used for the Picton survey. The survey was undertaken from the 10^{th} to 13^{th} of December 2001. Most sampling was concentrated on three main berths: Ferry terminal 2, Ferry terminal 3 and the Waitohi Wharf. Because of existing survey work for introduced marine species undertaken by the Cawthron Institute, no sampling was done on the

Shakespeare Bay terminal. A summary of sampling effort within the Port is provided in Tables 3a,b.

DIVER OBSERVATIONS AND COLLECTIONS ON WHARF PILES

Fouling assemblages were sampled on four pilings at each berth. Selected pilings were separated by 10 – 15 m and comprised two pilings on the outer face of the berth and, where possible, two inner pilings beneath the berth (Gust et al 2001). On each piling, four quadrats (40 cm x 25 cm) were fixed to the outer surface of the pile at water depths of approximately -0.5 m, -1.5 m, -3.0 m and -7 m. A diver descended slowly down the outer surface of each pile and filmed a vertical transect from approximately high water to the base of the pile, using a digital video camera in an underwater housing. On reaching the sea floor, the diver then ascended slowly and captured high-resolution still images of each quadrat using the photo capture mechanism on the video camera. Because of limited visibility, four overlapping still images, each covering approximately ¼ of the area of the quadrat were taken for each quadrat. A second diver then removed fouling organisms from the piling by scraping the organisms inside each quadrat into a 1-mm mesh collection bag, attached to the base of the quadrat (Fig. 3). Once scraping was completed, the sample bag was sealed and returned to the laboratory for processing. The second diver also made a visual search of each piling for potential invasive species and collected samples of large conspicuous organisms not represented in quadrats. Opportunistic visual searches were also made of breakwalls and rock facings within the commercial port area. Divers swam vertical profiles of the structures and collected specimens that could not be identified reliably in the field.

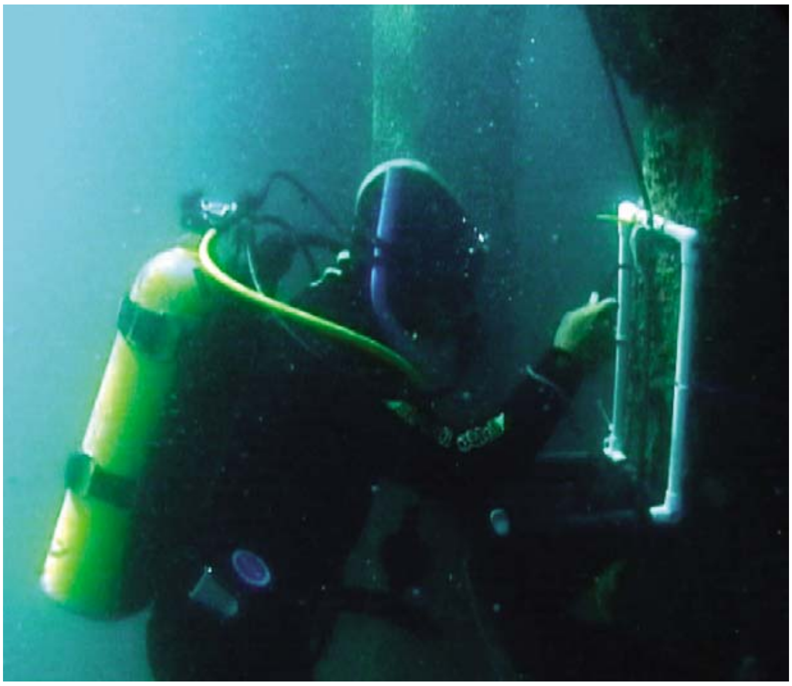

Figure 3: Diver sampling organisms on pier piles.

BENTHIC INFAUNA

Benthic infauna was sampled using a Shipek grab sampler deployed from a research vessel moored adjacent to the berth (Fig. 4), with samples collected from within 5 m of the edge of the berth. The Shipek grab removes a sediment sample of ~3 *l* and covers an area of approximately 0.04 m^2 on the seafloor to a depth of about 10 cm. It is designed to sample unconsolidated sediments ranging from fine muds and sands to hard-packed clays and small cobbles. Because of the strong torsion springs and single, rotating scoop action, the Shipek grab is generally more efficient at retaining samples intact than conventional VanVeen or Smith McIntyre grabs with double jaws (Fenwick, NIWA, *pers obs*). Three grab samples are typically taken at haphazard locations along each sampled berth. Sediment samples are then washed through a 1-mm mesh sieve and animals retained on the sieve were returned to the field laboratory for sorting and preservation. However, during the survey of the Port of Picton the grab was broken and benthic samples could not be obtained using this sample method.

Figure 4: Shipek grab sampler: releasing benthic sample into bucket

EPIBENTHOS

Larger benthic organisms were sampled using an Ocklemann sled (hereafter referred to as a "sled"). The sled is approximately one meter long with an entrance width of ~0.7 m x 0.2 m. A short yoke of heavy chain connects the sled to a tow line (Fig. 5). The mouth of the sled partially digs into the sediment and collects organisms in the surface layers to a depth of a few centimetres. Runners on each side of the sled prevent it from sinking completely into the sediment so that shallow burrowing organisms and small, epibenthic fauna pass into the exposed mouth. Sediment and other material that enters the sled is passed through a mesh basket that retains organisms larger than about two mm. Sleds were towed for a standard time of two minutes at approximately two knots. During this time, the sled typically traversed between 80 – 100 m of seafloor before being retrieved. Two to three sled tows were completed adjacent to each sampled berth within the port, and the entire contents were sorted.

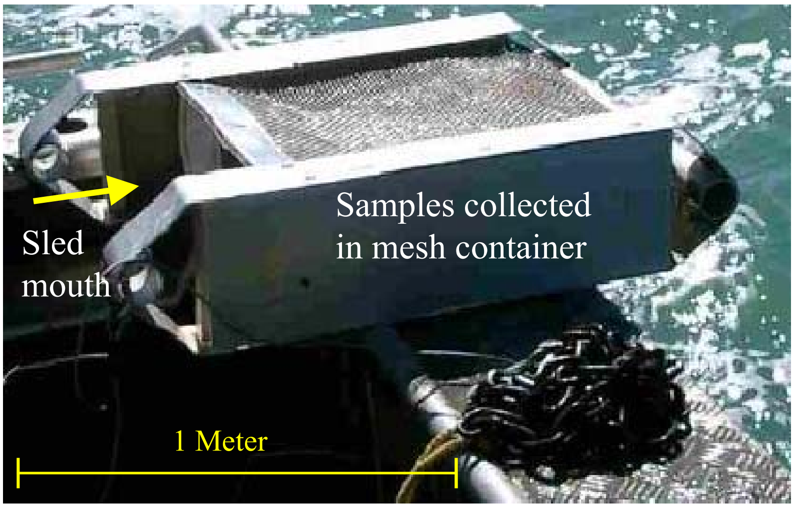

Figure 5: Benthic sled

SEDIMENT SAMPLING FOR CYST-FORMING SPECIES

A TFO gravity corer (hereafter referred to as a "javelin corer") was used to take small sediment cores for dinoflagellate cysts (Fig. 6). The corer consists of a 1.0-m long x 1.5-cm diameter hollow stainless steel shaft with a detachable 0.5-m long head (total length = 1.5 m). Directional fins on the shaft ensure that the javelin travels vertically through the water so that the point of the sampler makes first contact with the seafloor. The detachable tip of the javelin is weighted and tapered to ensure rapid penetration of unconsolidated sediments to a depth of 20 to 30 cm. A thin (1.2 cm diameter) sediment core is retained in a perspex tube within the hollow spearhead. In muddy sediments, the corer preserves the vertical structure of the sediments and fine flocculant material on the sediment surface more effectively than hand-held coring devices (Matsuoka and Fukuyo 2000). The javelin corer is deployed and retrieved from a small research vessel. Cyst sample sites were not constrained to the berths sampled by pile scraping and trapping techniques. Sampling focused on high sedimentation areas within the Port and avoided areas subject to strong tidal flow. On retrieval, the perspex tube was removed from the spearhead and the top 5 cm of sediment retained for analysis. Sediment samples were kept on ice and refrigerated prior to culturing. Culture procedures generally followed those described by Hewitt and Martin (2001).

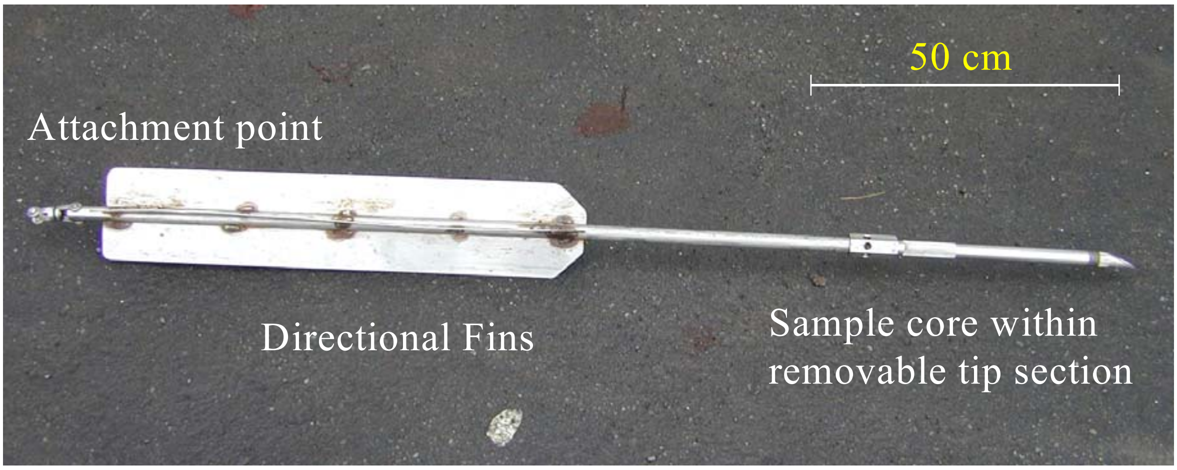

Figure 6: Javelin corer

MOBILE EPIBENTHOS

Benthic scavengers and fishes were sampled using a variety of baited trap designs described below.

Opera house fish traps

Opera house fish traps (1.2 m long x 0.8 m wide x 0.6 m high) were used to sample fishes and other bentho-pelagic scavengers (Fig. 7). These traps were covered in 1-cm^2 mesh netting and had entrances on each end consisting of 0.25 m long tunnels that tapered in diameter from 40 to 14 cm. The trap was baited with two dead pilchards (*Sardinops neopilchardus*) held in plastic mesh suspended in the centre of the trap. Two trap lines, each containing two opera house traps were set for a period of one hour at each site before retrieval. Previous studies have shown opera house traps to be more effective than other types of fish trap and that consistent catches are achieved with soak times of 20 to 50 minutes (Ferrell et al 1994; Thrush et al 2002).

Box traps

Fukui-designed collapsible box traps (63 cm x 42 cm x 20 cm) with a 1.3-cm mesh netting were used to sample mobile crabs and other small epibenthic scavengers (Fig. 7). A central mesh bait holder containing two dead pilchards was secured inside the trap. Organisms attracted to the bait enter the traps through slits in inward sloping panels at each end. Two trap lines, each containing two box traps, were set on the sea floor at each site and left to soak overnight before retrieval.

Starfish traps

Starfish traps designed by Whayman-Holdsworth were used to catch asteroids and other large benthic scavengers (Fig. 8). These are circular hoop traps with a basal diameter of 100 cm and an opening on the top of 60 cm diameter. The sides and bottom of the trap are covered with 26-mm mesh and a plastic, screw-top bait holder is secured in the centre of the trap entrance (Andrews et al 1996). Each trap was baited with two dead pilchards. Two trap lines, each with two starfish traps were set on the sea floor at each site and left to soak overnight before retrieval.

Shrimp traps

Shrimp traps were used to sample small, mobile crustaceans. They consisted of a 15 cm plastic cylinder with a 5-cm diameter screw top lid in which a funnel had been fitted. The funnel had a 20-cm entrance that tapered in diameter to 1 cm. The entrance was covered with 1-cm plastic mesh to prevent larger animals from entering and becoming trapped in the funnel entrance. Each trap was baited with a single dead pilchard. Two trap lines, each containing two scavenger traps, were set on the sea floor at each site and left to soak overnight before retrieval.

SAMPLING EFFORT

A summary of sampling effort within the Port of Picton is provided in Tables 3 a,b. We particularly focused sampling effort on hard substrata within ports (such as pier piles and wharves) where invasive species are likely to be found (Hewitt and Martin 2001), and increased the level of quadrat scraping replication on each pile from the CRIMP protocols, as well as sampling both shaded and unshaded piles. The distribution of effort within ports aimed to maximise spatial coverage and represent the diversity of active berthing sites within the area. Total sampling effort was constrained by the costs of processing and identifying specimens obtained during the survey.

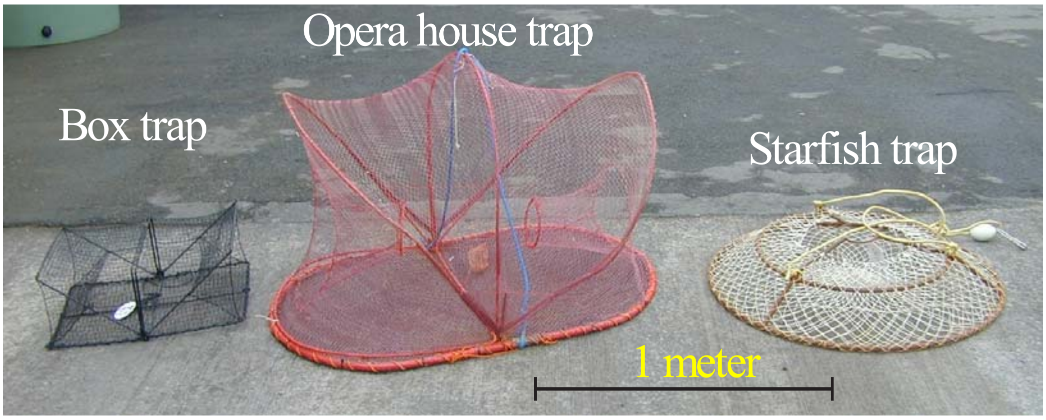

Figure 7: Trap types deployed in the port.

The spatial distribution of sampling effort in the Port of Picton is indicated in the following figures; diver pile scraping sites (Fig. 8), benthic sledding sites (Fig. 9) box, starfish and shrimp trapping sites (Fig. 10), opera house fish trapping (Fig. 11) and Javelin coring sites (Fig. 12). Malfunction of the Shipek grab sampler in the port of Picton meant that grab samples were not obtained. Sampling effort was varied between ports and marinas on the basis of risk assessments (Inglis 2001) to maximise the search efficiency for NIS nationwide. Sampling effort for the sixteen locations surveyed nationwide are summarised in Table 3c.

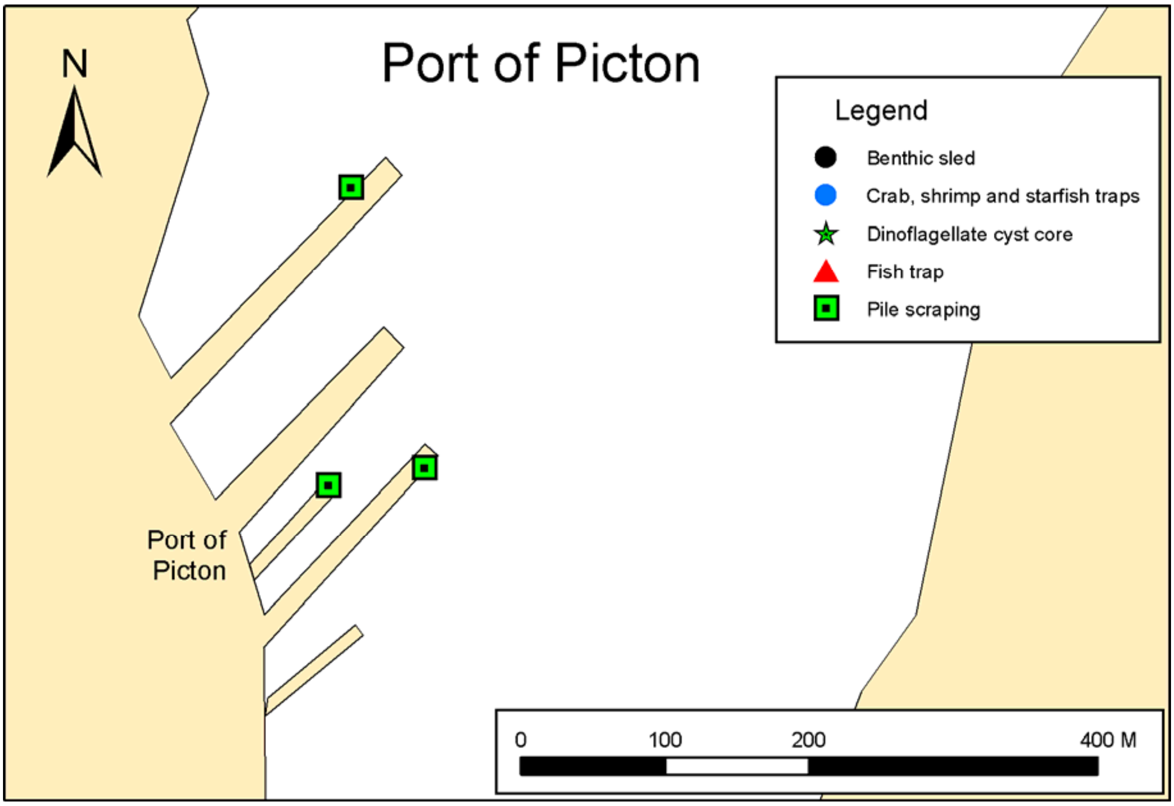

Figure 8: Diver pile scraping sites

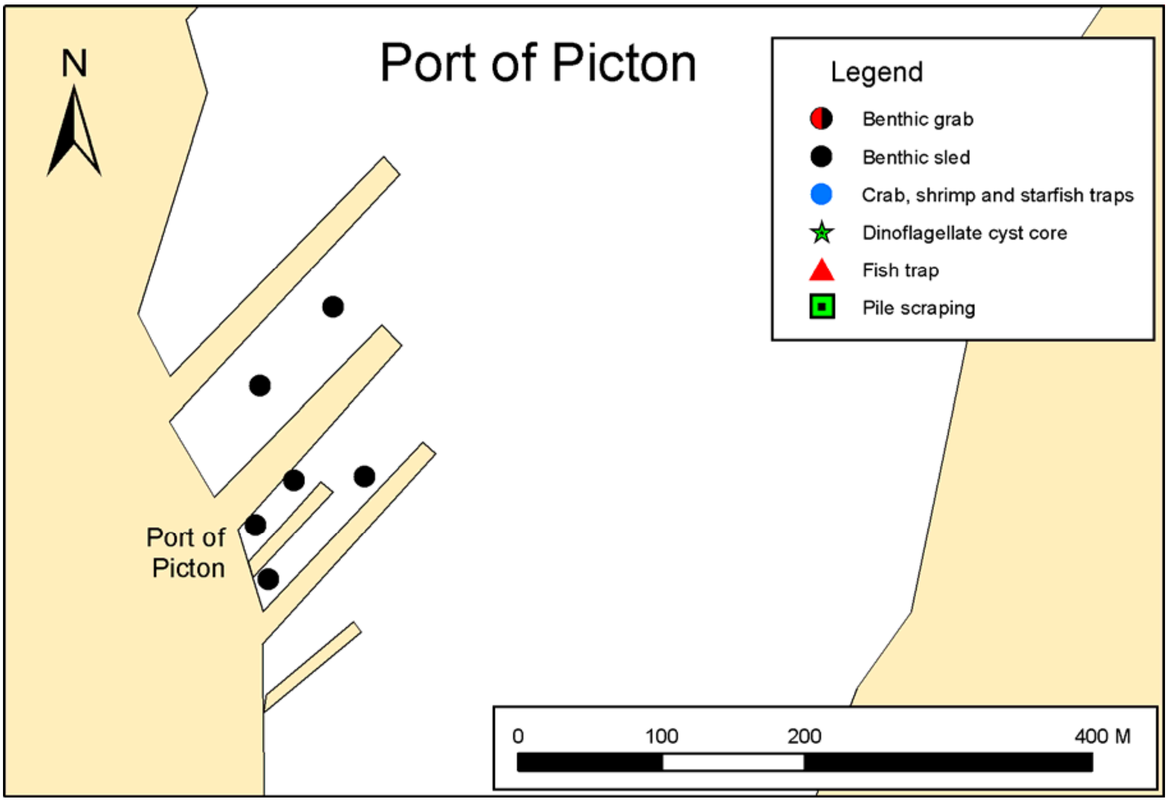

Figure 9: Benthic sledding sites

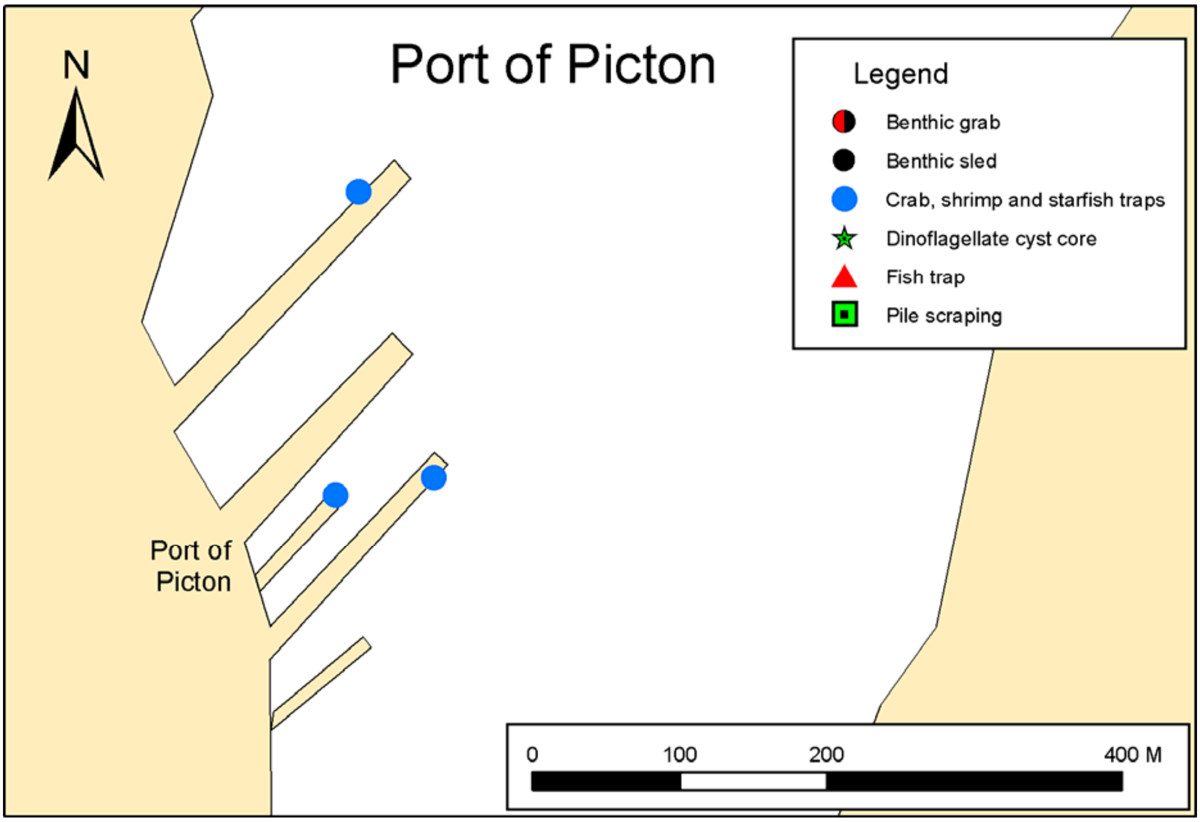

Figure 10: Box, starfish and shrimp trapping sites

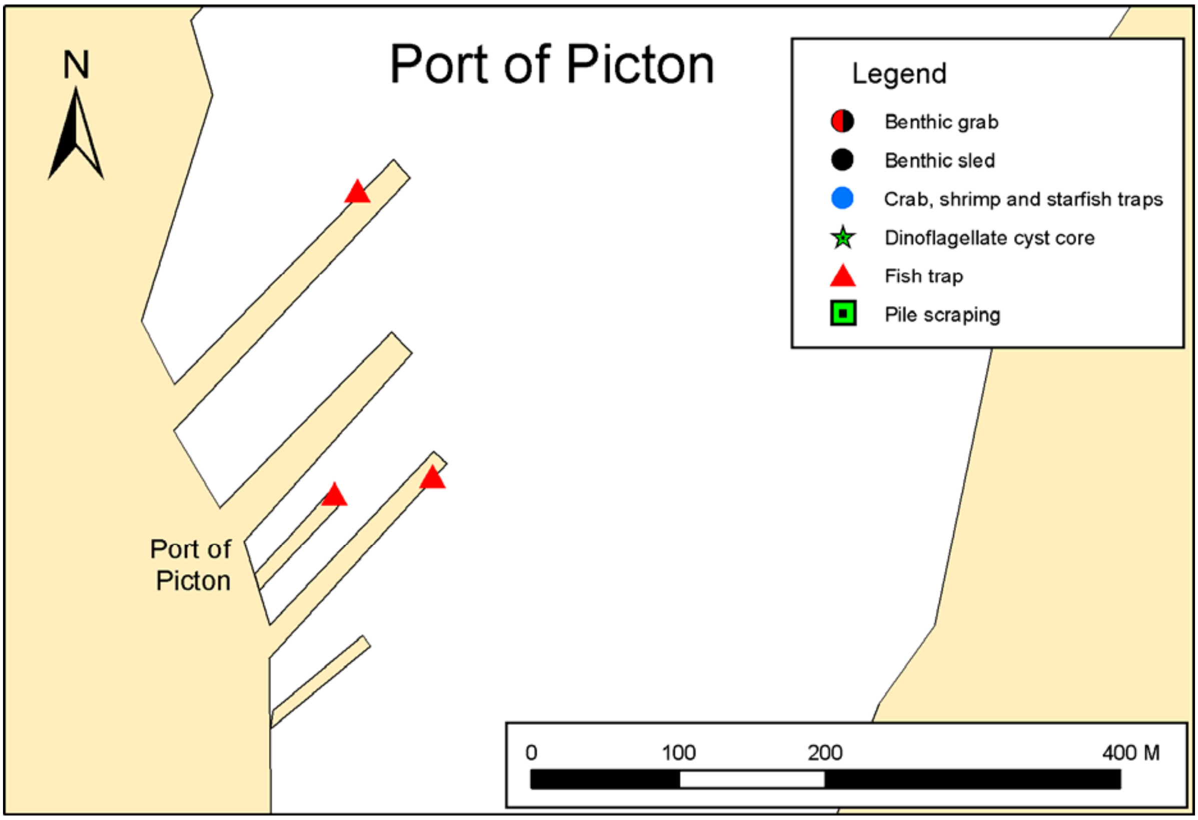

Figure 11: Opera house trapping sites

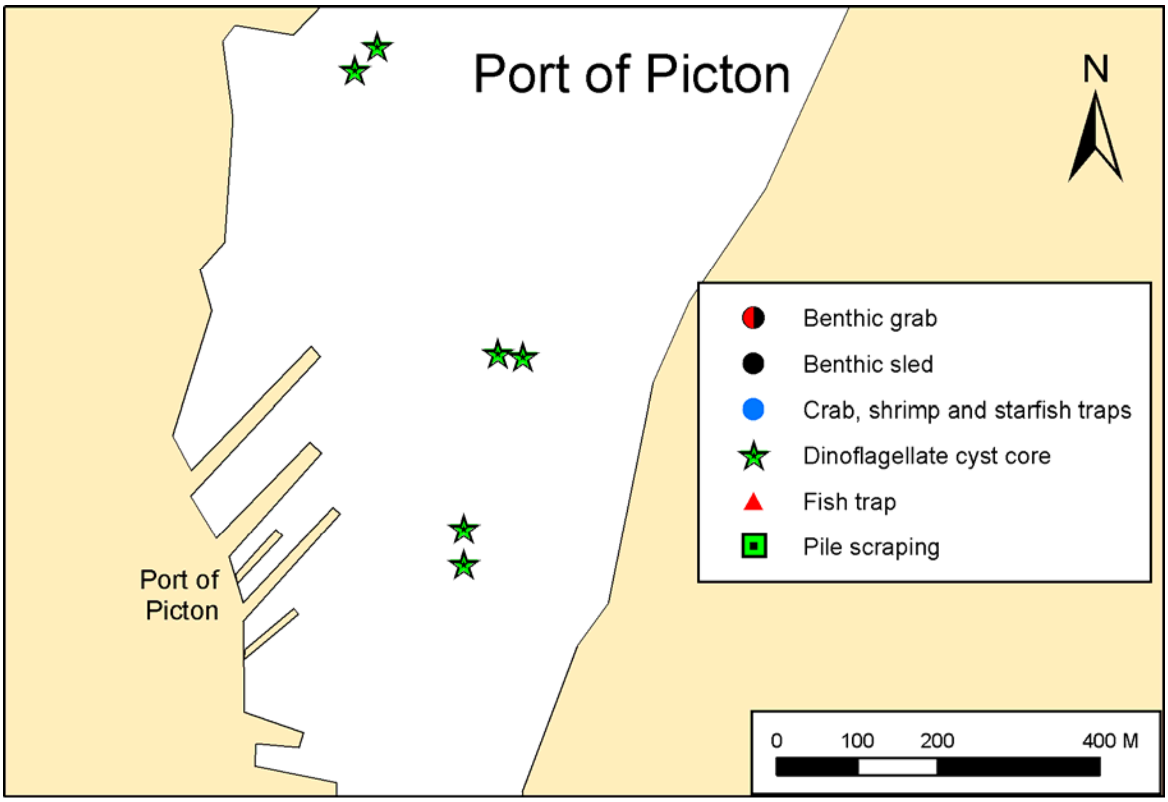

Figure 12. Javelin core sites for dinoflagellate cysts

SORTING AND IDENTIFICATION OF SPECIMENS

Each sample collected in the diver pile scrapings, benthic sleds, box, starfish and shrimp traps, opera house fish traps, shipek grabs and javelin cores was allocated a unique code on waterproof labels and transported to a nearby field laboratory where it was sorted by a team into broad taxonomic groups (e.g. ascidians, barnacles, sponges etc.). These groups were then preserved and individually labelled. Details of the preservation techniques varied for many of the major taxonomic groups collected, and the protocols adopted and preservative solutions used are indicated in Table 4. Specimens were subsequently sent to over 25 taxonomic experts (Appendix 1) for identification to species or lowest taxonomic unit (LTU). We also sought information from each taxonomist on the known biogeography of each species within New Zealand and overseas. Species lists compiled for each port were compared with the marine species listed on the New Zealand register of unwanted organisms under the Biosecurity Act 1993 (Table 5a) and the marine pest list produced by the Australian Ballast Water Management Advisory Council (Table 5b).

DEFINITIONS OF SPECIES CATEGORIES

Each species recovered during the survey was classified into one of four categories that reflected its known or suspected geographic origin. To do this we used the experience of taxonomic experts and reviewed published literature and unpublished reports to collate information on the species' biogeography.

Patterns of species distribution and diversity in the oceans are complex and still poorly understood (Warwick 1996). Worldwide, many species still remain undescribed or undiscovered and their biogeography is incomplete. These gaps in global marine taxonomy and biogeography make it difficult to reliably determine the true range and origin of many species. The four categories we used reflect this uncertainty. Species that were not demonstrably native or non-indigenous were classified as "cryptogenic" (sensu Carlton 1996). Cryptogenesis can arise because the species was spread globally by humans before scientific descriptions of marine flora and fauna began in earnest (i.e. historical introductions). Alternatively the species may have been discovered relatively recently and there is insufficient biogeographic information to determine its native range. We have used two categories of cryptogenesis to distinguish these different sources of uncertainty. In addition, a fifth category ("species indeterminata") was used for specimens that could not be identified to species-level. Formal definitions for each category are given below.

Native species

Native species are known to be endemic to the New Zealand biogeographical region and have not been introduced to coastal waters by human mediated transport.

Non-indigenous species (NIS)

Non-indigenous species (NIS) are known or suspected to have been introduced to New Zealand as a result of human activities. They were determined using a series of questions posed by Chapman and Carlton (1991, 1994), as exemplified by Cranfield et al (1998).

1. Has the species suddenly appeared locally where it has not been found before?
2. Has the species spread subsequently?
3. Is the species' distribution associated with human mechanisms of dispersal?
4. Is the species associated with, or dependent on, other non-indigenous species?
5. Is the species prevalent in, or restricted to, new or artificial environments?
6. Is the species' distribution restricted compared to natives?

The worldwide distribution of the species was tested by a further three criteria:

7. Does the species have a disjunctive worldwide distribution?
8. Are dispersal mechanisms of the species inadequate to reach New Zealand, and is passive dispersal in ocean currents unlikely to bridge ocean gaps to reach New Zealand?
9. Is the species isolated from the genetically and morphologically most similar species elsewhere in the world?

In this report we distinguish two categories of NIS. “NIS” refers to non-indigenous species previously recorded from New Zealand waters, and “NIS (new)” refers to non-indigenous species first discovered in New Zealand waters during this project.

Cryptogenic species Category 1

Species previously recorded from New Zealand whose identity as either native or non-indigenous is ambiguous. In many cases this status may have resulted from their spread around the world in the era of sailing vessels prior to scientific survey (Chapman and Carlton 1991, Carlton 1992), such that it is no longer possible to determine their original native distribution. Also included in this category are newly described species that exhibited invasive behaviour in New Zealand (Criteria 1 and 2 above), but for which there are no known records outside the New Zealand region.

Cryptogenic species Category 2:

Species that have recently been discovered but for which there is insufficient systematic or biogeographic information to determine whether New Zealand lies within their native range. This category includes previously undescribed species that are new to New Zealand and/or science.

Species indeterminata

Specimens that could not be reliably identified to species level. This group includes: (1) organisms that were damaged or juvenile and lacked morphological characteristics necessary for identification, and (2) taxa for which there is not sufficient taxonomic or systematic information available to allow identification to species level.

Survey results

A total of 215 species or higher taxa was identified from the Port of Picton survey. This collection consisted of 148 native (Table 6), 25 cryptogenic (Table 7), nine non-indigenous species (Table 8) and 33 species indeterminata (Table 9, Fig. 13). The biota included a diverse array of organisms from 12 phyla (groups of organisms), with Annelid worms and Phycophyta being the most diverse phyla sampled (Fig. 14). Fourteen species from the Port of Picton have not previously been described from New Zealand waters. For general descriptions of the main phyla encountered during this study refer to Appendix 2.

NATIVE SPECIES

A total of 148 native species was identified from the Port of Picton (Table 6). Native species represented 68.8 % of all species identified from this location, and included highly diverse assemblages of annelids (32 species), bryozoans (13 species), crustaceans (21 species), molluscs (26 species), phycophyta (15 species) and urochordates (12 species). Native species from a number of other less diverse phyla including cnidarians, echinoderms, porifera, pyrrophycophyta and vertebrates were also sampled from the Port (Table 6).

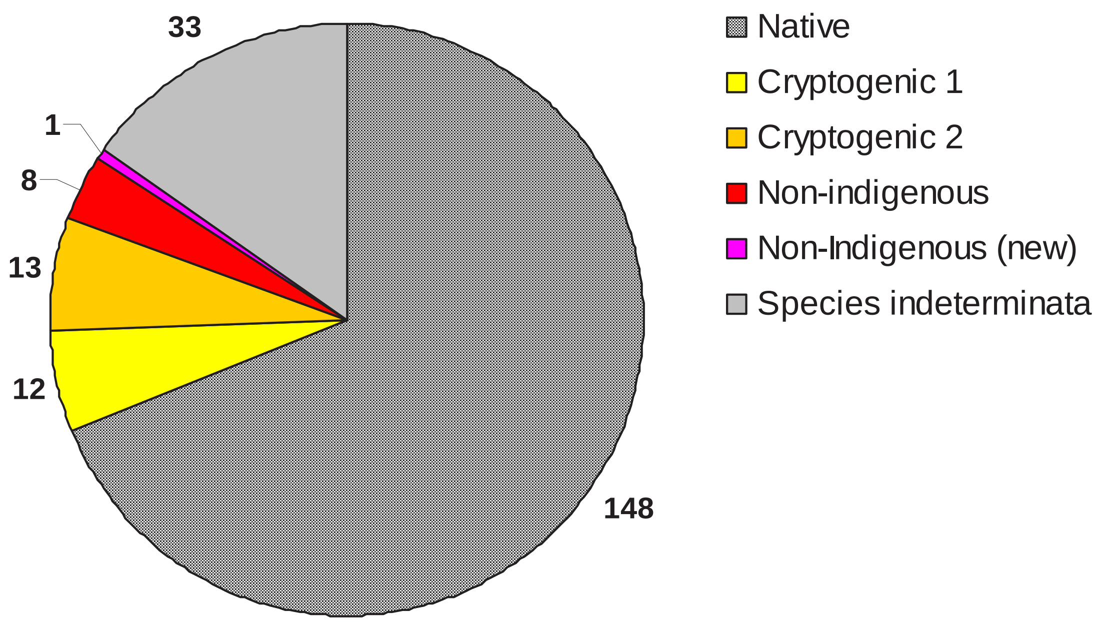

Figure 13: Diversity of marine species sampled in the Port of Picton. Values indicate the number of species in native, cryptogenic, non-indigenous and species indeterminata categories.

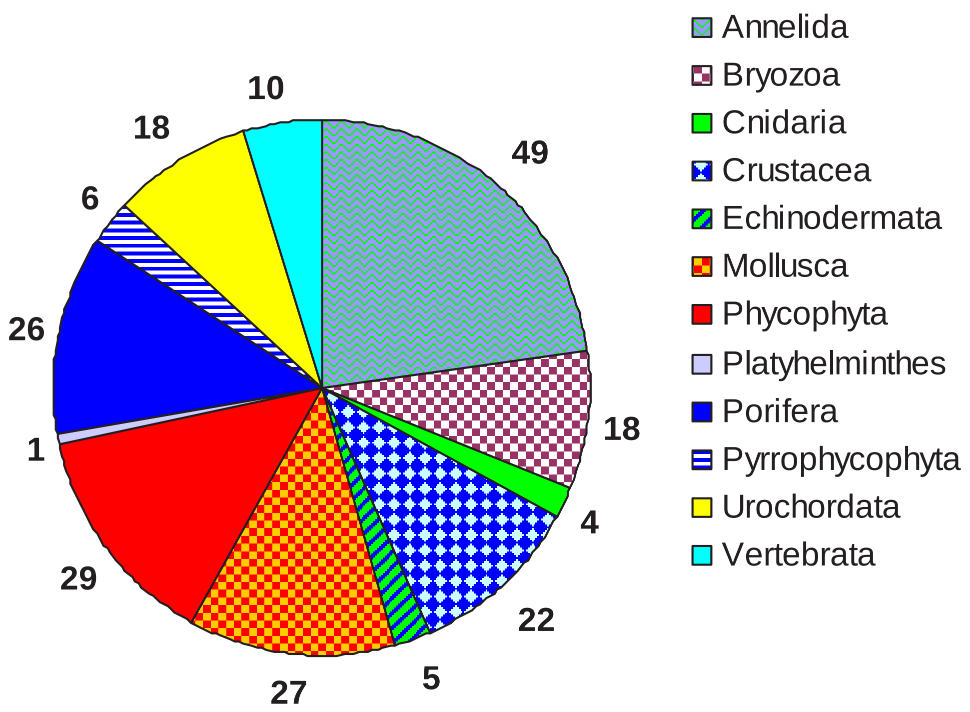

Figure 14: Marine Phyla sampled in the Port of Picton. Values indicate the number of species in each of the major taxonomic groups.

CRYPTOGENIC SPECIES

Twenty-five cryptogenic species were discovered in the Port of Picton during this survey. Cryptogenic species represent 11.6 % of all species or higher taxa identified from the Port. The cryptogenic organisms identified included 12 Category 1 and 13 Category 2 species as defined in Section 2.8 above. Cryptogenic organisms included two bryozoan species, one cnidarian, one crustacean, one mollusc, 16 sponges and four ascidians (Table 7). Many of the Category 1 cryptogenic species have been present in New Zealand for more than 100 years, but have distributions outside New Zealand that suggest non-native origins (e.g. the ascidians *Astereocarpa cerea*, *Botrylloides leachii*, *Corella eumyota*, the cnidarian *Plumularia setacea*, and the mussel *Mytilus galloprovincialis*; Cranfield et al. 1998). The thirteen species listed as cryptogenic Category 2 include twelve sponges and an amphipod (Table 7), have not been described previously in New Zealand.

NON-INDIGENOUS SPECIES

Nine non-indigenous species (NIS) were recorded from the Port of Picton (Table 8). NIS represent 4.2 % of all identified species from this location. One of these species, the ascidian *Cnemidocarpa sp*., was not previously known from New Zealand waters. The other NIS included three spionid polychaete worms (*Polydora hoplura*, *Dipolydora armata* and *D. flava*), two bryozoans (*Bugula flabellata* and *Watersipora subtorquata*), two algae (*Undaria pinnatifida* and *Griffithsia crassiuscula*), and one sponge (*Halisarca dudjardini*).

A list of Chapman and Carlton's (1994) criteria (see Section 2.9.2) that were met by the non-indigenous species sampled in this survey is given in Appendix 3. Below we summarise available information on the biology of each of these non-indigenous species. We provide images where available, and indicate what is known about each species' distribution, habitat preferences and impacts. This information was sourced from published literature, the taxonomists listed in Appendix 1 and from regional databases on non-indigenous marine species in Australia (National Introduced Marine Pest Information System; http://www.crimp.marine.csiro.au/nimpis) and the USA (National Exotic Marine and Estuarine Species Information System; http://invasions.si.edu/nemesis). Distribution maps for each NIS in the port are composites of multiple replicate samples. Where overlayed presence and absence symbols occur on the map, this indicates the NIS was found in at least one, but not all replicates at that GPS location. NIS are presented below by phyla in the same order as Table 8.

***Dipolydora armata* (Langerhans, 1880)**

No image available.

Dipolydora armata is a small (up to 8 mm) burrowing spionid polychaete worm. It is a cosmopolitan species known from both temperate and tropical waters including the Mediterranean, Belize, Brazil, Taiwan, and Vietnam. It can burrow into calcareous substrata such as corals, calcareous hydrozoans, coralline algae and bivalves. Adult worms have a mixed feeding mode (suspension feeding and deposit feeding). The life history of the species includes a period of asexual reproduction by fragmentation beginning soon after settlement, and once mature, individuals probably reproduce only sexually and can breed over an extended period, with larvae developing entirely inside egg capsules. Its impacts are associated with burrowing behaviour, for instance this species can weaken millepore corals by boring in high densities at the bases of branches and weakening the corals' structure. It could also act as a pest in temperate waters where it may burrow into oysters and other bivalves. Considerable damage can be caused by infestations of polydorid worms on shellfish beds (Lewis 1998).

D. armata has been present in New Zealand since at least 1900 and is known from Otago and Wellington Harbours and the Marlborough Sounds (Cranfield *et al.* 1998). During the port baseline surveys it was recored from Picton and Wellington Harbours. In the Port of Picton, *D. armata* occurred in pile scrape samples taken from the Ferry Terminal 3 berth (Fig. 15).

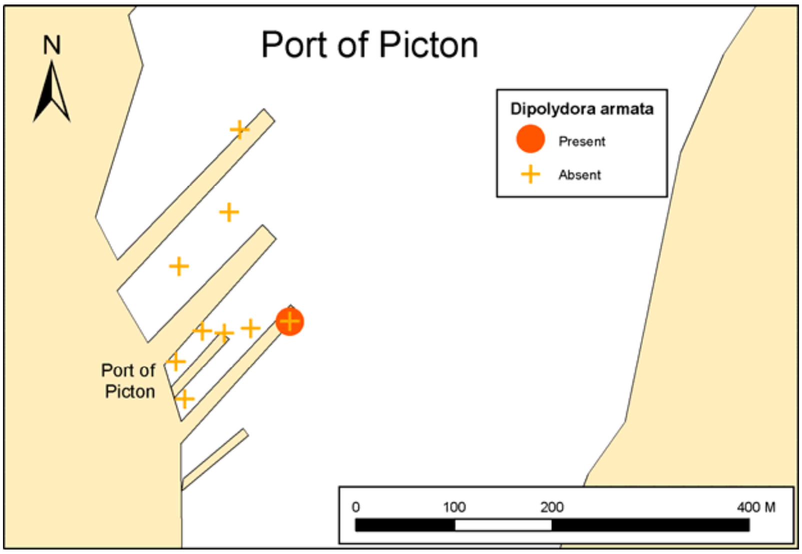

Figure 15: *Dipolydora armata* distribution in Picton

***Dipolydora flava* (Claparède, 1870)**
No image available.

Dipolydora flava is a spionid polychaete worm that occurs in subtidal muds and in the shells of molluscs. Like other species in this genus, *D. flava* burrows into the shells of oysters, mussels and other bivalves causing blistering on the internal surfaces. It can be a significant pest of mollusc aquaculture. The type specimen for this species was recorded from the Gulf of Naples, Italy (Claparède, E. 1870), but it is distributed widely in temperate and warm temperate seas, occuring in Japan, Indonesia, Sri Lanka, Uruguay, Argentina, and southern Australia (Australian Faunal Directory 2005). During the baseline port surveys, *D. flava* was recorded from the ports of Picton and Tauranga (Table 10). In the Port of Picton it occurred in pile scrape samples taken from Ferry Terminal 2 (Fig. 16).

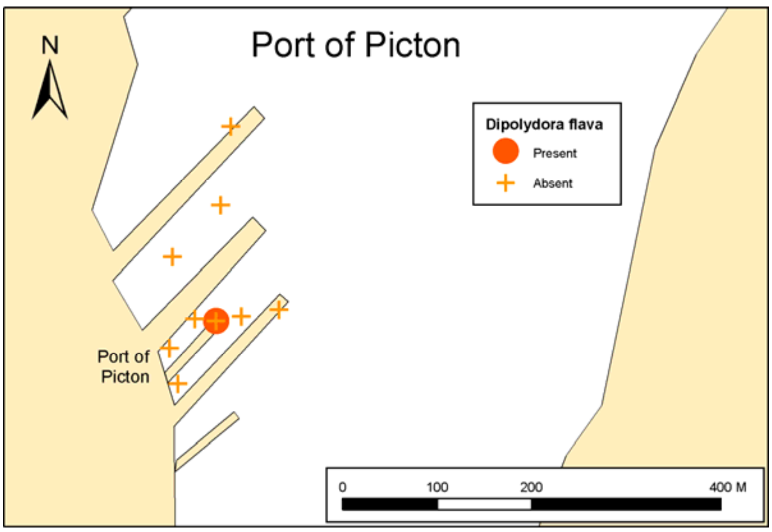

Figure 16: *Dipolydora flava* distribution in Picton

***Polydora hoplura* (Claparède, 1870)**
No image available.

Polydora hoplura is a spionid polychaete worm that bores into the shells of molluscs. It is a common pest of shellfish mariculture as its burrows cause blisters in the shells of farmed oysters, mussels and abalone (Pregenzer 1983, Handley 1995, Lleonart et al. 2003). The type specimen for this species was recorded from the Gulf of Naples, Italy (Claparède, E. 1870). Its native range is thought to be the Atlantic coast of Europe and the Mediterranean (Cranfield et al. 1998). *P. hoplura* has also been recorded from South Africa, southeastern Australia (Bass Strait and Victoria, central east coast, southern Gulf coast and Tasmania; Australian Faunal Directory 2005) and New Zealand where it is thought to have been introduced. It is not known when *P. hoplura* first arrived in New Zealand. In Europe and New Zealand, *P. hoplura* is often associated with shells of the introduced Pacific oyster *Crassostrea gigas* (Handley 1995).

Polydora hoplura had previously been recorded from Wellington and the Marlborough Sounds (Cranfield *et al.* 1998) and was recorded from Whangarei, Tauranga, Wellington, Picton, and Dunedin during the baseline port surveys (Table 10). In the Port of Picton it occurred in pile scrape samples taken from the Ferry Terminal 3 (Fig. 17).

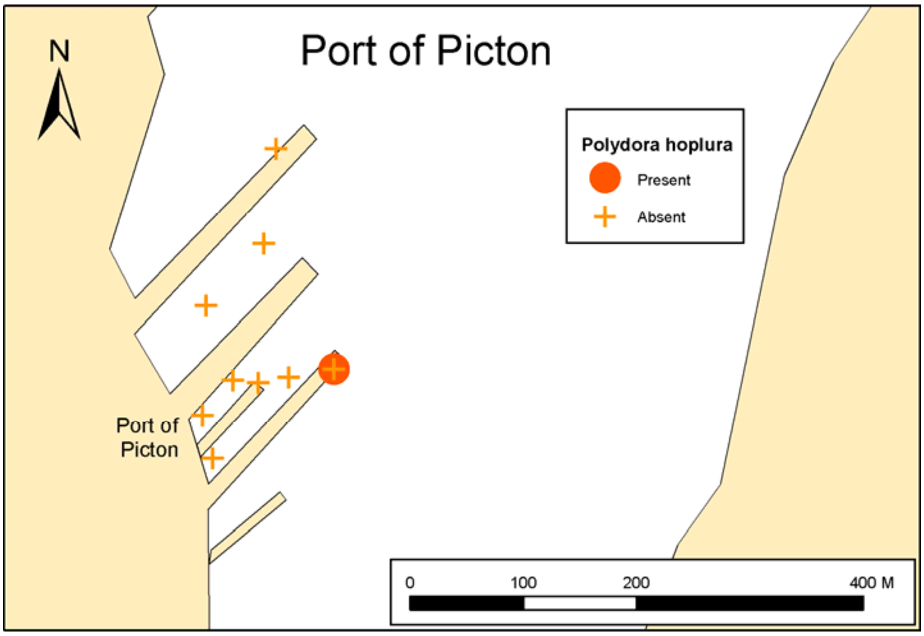

Figure 17: ***Polydora hoplura* distribution in Picton**

***Bugula flabellata* (Thompson in Gray, 1847)**

Image and information: NIMPIS (2002a)

Bugula flabellata is an erect bryozoan with broad, flat branches. It is a colonial organism and consists of numerous ‘zooids’ connected to one another. It is pale pink and can grow to about 4 cm high and attaches to hard surfaces such as rocks, pilings and pontoons or the shells of other marine organisms. It is often found growing with other erect bryozoan species such as *B. neritina* or growing on encrusting bryozoans. Vertical, shaded, sub-littoral rock surfaces also form substrata for this species. It has been recorded down to 35 m. *Bugula flabellata* is native to the British Isles and North Sea and has been introduced to Chile, Florida and the Caribbean and the northern east and west coasts of the USA, as well as Australia and New Zealand. It is cryptogenic on the Atlantic coasts of Spain, Portugal and France. *Bugula flabellata* is a major fouling bryozoan in ports and harbours, particularly on vessel hulls, pilings and pontoons and has also been reported from offshore oil platforms. There have been no recorded impacts from *B. flabellata.* During the current baseline surveys it was recorded from Opua marina, Whangarei, Auckland, Tauranga, Napier, Taranaki, Wellington, Picton, Nelson, Lyttelton, Timaru, Dunedin and Bluff. In the Port of Picton, *B. flabellata* occurred in pile scrape samples taken from Ferry Terminals 2 and 3, and from the Waitohi Wharf (Fig. 18).

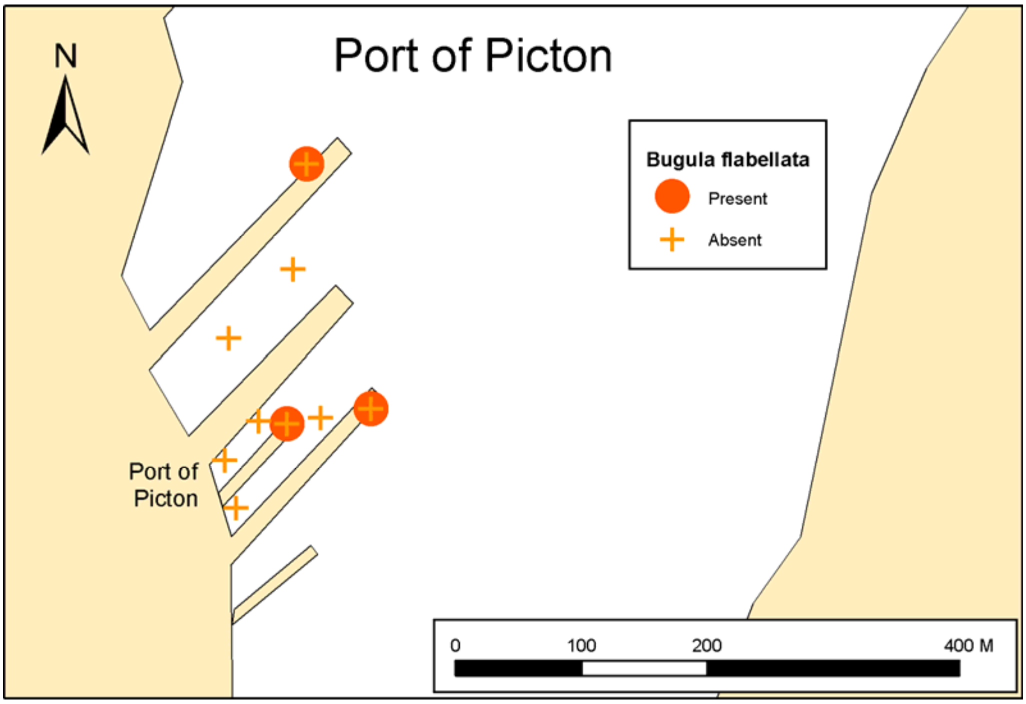

Figure 18: ***Bugula flabellata* distribution in Picton**

***Watersipora subtorquata* (d'Orbigny, 1842)**

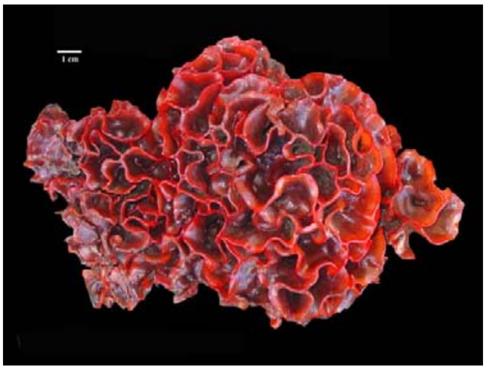

Image: California Academy of Sciences.
Information: Gordon and Matawari (1992)

Watersipora subtorquata is a loosely encrusting bryozoan capable of forming single or multiple layer colonies. The colonies are usually dark red-brown, with a black centre and a thin, bright red margin. The operculum is dark, with a darker mushroom shaped area centrally. *Watersipora subtorquata* has no spines, avicularia (defensive structures) or ovicells (reproductive structures). The native range of the species is unknown, but is thought to include the wider Caribbean and South Atlantic. The type specimen was described from Rio de Janeiro, Brazil (Gordon and Matawari 1992). It also occurs in the north-western Pacific, Torres Strait and north-eastern and southern Australia. It is an important marine fouling species in ports and harbours. It occurs on vessel hulls, pilings and pontoons. This species can also be found attached to rocks and seaweeds. It forms substantial colonies on these surfaces, typically around the low water mark. *Watersipora subtorquata* is also an abundant fouling organism and is resistant to a range of antifouling toxins. It can therefore spread rapidly on vessel hulls and provide an area for other species to settle onto which can adversely impact on vessel maintenance and speed, as fouling assemblages can build up on the hull. During the baseline port surveys, *W. subtorquata* was recorded from Opua marina, Whangarei harbour, Gulf Harbour marina, Tauranga, Gisborne, Napier, Taranaki, Wellington, Picton, Nelson, Lyttelton, Timaru, Dunedin and Bluff. In the Port of Picton, *W. subtorquata* occurred in pile scrape samples taken from Ferry Terminals 2 and 3 (Fig. 19).

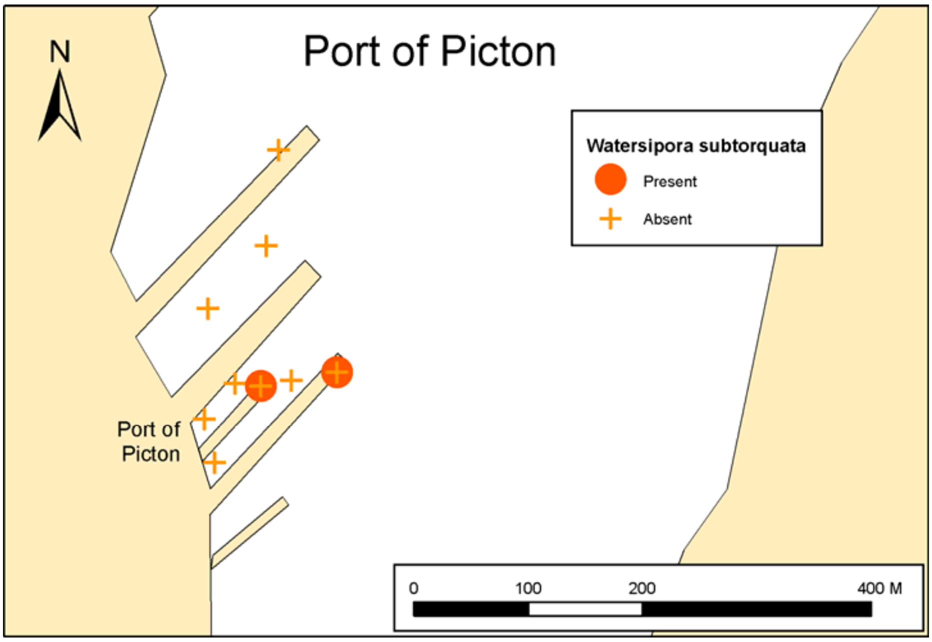

Figure 19: *Watersipora subtorquata* distribution in Picton

***Undaria pinnatifida* (Harvey) Suringer, 1873**

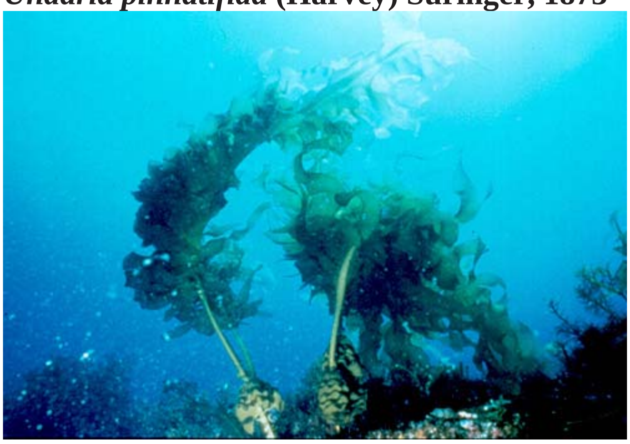

Image and information: NIMPIS (2002b)

Undaria pinnatifida is a brown seaweed that can reach an overall length of 1-3 metres. It is an annual species with two separate life stages; it has a large, "macroscopic" stage, usually present through the late winter to early summer months, and small, "microscopic" stage, present during the colder months. The macroscopic stage is golden-brown in colour, with a lighter coloured stipe with leaf-like extensions at the beginning of the blade and develops a distinctive convoluted structure called the "sporophyll" at the base during the reproductive season. It is this sporophyll that makes *Undaria* easily distinguishable from native New Zealand kelp species such as *Ecklonia radiata*. It is native to the Japan Sea and the northwest Pacific coasts of Japan and Korea and has been introduced to the Mediterranean and Atlantic coasts of France, Spain and Italy, the south coast of England, and parts of the coastline of Tasmania and Victoria (Australia), southern California and Argentina. It is cryptogenic on the coast of China.

Undaria pinnatifida is an opportunistic alga that has the ability to rapidly colonise disturbed or new surfaces. It grows from the intertidal zone down to the subtidal zone to a depth of 15-20 metres, particularly in sheltered reef areas subject to oceanic influence. It does not tend to become established successfully in areas with high wave action, exposure and abundant local vegetation. *Undaria pinnatifida* is highly invasive, grows rapidly and has the potential to overgrow and exclude native algal species. The effects on the marine communities it invades are not yet well understood, although its presence may alter the food resources of herbivores that would normally consume native species. In areas of Tasmania (Australia) it has become very common, growing in large numbers in areas where sea urchins have depleted stocks of native algae. It can also become a problem for marine farms by increasing labour costs due to fouling problems. *U. pinnatifida* is known to occur in a range of ports and marinas throughout eastern New Zealand, from Gisborne to Stewart Island. In the Port of Picton *U. pinnatifida* was observed by divers and occurred in pile scrape samples from Ferry Terminals 2 and 3, and from the Waitohi Wharf (Fig. 20).

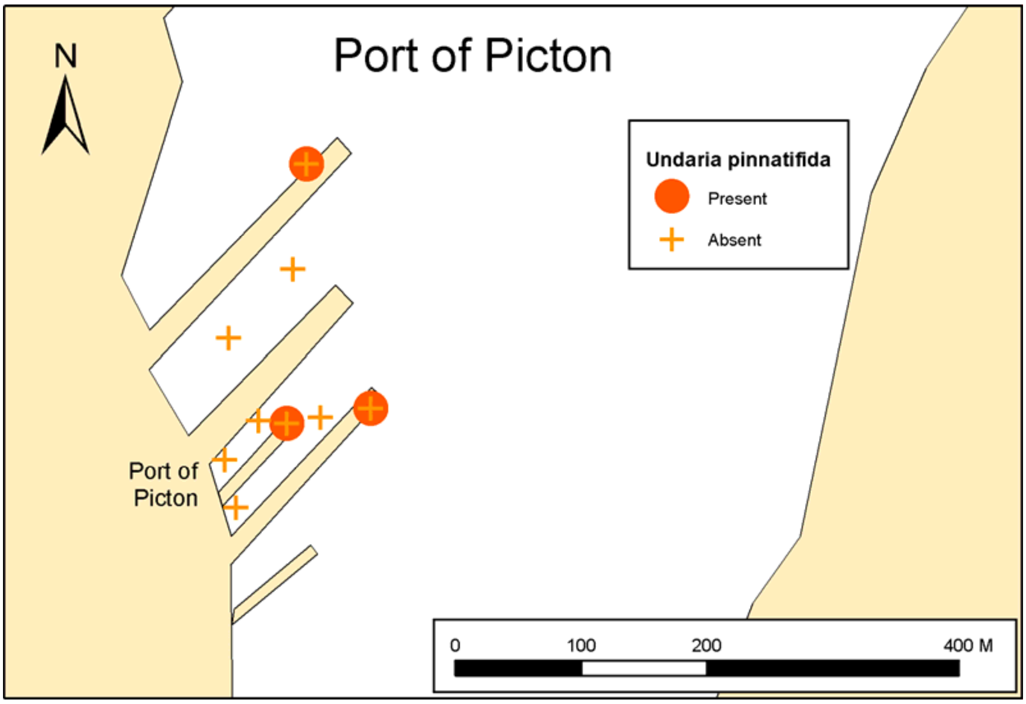

Figure 20: ***Undaria pinnatifida* distribution in Picton**

***Griffithsia crassiuscula* (C. Agardh, 1824)**

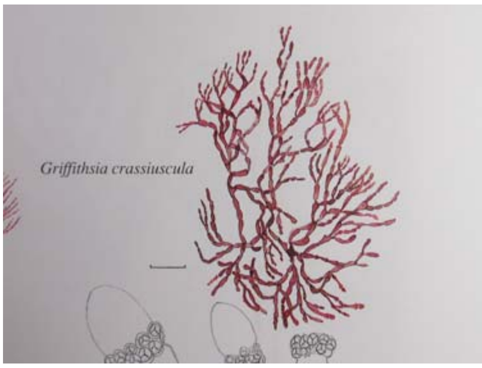

Image and information: Adams (1994)

Griffithsia crassiuscula is a small filamentous red alga. Plants are up to 10 cm high, dichotomously branched, with holdfasts of copious rhizoids. This species is bright rosy red to pink and of a turgid texture. Its native origin is thought to be southern Australia. *Griffithsia crassiuscula* is found subtidally and is mainly epiphytic on other algae and shells, but can also be found on rocks and pebbles. It has no known impacts. During the port baseline surveys, *G. crassicuscula* was recorded from Taranaki, Wellington, Picton, Lyttelton, Timaru and Bluff. In the Port of Picton it occurred in pile scrape samples taken from the Waitohi Wharf (Fig. 21).

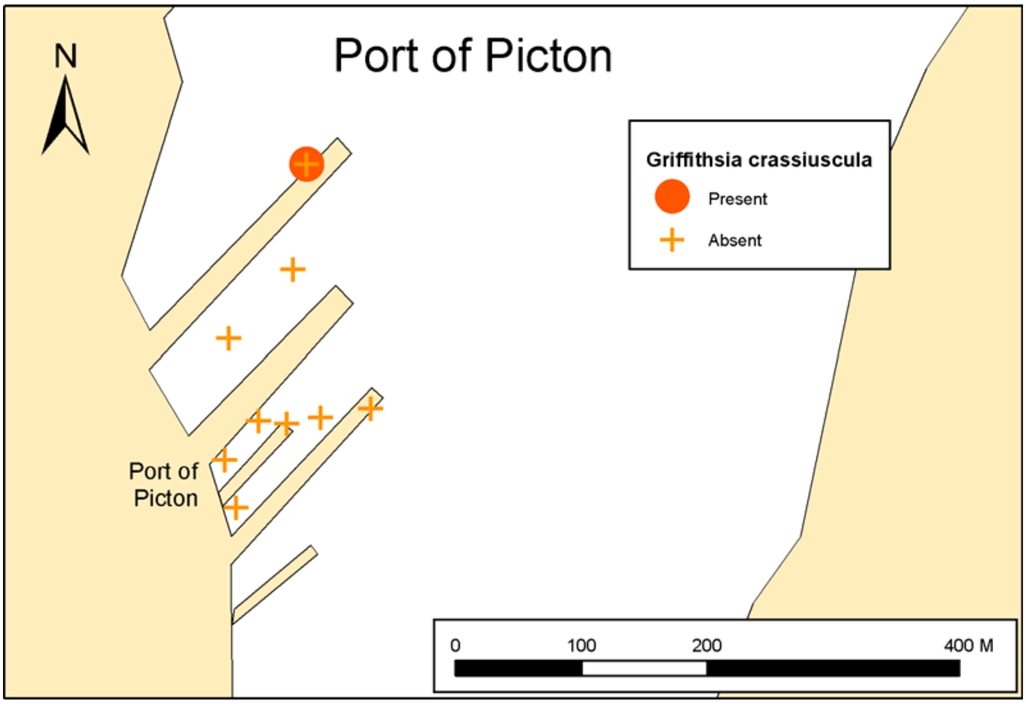

Figure 21: *Griffithsia crassiuscula* distribution in Picton

***Halisarca dujardini* (Johnston, 1842)**

No image available.

Halisarca dujardini is an encrusting cold-water sponge. It is a cosmopolitan species with a wide distribution that includes the Arctic and Antarctic, the Subantarctic Islands, Australia, New Zealand, Chile, England, the Atlantic and the Mediterranean. It occurs from the shallow subtidal to a depth of 450 m. It has no known impacts. During the port baseline surveys *H. dujardini* was recorded from Auckland, Taranaki, Wellington, Dunedin and Bluff. In the Port of Picton it was collected in pile scrape samples taken from Ferry Terminal 2 and the Waitohi Wharf (Fig. 22).

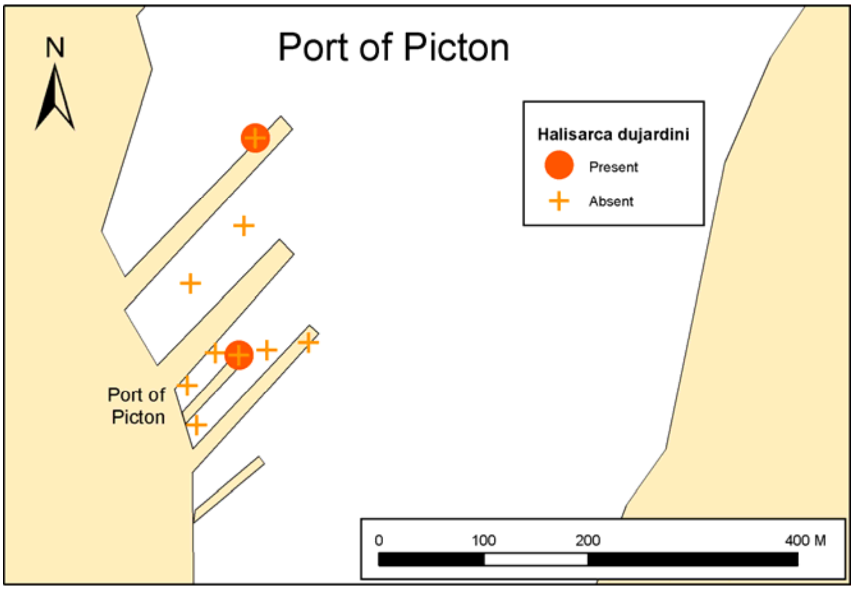

Figure 22: ***Halisarca dujardini* distribution in Picton**

***Cnemidocarpa sp.* (Kott, 1952)**

No image available.

This ascidian is in the family Styelidae. It appears to be a new species that is closely related to *C. nisiotus*, but varies from this species in gonad structure, the number of branchial tentacles and shape of rectal opening. It is not similar to any species described in Australia, Japan or South Africa. Its native distribution, habitat preferences and impacts are unknown. Specimens matching this description were also recovered from Gulf Harbour marina, Auckland, Tauranga, Gisborne, Taranaki, Wellington, Lyttelton and Timaru during the port baseline surveys. In the Port of Picton it was collected in pile scrape samples taken from Ferry Terminals 2 and 3, and from the Wiatohi Wharf (Fig. 23).

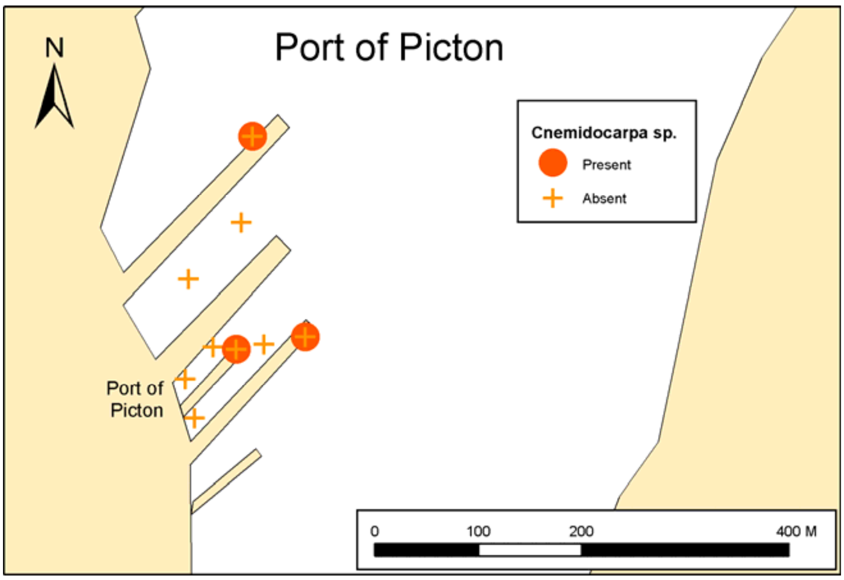

Figure 23: ***Cnemidocarpa* sp. distribution in the Port of Picton**

SPECIES INDETERMINATA

Thirty-three organisms from the Port of Picton were classified as species indeterminata. If each of these organisms is considered a species of unresolved identity, then together they represent 15.3 % of all species collected from this survey (Fig 13). Species indeterminata from the Port of Picton included seven Phyla with the following numbers of species for each; 14 Annelida, one Bryozoa, two Cnidaria, 12 Phycophyta, one Platyhelminth, one Urochordata and two Vertebrates (Table 9).

NOTIFIABLE AND UNWANTED SPECIES

Of the nine non-indigenous species identified from the Port of Picton, only the Asian seaweed, *Undaria pinnatifida*, is currently listed as an unwanted species on the New Zealand register of unwanted organisms (Table 5a). This seaweed is also listed on the ABWMAC list of pest species in Australian (Table 5b). Further detail on this widespread non-indigenous species is given in section 3.3.6 above.

PREVIOUSLY UNDESCRIBED SPECIES IN NEW ZEALAND

Fourteen species collected and identified from the Port of Picton during this study had not previously been described from New Zealand waters. These species are classified either as Category 2 cryptogenic species in Table 7, or are marked as new records in the non-indigenous species list (Table 8). Previously undescribed cryptogenic species included one amphipod crustacean (*Meridiolembos* sp. aff. *acherontis*) and 12 species of sponges that may be new to science (*Adocia* n. sp. 1, *Adocia* n. sp. 2, *Chalinula* n. sp. 2, *Dysidea* n. sp. 1, *Dysidea* n. sp. 3, *Esperiopsis* n. sp. 1, *Euryspongia* n. sp. 1, *Halichondria* n. sp. 1, *Haliclona* n. sp. 1, *Haliclona* n. sp. 2, *Haliclona* n. sp. 5, *Haliclona* n. sp. 6; Table 7). The previously undescribed non-indigenous ascidian *Cnemidocarpa* sp. was also discovered in the Port of Picton (Table 8).

CYST-FORMING SPECIES

Cysts of six species of dinoflagellate (Phylum Pyrrophycophyta) were identified from the Port of Picton. These are listed as Pyrrophycophyta in Table 6. The motile form of one of these species (*Lingulodinium polyedrum*) can potentially cause diarrhetic shellfish poisoning and blooms can cause problems for aquaculture and recreational harvesting of shellfish.

POSSIBLE VECTORS FOR THE INTRODUCTION OF NON-INDIGENOUS SPECIES TO THE PORT

The non-indigenous species located in the Port are thought to have arrived in New Zealand via international shipping. Table 8 indicates the possible vectors for the introduction of each NIS recorded from Picton. Likely vectors of introduction are largely derived from Cranfield et al (1998) and indicate that approximately 56 % (five of the nine NIS) probably arrived via hull fouling. Forty-four percent (four species) probably were introduced to New Zealand via either hull fouling or ballast water.

COMPARISON WITH OTHER PORTS

Sixteen locations (13 ports and three marinas) were surveyed during the summers of 2001/2002 and 2002/2003 (Fig. 1). The total number of species identified in these surveys varied from 336 in the Port of Wellington to 56 in Whangarei Marina (Fig. 24a). The number of species recorded in each port or marina reflects sampling effort (Table 3c) and local patterns of marine biodiversity within the locations surveyed nationwide. Sampling effort alone (expressed as the total number of registered samples in each port), accounted for significant proportions of variation in the numbers of native (linear regression; $F_{1,14} = 33.14$, $P < 0.001$, $R^2 = 0.703$), Cryptogenic 1 ($F_{1,14} = 5.94$, $P = 0.029$, $R^2 = 0.298$) and Cryptogenic 2 ($F_{1,14} = 7.37$, $P = 0.017$, $R^2 = 0.345$) species recorded in the different locations (Fig 25).

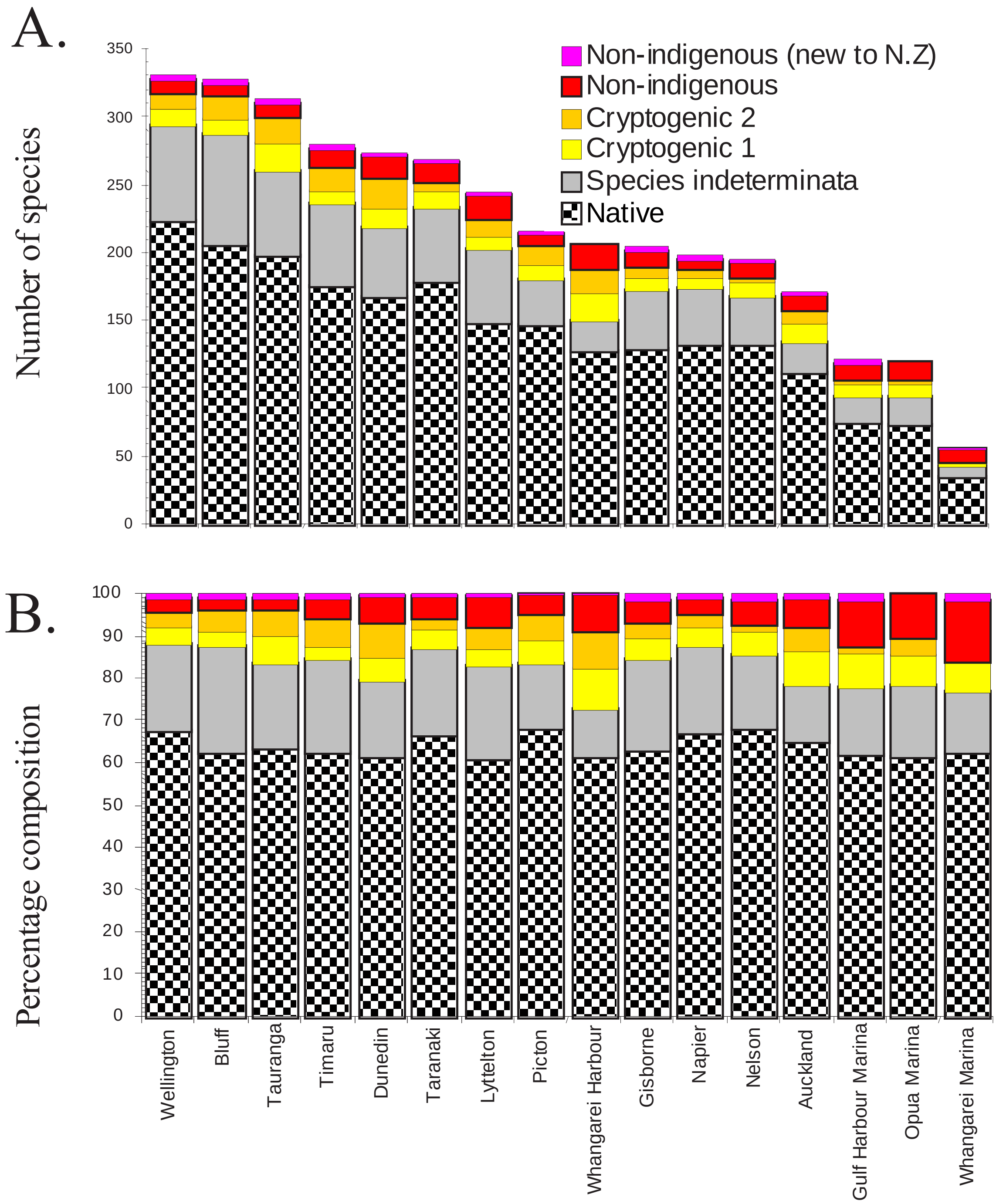

Figure 24: Differences in (a) the number of species, and (b) the relative proportions of non-indigenous, cryptogenic, species indeterminata and native categories among the sixteen locations sampled over the summers of 2001 – 2002, and 2002-2003. Locations are presented in order of decreasing species diversity sampled

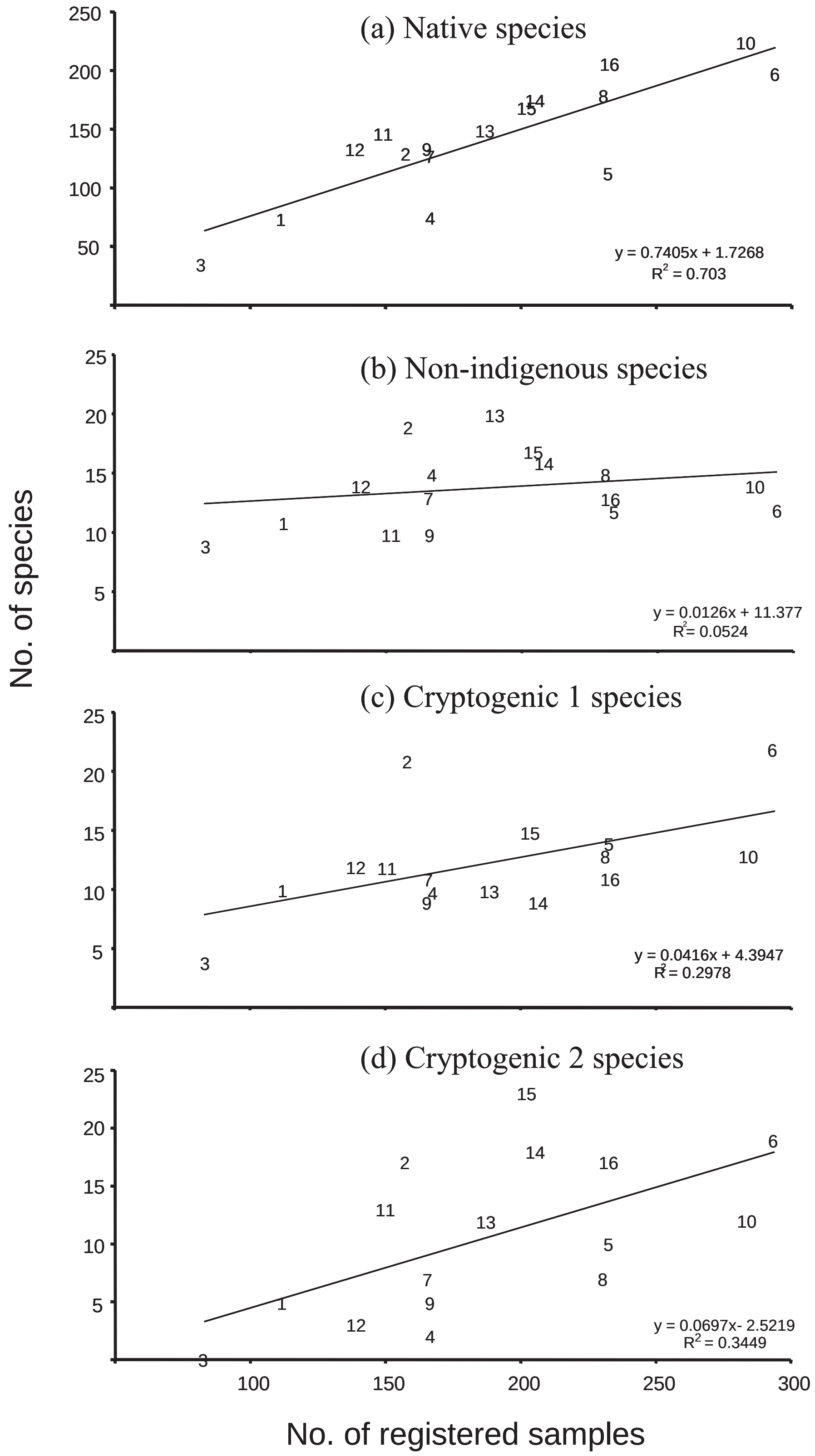

Figure 25. **Linear regression equations relating numbers of species detected to sample effort at the 16 locations surveyed nation-wide. Location codes are as follows; 1 = Opua, 2 = Whangarei port, 3 = Whangarei marina, 4 = Gulf Harbour marina, 5 = Auckland port, 6 = Tauranga port, 7 = Gisborne port, 8 = Taranaki port, 9 = Napier Port, 10 = Wellington port, 11 = Picton port, 12 = Nelson port, 13 = Lyttelton port, 14 = Timaru port, 15 = Dunedin port, 16 = Bluff port**

However differing sampling effort between locations did not explain differences in the numbers of NIS found there ($F_{1,14} = 0.77$, $P = 0.394$, $R^2 = 0.052$). Largest numbers of NIS were reported from the ports of Lyttelton and Whangarei, but significantly more Cryptogenic 1 species were recorded in Whangarei Port than in other surveyed locations (Fig 25c, Studentised residual = 3.87). When we allow for differences in sampling effort between locations, the Port of Picton had an above-average number of native species, a below-average number of NIS, an average number of Cryptogenic 1 species, and an above-average number of Cryptogenic 2 species relative to the other ports and marinas surveyed nationwide (Fig 25a, c, d).

Native organisms represented over 60 % of the species diversity sampled in each surveyed location, with a minimum contribution of 61.0 % in the Port of Lyttelton and a maximum of 68.8 % in the Port of Picton (Fig. 24b). Species indeterminata organisms represented between 10.6 % and 25.2 % of the sampled diversity in each location. Non-indigenous and category 1 and 2 cryptogenic species were present in each port and marina, although their relative contributions differed between locations (Fig. 24b). The port of Picton's nine NIS was the lowest number of non-indigenous species recorded from any of the locations surveyed (Whangarei Marina also had nine NIS). NIS comprised 4.2 % of the total sampled diversity in the Port of Picton (Fig. 24b), ranking it third lowest in percentage composition of NIS from the sixteen locations surveyed nationwide.

Assessment of the risk of new introductions to the port

Many NIS introduced to New Zealand ports, through hull fouling, ships' sea chests, or ballast water discharge; do not survive to establish self-sustaining local populations. Species that do survive often come from coastlines with similar marine environments to New Zealand. For example, approximately 80% of the marine NIS known to be present within New Zealand are native to temperate coastlines of Europe, the North West Pacific, and southern Australia (Cranfield et al. 1998).

The Port of Picton receives comparatively little international commercial shipping compared with other New Zealand ports. Only eight commercial vessels were recorded arriving in the Port of Picton from overseas in 2003 (Cambell 2004). Three of these vessels were from Australia, with the other countries of origin not being identified (Campbell 2004). In 1999 the total recorded volume of ballast water discharged in the Port of Picton was 6956 m^3 (Inglis 2001). This figure is three orders of magnitude lower than the recorded ballast water discharge into the Port of New Plymouth, and two orders of magnitude lower that the volumes discharged in Lyttelton, Tauranga, Whangarei and Nelson Ports. Of the 6956 m^3 of ballast water discharged in 1999, 2% was known to have originated from Australia, 23% was from Japan and the remaining 75% was from unspecified source countries. Shipping from both these identified regions presents a low, but on-going risk of introduction of new NIS to the Port of Picton.

Assessment of translocation risk for non-indigenous species in the port

The Port of Picton is connected directly to the ports of Wellington and Nelson by regular coastal shipping and, is indirectly connected to most other domestic ports throughout mainland New Zealand (Dodgshun et al. 2004). Although many of the non-indigenous species found in the Port of Picton survey have been recorded previously in New Zealand, there was an exception. The ascidian *Cnemidocarpa sp*. was first described from New Zealand waters during these port surveys, and was found to be present in Auckland, Gisborne, Gulf Harbour Marina, Nelson, Picton, Tauranga, Taranaki, Timaru and Wellington. Little is currently known about this species, however it appears to be widely spread through New Zealand's shipping ports where it may be competing with native fauna for space in fouling assemblages. The highly invasive alga, *Undaria pinnatifida*, has been present in the Port of Picton since 1991. It has been spread by shipping and other vectors to 11 of the 16 ports and marinas surveyed during the baseline surveys (the exceptions being Opua, Whangarei Port and Marina, Gulf Harbour Marina, Tauranga Port). A control programme in Bluff Harbour has subsequently removed *U. pinnatifida* populations established there. Nevertheless, vessels departing from Picton after having spent time at berth within the port may pose a significant risk of spreading this species to ports within New Zealand that remain uninfested. The risk of translocation for *U. pinnatifida* and other fouling species is highest for slow-moving vessels, such as yachts and barges, and vessels that have long residence times in the port prior to voyages. In the Port of Picton barges, recreational craft or seasonal fishing vessels that are laid up for significant periods of time pose an increased risk for the spread of these species.

Management of existing non-indigenous species in the port

Most of the NIS detected in this survey appear to be well established in the Port of Picton. For most marine NIS eradication by physical removal or chemical treatment is not yet a cost-effective option. Many of the species recorded in the Port of Picton are widespread and local population controls are unlikely to be effective. Management should be directed toward preventing spread of species established in the Port of Picton to locations where they do not presently occur. This may be particularly relevant to species with limited distributions around the country such as the spionid worms, *Dipolydora armata* and *Dipolydora flava*, and the invasive Japanese kelp *Undaria pinnatifida* discussed above. However, *D. armata* and *D. flava* are perhaps more likely to be transported domestically, by the movement of shellfish aquaculture stock. Such management will require better understanding of the frequency of movements by vessels and other vectors from Picton and surrounding regions to other domestic and international locations and improved procedures for hull maintenance and domestic ballast transfer by vessels leaving this port.

Prevention of new introductions

Interception of unwanted species transported by shipping is best achieved offshore, through control and treatment of ships destined for the Port of Picton from high-risk locations elsewhere in New Zealand or overseas. Under the Biosecurity Act 1993, the New Zealand Government has developed an Import Health Standard for ballast water that requires large ships to exchange foreign coastal ballast water with oceanic water prior to entering New Zealand, unless exempted on safety grounds. This procedure ("ballast exchange") does not remove all risk, but does reduce the abundance and diversity of coastal species that may be discharged with ballast. Ballast exchange requirements do not currently apply to ballast water that is uptaken domestically. Globally, shipping nations are moving toward implementing the International Convention for the Control and Management of Ships Ballast Water & Sediments that was recently adopted by the International Maritime Organisation (IMO). By 2016 all merchant vessels will be required to meet discharge standards for ballast water that are stipulated within the agreement.

Options are currently lacking, however, for effective in-situ treatment of biofouling and sea-chests. Biosecurity New Zealand has recently embarked on a national survey of hull fouling on vessels entering New Zealand from overseas. The study will characterise risks from this pathway (including high risk source regions and vessel types) and identify predictors of risk that may be used to manage problem vessels. Shipping companies and vessel owners can reduce the risk of transporting NIS in hull fouling or sea chests through regular maintenance and antifouling of their vessels.

Overseas studies have suggested that changes in trade routes can herald an influx of new NIS from regions that have not traditionally had major shipping links with the country or port (Carlton 1987). The growing number of baseline port surveys internationally and an associated increase in published literature on marine NIS means that information is becoming available that will allow more robust risk assessments to be carried out for new shipping routes. We recommend that port companies consider undertaking such assessments for their ports when new import or export markets are forecast to develop. The assessment would allow potential problem species to be identified and appropriate management and monitoring requirements to be put in place.

Conclusions and recommendations

The national biological baseline surveys have significantly increased our understanding of the identity, prevalence and distribution of introduced species in New Zealand's shipping ports and selected marinas. They represent a first step towards a comprehensive assessment of the risks posed to native coastal marine ecosystems from non-indigenous marine species. Although measures are being taken by the New Zealand government to reduce the rate of new incursions, foreign species are likely to continue being introduced to New Zealand waters by shipping, especially considering the lack of management options for hull fouling introductions. There is a need for continued monitoring of marine NIS in port environments to allow for (1) early detection and control of harmful or potentially harmful non-indigenous species, (2) to provide on-going evaluation of the efficacy of management activities, and (3) to allow trading partners to be notified of species that may be potentially harmful. Baseline inventories, like this one, facilitate the second and third of these two purposes. They become outdated when new introductions occur and, therefore, should be repeated on a regular basis to ensure they remain current. Hewitt and Martin (2001) recommend an interval of three to five years between repeat surveys.

The predominance of hull fouling as a likely introduction vector for NIS encountered in the Port of Picton (probably responsible for at least 56% of the NIS introductions) is consistent with previous findings from a range of overseas locations. For instance, Hewitt et al (1999) attributed the introduction of 77% of the 99 NIS encountered in Port Phillip Bay (Australia) to hull fouling, and only 20% to ballast water. Similarly, 61% of the 348 marine and brackish water NIS established in the Hawaiian Islands are thought to have arrived on ships' hulls, but only 5% in ballast water (Eldredge and Carlton 2002). However, ballast water is thought to be responsible for the introduction of 30% of the 212 marine NIS established in San Fransisco Bay (USA), compared to 34% for hull fouling (Cohen and Carlton 1995). The high percentages of NIS thought to have been introduced by hull fouling in Australasia may reflect the fact that hull fouling has a far longer history (~200 years) as an introduction vector than ballast water (~40 years) (Hewitt et al 1999). However, the fact that some of New Zealand and Australia's most recent marine NIS introductions (e.g. *Undaria pinnatifida*, *Codium fragile sp. tomentosoides*) have been facilitated by hull fouling suggests that it has remained an important transport mechanism (Cranfield et al 1998; Hewitt et al 1999).

Non-indigenous marine species can have a range of adverse impacts through interactions with native organisms. For instance, NIS can cause ecological impacts through competition, predator-prey interactions, hybridisation, parasitism or toxicity and can modify the physical environment through altering habitat structure (Ruiz et al 1999; Ricciardi 2001). Assessing the impact of a NIS in a given location ideally requires information on a range of factors, including the mechanism of their impact and their local abundance and distribution (Parker et al 1999). To predict or quantify NIS impacts over larger areas or longer time scales requires additional information on the species' seasonality, population size and mechanisms of dispersal (Mack et al 2000). Further studies may be warranted to establish the abundance and potential impacts of the non-indigenous species encountered in this port to determine the threat they represent to New Zealand's native ecosystems.

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Tables

Table 1: Berthage facilities in the Port of Picton.

Berth	Berth No.	Purpose	Construction	Length of berth (m)	Maximum draught (m)	Maximum beam (m)
Inter-island ferry terminal	1	Vehicle-carrying high speed ferries	Concrete deck/wood and steel casing piles + wooden pile fendering	120	7.5	26
	2	Road and rail-carrying conventional ferries	Concrete dec/steel casing piles + wooden pile fendering	160	7.5	22
	3	Vehicle-carrying conventional vessels	Concrete dec/steel casing piles + wooden pile fendering	140	7.5	16
Waihohi Wharf	East	Overseas and coastal cargo vessels, fishing, bulk cargo and passenger cruise ships	Concrete deck/concrete piles + wooden pile fendering	210	10.3	32
	West		Concrete deck/steel casing piles + wooden pile fendering	210	10.3	32

Table 2. Comparison of survey methods used in this study with the CRIMP protocols (Hewitt and Martin 2001), indicating modifications made to the protocols following recommendations from a workshop of New Zealand scientists. Full details of the workshop recommendations can be found in Gust et al. (2001).

	CRIMP Protocol		NIWA Method		
Taxa sampled	Survey method	Sample procedure	Survey method	Sample procedure	Notes
Dinoflagellate cysts	Small hand core	Cores taken by divers from locations where sediment deposition occurs	TFO Gravity core ("javelin" core)	Cores taken from locations where sediment deposition occurs	Use of the javelin core eliminated the need to expose divers to unnecessary hazards (poor visibility, snags, boat movements, repetitive dives > 10 m). It is a method recommended by the WESTPAC/IOC Harmful Algal Bloom project for dinoflagellate cyst collection (Matsuoka and Fukuyo 2000)
Benthic infauna	Large core	3 cores close to (0 m) and 3 cores away (50 m) from each berth	Shipek benthic grab	3 cores within 10 m of each sampled berth and at sites in the port basin	Use of the benthic grab eliminated need to expose divers to unnecessary hazards (poor visibility, snags, boat movements, repetitive dives > 10 m).
Dinoflagellates	20µm plankton net	Horizontal and vertical net tows	Not sampled	Not sampled	Plankton assemblages spatially and temporally variable, time-consuming and difficult to identify to species. Workshop recommended using resources to sample other taxa more comprehensively
Zooplankton and/ phytoplankton	100 µm plankton net	Vertical net tow	Not sampled	Not sampled	Plankton assemblages spatially and temporally variable, time-consuming and difficult to identify to species. Workshop recommended using resources to sample other taxa more comprehensively
Crab/shrimp	Baited traps	3 traps of each kind left overnight at each site	Baited traps	4 traps (2 line x 2 traps) of each kind left overnight at each site	
Macrobiota	Qualitative visual survey	Visual searches of wharves & breakwaters for target species	Qualitative visual survey	Visual searches of wharves & breakwaters for target species	

Taxa sampled	CRIMP Protocol Survey method	 Sample procedure	NIWA Method Survey method	 Sample procedure	Notes
Sedentary / encrusting biota	Quadrat scraping	0.10 m^2 quadrats sampled at -0.5 m, -3.0 m and -7.0 m on 3 outer piles per berth	Quadrat scraping	0.10 m^2 quadrats sampled at -0.5 m, -1.5 m, -3.0 m and -7 m on 2 inner and 2 outer piles per berth	Workshop recommended extra quadrat in high diversity algal zone (-1.5 m) and to sample inner pilings for shade tolerant species
Sedentary / encrusting biota	Video / photo transect	Video transect of pile/rockwall facing. Still images taken of the three 0.10 m^2 quadrats	Video / photo transect	Video transect of pile/rockwall facing. Still images taken of the four 0.10 m^2 quadrats	
Mobile epifauna	Beam trawl or benthic sled	1 x 100 m or timed trawl at each site	Benthic sled	2 x 100 m (or 2 min.) tows at each site	
Fish	Poison station	Divers & snorkelers collect fish from poison stations	Opera house fish traps	4 traps (2 lines x 2 traps) left for min. 1 hr at each site	Poor capture rates anticipated from poison stations because of low visibility in NZ ports. Some poisons also an OS&H risk to personnel and may require resource consent.
Fish/mobile epifauna	Beach seine	25 m seine haul on sand or mud flat sites	Opera house fish traps / Whayman Holdsworth starfish traps	4 traps (2 lines x 2 traps) of left at each site (Whayman Holdworth starfish traps left overnight)	Few NZ ports have suitable intertidal areas to beach seine.

Table 3a: Summary of the Port of Picton sampling effort.

Sample method	Number of shipping berths sampled	Number of replicate samples taken
Benthic Sled Tows	3 *1	6
Benthic Grab (Shipek)	0 *2	0 *2
Box traps	3	18
Diver quadrat scraping	3	53
Opera house fish traps	3	16
Starfish traps	3	24
Shrimp traps	3	24
Javelin cores	N/A	6

*1 sled towed between two wharves on all occasions.
*2 Shipek grab malfunctioned and prevented sample collection in this port.

Table 3b: Pile scraping sampling effort in the Port of Picton. Number of replicate quadrats scraped on Outer (unshaded) and Inner (shaded) pier piles at four depths. Pile materials scraped are indicated. Miscellaneous samples are opportunistic additional specimens collected from piles outside of the scraped quadrat areas.

Sample Depth (M)	Outer Piles	Inner Piles
0.5	6 wood	6 wood
1.5	6 wood	6 wood
3.5	6 wood	6 wood
7	5 wood	6 wood
Miscellaneous	2 wood	4 wood

Table 3c: Summary of sampling effort in Ports and Marinas surveyed during the austral summers of 2001-2002 (shown in bold type), and 2002-2003 (shown in plain type). The number of shipping berths sampled is indicated, along with the total numbers of samples taken (in brackets).

Survey Location	Benthic sled tows	Benthic grab	Box traps	Diver quadrat scraping	Opera house traps	Starfish traps	Shrimp traps	Javelin cores
Port of Lyttelton	5 (10)	5 (15)	6 (20)	5 (77)	5 (20)	6 (20)	6 (19)	(8)
Port of Nelson	4 (8)	1 (2) *	4 (16)	4 (55)	4 (16)	4 (16)	4 (16)	(8)
Port of Picton	3 (6)	*	3 (18)	3 (53)	3 (16)	3 (24)	3 (24)	(6)
Port of Taranaki	6 (12)	6 (21)	7 (25)	4 (66)	6 (24)	6 (24)	6 (24)	(14)
Port of Tauranga	6 (18)	6 (28)	8 (32)	6 (107)	6 (25)	7 (28)	7 (28)	(8)
Port of Timaru	6 (12)	4 (14)	5 (20)	4 (58)	5 (20)	5 (20)	5 (20)	(8)
Port of Wellington	7 (13)	6 (18)	7 (28)	6 (98)	7 (34)	7 (28)	7 (28)	(6)
Port of Auckland	6 (12)	6 (18)	6 (24)	6 (101)	6 (24)	6 (24)	5 (20)	(10)
Port of Bluff	6 (21)	7 (21)	7 (29)	5 (75)	6 (24)	7 (28)	7 (24)	(12)
Dunedin Harbour	5 (10)	5 (15)	5 (20)	5 (75)	5 (20)	5 (20)	5 (18)	(9)
Port of Gisborne	5 (10)	6 (18)	5 (20)	4 (50)	5 (20)	5 (20)	5 (20)	(8)
Gulf Harbour Marina	(17)	4 (12)	4 (16)	4 (66)	4 (16)	4 (16)	4 (16)	(8)
Port of Napier	5 (10)	5 (15)	5 (18)	4 (59)	5 (20)	5 (18)	5 (18)	(8)
Opua Marina	(10)	4 (12)	4 (12)	4 (46)	4 (8)	4 (8)	4 (8)	(8)
Whangarei Marina	3 (6)	2 (6)	2 (8)	4 (33)	2 (8)	2 (8)	2 (8)	(6)
Whangarei Harbour	4 (9)	4 (12)	4 (16)	4 (65)	4 (16)	4 (16)	4 (16)	(7)

* Shipek grab malfunctioned in the Ports of Nelson and Picton

Table 4: Preservatives used for the major taxonomic groups of organisms collected during the port survey. [1] indicates photographs were taken before preservation, and [2] indicates they were relaxed in magnesium chloride prior to preservation.

5 % Formalin solution	10 % Formalin solution	70 % Ethanol solution	Air dried
Phycophyta	Asteroidea	Alcyonacea [2]	Bryozoa
	Brachiopoda	Ascidiacea [1, 2]	
	Crustacea (large)	Crustacea (small)	
	Ctenophora [1]	Holothuria [1, 2]	
	Echinoidea	Mollusca (with shell)	
	Hydrozoa	Mollusca [1, 2] (without shell)	
	Nudibranchia [1]	Platyhelminthes [1]	
	Ophiuroidea	Porifera [1]	
	Polychaeta	Zoantharia [1, 2]	
	Scleractinia		
	Scyphozoa [1, 2]		
	Vertebrata [1] (pisces)		

Table 5a: Marine pest species listed on the New Zealand register of Unwanted Organisms under the Biosecurity Act 1993.

Phylum	Class/Order	Genus and Species
Annelida	Polychaeta	*Sabella spallanzanii*
Arthropoda	Decapoda	*Carcinus maenas*
Arthropoda	Decapoda	*Eriocheir sinensis*
Echinodermata	Asteroidea	*Asterias amurensis*
Mollusca	Bivalvia	*Potamocorbula amurensis*
Phycophyta	Chlorophyta	*Caulerpa taxifolia*
Phycophyta	Phaeophyceae	*Undaria pinnatifida*

Table 5b: Marine pest species listed on the Australian Ballast Water Management Advisory Council's (ABWMAC) schedule of non-indigenous pest species.

Phylum	Class/Order	Genus and Species
Annelida	Polychaeta	*Sabella spallanzanii*
Arthropoda	Decapoda	*Carcinus maenas*
Echinodermata	Asteroidea	*Asterias amurensis*
Mollusca	Bivalvia	*Corbula gibba*
Mollusca	Bivalvia	*Crassostrea gigas*
Mollusca	Bivalvia	*Musculista senhousia*
Phycophyta	Dinophyceae	*Alexandrium catenella*
Phycophyta	Dinophyceae	*Alexandrium minutum*
Phycophyta	Dinophyceae	*Alexandrium tamarense*
Phycophyta	Dinophyceae	*Gymnodinium catenatum*

Table 6: Native species recorded from the Port of Picton survey.

Phylum, Class	Order	Family	Genus and species
Annelida			
Polychaeta	Eunicida	Dorvilleidae	*Dorvillea australiensis*
Polychaeta	Eunicida	Dorvilleidae	*Schistomeringos loveni*
Polychaeta	Eunicida	Eunicidae	*Lysidice ninetta*
Polychaeta	Eunicida	Lumbrineridae	*Lumbrineris sphaerocephala*
Polychaeta	Phyllodocida	Nereididae	*Neanthes cricognatha*
Polychaeta	Phyllodocida	Nereididae	*Neanthes kerguelensis*
Polychaeta	Phyllodocida	Nereididae	*Nereis falcaria*
Polychaeta	Phyllodocida	Nereididae	*Perinereis amblyodonta*
Polychaeta	Phyllodocida	Nereididae	*Perinereis camiguinoides*
Polychaeta	Phyllodocida	Phyllodocidae	*Eulalia capensis*
Polychaeta	Phyllodocida	Polynoidae	*Harmothoe macrolepidota*
Polychaeta	Phyllodocida	Polynoidae	*Lepidastheniella comma*
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus banksi*
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus fiordlandica*
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus jacksoni*
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus polychromus*
Polychaeta	Phyllodocida	Polynoidae	*Ophiodromus angustifrons*
Polychaeta	Phyllodocida	Syllidae	*Haplosyllis spongicola*
Polychaeta	Phyllodocida	Syllidae	*Trypanosyllis zebra*
Polychaeta	Sabellida	Sabellidae	*Megalomma suspiciens*
Polychaeta	Sabellida	Serpulidae	*Galeolaria hystrix*
Polychaeta	Sabellida	Serpulidae	*Romanchella perrieri*
Polychaeta	Sabellida	Serpulidae	*Spirobranchus cariniferus*
Polychaeta	Scolecida	Orbiniidae	*Scoloplos cylindrifer*
Polychaeta	Terebellida	Acrocirridae	*Acrocirrus trisectus*
Polychaeta	Terebellida	Cirratulidae	*Timarete anchylochaetus*
Polychaeta	Terebellida	Flabelligeridae	*Flabelligera affinis*
Polychaeta	Terebellida	Flabelligeridae	*Pherusa parmata*
Polychaeta	Terebellida	Terebellidae	*Nicolea armilla*
Polychaeta	Terebellida	Terebellidae	*Pseudopista rostrata*
Polychaeta	Terebellida	Terebellidae	*Streblosoma toddae*
Polychaeta	Terebellida	Terebellidae	*Thelepus extensus*
Bryozoa			
Gymnolaemata	Cheilostomata	Beaniidae	*Beania discodermiae*
Gymnolaemata	Cheilostomata	Beaniidae	*Beania n. sp. [whitten]*
Gymnolaemata	Cheilostomata	Bitectiporidae	*Bitectipora mucronifera*
Gymnolaemata	Cheilostomata	Buffonellodidae	*Aimulosia marsupium*
Gymnolaemata	Cheilostomata	Calloporidae	*Valdemunitella valdemunitella*
Gymnolaemata	Cheilostomata	Eurystomellidae	*Eurystomella foraminigera*

Phylum, Class	Order	Family	Genus and species
Gymnolaemata	Cheilostomata	Hippothoidae	*Celleporella delta*
Gymnolaemata	Cheilostomata	Hippothoidae	*Celleporella tongima*
Gymnolaemata	Cheilostomata	Microporellidae	*Fenestrulina n. sp. [Leigh]*
Gymnolaemata	Cheilostomata	Microporellidae	*Microporella agonistes*
Gymnolaemata	Cheilostomata	Smittinidae	*Smittina rosacea*
Gymnolaemata	Cheilostomata	Smittinidae	*Smittina torques*
Stenolaemata	Cyclostomata	Tubuliporidae	*Tubulipora cf. connata*
Cnidaria			
Hydrozoa	Hydroida	Sertulariidae	*Sertularella robusta*
Crustacea			
Cirripedia	Thoracica	Balanidae	*Austrominius modestus*
Malacostraca	Amphipoda	Aoridae	*Aora typica*
Malacostraca	Amphipoda	Aoridae	*Haplocheira barbimana*
Malacostraca	Amphipoda	Leucothoidae	*Leucothoe trailli*
Malacostraca	Amphipoda	Liljeborgiidae	*Liljeborgia hansoni*
Malacostraca	Amphipoda	Lysianassidae	*Parawaldeckia vesca*
Malacostraca	Amphipoda	Melitidae	*Melita inaequistylis*
Malacostraca	Amphipoda	Phtisicidae	*Caprellina longicollis*
Malacostraca	Anomura	Paguidae	*Pagurus traversi*
Malacostraca	Anomura	Porcellanidae	*Petrolisthes elongatus*
Malacostraca	Anomura	Porcellanidae	*Petrolisthes novaezelandiae*
Malacostraca	Brachyura	Cancridae	*Cancer novaezelandiae*
Malacostraca	Brachyura	Hymenosomatidae	*Halicarcinus innominatus*
Malacostraca	Brachyura	Hymenosomatidae	*Halicarcinus varius*
Malacostraca	Brachyura	Hymenosomatidae	*Neohymenicus pubescens*
Malacostraca	Brachyura	Majidae	*Notomithrax minor*
Malacostraca	Brachyura	Majidae	*Notomithrax ursus*
Malacostraca	Brachyura	Xanthidae	*Pilumnus lumpinus*
Malacostraca	Caridea	Crangonidae	*Pontophilus hamiltoni*
Malacostraca	Caridea	Hippolytidae	*Hippolyte bifidirostris*
Malacostraca	Isopoda	Cirolanidae	*Natatolana rossi*
Echinodermata			
Asteroidea	Forcipulata	Asteriidae	*Allostichaster insignis*
Asteroidea	Valvatida	Asterinidae	*Patiriella regularis*
Echinoidea	Temnopleuroida	Temnopleuridae	*Pseudechinus albocinctus*
Holothuroidea	Aspidochirotida	Stichopodidae	*Stichopus mollis*
Ophiuroidea	Ophiurida	Amphiuridae	*Amphipholis squamata*
Mollusca			
Bivalvia	Myoida	Hiatellidae	*Hiatella arctica*

Phylum, Class	Order	Family	Genus and species
Bivalvia	Mytiloida	Mytilidae	*Aulacomya atra maoriana*
Bivalvia	Mytiloida	Mytilidae	*Modiolarca impacta*
Bivalvia	Mytiloida	Mytilidae	*Perna canaliculus*
Bivalvia	Nuculoida	Nuculidae	*Nucula hartvigiana*
Bivalvia	Ostreoida	Anomiidae	*Pododesmus zelandicus*
Bivalvia	Ostreoida	Ostreidae	*Ostrea chilensis*
Bivalvia	Pterioida	Pectinidae	*Talochlamys zelandiae*
Bivalvia	Veneroida	Kelliidae	*Kellia cycladiformis*
Bivalvia	Veneroida	Lasaeidae	*Borniola reniformis*
Bivalvia	Veneroida	Veneridae	*Ruditapes largillierti*
Cephalopoda	Octopoda	Octopodidae	*Octopus maorum*
Gastropoda	Littorinimorpha	Calyptraeidae	*Sigapatella novaezelandiae*
Gastropoda	Littorinimorpha	Calyptraeidae	*Sigapatella tenuis*
Gastropoda	Littorinimorpha	Turritellidae	*Maoricolpus roseus*
Gastropoda	Neogastropoda	Buccinidae	*Buccinulum vittatum*
Gastropoda	Neogastropoda	Buccinidae	*Cominella adspersa*
Gastropoda	Neogastropoda	Muricidae	*Xymene pusillus*
Gastropoda	Nudibranchia	Dendrodorididae	*Dendrodoris citrina*
Gastropoda	Patellogastropoda	Lottiidae	*Asteracmea suteri*
Gastropoda	Vetigastropoda	Trochidae	*Trochus tiaratus*
Gastropoda	Vetigastropoda	Trochidae	*Trochus viridus*
Gastropoda	Vetigastropoda	Turbinidae	*Turbo smaragdus*
Polyplacophora	Acanthochitonina	Acanthochitonidae	*Cryptoconchus porosus*
Polyplacophora	Ischnochitonina	Chitonidae	*Rhyssoplax aerea*
Polyplacophora	Ischnochitonina	Chitonidae	*Sypharochiton pelliserpentis*
Phycophyta			
Phaeophyceae	Cutleriales	Cutleriaceae	*Microzonia velutina*
Phaeophyceae	Fucales	Sargassaceae	*Sargassum sinclairii*
Rhodophyceae	Ceramiales	Ceramiaceae	*Antithamnionella adnata*
Rhodophyceae	Ceramiales	Ceramiaceae	*Ceramium apiculatum*
Rhodophyceae	Ceramiales	Ceramiaceae	*Ceramium rubrum*
Rhodophyceae	Ceramiales	Delesseriaceae	*Erythroglossum undulatissimum*
Rhodophyceae	Ceramiales	Delesseriaceae	*Myriogramme denticulata*
Rhodophyceae	Ceramiales	Delesseriaceae	*Phycodrys quercifolia*
Rhodophyceae	Ceramiales	Delesseriaceae	*Schizoseris dichotoma*
Rhodophyceae	Ceramiales	Delesseriaceae	*Schizoseris griffithsia*
Rhodophyceae	Gigartinales	Cystocloniaceae	*Craspedocarpus erosus*
Rhodophyceae	Gigartinales	Kallymeniaceae	*Callophyllis depressa*
Rhodophyceae	Rhodymeniales	Lomentariaceae	*Lomentaria umbellata*
Rhodophyceae	Rhodymeniales	Rhodomeniaceae	*Rhodymenia leptophylla*
Rhodophyceae	Rhodymeniales	Rhodomeniaceae	*Rhodymenia linearis*

Phylum, Class	Order	Family	Genus and species
Porifera			
Demospongiae	Dictyoceratida	Dysideidae	*Euryspongia cf. arenaria*
Demospongiae	Haplosclerida	Callyspongiidae	*Callyspongia stellata*
Demospongiae	Haplosclerida	Chalinidae	*Haliclona cf. isodictyale*
Demospongiae	Haplosclerida	Chalinidae	*Haliclona cf. punctata*
Demospongiae	Haplosclerida	Chalinidae	*Haliclona glabra*
Demospongiae	Haplosclerida	Chalinidae	*Haliclona stelliderma*
Demospongiae	Poecilosclerida	Hymedesmiidae	*Phorbas fulva*
Demospongiae	Poecilosclerida	Microcionidae	*Clathria (Microciona) coccinea*
Demospongiae	Poecilosclerida	Tedaniidae	*Tedania diversiraphidiophora*
Pyrrophycophyta			
Dinophyceae	Peridiniales	Gonyaulacaceae	*Gonyaulax grindleyi*
Dinophyceae	Peridiniales	Gonyaulacaceae	*Gonyaulax spinifera*
Dinophyceae	Peridiniales	Peridiniaceae	*Lingulodinium polyedrum*
Dinophyceae	Peridiniales	Peridiniaceae	*Protoperidinium conicum*
Dinophyceae	Peridiniales	Peridiniaceae	*Protoperidinium sp.*
Dinophyceae	Peridiniales	Peridiniaceae	*Scrippsiella trochoidea*
Urochordata			
Ascidiacea	Stolidobranchia	Molgulidae	*Molgula mortenseni*
Ascidiacea	Stolidobranchia	Polyzoinae	*Polyzoa opuntia*
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura cancellata*
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura picta*
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura pulla*
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura rugata*
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura subuculata*
Ascidiacea	Stolidobranchia	Styelidae	*Asterocarpa coerulea*
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa bicornuta*
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa nisiotus*
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa regalis*
Ascidiacea	Stolidobranchia	Styelidae	*Pyura trita*
Vertebrata			
Actinopterygii	Anguilliformes	Anguillidae	*Anguilla dieffenbachii*
Actinopterygii	Gadiformes	Moridae	*Pseudophycis bachus*
Actinopterygii	Perciformes	Gobiesocidae	*Trachelochismus melobesia*
Actinopterygii	Perciformes	Labridae	*Notolabrus celidotus*
Actinopterygii	Perciformes	Plesiopidae	*Acanthoclinus fuscus*
Actinopterygii	Perciformes	Trypterigiidae	*Forsterygion lapillum*
Actinopterygii	Perciformes	Trypterigiidae	*Grahamina capito*
Actinopterygii	Perciformes	Trypterigiidae	*Grahamina gymnota*

Table 7. Cryptogenic marine species recorded from the Port of Picton survey. Category 1 cryptogenic species (C1); Category 2 cryptogenic species (C2). Refer to section 2.9 for definitions.

Phylum, Class	Order	Family	Genus and species	
Bryozoa				
Gymnolaemata	Cheilostomata	Phidoloporidae	*Rhynchozoon larreyi*	C1
Gymnolaemata	Cheilostomata	Scrupariidae	*Scruparia ambigua*	C1
Cnidaria				
Hydrozoa	Hydroida	Plumulariidae	*Plumularia setacea*	C1
Crustacea				
Malacostraca	Amphipoda	Corophiidae	*Meridiolembos sp. aff. acherontis*	C2
Mollusca				
Bivalvia	Mytiloida	Mytilidae	*Mytilus galloprovincialis*	C1
Porifera				
Demospongiae	Dictyoceratida	Dysideidae	*Dysidea n. sp. 1*	C2
Demospongiae	Dictyoceratida	Dysideidae	*Dysidea n. sp. 3*	C2
Demospongiae	Dictyoceratida	Dysideidae	*Euryspongia n. sp. 1*	C2
Demospongiae	Halichondrida	Halichondriidae	*Halichondria n. sp. 1*	C2
Demospongiae	Haplosclerida	Callyspongiidae	*Callyspongia diffusa*	C1
Demospongiae	Haplosclerida	Chalinidae	*Adocia n. sp. 1*	C2
Demospongiae	Haplosclerida	Chalinidae	*Adocia n. sp. 2*	C2
Demospongiae	Haplosclerida	Chalinidae	*Chalinula n. sp. 2*	C2
Demospongiae	Haplosclerida	Chalinidae	*Haliclona n. sp. 1*	C2
Demospongiae	Haplosclerida	Chalinidae	*Haliclona n. sp. 2*	C2
Demospongiae	Haplosclerida	Chalinidae	*Haliclona n. sp. 5*	C2
Demospongiae	Haplosclerida	Chalinidae	*Haliclona n. sp. 6*	C2
Demospongiae	Poecilosclerida	Acarnidae	*Iophon proximum*	C1
Demospongiae	Poecilosclerida	Ancinoiidae	*Crella (Pytheas) incrustans*	C1
Demospongiae	Poecilosclerida	Chondropsidae	*Chondropsis kirkii*	C1
Demospongiae	Poecilosclerida	Esperiopsidae	*Esperiopsis n. sp. 1*	C2
Urochordata				
Ascidiacea	Aplousobranchia	Didemnidae	*Didemnum incanum*	C1
Ascidiacea	Phlebobranchia	Rhodosomatidae	*Corella eumyota*	C1
Ascidiacea	Stolidobranchia	Botryllinae	*Botrylliodes leachii*	C1
Ascidiacea	Stolidobranchia	Styelidae	*Asterocarpa cerea*	C1

Table 8: Non-indigenous marine species recorded from the Port of Picton survey. Likely vectors of introduction are largely derived from Cranfield et al (1998), where H = Hull fouling and B = Ballast water transport. Novel NIS not listed in Cranfield et al (1998) or previously encountered by taxonomic experts in New Zealand waters are marked as New Records (NR). For these species and others for which information is scarce, we provide dates of first detection rather than probable dates of introduction.

Phylum, Class	Order	Family	Genus and species	Probable means of introduction	Date of introduction or detection (d)
Annelida					
Polychaeta	Spionida	Spionidae	*Dipolydora armata*	H	~ 1900
Polychaeta	Spionida	Spionidae	*Dipolydora flava*	H or B	Unknown [1]
Polychaeta	Spionida	Spionidae	*Polydora hoplura*	H	Unknown [1]
Bryozoa					
Gymnolaemata	Cheilostomata	Bugulidae	*Bugula flabellata*	H	Pre-1949
Gymnolaemata	Cheilostomata	Watersiporidae	*Watersipora subtorquata*	H or B	Pre-1982
Phycophyta					
Phaeophyceae	Laminariales	Alariaceae	*Undaria pinnatifida*	H or B	Pre-1987
Rhodophyceae	Ceramiales	Ceramiaceae	*Griffithsia crassiuscula*	H	Pre-1954
Porifera					
Demospongiae	Halisarcida	Halisarcidae	*Halisarca dujardini*	H or B	Pre-1973
Urochordata					
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa sp.* **(NR)**	H	Dec. 2001 [d]

[1] Date of introduction currently unknown but species had been encountered in New Zealand prior to the present survey.

Table 9: Species indeterminata recorded from the Port of Picton survey. This group includes: (1) organisms that were damaged or juvenile and lacked crucial morphological characteristics, and (2) taxa for which there is not sufficient taxonomic or systematic information available to allow positive identification to species level.

Phylum, Class	Order	Family	Genus and species
Annelida			
Polychaeta	Phyllodocida	Nereididae	*Nereididae indet*
Polychaeta	Phyllodocida	Phyllodocidae	*Eulalia Eulalia-NIWA-2*
Polychaeta	Phyllodocida	Phyllodocidae	*Pirakia Pirakia-A*
Polychaeta	Phyllodocida	Polynoidae	*Lepidastheniella Indet*
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotinae Indet*
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus Lepidonotus-A*
Polychaeta	Phyllodocida	Polynoidae	*Polynoidae indet*
Polychaeta	Phyllodocida	Syllidae	*Eusyllis Eusyllis-D*
Polychaeta	Sabellida	Serpulidae	*Serpula Serpula-C*
Polychaeta	Sabellida	Serpulidae	*Serpula Serpula-D*
Polychaeta	Sabellida	Serpulidae	*Spirorbinae Indet*
Polychaeta	Spionida	Spionidae	*Boccardia Indet*
Polychaeta	Terebellida	Terebellidae	*Terebella Terebella-B*
Polychaeta	Terebellida	Terebellidae	*Terebellidae Indet*
Bryozoa			
Gymnolaemata	Cheilostomata	Aeteidae	*Aetea ?australis*
Cnidaria			
Anthozoa	Actiniaria	Diadumenidae	*Diadumene sp.*
Anthozoa	Actiniaria		*Acontiaria sp.*
Phycophyta			
Phaeophyceae			*Unidentifiable brown*
Rhodophyceae	Ceramiales	Ceramiaceae	*Griffithsia sp.*
Rhodophyceae	Ceramiales	Delesseriaceae	*Phycodrys sp.*
Rhodophyceae	Ceramiales	Delesseriaceae	*Schizoseris sp.*
Rhodophyceae	Ceramiales	Delesseriaceae	*Unidentifiable Delesseriaceae*
Rhodophyceae	Ceramiales	Rhodomelaceae	*Polysiphonia sp.*
Rhodophyceae	Corallinales	Corallinaceae	*Coralline (Melobesia?)*
Rhodophyceae	Gigartinales	Kallymeniaceae	*Callophyllis sp.*
Rhodophyceae	Rhodymeniales	Rhodomeniaceae	*Rhodymenia sp.*
Rhodophyceae			*Unidentifiable red*
Ulvophyceae	Cladophorales	Cladophoraceae	*Cladophora sp.*
Ulvophyceae	Ulvales	Ulvaceae	*Ulva sp.*
Platyhelminthes			
Turbellaria	Polycladida		*Indet genus indet sp.*
Urochordata			
Ascidiacea	Aplousobranchia	Didemnidae	*Didemnum sp.*
Vertebrata			
Actinopterygii	Perciformes	Gobiesocidae	*Gobiesocidae unid. larva*
Actinopterygii	Perciformes	Trypterigiidae	*Forsterygion sp. post larva*

Table 10: Non-indigenous marine organisms recorded from the Port of Picton survey and the techniques used to capture each species. Species distributions throughout the port and in other ports and marinas around New Zealand are indicated.

Genus and species	Capture techniques in the Port of Picton	Locations detected in the Port of Picton	Detected in other locations surveyed in ZBS2000_04
Dipolydora armata	Pile scrape	Ferry Terminal 3 See Fig 15	Wellington
Dipolydora flava	Pile scrape	Ferry Terminal 2 See Fig 16	Tauranga
Polydora hoplura	Pile scrape	Ferry Terminal 3 See Fig 17	Dunedin, Tauranga, Whangarei Harbour, Wellington
Bugula flabellata	Pile scrape	Ferry Terminal 2; Ferry Terminal 3; Waitohi Whar See Fig 18	Auckland, Bluff, Dunedin, Lyttleton, Napier, Nelson, Opua Marina, Taranaki, Tauranga, Timaru, Whangarei Harbour, Wellington
Watersipora subtorquata	Pile scrape	Ferry Terminal 2; Ferry Terminal 3; See Fig 19	Bluff, Dunedin, Gisborne, Lyttleton, Napier, Nelson, Opua, Taranaki, Tauranga, Timaru, Whangarei Harbour, Wellington
Undaria pinnatifida	Pile scrape	Ferry Terminal 2; Ferry Terminal 3; Waitohi Wharf See Fig 20	Dunedin, Gisborne, Lyttleton, Napier, Timaru, Wellington
Griffithsia crassiuscula	Pile scrape	Waitohi Wharf See Fig 21	Bluff, Lyttleton, Taranaki, Timaru, Wellington
Halisarca dujardini	Pile scrape	Ferry Terminal 2; Waitohi Wharf See Fig 22	Auckland, Bluff, Dunedin, Taranaki, Wellington
Cnemidocarpa sp.	Pile scrape	Ferry Terminal 2; Ferry Terminal 3; Waitohi Wharf See Fig 23	Auckland, Gisborne, Gulf Harbour Marina, Lyttleton, Nelson, Taranaki, Tauranga, Timaru, Wellington

Appendices

Appendix 1: Specialists engaged to identify specimens obtained from the New Zealand Port surveys.

Phylum	Class	Specialist	Institution
Annelida	Polychaeta	Geoff Read, Jeff Forman	NIWA Greta Point
Bryozoa	Gymnolaemata	Dennis Gordon	NIWA Greta Point
Chelicerata	Pycnogonida	David Staples	Melbourne Museum, Victoria, Australia
Cnidaria	Anthozoa	Adorian Ardelean	West University of Timisoara, Timisoara, 1900, Romania
Cnidaria	Hydrozoa	Jan Watson	Hydrozoan Research Laboratory, Clifton Springs, Victoria, Australia
Crustacea	Amphipoda	Graham Fenwick	NIWA Christchurch
Crustacea	Cirripedia	Graham Fenwick, Isla Fitridge John Buckeridge[1]	NIWA Christchurch and [1]Auckland University of Technology
Crustacea	Decapoda	Colin McLay[1] Graham Fenwick, Nick Gust	[1]University of Canterbury and
			NIWA Christchurch
Crustacea	Isopoda	Niel Bruce	NIWA Greta Point
Crustacea	Mysidacea	Fukuoka Kouki	National Science Museum, Tokyo
Echinodermata	Asteroidea	Don McKnight	NIWA Greta Point
Echinodermata	Echinoidea	Don McKnight	NIWA Greta Point
Echinodermata	Holothuroidea	Niki Davey	NIWA Nelson
Echinodermata	Ophiuroidea	Don McKnight, Helen Rotman	NIWA Greta Point
Echiura	Echiuroidea	Geoff Read	NIWA Greta Point
Mollusca	Bivalvia. Cephalopoda, Gastropoda, Polyplacophora	Bruce Marshall	Museum of NZ Te Papa Tongarewa
Nemertea	Anopla, Enopla	Geoff Read	NIWA Greta Point
Phycophyta	Phaeophyceae, Rhodophyceae, Ulvophyceae	Wendy Nelson, Kate Neill	NIWA Greta Point
Platyhelminthes	Turbellaria	Sean Handley	NIWA Nelson
Porifera	Demospongiae, Calcarea	Michelle Kelly-Shanks	NIWA Auckland
Priapula	Priapulidae	Geoff Read	NIWA Greta Point
Pyrrophycophyta	Dinophyceae	Hoe Chang, Rob Stewart	NIWA Greta Point
Urochordata	Ascidiacea	Mike Page, Anna Bradley Patricia Kott[1]	NIWA Nelson and [1]Queensland Museum
Vertebrata	Osteichthyes	Clive Roberts, Andrew Stewart	Museum of NZ Te Papa Tongarewa

Appendix 2: Generic descriptions of representative groups of the main marine phyla collected during sampling.

Phylum Annelida

Polychaetes: The polychaetes are the largest group of marine worms and are closely related to the earthworms and leeches found on land. Polychaetes are widely distributed in the marine environment and are commonly found under stones and rocks, buried in the sediment or attached to submerged natural and artificial surfaces including rocks, pilings, ropes and the shells or carapaces of other species. All polychaete worms have visible legs or bristles. Many species live in tubes secreted by the body or assembled from debris and sediments, while others are free-living. Depending on species, polychaetes feed by filtering small food particles from the water or by preying upon smaller creatures.

Phylum Bryozoa

Bryozoans: This group of organisms is also referred to as 'moss animals' or 'lace corals'. Bryozoans are sessile and live attached to submerged natural and artificial surfaces including rocks, pilings, ropes and the shells or carapaces of other species. They are all colonial, with individual colonies consisting of hundreds of individual 'zooids'. Bryozoans can have encrusting growth forms that are sheet-like and approximately 1 mm thick, or can form erect or branching structures several centimetres high. Bryozoans feed by filtering small food particles from the water column, and colonies grow by producing additional zooids.

Phylum Chelicerata

Pycnogonids: The pycnogonids, or sea spiders, are a group within the Arthropoda, and closely related to land spiders. They are commonly encountered living among sponges, hydroids and bryozoans on the seafloor. They range in size from a few mm to many cm and superficially resemble spiders found on land.

Phylum Cnidaria

Hydroids: Hydroids can easily be mistaken for erect and branching bryozoans. They are also sessile organisms that live attached to submerged natural and artificial surfaces including rocks, pilings, ropes and the shells or carapaces of other species. All hydroids are colonial, with individual colonies consisting of hundreds of individual 'polyps'. Like bryozoans, they feed by filtering small food particles from the water column.

Phylum Crustacea

Crustaceans: The crustaceans represent one of the sea's most diverse groups of organisms, well known examples include shrimps, crabs and lobsters. Most crustaceans are motile (capable of movement) although there are also a variety of sessile species (e.g. barnacles). All crustaceans are protected by an external carapace, and most can be recognised by having two pairs of antennae.

Phylum Echinodermata

Echinoderms: This phylum contains a range of predominantly motile organisms – sea stars, brittle stars, sea urchins, sea cucumbers, sand dollars, feather stars and sea lilies. Echinoderms feed by filtering small food particles from the water column or by extracting food particles from sediment grains or rock surfaces.

Phylum Mollusca

Molluscs: The molluscs are a highly diverse group of marine animals characterised by the presence of an external or internal shell. This phyla includes the bivalves (organisms with hinged shells e.g. mussels, oysters, etc), gastropods (marine snails, e.g. winkles, limpets, topshells), chitons, sea slugs and sea hares, as well as the cephalopods (squid, cuttlefish and octopus).

Phylum Phycophyta

Algae: These are the marine plants. Several types were encountered during our survey. Large *macroalgae* were sampled that live attached to submerged natural and artificial surfaces including rocks, pilings, ropes and the shells or carapaces of other species. These include the green algae (Ulvophyceae), red algae (Rhodophyceae) and brown algae (Phaeophyceae). We also encountered microscopic algal species called *dinoflagellates* (phylum Pyrrophycophyta), single-celled algae that live in the water column or within the sediments.

Phylum Porifera

Sponges: Sponges are very simple colonial organisms that live attached to submerged natural and artificial surfaces including rocks, pilings, ropes and the shells or carapaces of other species. They vary greatly in colour and shape, and include sheet-like encrusting forms, branching forms and tubular forms. Sponge surfaces have thousands of small pores to through which water is drawn into the colony, where small food particles are filtered out before the water is again expelled through one or several other holes.

Phylum Pyrrophycophyta

Dinoflagellates: Dinoflagellates are a large group of unicellular algae common in marine plankton. About half of all dinoflagellates are capable of photosynthesis and some are symbionts, living inside organisms such as jellyfish and corals. Some dinoflagellates are phosphorescent and can be responsible for the phosphorescence visible at night in the sea. The phenomenon known as red tide occurs when the rapid reproduction of certain dinoflagellate species results in large brownish red algal blooms. Some dinoflagellates are highly toxic and can kill fish and shellfish, or poison humans that eat these infected organisms.

Phylum Urochordata

Ascidians: This group of organisms is sometimes referred to as ‘sea squirts’. Adult ascidians are sessile (permanently attached to the substrate) organisms that live on submerged natural and artificial surfaces including rocks, pilings, ropes and the shells or carapaces of other species. Ascidians can occur as individuals (solitary ascidians) or merged together into colonies (colonial ascidians). They are soft-bodied and have a rubbery or jelly-like outer coating (test). They feed by pumping water into the body through an inhalant siphon. Inside the body, food particles are filtered out of the water, which is then expelled through an exhalant siphon. Ascidians reproduce via swimming larvae (ascidian tadpoles) that retain a notochord, which explains why these animals are included in the phylum Chordata along with vertebrates.

Phylum Vertebrata

Fishes: Fishes are an extremely diverse group of the verterbrates familiar to most people. Approximately 200 families of fish are represented in New Zealand waters ranging from tropical and subtropical groups in the north to subantarctic groups in the south. Fishes can be classified according to their depth preferences. Fish that live on or near the sea floor are considered demersal while those living in the upper water column are termed pelagics.

Appendix 3: Chapman and Carlton's (1994) criteria for assigning non-indigenous species status to species sampled in the Port of Picton.

Criteria (C1-C9) that apply to each species are indicated by (+). Cranfield et al's (1998) analysis was used for species previously known from New Zealand waters. For non-indigenous species that were first detected during the present study, criteria were assigned using advice from the taxonomists that identified them. Refer to footnote for a full description of C1 – C9.

Phylum and species	C1	C2	C3	C4	C5	C6	C7	C8	C9
Annelida									
Dipolydora armata			+		+	+	+	+	
Dipolydora flava	+		+		+			+	
Polydora hoplura			+		+	+	+	+	+
Bryozoa									
Bugula flabellata	+	+	+		+	+	+	+	+
Watersipora subtorquata	+	+	+		+	+	+	+	+
Phycophyta									
Undaria pinnatifida	+	+	+		+	+	+	+	+
Griffithsia crassiuscula	+	+				+		+	+
Porifera									
Halisarca dujardini	+		+	+		+	+	+	+
Urochordata									
Cnemidocarpa sp.	+		+		+			+	

Criterion 1: Has the species suddenly appeared locally where it has not been found before?
Criterion 2: Has the species spread subsequently?
Criterion 3: Is the species' distribution associated with human mechanisms of dispersal?
Criterion 4: Is the species associated with, or dependent on, other introduced species?
Criterion 5: Is the species prevalent in, or restricted to, new or artificial environments?
Criterion 6: Is the species' distribution restricted compared to natives?
Criterion 7: Does the species have a disjunct worldwide distribution?
Criterion 8: Are dispersal mechanisms of the species inadequate to reach New Zealand, and is passive dispersal in ocean currents unlikely to bridge ocean gaps to reach New Zealand?
Criterion 9: Is the species isolated from the genetically and morphologically most similar species elsewhere in the world?

Appendix 4. Geographic locations of the sample sites in the port of Picton

Site	Eastings	Northings	NZ Latitude	NZ Longitude	Survey Method	No. of sample units
1	2594344	5991455	-41.28103	174.00682	CYST	1
2	2594372	5991484	-41.28076	174.00715	CYST	1
3	2594521	5991103	-41.28418	174.00898	CYST	1
4	2594552	5991099	-41.28421	174.00935	CYST	1
5	2594479	5990886	-41.28614	174.00851	CYST	1
6	2594479	5990841	-41.28654	174.00852	CYST	1
BETWEEN FT1 & WW	2594255	5991006	-41.28508	174.00582	BSLD	1
	2594204	5990951	-41.28558	174.00522	BSLD	1
BETWEEN FT2 & FT1	2594228	5990885	-41.28617	174.00551	BSLD	1
	2594201	5990854	-41.28645	174.00520	BSLD	1
BETWEEN FT3 & FT2	2594277	5990888	-41.28614	174.00610	BSLD	1
	2594210	5990816	-41.28680	174.00531	BSLD	1
FT2	2594250	5990883	-41.28619	174.00578	CRBTP	6
	2594250	5990883	-41.28619	174.00578	FSHTP	4
	2594250	5990883	-41.28619	174.00578	PSC	17
	2594250	5990883	-41.28619	174.00578	SHRTP	8
	2594250	5990883	-41.28619	174.00578	STFTP	8
FT3	2594317	5990895	-41.28607	174.00657	CRBTP	6
	2594317	5990895	-41.28607	174.00657	FSHTP	4
	2594317	5990895	-41.28607	174.00657	PSC	17
	2594317	5990895	-41.28607	174.00657	SHRTP	5
	2594317	5990895	-41.28607	174.00657	STFTP	8
WW	2594266	5991090	-41.28432	174.00594	CRBTP	6
	2594266	5991090	-41.28432	174.00594	FSHTP	8
	2594266	5991090	-41.28432	174.00594	PSC	19
	2594266	5991090	-41.28432	174.00594	SHRTP	8
	2594266	5991090	-41.28432	174.00594	STFTP	8

*Survey methods: PSC = pile scrape, BSLD = benthic sled, BGRB = benthic grab, CYST = dinoflagellate cyst core, CRBTP = crab trap, FSHTP = fish trap, STFTP = starfish trap, SHRTP = shrimp trap.

Appendix 5a. Results from the diver collections and pile scrapings

					Berth code	FT2																	FT3												
					Pile replicate	1									2								1									2			
					Pile position	IN				OUT					IN				OUT				IN				OUT					IN			
Class	Orders	Family	Genus	Species	*Status	1	2	3	4	1	2	3	4	MISC	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	MISC	1	2	3	4
Actinopterygii	Perciformes	Gobiesocidae	*Gobiesocidae*	*unid. larva*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Perciformes	Plesiopidae	*Acanthoclinus*	*fuscus*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Actinopterygii	Perciformes	Trypterigiidae	*Forsterygion*	*sp. post larva*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Perciformes	Trypterigiidae	*Forsterygion*	*lapillum*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthozoa	Actiniaria	Diadumenidae	*Diadumene*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ascidiacea	Aplousobranchia	Didemnidae	*Didemnum*	*sp.*	SI	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Aplousobranchia	Didemnidae	*Didemnum*	*incanum*	C1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Ascidiacea	Phlebobranchia	Rhodosomatidae	*Corella*	*eumyota*	C1	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Botryllinae	*Botrylliodes*	*leachii*	C1	0	1	1	0	0	0	1	0	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Ascidiacea	Stolidobranchia	Molgulidae	*Molgula*	*mortenseni*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Polyzoinae	*Polyzoa*	*opuntia*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*cancellata*	N	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	1	1	1	0	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*picta*	N	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*rugata*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*subuculata*	N	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1	0	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*pulla*	N	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa*	*nisiotus*	N	0	0	1	1	0	0	1	0	0	0	0	1	1	0	0	0	1	0	0	1	1	0	1	0	0	0	0	1	1	0
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa*	*sp.*	A	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	1	0	0	0	0	1	0	1	0
Ascidiacea	Stolidobranchia	Styelidae	*Asterocarpa*	*cerea*	C1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa*	*regalis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa*	*bicornuta*	N	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
Ascidiacea	Stolidobranchia	Styelidae	*Asterocarpa*	*coerulea*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Styelidae	*Pyura*	*trita*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Asteroidea	Forcipulata	Asteriidae	*Allostichaster*	*insignis*	N	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteroidea	Valvatida	Asterinidae	*Patiriella*	*regularis*	N	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	Myoida	Hiatellidae	*Hiatella*	*arctica*	N	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	0	0	0	0	0	1	1	1	0
Bivalvia	Mytiloida	Mytilidae	*Aulacomya*	*atra maoriana*	N	1	0	1	1	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1
Bivalvia	Mytiloida	Mytilidae	*Perna*	*canaliculus*	N	1	1	0	1	0	0	1	0	0	1	0	0	0	0	1	1	1	0	0	0	1	1	1	1	0	0	1	1	1	1
Bivalvia	Mytiloida	Mytilidae	*Modiolarca*	*impacta*	N	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0	0	1	1	1	1	0	0	1	0	1	0	1
Bivalvia	Mytiloida	Mytilidae	*Mytilus*	*galloprovincialis*	C1	1	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0
Bivalvia	Ostreoida	Anomiidae	*Pododesmus*	*zelandicus*	N	0	1	1	1	0	0	0	0	0	0	1	1	0	0	1	1	1	0	1	0	1	0	1	0	1	0	1	0	1	1
Bivalvia	Ostreoida	Ostreidae	*Ostrea*	*chilensis*	N	1	1	1	1	0	0	1	0	1	1	1	1	0	0	1	1	0	1	1	1	1	1	1	0	1	0	1	1	1	1
Bivalvia	Pterioida	Pectinidae	*Talochlamys*	*zelandiae*	N	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0
Bivalvia	Veneroida	Kelliidae	*Kellia*	*cycladiformis*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Bivalvia	Veneroida	Lasaeidae	*Borniola*	*reniformis*	N	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Bivalvia	Veneroida	Veneridae	*Ruditapes*	*largillierti*	N	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladophorophyceae	Cladophorales	Cladophoraceae	*Cladophora*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Anomura	Paguidae	*Pagurus*	*traversi*	N	0	0	1	1	0	0	1	1	0	0	1	0	1	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Crustacea	Anomura	Porcellanidae	*Petrolisthes*	*elongatus*	N	1	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	0
Crustacea	Anomura	Porcellanidae	*Petrolisthes*	*novaezelandiae*	N	1	0	0	1	0	0	0	0	0	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	0	0	0	1	1	1
Crustacea	Brachyura	Hymenosomatidae	*Halicarcinus*	*innominatus*	N	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	0	0	1	0	1	0
Crustacea	Brachyura	Hymenosomatidae	*Halicarcinus*	*varius*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Crustacea	Brachyura	Hymenosomatidae	*Neohymenicus*	*pubescens*	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Brachyura	Majidae	*Notomithrax*	*minor*	N	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0
Crustacea	Brachyura	Majidae	*Notomithrax*	*ursus*	N	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Brachyura	Xanthidae	*Pilumnus*	*lumpinus*	N	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0
Crustacea	Caridea	Hippolytidae	*Hippolyte*	*bifidirostris*	N	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Crustacea	Thoracica	Balanidae	*Austrominius*	*modestus*	N	1	1	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0
Demospongiae	Dictyoceratida	Dysideidae	*Euryspongia*	*n. sp. 1 (soft spikey tan cushion)*	C2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	1	1	1
Demospongiae	Dictyoceratida	Dysideidae	*Dysidea*	*n. sp. 1 (erect cactus)*	C2	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Demospongiae	Dictyoceratida	Dysideidae	*Euryspongia*	*cf. arenaria*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Halichondrida	Halichondriidae	*Halichondria*	*n. sp. 1 (knubby oxeas 290-380)*	C2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Halisarcida	Halisarcidae	*Halisarca*	*dujardini*	A	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Haplosclerida	Callyspongiidae	*Callyspongia*	*stellata*	N	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Haplosclerida	Callyspongiidae	*Callyspongia*	*diffusa*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Demospongiae	Haplosclerida	Chalinidae	*Adocia*	*n. sp. 2 (smooth tough 180)*	C2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

*Status: A = non-indigenous (highlighted by shading), C1 = cryptogenic category 1, C2 = cryptogenic category 2, N = native, SI = species indeterminata. See text for details.

Appendix 5a. Results from the diver collections and pile scrapings

					Berth code	FT2																	FT3												
					Pile replicate	1									2								1									2			
					Pile position	IN				OUT					IN				OUT				IN				OUT					IN			
Class	Orders	Family	Genus	Species	*Status	1	2	3	4	1	2	3	4	MISC	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	MISC	1	2	3	4
Demospongiae	Haplosclerida	Chalinidae	*Haliclona*	*glabra*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Demospongiae	Haplosclerida	Chalinidae	*Haliclona*	*cf. punctata*	N	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Demospongiae	Haplosclerida	Chalinidae	*Haliclona*	*cf. isodictyale*	N	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Poecilosclerida	Acarnidae	*Iophon*	*proximum*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0
Demospongiae	Poecilosclerida	Ancinoiidae	*Crella (Pytheas)*	*incrustans*	C1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	1	0	1	0	0	1	1	1	0	1
Demospongiae	Poecilosclerida	Chondropsidae	*Chondropsis*	*kirkii*	C1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Demospongiae	Poecilosclerida	Esperiopsidae	*Esperiopsis*	*n. sp. 1 (smooth bubble sponge)*	C2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	1	0	0	1
Demospongiae	Poecilosclerida	Microcionidae	*Clathria (Microciona)*	*coccinea*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Poecilosclerida	Tedaniidae	*Tedania*	*diversiraphidiophora*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Gastropoda	Littorinimorpha	Calyptraeidae	*Sigapatella*	*novaezelandiae*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Littorinimorpha	Calyptraeidae	*Sigapatella*	*tenuis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Neogastropoda	Buccinidae	*Buccinulum*	*vittatum*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Nudibranchia	Dendrodorididae	*Dendrodoris*	*citrina*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Gastropoda	Patellogastropoda	Lottiidae	*Asteracmea*	*suteri*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Vetigastropoda	Trochidae	*Trochus*	*viridus*	N	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Aeteidae	*Aetea*	*?australis*	SI	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Beaniidae	*Beania*	*n. sp. [whitten]*	N	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
Gymnolaemata	Cheilostomata	Beaniidae	*Beania*	*discodermiae*	N	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Bitectiporidae	*Bitectipora*	*mucronifera*	N	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Gymnolaemata	Cheilostomata	Buffonellodidae	*Aimulosia*	*marsupium*	N	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Bugulidae	*Bugula*	*flabellata*	A	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Gymnolaemata	Cheilostomata	Calloporidae	*Valdemunitella*	*valdemunitella*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Eurystomellidae	*Eurystomella*	*foraminigera*	N	0	1	1	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Hippothoidae	*Celleporella*	*tongima*	N	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Hippothoidae	*Celleporella*	*delta*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Microporellidae	*Microporella*	*agonistes*	N	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0
Gymnolaemata	Cheilostomata	Microporellidae	*Fenestrulina*	*n. sp. [Leigh]*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Phidoloporidae	*Rhynchozoon*	*larreyi*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Scrupariidae	*Scruparia*	*ambigua*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Gymnolaemata	Cheilostomata	Smittinidae	*Smittina*	*torques*	N	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Gymnolaemata	Cheilostomata	Smittinidae	*Smittina*	*rosacea*	N	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Gymnolaemata	Cheilostomata	Watersiporidae	*Watersipora*	*subtorquata*	A	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Holothuroidea	Aspidochirotida	Stichopodidae	*Stichopus*	*mollis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrozoa	Hydroida	Plumulariidae	*Plumularia*	*setacea*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Hydrozoa	Hydroida	Sertulariidae	*Sertularella*	*robusta*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Aoridae	*Haplocheira*	*barbimana*	N	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Aoridae	*Aora*	*typica*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Malacostraca	Amphipoda	Corophiidae	*Meridiolembos*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Leucothoidae	*Leucothoe*	*trailli*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Malacostraca	Amphipoda	Liljeborgiidae	*Liljeborgia*	*hansoni*	N	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Lysianassidae	*Parawaldeckia*	*vesca*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Melitidae	*Melita*	*inaequistylis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Phtisicidae	*Caprellina*	*longicollis*	N	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ophiuroidea	Ophiurida	Amphiuridae	*Amphipholis*	*squamata*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Phaeophyceae	Cutleriales	Cutleriaceae	*Microzonia*	*velutina*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Phaeophyceae	Laminariales	Alariaceae	*Undaria*	*pinnatifida*	A	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	0	0	0	0
Polychaeta	Eunicida	Dorvilleidae	*Dorvillea*	*australiensis*	N	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0
Polychaeta	Eunicida	Dorvilleidae	*Schistomeringos*	*loveni*	N	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Eunicida	Eunicidae	*Lysidice*	*ninetta*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Polychaeta	Eunicida	Lumbrineridae	*Lumbrineris*	*sphaerocephala*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Polychaeta	Phyllodocida	Hesionidae	*Ophiodromus*	*angustifrons*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	1	1	1	0
Polychaeta	Phyllodocida	Nereididae	*Neanthes*	*kerguelensis*	N	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	1
Polychaeta	Phyllodocida	Nereididae	*Nereis*	*falcaria*	N	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	0	0	1	0	1	0	0	0	0	0	1	1
Polychaeta	Phyllodocida	Nereididae	*Perinereis*	*amblyodonta*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Nereididae	*Neanthes*	*cricognatha*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Nereididae	*Nereididae*	*indet*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Status: A = non-indigenous (highlighted by shading), C1 = cryptogenic category 1, C2 = cryptogenic category 2, N = native, SI = species indeterminata. See text for details.

Appendix 5a. Results from the diver collections and pile scrapings

					Berth code	FT2																				FT3																			
					Pile replicate	1									2									1									2			
					Pile position	IN				OUT					IN				OUT					IN				OUT					IN			
Class	Orders	Family	Genus	Species	*Status	1	2	3	4	1	2	3	4	MISC	1	2	3	4	1	2	3	4		1	2	3	4	1	2	3	4	MISC	1	2	3	4
Polychaeta	Phyllodocida	Nereididae	*Perinereis*	*camiguinoides*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Phyllodocidae	*Pirakia*	*Pirakia-A*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	0	0	0	1	0
Polychaeta	Phyllodocida	Phyllodocidae	*Eulalia*	*Eulalia-NIWA-2*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Phyllodocidae	*Eulalia*	*capensis*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*polychromus*	N	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1		1	0	1	0	1	1	0	0	0	1	0	1	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidastheniella*	*comma*	N	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0		0	0	0	0	0	1	1	0	0	1	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Polynoidae*	*indet*	SI	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Harmothoe*	*macrolepidota*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidastheniella*	*Indet*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotinae*	*Indet*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*Lepidonotus-A*	SI	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*banksi*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*fiordlandica*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*jacksoni*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Syllidae	*Eusyllis*	*Eusyllis-D*	SI	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	0	0	0	1	0
Polychaeta	Phyllodocida	Syllidae	*Haplosyllis*	*spongicola*	N	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0		0	1	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Syllidae	*Trypanosyllis*	*zebra*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Sabellida	Sabellidae	*Megalomma*	*suspiciens*	N	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0		0	1	0	0	0	0	0	0	0	1	1	1	0
Polychaeta	Sabellida	Serpulidae	*Galeolaria*	*hystrix*	N	0	1	1	0	0	0	1	0	0	1	0	0	0	0	1	0	1		0	0	1	1	1	1	0	0	0	1	0	1	0
Polychaeta	Sabellida	Serpulidae	*Romanchella*	*perrieri*	N	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Sabellida	Serpulidae	*Serpula*	*Serpula-C*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	0	0	0	0	0
Polychaeta	Sabellida	Serpulidae	*Spirobranchus*	*cariniferus*	N	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	1	0	0
Polychaeta	Sabellida	Serpulidae	*Serpula*	*Serpula-D*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	1	0
Polychaeta	Sabellida	Serpulidae	*Spirorbinae*	*Indet*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Scolecida	Orbiniidae	*Scoloplos*	*cylindrifer*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Spionida	Spionidae	*Boccardia*	*Indet*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	0	0	0	0	0
Polychaeta	Spionida	Spionidae	*Dipolydora*	*armata*	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	1	0
Polychaeta	Spionida	Spionidae	*Dipolydora*	*flava*	A	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Spionida	Spionidae	*Polydora*	*hoplura*	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	1	0
Polychaeta	Terebellida	Acrocirridae	*Acrocirrus*	*trisectus*	N	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Terebellida	Cirratulidae	*Timarete*	*anchylochaetus*	N	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	1	0	0
Polychaeta	Terebellida	Flabelligeridae	*Flabelligera*	*affinis*	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Terebellida	Flabelligeridae	*Pherusa*	*parmata*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Terebellida	Terebellidae	*Nicolea*	*armilla*	N	1	1	0	0	0	0	0	0	0	1	1	1	1	0	1	1	1		0	1	1	1	1	1	1	0	1	1	1	1	1
Polychaeta	Terebellida	Terebellidae	*Pseudopista*	*rostrata*	N	0	0	0	1	0	0	0	0	0	1	0	1	1	0	1	1	1		0	0	1	1	0	0	0	0	0	1	0	1	1
Polychaeta	Terebellida	Terebellidae	*Terebella*	*Terebella-B*	SI	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0		0	0	0	1	0	0	0	0	0	1	0	1	0
Polychaeta	Terebellida	Terebellidae	*Streblosoma*	*toddae*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Terebellida	Terebellidae	*Terebellidae*	*Indet*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Terebellida	Terebellidae	*Thelepus*	*extensus*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		0	0	0	0	0	0	0	0	0	0	0	0	0
Polyplacophora	Acanthochitonina	Acanthochitonidae	*Cryptoconchus*	*porosus*	N	0	1	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0		0	0	1	0	1	0	0	0	0	1	0	0	0
Polyplacophora	Ischnochitonina	Chitonidae	*Sypharochiton*	*pelliserpentis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Griffithsia*	*sp.*	SI	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Ceramium*	*apiculatum*	N	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Griffithsia*	*crassiuscula*	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Ceramium*	*rubrum*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Antithamnionella*	*adnata*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Deleseriaceae	*Phycodrys*	*quercifolia*	N	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	1	0		0	1	0	1	1	1	1	1	0	0	0	1	0
Rhodophyceae	Ceramiales	Deleseriaceae	*Myriogramme*	*denticulata*	N	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0		0	1	0	0	1	1	1	1	1	0	1	0	0
Rhodophyceae	Ceramiales	Deleseriaceae	*Schizoseris*	*sp*	SI	0	0	0	0	1	1	0	0	1	0	0	1	0	0	1	1	0		0	1	0	0	0	1	0	1	0	0	0	1	0
Rhodophyceae	Ceramiales	Deleseriaceae	*Schizoseris*	*griffithsia*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		1	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Delesseriaceae	*Schizoseris*	*dichotoma*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1		0	0	0	0	1	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Delesseriaceae	*Erythroglossum*	*undulatissimum*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Delesseriaceae	*Phycodrys*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Rhodomelaceae	*Polysiphonia*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Corallinales	Corallinaceae	*Coralline*	*(Melobesia?)*	SI	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Gigartinales	Kallymeniaceae	*Callophyllis*	*depressa*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	1	0	0	0	0	0	0	0	0	0	0	0

*Status: A = non-indigenous (highlighted by shading), C1 = cryptogenic category 1, C2 = cryptogenic category 2, N = native, SI = species indeterminata. See text for details.

Appendix 5a. Results from the diver collections and pile scrapings

					Berth code	FT2																		FT3												
					Pile replicate	1									2									1									2			
					Pile position	IN				OUT					IN				OUT					IN				OUT					IN			
Class	Orders	Family	Genus	Species	*Status	1	2	3	4	1	2	3	4	MISC	1	2	3	4	1	2	3	4		1	2	3	4	1	2	3	4	MISC	1	2	3	4
Rhodophyceae	Gigartinales	Kallymeniaceae	*Callophyllis*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Rhodymeniales	Lomentariaceae	*Lomentaria*	*umbellata*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Rhodymeniales	Rhodomeniaceae	*Rhodymenia*	*sp.*	SI	0	0	1	0	1	0	0	0	1	0	0	0	0	0	1	0	1		0	1	0	0	0	1	1	1	0	0	0	0	0
Rhodophyceae	Rhodymeniales	Rhodomeniaceae	*Rhodymenia*	*linearis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Rhodymeniales	Rhodomeniaceae	*Rhodymenia*	*leptophylla*	N	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae		Delesseriaceae	*Unidentifiable*	*Delesseriaceae*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae			*Unidentifiable*	*red*	SI	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1		0	0	0	0	0	0	0	0	0	0	0	0	0
Stenolaemata	Cyclostomata	Tubuliporidae	*Tubulipora*	*cf. connata*	N	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1		0	0	0	0	1	0	0	0	0	0	1	0	0
Turbellaria	Polycladida		*Indet genus*	*indet sp.*	SI	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Ulvophyceae	Ulvales	Ulvaceae	*Ulva*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0		0	0	0	0	1	0	0	0	0	0	0	0	0

*Status: A = non-indigenous (highlighted by shading), C1 = cryptogenic category 1, C2 = cryptogenic category 2, N = native, SI = species indeterminata. See text for details.

Appendix 5a. Results from the diver collections and pile scrapings

					Berth code					WW																		
					Pile replicate						1									2								
					Pile position	OUT				IN				OUT					IN					OUT				
Class	Orders	Family	Genus	Species	*Status	1	2	3	4	1	2	3	MISC	1	2	3	4	MISC	1	2	3	4	MISC	1	2	3	4	MISC
Actinopterygii	Perciformes	Gobiesocidae	*Gobiesocidae*	*unid. larva*	SI	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Perciformes	Plesiopidae	*Acanthoclinus*	*fuscus*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Perciformes	Trypterigiidae	*Forsterygion*	*sp. post larva*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Actinopterygii	Perciformes	Trypterigiidae	*Forsterygion*	*lapillum*	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthozoa	Actiniaria	Diadumenidae	*Diadumene*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Aplousobranchia	Didemnidae	*Didemnum*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ascidiacea	Aplousobranchia	Didemnidae	*Didemnum*	*incanum*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Phlebobranchia	Rhodosomatidae	*Corella*	*eumyota*	C1	1	0	0	0	0	1	1	0	0	0	0	1	1	0	1	1	0	0	1	1	1	0	0
Ascidiacea	Stolidobranchia	Botryllinae	*Botrylliodes*	*leachii*	C1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Molgulidae	*Molgula*	*mortenseni*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0
Ascidiacea	Stolidobranchia	Polyzoinae	*Polyzoa*	*opuntia*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*cancellata*	N	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	0	1	0	1	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*picta*	N	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*rugata*	N	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*subuculata*	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*pulla*	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa*	*nisiotus*	N	1	0	0	0	0	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	1	0	0
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa*	*sp.*	A	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Styelidae	*Asterocarpa*	*cerea*	C1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa*	*regalis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa*	*bicornuta*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ascidiacea	Stolidobranchia	Styelidae	*Asterocarpa*	*coerulea*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ascidiacea	Stolidobranchia	Styelidae	*Pyura*	*trita*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteroidea	Forcipulata	Asteriidae	*Allostichaster*	*insignis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1
Asteroidea	Valvatida	Asterinidae	*Patiriella*	*regularis*	N	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Bivalvia	Myoida	Hiatellidae	*Hiatella*	*arctica*	N	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	0	0
Bivalvia	Mytiloida	Mytilidae	*Aulacomya*	*atra maoriana*	N	1	1	0	0	1	1	1	0	1	0	0	1	0	1	1	1	1	0	1	1	1	1	0
Bivalvia	Mytiloida	Mytilidae	*Perna*	*canaliculus*	N	1	0	0	0	0	0	1	0	0	0	0	1	0	1	1	1	1	0	1	0	1	0	0
Bivalvia	Mytiloida	Mytilidae	*Modiolarca*	*impacta*	N	1	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	1	0	0	0	1	1	0
Bivalvia	Mytiloida	Mytilidae	*Mytilus*	*galloprovincialis*	C1	1	0	0	0	1	0	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0
Bivalvia	Ostreoida	Anomiidae	*Pododesmus*	*zelandicus*	N	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	0
Bivalvia	Ostreoida	Ostreidae	*Ostrea*	*chilensis*	N	1	0	0	0	1	1	1	0	0	1	0	1	1	1	1	1	1	0	1	1	1	1	0
Bivalvia	Pterioida	Pectinidae	*Talochlamys*	*zelandiae*	N	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0
Bivalvia	Veneroida	Kelliidae	*Kellia*	*cycladiformis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	Veneroida	Lasaeidae	*Borniola*	*reniformis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	Veneroida	Veneridae	*Ruditapes*	*largillierti*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladophorophyceae	Cladophorales	Cladophoraceae	*Cladophora*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Anomura	Paguidae	*Pagurus*	*traversi*	N	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	0	1	0	1	0	0
Crustacea	Anomura	Porcellanidae	*Petrolisthes*	*elongatus*	N	1	0	0	0	1	1	0	0	1	1	0	1	0	1	1	0	1	0	1	1	1	1	0
Crustacea	Anomura	Porcellanidae	*Petrolisthes*	*novaezelandiae*	N	1	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1	1	0	1	1	1	1	1
Crustacea	Brachyura	Hymenosomatidae	*Halicarcinus*	*innominatus*	N	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0
Crustacea	Brachyura	Hymenosomatidae	*Halicarcinus*	*varius*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Crustacea	Brachyura	Hymenosomatidae	*Neohymenicus*	*pubescens*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Brachyura	Majidae	*Notomithrax*	*minor*	N	0	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	1	0	1	1	1	1	0
Crustacea	Brachyura	Majidae	*Notomithrax*	*ursus*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Brachyura	Xanthidae	*Pilumnus*	*lumpinus*	N	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0	1	0	1	1	0
Crustacea	Caridea	Hippolytidae	*Hippolyte*	*bifidirostris*	N	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Thoracica	Balanidae	*Austrominius*	*modestus*	N	1	0	0	0	1	1	0	0	1	0	0	0	0	1	1	1	0	0	0	0	0	1	0
Demospongiae	Dictyoceratida	Dysideidae	*Euryspongia*	*n. sp. 1 (soft spikey tan cushion)*	C2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0
Demospongiae	Dictyoceratida	Dysideidae	*Dysidea*	*n. sp. 1 (erect cactus)*	C2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Demospongiae	Dictyoceratida	Dysideidae	*Euryspongia*	*cf. arenaria*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Halichondrida	Halichondriidae	*Halichondria*	*n. sp. 1 (knubby oxeas 290-380)*	C2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Halisarcida	Halisarcidae	*Halisarca*	*dujardini*	A	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Haplosclerida	Callyspongiidae	*Callyspongia*	*stellata*	N	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0
Demospongiae	Haplosclerida	Callyspongiidae	*Callyspongia*	*diffusa*	C1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Demospongiae	Haplosclerida	Chalinidae	*Adocia*	*n. sp. 2 (smooth tough 180)*	C2	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0

*Status: A = non-indigenous (highlighted by shading), C1 = cryptogenic category 1, C2 = cryptogenic category 2, N = native, SI = species indeterminata. See text for details.

Appendix 5a. Results from the diver collections and pile scrapings

Class	Orders	Family	Genus	Species	Berth code	WW																						
					Pile replicate	1													2									
					Pile position	OUT				IN				OUT					IN					OUT				
					*Status	1	2	3	4	1	2	3	MISC	1	2	3	4	MISC	1	2	3	4	MISC	1	2	3	4	MISC
Demospongiae	Haplosclerida	Chalinidae	*Haliclona*	*glabra*	N	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
Demospongiae	Haplosclerida	Chalinidae	*Haliclona*	*cf. punctata*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Demospongiae	Haplosclerida	Chalinidae	*Haliclona*	*cf. isodictyale*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Poecilosclerida	Acarnidae	*Iophon*	*proximum*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0
Demospongiae	Poecilosclerida	Ancinoiidae	*Crella (Pytheas)*	*incrustans*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Demospongiae	Poecilosclerida	Chondropsidae	*Chondropsis*	*kirkii*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Poecilosclerida	Esperiopsidae	*Esperiopsis*	*n. sp. 1 (smooth bubble sponge)*	C2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Demospongiae	Poecilosclerida	Microcionidae	*Clathria (Microciona)*	*coccinea*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Demospongiae	Poecilosclerida	Tedaniidae	*Tedania*	*diversiraphidiophora*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Littorinimorpha	Calyptraeidae	*Sigapatella*	*novaezelandiae*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Gastropoda	Littorinimorpha	Calyptraeidae	*Sigapatella*	*tenuis*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Neogastropoda	Buccinidae	*Buccinulum*	*vittatum*	N	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0
Gastropoda	Nudibranchia	Dendrodorididae	*Dendrodoris*	*citrina*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Gastropoda	Patellogastropoda	Lottiidae	*Asteracmea*	*suteri*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Vetigastropoda	Trochidae	*Trochus*	*viridus*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Aeteidae	*Aetea*	*?australis*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Beaniidae	*Beania*	*n. sp. [whitten]*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Beaniidae	*Beania*	*discodermiae*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Bitectiporidae	*Bitectipora*	*mucronifera*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Buffonellodidae	*Aimulosia*	*marsupium*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Bugulidae	*Bugula*	*flabellata*	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Calloporidae	*Valdemunitella*	*valdemunitella*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Eurystomellidae	*Eurystomella*	*foraminigera*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Hippothoidae	*Celleporella*	*tongima*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Hippothoidae	*Celleporella*	*delta*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Microporellidae	*Microporella*	*agonistes*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Microporellidae	*Fenestrulina*	*n. sp. [Leigh]*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Phidoloporidae	*Rhynchozoon*	*larreyi*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Scrupariidae	*Scruparia*	*ambigua*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Smittinidae	*Smittina*	*torques*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Smittinidae	*Smittina*	*rosacea*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnolaemata	Cheilostomata	Watersiporidae	*Watersipora*	*subtorquata*	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Holothuroidea	Aspidochirotida	Stichopodidae	*Stichopus*	*mollis*	N	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrozoa	Hydroida	Plumulariidae	*Plumularia*	*setacea*	C1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrozoa	Hydroida	Sertulariidae	*Sertularella*	*robusta*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Aoridae	*Haplocheira*	*barbimana*	N	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Aoridae	*Aora*	*typica*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Corophiidae	*Meridiolembos*	*sp.*	SI	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Leucothoidae	*Leucothoe*	*trailli*	N	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Liljeborgiidae	*Liljeborgia*	*hansoni*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Lysianassidae	*Parawaldeckia*	*vesca*	N	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Melitidae	*Melita*	*inaequistylis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Phtisicidae	*Caprellina*	*longicollis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ophiuroidea	Ophiurida	Amphiuridae	*Amphipholis*	*squamata*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Phaeophyceae	Cutleriales	Cutleriaceae	*Microzonia*	*velutina*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaeophyceae	Laminariales	Alariaceae	*Undaria*	*pinnatifida*	A	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
Polychaeta	Eunicida	Dorvilleidae	*Dorvillea*	*australiensis*	N	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Polychaeta	Eunicida	Dorvilleidae	*Schistomeringos*	*loveni*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Polychaeta	Eunicida	Eunicidae	*Lysidice*	*ninetta*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Eunicida	Lumbrineridae	*Lumbrineris*	*sphaerocephala*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0
Polychaeta	Phyllodocida	Hesionidae	*Ophiodromus*	*angustifrons*	N	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	1	1	0	1	0	1	0	0
Polychaeta	Phyllodocida	Nereididae	*Neanthes*	*kerguelensis*	N	1	0	0	0	0	1	1	0	0	0	0	0	1	1	0	1	0	0	0	1	1	1	0
Polychaeta	Phyllodocida	Nereididae	*Nereis*	*falcaria*	N	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Polychaeta	Phyllodocida	Nereididae	*Perinereis*	*amblyodonta*	N	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Nereididae	*Neanthes*	*cricognatha*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Polychaeta	Phyllodocida	Nereididae	*Nereididae*	*indet*	SI	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Status: A = non-indigenous (highlighted by shading), C1 = cryptogenic category 1, C2 = cryptogenic category 2, N = native, SI = species indeterminata. See text for details.

Appendix 5a. Results from the diver collections and pile scrapings

					Berth code	WW																						
					Pile replicate					1									2									
					Pile position	OUT				IN				OUT					IN					OUT				
Class	Orders	Family	Genus	Species	*Status	1	2	3	4	1	2	3	MISC	1	2	3	4	MISC	1	2	3	4	MISC	1	2	3	4	MISC
Polychaeta	Phyllodocida	Nereididae	*Perinereis*	*camiguinoides*	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Phyllodocidae	*Pirakia*	*Pirakia-A*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Polychaeta	Phyllodocida	Phyllodocidae	*Eulalia*	*Eulalia-NIWA-2*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Polychaeta	Phyllodocida	Phyllodocidae	*Eulalia*	*capensis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*polychromus*	N	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidastheniella*	*comma*	N	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Polychaeta	Phyllodocida	Polynoidae	*Polynoidae*	*indet*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Harmothoe*	*macrolepidota*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidastheniella*	*Indet*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotinae*	*Indet*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*Lepidonotus-A*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*banksi*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*fiordlandica*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus*	*jacksoni*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Syllidae	*Eusyllis*	*Eusyllis-D*	SI	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Syllidae	*Haplosyllis*	*spongicola*	N	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Phyllodocida	Syllidae	*Trypanosyllis*	*zebra*	N	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Polychaeta	Sabellida	Sabellidae	*Megalomma*	*suspiciens*	N	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Polychaeta	Sabellida	Serpulidae	*Galeolaria*	*hystrix*	N	1	0	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	1	1	0	0
Polychaeta	Sabellida	Serpulidae	*Romanchella*	*perrieri*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Polychaeta	Sabellida	Serpulidae	*Serpula*	*Serpula-C*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Polychaeta	Sabellida	Serpulidae	*Spirobranchus*	*cariniferus*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Sabellida	Serpulidae	*Serpula*	*Serpula-D*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Sabellida	Serpulidae	*Spirorbinae*	*Indet*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Polychaeta	Scolecida	Orbiniidae	*Scoloplos*	*cylindrifer*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Spionida	Spionidae	*Boccardia*	*Indet*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Spionida	Spionidae	*Dipolydora*	*armata*	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Spionida	Spionidae	*Dipolydora*	*flava*	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Spionida	Spionidae	*Polydora*	*hoplura*	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Terebellida	Acrocirridae	*Acrocirrus*	*trisectus*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0
Polychaeta	Terebellida	Cirratulidae	*Timarete*	*anchylochaetus*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Terebellida	Flabelligeridae	*Flabelligera*	*affinis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Polychaeta	Terebellida	Flabelligeridae	*Pherusa*	*parmata*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Polychaeta	Terebellida	Terebellidae	*Nicolea*	*armilla*	N	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1	1	1	0	0	1	1	1	1	1
Polychaeta	Terebellida	Terebellidae	*Pseudopista*	*rostrata*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1
Polychaeta	Terebellida	Terebellidae	*Terebella*	*Terebella-B*	SI	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	1	0	0
Polychaeta	Terebellida	Terebellidae	*Streblosoma*	*toddae*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
Polychaeta	Terebellida	Terebellidae	*Terebellidae*	*Indet*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta	Terebellida	Terebellidae	*Thelepus*	*extensus*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polyplacophora	Acanthochitonina	Acanthochitonidae	*Cryptoconchus*	*porosus*	N	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1
Polyplacophora	Ischnochitonina	Chitonidae	*Sypharochiton*	*pelliserpentis*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Griffithsia*	*sp.*	SI	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Ceramium*	*apiculatum*	N	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1
Rhodophyceae	Ceramiales	Ceramiaceae	*Griffithsia*	*crassiuscula*	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Ceramium*	*rubrum*	N	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Rhodophyceae	Ceramiales	Ceramiaceae	*Antithamnionella*	*adnata*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Deleseriaceae	*Phycodrys*	*quercifolia*	N	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1	0
Rhodophyceae	Ceramiales	Deleseriaceae	*Myriogramme*	*denticulata*	N	1	1	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0
Rhodophyceae	Ceramiales	Deleseriaceae	*Schizoseris*	*sp*	SI	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
Rhodophyceae	Ceramiales	Deleseriaceae	*Schizoseris*	*griffithsia*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Delesseriaceae	*Schizoseris*	*dichotoma*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Delesseriaceae	*Erythroglossum*	*undulatissimum*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Delesseriaceae	*Phycodrys*	*sp.*	SI	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Ceramiales	Rhodomelaceae	*Polysiphonia*	*sp.*	SI	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Corallinales	Corallinaceae	*Coralline*	*(Melobesia?)*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Gigartinales	Kallymeniaceae	*Callophyllis*	*depressa*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Status: A = non-indigenous (highlighted by shading), C1 = cryptogenic category 1, C2 = cryptogenic category 2, N = native, SI = species indeterminata. See text for details.

Appendix 5a. Results from the diver collections and pile scrapings

					Berth code	WW																						
					Pile replicate	1														2								
					Pile position	OUT				IN				OUT						IN					OUT			
Class	Orders	Family	Genus	Species	*Status	1	2	3	4	1	2	3	MISC	1	2	3	4	MISC		1	2	3	4	MISC	1	2	3	4	MISC
Rhodophyceae	Gigartinales	Kallymeniaceae	*Callophyllis*	*sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Rhodymeniales	Lomentariaceae	*Lomentaria*	*umbellata*	N	0	0	0	0	0	0	0	0	0	0	1	0	0		0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Rhodymeniales	Rhodomeniaceae	*Rhodymenia*	*sp.*	SI	1	0	1	0	0	0	0	0	0	0	0	1	1		0	0	0	0	0	1	1	1	0	1
Rhodophyceae	Rhodymeniales	Rhodomeniaceae	*Rhodymenia*	*linearis*	N	0	1	1	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
Rhodophyceae	Rhodymeniales	Rhodomeniaceae	*Rhodymenia*	*leptophylla*	N	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
Rhodophyceae		Delesseriaceae	*Unidentifiable*	*Delesseriaceae*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	1
Rhodophyceae			*Unidentifiable*	*red*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
Stenolaemata	Cyclostomata	Tubuliporidae	*Tubulipora*	*cf. connata*	N	0	0	0	0	0	0	0	0	0	0	0	0	0		0	1	0	0	0	0	0	0	0	0
Turbellaria	Polycladida		*Indet genus*	*indet sp.*	SI	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0
Ulvophyceae	Ulvales	Ulvaceae	*Ulva*	*sp.*	SI	1	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	0	0	1	1	0	0	0

*Status: A = non-indigenous (highlighted by shading), C1 = cryptogenic category 1, C2 = cryptogenic category 2, N = native, SI = species indeterminata. See text for details.

Appendix 5b. Results from the benthic grab samples

During the survey at the Port of Picton the Grab Sampler was broken and therefore, no samples were taken from this location.

Appendix 5c. Results from the benthic sled samples.

Class	Order	Family	Genus	Species	*Status	Berth code BETWEEN FT1 & WW 1	2	BETWEEN FT2 & FT1 1	2	BETWEEN FT3 & FT2 1	2
Actinopterygii	Perciformes	Gobiesocidae	*Trachelochismus*	*melobesia*	N	0	0	0	1	1	0
Actinopterygii	Perciformes	Plesiopidae	*Acanthoclinus*	*fuscus*	N	0	0	0	0	0	1
Actinopterygii	Perciformes	Trypterigiidae	*Forsterygion*	*lapillum*	N	0	0	0	0	1	0
Actinopterygii	Perciformes	Trypterigiidae	*Grahamina*	*capito*	N	0	0	0	0	0	1
Anthozoa	Actiniaria		*Acontiaria*	*sp.*	SI	0	0	0	1	0	0
Ascidiacea	Phlebobranchia	Rhodosomatidae	*Corella*	*eumyota*	C1	0	0	0	0	0	1
Ascidiacea	Stolidobranchia	Pyuridae	*Pyura*	*cancellata*	N	0	0	0	0	0	1
Ascidiacea	Stolidobranchia	Styelidae	*Cnemidocarpa*	*bicornuta*	N	0	0	0	0	0	1
Asteroidea	Forcipulata	Asteriidae	*Allostichaster*	*insignis*	N	0	0	0	0	1	0
Asteroidea	Valvatida	Asterinidae	*Patiriella*	*regularis*	N	0	0	0	0	1	0
Bivalvia	Myoida	Hiatellidae	*Hiatella*	*arctica*	N	0	0	0	0	0	1
Bivalvia	Mytiloida	Mytilidae	*Modiolarca*	*impacta*	N	0	0	1	0	0	1
Bivalvia	Nuculoida	Nuculidae	*Nucula*	*hartvigiana*	N	1	0	0	0	0	0
Bivalvia	Ostreoida	Anomiidae	*Pododesmus*	*zelandicus*	N	0	0	0	0	0	1
Bivalvia	Ostreoida	Ostreidae	*Ostrea*	*chilensis*	N	0	0	1	1	0	0
Crustacea	Anomura	Porcellanidae	*Petrolisthes*	*elongatus*	N	0	0	0	0	0	1
Crustacea	Caridea	Crangonidae	*Pontophilus*	*hamiltoni*	N	0	0	0	0	0	1
Demospongiae	Halichondrida	Halichondriidae	*Halichondria*	*n. sp. 1 (knubby oxeas 290-380)*	C2	0	0	0	1	0	0
Demospongiae	Haplosclerida	Chalinidae	*Adocia*	*n. sp. 2 (smooth tough 180)*	C2	1	0	0	0	0	0
Demospongiae	Poecilosclerida	Acarnidae	*Iophon*	*proximum*	C1	0	0	0	0	0	1
Demospongiae	Poecilosclerida	Esperiopsidae	*Esperiopsis*	*n. sp. 1 (smooth bubble sponge)*	C2	0	0	1	0	0	0
Echinoidea	Temnopleuroida	Temnopleuridae	*Pseudechinus*	*albocinctus*	N	0	0	0	0	0	1
Gastropoda	Littorinimorpha	Turritellidae	*Maoricolpus*	*roseus*	N	0	0	0	1	0	0
Gastropoda	Neogastropoda	Muricidae	*Xymene*	*pusillus*	N	1	0	0	0	0	0
Gastropoda	Vetigastropoda	Trochidae	*Trochus*	*viridus*	N	0	0	1	1	1	1
Gastropoda	Vetigastropoda	Trochidae	*Trochus*	*tiaratus*	N	1	0	1	0	1	0
Gastropoda	Vetigastropoda	Turbinidae	*Turbo*	*smaragdus*	N	0	0	0	0	0	1
Holothuroidea	Aspidochirotida	Stichopodidae	*Stichopus*	*mollis*	N	0	0	0	0	1	0
Phaeophyceae	Fucales	Sargassaceae	*Sargassum*	*sinclairii*	N	1	0	0	0	0	0
Phaeophyceae			*Unidentifiable*	*brown*	SI	0	1	0	0	0	0
Polychaeta	Phyllodocida	Nereididae	*Neanthes*	*kerguelensis*	N	0	0	0	0	0	1
Polychaeta	Phyllodocida	Nereididae	*Nereis*	*falcaria*	N	0	0	0	0	0	1
Polyplacophora	Ischnochitonina	Chitonidae	*Rhyssoplax*	*aerea*	N	0	0	0	1	0	1
Rhodophyceae	Ceramiales	Ceramiaceae	*Ceramium*	*rubrum*	N	0	0	0	1	0	0
Rhodophyceae	Gigartinales	Cystocloniaceae	*Craspedocarpus*	*erosus*	N	0	0	0	0	0	1
Rhodophyceae	Gigartinales	Kallymeniaceae	*Callophyllis*	*depressa*	N	0	0	0	0	0	1
Rhodophyceae	Rhodymeniales	Rhodomeniaceae	*Rhodymenia*	*sp.*	SI	0	0	0	1	1	0

*Status: A = non-indigenous (highlighted by shading), N = native, C! = cryptogenic category 1, C2 = cryptogenic category 2, SI = species indeterminata. See text for details.

Appendix 5d. Results from the dinoflagellate cyst core samples.

				Berth code		1	2	3	4	5	6
Class	Order	Family	Genus	Species	*Status	1	2	3	4	5	6
Dinophyceae	Peridiniales	Gonyaulacaceae	*Gonyaulax*	*grindleyi*	N	0	1	0	1	0	0
Dinophyceae	Peridiniales	Gonyaulacaceae	*Gonyaulax*	*spinifera*	N	0	1	1	0	0	0
Dinophyceae	Peridiniales	Peridiniaceae	*Lingulodinium*	*polyedrum*	N	0	1	1	1	1	0
Dinophyceae	Peridiniales	Peridiniaceae	*Protoperidinium*	*sp.*	N	0	1	0	0	0	1
Dinophyceae	Peridiniales	Peridiniaceae	*Scrippsiella*	*trochoidea*	N	1	1	0	0	0	0
Dinophyceae	Peridiniales	Peridiniaceae	*Protoperidinium*	*conicum*	N	0	0	1	0	0	0

*Status: A = non-indigenous (highlighted by shading), N = native, C1 = cryptogenic category 1, C2 = cryptogenic category 2, SI = species indeterminata. See text for details.

Appendix 5e. Results from the fish trap samples.

				Berth code	FT2				FT3				WW							
				Line No.			2		1		2		1		2		3		4	
Class	Order	Family	Genus	Species	*Status	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Actinopterygii	Perciformes	Labridae	*Notolabrus*	*celidotus*	N	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Actinopterygii	Perciformes	Trypterigiidae	*Grahamina*	*gymnota*	N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Asteroidea	Valvatida	Asterinidae	*Patiriella*	*regularis*	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Brachyura	Majidae	*Notomithrax*	*minor*	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Status: A = non-indigenous (highlighted by shading), N = native, C1 = cryptogenic category 1, C2 = cryptogenic category 2, SI = species indeterminata. See text for details.

Appendix 5f. Results from the crab trap samples.

					Berth code	FT2						FT3						WW						
					Line no.			2		3		1		2		3		1		2		3		
Class	Order	Family	Genus	Species	*Status	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	Total
Actinopterygii	Anguilliformes	Anguillidae	*Anguilla*	*dieffenbachii*	N	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Actinopterygii	Gadiformes	Moridae	*Pseudophycis*	*bachus*	N	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Actinopterygii	Perciformes	Labridae	*Notolabrus*	*celidotus*	N	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	16
Asteroidea	Valvatida	Asterinidae	*Patiriella*	*regularis*	N	1	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	8
Cephalopoda	Octopoda	Octopodidae	*Octopus*	*maorum*	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Crustacea	Anomura	Paguidae	*Pagurus*	*traversi*	N	1	1	1	1	0	1	0	0	0	0	0	0	1	1	1	0	0	0	8

*Status: A = non-indigenous (highlighted by shading), N = native, C1 = cryptogenic category 1, C2 = cryptogenic category 2, SI = species indeterminata. See text for details.

Appendix 5g. Results from the starfish trap samples.

					Berth code	FT2								FT3								WW							
					Line No.	1		2		3				1		2		3				1		2		3			
Class	Order	Family	Genus	Species	*Status	1	2	1	2	1	2	3	4	1	2	1	2	1	2	3	4	1	2	1	2	1	2	3	4
Actinoptery	Perciformes	Labridae	Notolabrus	celidotus	N	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteroidea	Valvatida	Asterinidae	Patiriella	regularis	N	1	1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
Crustacea	Anomura	Paguidae	Pagurus	traversi	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
Crustacea	Brachyura	Cancridae	Cancer	novaezelanc	N	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crustacea	Brachyura	Majidae	Notomithra›	minor	N	0	1	1	0	0	1	0	0	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0
Gastropoda	Neogastrop	Buccinidae	Cominella	adspersa	N	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostrac	Isopoda	Cirolanidae	Natatolana	rossi	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

*Status: A = non-indigenous (highlighted by shading), N = native, C1 = cryptogenic category 1, C2 = cryptogenic category 2, SI = species indeterminata. See text for details.

Appendix 5h. Results from the shrimp trap samples.

					Berth code	FT2								FT3					WW							
					Line No.	1		2		3				1		2		3	1		2		3			
Class	Order	Family	Genus	Species	*Status	1	2	1	2	1	2	3	4	1	2	1	2	1	1	2	1	2	1	2	3	4
Malacostraca	Isopoda	Cirolanidae	*Natatolana*	*rossi*	N	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	1

*Status: A = non-indigenous (highlighted by shading), N = native, C1 = cryptogenic category 1, C2 = cryptogenic category 2, SI = species indeterminata. See text for details.

Addendum

After completing these reports we were advised of changes in the identification of one species. The ascidian *Cnemidocarpa sp*. refered to in this report as a new introduction to New Zealand has been revised to *Cnemidocarpa nisiotus* (status: native).